

Redfish (*Sebastes mentella* and *Sebastes fasciatus*) in Division 3M Advice June 2023 for 2024







Recommendation for 2024


Some instability in the assessment results compared to previous assessments was evident. SC was not able to resolve the reason for this retrospective pattern and this adds uncertainty to the projection results.


Given the uncertainty in the projections, this stock will be reassessed in 2024, and therefore SC is providing advice for only one year. The TAC corresponding to a fishing mortality of $F_{0.1}$ would be 21 888 t in 2024. However, SC advises that fishing mortality be kept at the current level, corresponding to a TAC of 17 503 t in 2024.


Management objectives


No explicit management plan or management objectives defined by Fisheries Commission. Convention General Principles are applied (NAFO GC Doc. 07-04).

Convention Principle	Status	Comment
Restore to or maintain at Bmsy		Bmsy and Blim undefined, B above the time series average
Eliminate Overfishing (Stock)		Flim undefined, F is low
Eliminate Overfishing (Ecosystem)		Total EPU catches < 2TCI
Apply Precautionary Approach		No reference points defined
Minimize harmful impacts on living marine resources and ecosystems		Directed fishery, VME closures in effect, Effectiveness of bycatch regulations uncertain
Preserve marine biodiversity		Cannot be evaluated

 OK

 Intermediate

 Not accomplished

 Unknown

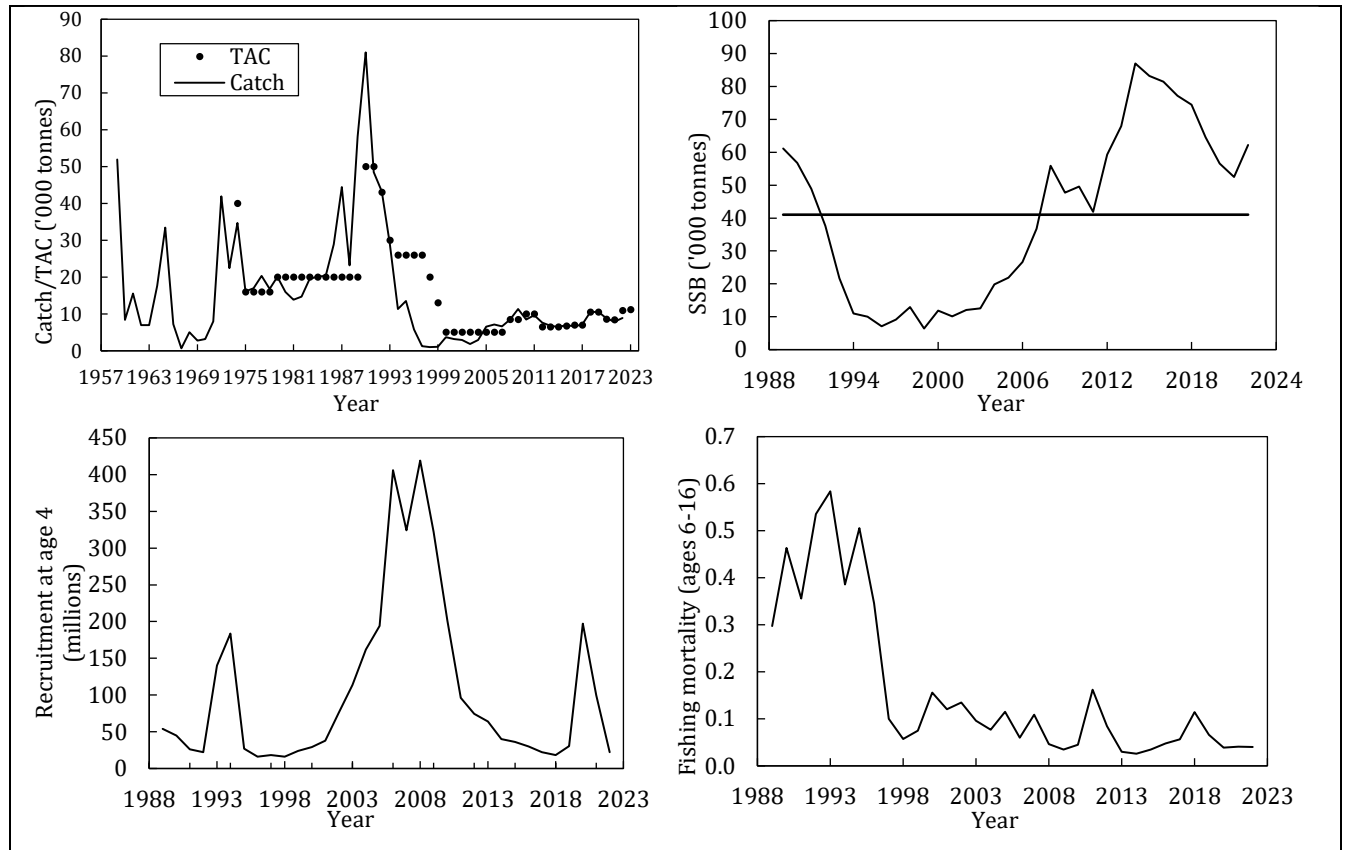
Management unit

Catches of redfish in Div. 3M include three species of the genus *Sebastes*; *S. mentella*, *S. norvegicus* (= *S. marinus*) and *S. fasciatus*. For management purposes, they are treated as one stock. The assessment and advice are based on data for only two species (*S. mentella* & *S. fasciatus*), labeled as beaked redfish. The TAC advice is adjusted to reflect all three species on the Flemish Cap, based upon the relative species distribution in recent surveys.

Stock status

