

3. Scientific Council Advice of its own accord

a) Witch flounder in Divisions 3NO






Recommendation for 2021 and 2022





There is more than a 10% probability of the stock being below B_{lim} in 2021 (11%). For 2022 and 2023 this probability ranges from 7% to 11% for scenarios with fishing mortality greater than zero. Advice is provided in the context of the NAFO Precautionary Approach framework which specifies that there should be a very low probability of being below B_{lim} .

SC considers that there is not sufficient evidence that the stock would be able to sustain a fishery at this time and recommends that there be no directed fishing in 2021 and 2022.

Management objectives

The Commission adopted a total allowable catch (TAC) of 1 175 tonnes for 2020 and 2021. Convention General Principles are applied.

<i>Convention General Principles</i>	<i>Status</i>	<i>Comment/consideration</i>
Restore to or maintain at B_{msy}		Probability of $B_{2020} < B_{msy} = 97\%$
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

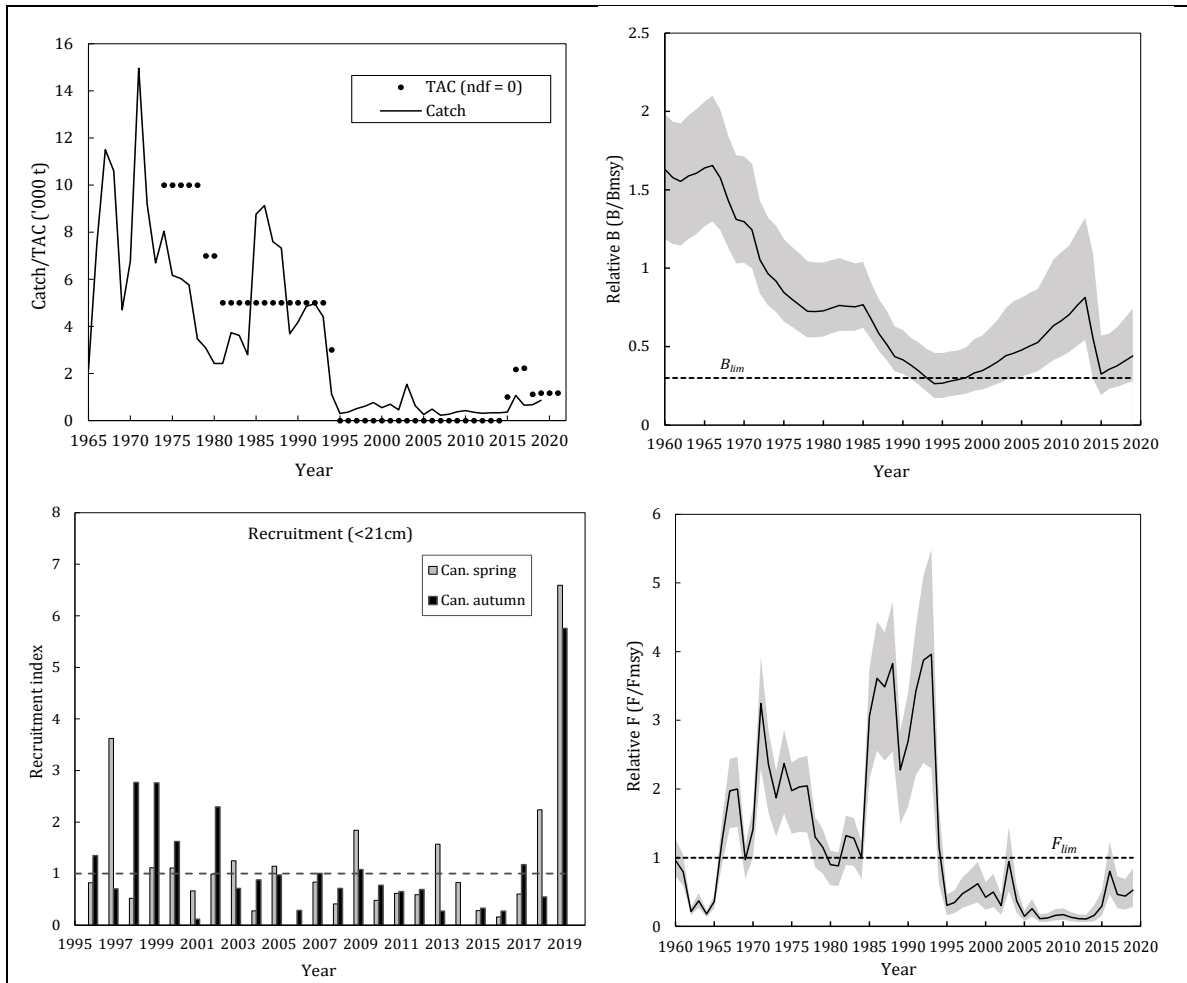
Management unit

The management unit is NAFO Divisions 3NO. The stock mainly occurs in Div. 30 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 size increased from 1994 to 2013, then declined during 2013-2015 and has since increased slightly. In 2020 the stock is at 44% B_{msy} (59 880 tonnes). There is 14% risk of the stock being below B_{lim} and a 4% risk of F being above F_{lim} ($F_{msy}=0.063$). With the exception of the growth of the stock following improved recruitment in the late 1990s, it is unclear if the recruitment index is representative. Nevertheless, the recruitment index in 2019 is the highest in the time series.