SSB has declined since 2014, but in 2022 is still well above the long term mean. After an extended period of declining recruitment, the recruitment estimates for 2020 and 2021 are at or above the mean while the 2022 value is low. Fishing mortality remains relatively low compared to the 1980s and 1990s.





Reference points

No reference points have been defined.

Assessment

Input data comes from the EU Flemish Cap bottom trawl survey and the fishery. A quantitative model (XSA) introduced in 2003 was used. Increased natural mortality was assumed from 2006 to 2010, but natural mortality was low (more typical of redfish) in other years. There is no evidence that natural mortality has increased recently from the level of 0.1 adopted in the 2017 assessment, and therefore, the 2023 XSA assessment was run with average M from 2015 onwards fixed at 0.1.

The next full assessment of this stock will be in 2024.

Projections

Short term (2024-2026) stochastic projections were carried out for female spawning stock biomass (SSB) and catch, under the most recent level of natural mortality and considering six options for fishing mortality and catch levels (F_0 , $F_{0.1}$, $F=M$, $F_{statusquo}$, 1.25 TAC and 0.75 TAC). Projections assume that redfish catches (all species) in 2023 are equal to the redfish TAC ($F_{statusquo}$ is defined as the corresponding F). Recruitment entering in 2023 to 2025 is given by the geometric mean of the 2017-2019 recruitments (age 4 XSA).

The assessment has had a consistent tendency to underestimate stock size (both SSB and 4+ biomass) for the last five years. Since the previous assessment in 2021 the fishable biomass series has therefore been revised upwards and in addition this component of the stock has increased since 2021. The potential yields estimated in the projections are therefore also more optimistic than seen in the 2021 assessment. STACFIS was not able to resolve the reason for this retrospective pattern, and this adds uncertainty to the projection results. SSB is projected to decline under all projection scenarios, with the exception of the $F=0$ scenario, and to be at around the average for the assessment time-series (since the late 1980s) by 2026.

F=0

Year	SSB Median and 80% CI	Yield	TAC
2023 _{deterministic}	59314	10937	11171
2024	55090 (49792 - 63774)	0	0
2025	57333 (51786 - 66352)		
2026	58901 (52905 - 68977)		

F_{0.1}=0.0635

Year	SSB Median and 80% CI	Yield	TAC
2023 _{deterministic}	59314	10937	11171
2024	55090 (49792 - 63774)	20243	21888
2025	50045 (45230 - 57911)		
2026	45495 (40633 - 53368)		

F=M=0.1

Year	SSB Median and 80% CI	Yield	TAC
2023 _{deterministic}	59314	10937	11171
2024	55090 (49792 - 63774)	30510	32988
2025	46450 (41969 - 53691)		
2026	39584 (35278 - 46516)		

Fsq= 0.0500

Year	SSB Median and 80% CI	Yield	TAC
2023 _{deterministic}	59314	10937	11171
2024	55090 (49792 - 63774)	16188	17503
2025	51496 (46584 - 59550)		
2026	48009 (42944 - 56417)		

1.25 TAC (F= 0.039355)

Year	SSB Median and 80% CI	Yield	TAC
2021 _{deterministic}	59314	10937	11171
2024	55090 (49792 - 63774)	12915	13964
2025	52661 (47650 - 60824)		
2026	50096 (44840 - 58802)		

0.75 TAC (F=0.0231331)

Year	SSB Median and 80% CI	Yield	TAC
2023 _{deterministic}	59314	10937	11171
2024	55090 (49792 - 63774)	7749	8378
2025	54502 (49317 - 63022)		
2026	53524 (48040 - 62834)		

average beaked redfish proportion in the 2020-2022 3M redfish catch

0.925

	F _{0.1}	F=M	Fsq	1.25 TAC	0.75 TAC
P(SSB ₂₀₂₄ >SSB ₂₀₂₃)	<10%	<10%	<10%	<10%	<10%
P(SSB ₂₀₂₅ >SSB ₂₀₂₃)	<10%	<10%	>10%	>10%	>10%
P(SSB ₂₀₂₆ >SSB ₂₀₂₃)	<10%	<10%	<10%	<10%	>10%



Human impact

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

Biology and Environmental Interactions

Shrimp and cod are important prey and predator of redfish. There are strong trophic interactions between these species in the Flemish Cap.

The Flemish Cap (3M) Ecosystem Production Unit (EPU) has not experienced sustained reductions in overall productivity observed in other EPUs. With the exception of a short-lived increase in 2005-2009, total EPU biomass has remained fairly stable over time despite the changes in individual stocks.

Ecosystem sustainability of catches

The impact of bottom fishing activities on 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. A number of areas in the Flemish Cap (3M) EPU have been closed to bottom fishing to protect VMEs.

3M redfish is included in the piscivores guild of the Flemish Cap (3M) Ecosystem Production Unit (EPU). Other NAFO managed stocks in this guild and EPU are 3M cod and 2+3KLMNOPs Greenland halibut. The Catch/TCI is below the 2TCI ecosystem reference point (3M Piscivore Catch₂₀₂₂/TCI=0.98) indicating a low risk of ecosystem overfishing.

Fishery

Redfish is caught in directed bottom trawl fisheries at intermediate depths (300-700m), but also as bycatch in fisheries directed for cod and Greenland halibut. The fishery in NAFO Div. 3M is regulated by minimum mesh size and quota.

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

	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
TAC	6.5	6.7	7.0	7.0	10.5	10.5	8.6	8.4	10.9	11.2
STATLANT 21	6.4	6.9	6.6	7.1	10.5	10.5	8.6	8.6	NA*	
STACFIS Total catch ¹	7.4	6.9	6.6	7.1	10.5	10.6	8.8	8.3	10.0	
STACFIS Catch ²	4.6	5.2	6.2	6.9	10.3	10.2	8.7	7.9	8.9	

¹ STACFIS total catch on 2011-2014 based on the average 2006-2010 bias.

² STACFIS beaked redfish catch estimate, based on beaked redfish proportions on observed catch.

* STATLANT 21a data for 2022 were not yet available at the time of writing

Sources of information: SCR Doc. 23/003, 040; 21/34, SCS Doc. 23/06, 13; 22/06,13; 21/05,06