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 2020 is 16% at a catch of 1 175 tonnes (TAC 2020). The probability of F being above F_{lim} ranged from 2% to 50% for the catch scenarios tested. The population is projected to grow under all scenarios and the probability that the biomass in 2023 is greater than the biomass in 2020 is greater than 60% in all scenarios. The population is projected to remain below B_{msy} through to the beginning of 2023 for all levels of F examined with a probability of greater than 88%. The probability of projected biomass being below B_{lim} by 2023 was 7% to 11% in all catch scenarios examined and was 4% by 2023 in the $F=0$ scenario.

A second set of projections assuming that the catch in both 2020 and 2021 was equal to the adopted TAC (1 175 tonnes) was also conducted. The probability of projected biomass being below B_{lim} by 2023 was 8% to 10% in all catch scenarios examined and was 7% by 2023 in the $F=0$ scenario.

Projected yield (tonnes) and the risk of $F > F_{lim}$, $B < B_{lim}$ and $B < B_{msy}$ and probability of stock growth ($B_{2023} > B_{2020}$) under projected F values of $F=0$, F_{2019} , $2/3 F_{msy}$, $85\% F_{msy}$, and F_{msy} , and two levels of catch (800 tonnes and 1 175 tonnes), for the two sets of projections, are presented in the following tables.

Projections with catch in 2020 = TAC (1 175 t)		
Year	Yield (t) median	Projected relative Biomass(B/B_{msy}) median (80% CL)
F_0		
2021	0	0.49 (0.30, 0.89)
2022	0	0.53 (0.32, 0.97)
2023		0.58 (0.35, 1.06)
<i>Catch 800 t</i>		
2021	800	0.49 (0.30, 0.90)
2022	800	0.52 (0.31, 0.97)
2023		0.54 (0.31, 1.03)
$F_{2019} = 0.033$		
2021	957	0.49 (0.30, 0.89)
2022	1011	0.52 (0.31, 0.96)
2023		0.55 (0.32, 1.03)
<i>Catch 1 175t</i>		
2021	1175	0.49 (0.30, 0.90)
2022	1175	0.52 (0.31, 0.97)
2023		0.54 (0.31, 1.03)
$2/3 F_{msy} = 0.042$		
2021	1212	0.49 (0.29, 0.89)
2022	1281	0.51 (0.30, 0.96)
2023		0.54 (0.31, 1.02)
$85\% F_{msy} = 0.054$		
2021	1554	0.49 (0.30, 0.89)
2022	1615	0.51 (0.30, 0.95)
2023		0.53 (0.30, 1.01)
$F_{msy} = 0.063$		
2021	1823	0.49 (0.30, 0.88)
2022	1879	0.50 (0.29, 0.94)
2023		0.52 (0.29, 0.99)

Projections with catch in 2020 and 2021 = TAC (1 175t)		
Year	Yield (t) median	Projected relative Biomass(B/B_{msy}) median (80% CL)
F_0		
2021	1175	0.49 (0.30, 0.89)
2022	0	0.52 (0.31, 0.96)
2023		0.56 (0.33, 1.05)
<i>Catch 800 t</i>		
2021	1175	0.49 (0.30, 0.89)
2022	800	0.52 (0.31, 0.96)
2023		0.56 (0.33, 1.04)
$F_{2019} = 0.033$		
2021	1175	0.49 (0.30, 0.89)
2022	1006	0.52 (0.31, 0.96)
2023		0.55 (0.32, 1.03)
<i>Catch 1 175t</i>		
2021	1175	0.49 (0.30, 0.90)
2022	1175	0.52 (0.31, 0.97)
2023		0.54 (0.31, 1.03)
$2/3 F_{msy} = 0.042$		
2021	1175	0.49 (0.30, 0.89)
2022	1285	0.52 (0.31, 0.96)
2023		0.54 (0.31, 1.02)
$85\% F_{msy} = 0.054$		
2021	1175	0.49 (0.30, 0.89)
2022	1638	0.52 (0.31, 0.96)
2023		0.54 (0.31, 1.01)
$F_{msy} = 0.063$		
2021	1175	0.49 (0.30, 0.89)
2022	1928	0.52 (0.31, 0.96)
2023		0.53 (0.30, 1.01)

Catch 2020=1 175 t	Yield (t)		$P(F > F_{lim})$		$P(B < B_{lim})$			$P(B < B_{msy})$			$P(B_{2023} > B_{2020})$
	2021	2022	2021	2022	2021	2022	2023	2021	2022	2023	
F_0	0	0	0%	0%	11%	7%	4%	93%	91%	88%	74%
Catch ₂₀₂₁ & Catch ₂₀₂₂ =800t	800	800	2%	2%	11%	9%	7%	93%	91%	89%	68%
$F_{2019} = 0.033$	957	1011	6%	7%	11%	9%	8%	93%	91%	89%	67%
Catch ₂₀₂₁ & Catch ₂₀₂₂ = 1 175t	1175	1175	15%	13%	11%	9%	8%	93%	91%	89%	65%
$2/3 F_{msy} = 0.042$	1212	1281	17%	18%	11%	10%	9%	93%	91%	89%	66%
$85\% F_{msy} = 0.054$	1554	1615	35%	36%	11%	10%	10%	93%	91%	90%	63%
$F_{msy} = 0.063$	1823	1879	50%	50%	11%	11%	11%	93%	92%	90%	61%

Catch 2020 and 2021= 1 175 t	Yield (t)		$P(F > F_{lim})$		$P(B < B_{lim})$			$P(B < B_{msy})$			$P(B_{2023} > B_{2020})$
	2021	2022	2021	2022	2021	2022	2023	2021	2022	2023	
F_0	1175	0	15%	0%	11%	9%	7%	93%	91%	88%	70%
Catch ₂₀₂₂ =800t	1175	800	15%	2%	11%	9%	8%	93%	91%	89%	67%
$F_{2019} = 0.033$	1175	1006	15%	7%	11%	9%	8%	93%	91%	89%	66%
Catch ₂₀₂₁ & Catch ₂₀₂₂ = 1 175t	1175	1175	15%	13%	11%	9%	8%	93%	91%	89%	65%
$2/3 F_{msy} = 0.042$	1175	1285	15%	18%	11%	9%	9%	93%	91%	89%	65%
$85\% F_{msy} = 0.054$	1175	1638	15%	36%	11%	9%	9%	93%	91%	89%	64%
$F_{msy} = 0.063$	1175	1928	15%	50%	11%	9%	10%	93%	91%	90%	63%



Assessment

This stock is assessed utilizing a surplus production model in a Bayesian framework. Full assessments were conducted in 2017, 2018 and 2019. Due to workload issues and the schedule of stocks assessed on a multi-year basis, which would create considerable difficulties for assessing the stock in 2021, a full assessment was conducted in 2020 by SC of its own accord.

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

The next assessment is planned for 2022.

Human impact

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

Biological and environmental interactions

Witch flounder in NAFO Divs. 3NO are distributed mainly along the tail and southwestern slopes of the Grand Bank. The Southern Grand Bank (3NO) EPU is currently experiencing low productivity conditions and biomass has declined across multiple trophic levels and stocks since 2014.

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 ('000 tonnes) are:

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
TAC	ndf	ndf	ndf	ndf	1.0	2.2	2.2	1.1	1.2	1.2
STATLANT 21	0.4	0.3	0.3	0.3	0.4	1.0	0.6	0.6	0.9	
STACFIS	0.4	0.3	0.3	0.3	0.4	1.1	0.7	0.7	0.9	

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

Sources of Information

SCR 20/002, 20/009, 20/046; SCS 20/06, 20/07, 20/09, 20/11, 20/13