Northwest Atlantic Fisheries Organization

Serial No. N7363 **NAFO SCS Doc. 22/22**

SCIENTIFIC COUNCIL MEETING – 19 - 23 SEPTEMBER 2022

Recommended Citation:

NAFO. 2022. Report of the Scientific Council, 19 - 23 September 2022, Porto, Portugal. NAFO SCS Doc. 22/22.

REPORT OF SCIENTIFIC COUNCIL MEETING

19-23 September 2022

Chair: Karen Dwyer Rapporteur: Tom Blasdale

I. PLENARY SESSIONS

The Scientific Council (SC) and its Standing Committees met at the Palácio da Bolsa, Porto, with additional participants joining the meeting by Webex, from 19 to 23 September 2022 to consider the various matters in its agenda. Representatives attended from Canada, Denmark (in respect of the Faroes and Greenland), the European Union, France (in respect of St. Pierre et Miquelon), Japan, Norway, the Russian Federation, Ukraine, the United Kingdom and the United States of America. The Executive Secretary, Scientific Council Coordinator and other members of the Secretariat were in attendance. Anthony Thompson (FAO) attended the meeting as an observer.

The Executive Committee met prior to the opening session of the Council to discuss the provisional agenda and plan of work.

The Council was called to order at 10:00 on 19 September 2022. The provisional agenda was **adopted** and the Scientific Council Coordinator was appointed the rapporteur. The opening session was adjourned at 13:00 on 19 September 2022.

The final session was called to order at 09:00 on 23 September 2022. The Council considered and adopted the reports of the STACREC and STACFIS Standing Committees and agreed that the report of this meeting would be finalized by correspondence. The meeting was adjourned at 16:00 on 23 September 2022.

The Agenda, List of Summary (SCS) Documents, and List of Representatives, Advisers and Experts, are given in Appendices III-V.

The Council's considerations on the Standing Committee Reports and other matters addressed by the Council follow in Sections II-X.

II. REVIEW OF SCIENTIFIC COUNCIL RECOMMENDATIONS

There were no Scientific Council recommendation requiring immediate attention at this meeting. A detailed review of recommendations was deferred to the June 2023 meeting.

III. JOINT SESSION OF COMMISSION AND SCIENTIFIC COUNCIL

The Commission and Scientific Council met in joint sessions on 20 September to discuss the 2018 NAFO performance review, the Scientific Council's response to requests for advice from the Commission, the reports of the joint SC/Commission Working Groups and other matters of common interest.

1. Presentation of scientific advice by the Chair of the Scientific Council

a) Response of the Scientific Council to the Commission's request for scientific advice

The Chair of the Scientific Council, presented this year's scientific advice. The advice represents the response of Scientific Council to the request from the Commission (COM Doc. 22-16). The scientific advice on fish stocks and on other topics were formulated mainly during the Scientific Council meeting in June 2022 (SCS Doc. 22-18), except for the shrimp stocks in 3M, which was formulated during the SC shrimp assessment meeting, 12-16 September 2022 (SCS Doc 22/21) and for squid (*Illex illecebrosus*) in Subarea 3+4 which was formulated at this meeting.

The advice relating to risk-based management strategies (e.g. 2+3KLMNO Greenland halibut and 3LN redfish management strategy evaluation (MSE) processes and revision of the Precautionary Approach Framework (PAF)) and ecosystem approach to fisheries management (e.g. Vulnerable Marine Ecosystems (VME), Significant Adverse Impact (SAI), Total Catch Indices (TCI), SC Roadmap Tier 2, was taken on by Working Groups at their subsequent meetings (see items 2.b-c below).

A summary of the Scientific Council advice on fish stocks in which the Commission took management actions at this meeting is presented in the table below. The detailed advice and responses to the Commission requests are contained in the above-mentioned documents.

Fish Stock	*Scientific Council Advice (from SCS Doc 22-18)*
Cod in Div. 3M	Yield corresponding to F less than or equal to 3/4 F_{lim} in 2023 results in a very low probability (≤10%) of SSB being below B_{lim} in 2024 and a very low probability (≤10%) of exceeding F_{lim}. However, given the present level of the SSB and projected decline of total biomass under any fishing scenario, in order to promote growth in SSB with more than 60% probability, Scientific Council advises scenarios with F no more than $F_{statusquo}$.
Pelagic Sebastes mentella (oceanic redfish) in Subarea 2 + Division 1F and 3K	ICES has advised that when the precautionary approach is applied, there should be zero catch in each of the years 2022, 2023, and 2024. Scientific Council **endorsed** the conclusions of both the ICES assessment results and its advice.
Shrimp in Div. 3M	To be consistent with the NAFO precautionary approach, Scientific Council advises that no directed fishery should occur in 2023.
Redfish in Divisions 3LN	Scientific Council advises that catches should not exceed their current level of 11 500 tonnes (the mean of the last 5 years).
Redfish in Division 3O	The stock is below an interim survey-based proxy for B_{MSY} but above the limit reference point (B_{lim} =0.3$_{MSY}$-proxy) with a probability >99%. There is insufficient information on which to base predictions of annual yield potential. Catches have averaged about 9 000 tonnes over the period used for the MSY proxy calculation (1991 -2021). Scientific Council is unable to advise on an appropriate TAC for 2023, 2024 and 2025.
Witch Flounder in Divisions 3NO	Scientific Council therefore recommends that F should be no higher than 2/3 F_{MSY}.
Thorny skate in Divisions 3LNO	The stock has been stable at recent catch levels in Div. 3LNO (approximately 3 710 tonnes, 2017 - 2021) however, given the low resilience to fishing mortality and higher historic stock levels, Scientific Council advises no increase in catches.
Greenland halibut in Subarea 2 and Divisions 3KLMNO	Scientific Council advises that Exceptional Circumstances are not occurring. Therefore, the TAC for 2023 derived from the HCR is 15 156 tonnes. This is 5% lower than the 2022 TAC (15 864 t).
Northern shortfin squid in Subareas 3+4	Scientific Council advises catches between 19 000 and 34 000 tonnes per year (two proxies for Flim, the potential yield which the northern stock component may be able to sustain under a low productivity regime).

b) Feedback to the Scientific Council regarding the advice and its work during this meeting

Feedback questions from Contracting Parties arising from scientific advice were vetted and forwarded to Scientific Council for further clarification at this meeting. The questions pertain to stocks 3M cod, 3M shrimp and 3NO witch flounder. There was also a follow-up question pertaining to the advice on TCI (Total Catch Index). The feedback questions from the Commission and SC responses to these questions are presented in section VI.

c) Other issues as determined by the Chairs of the Commission and the Scientific Council

The Scientific Council Chair re-iterated the issue of the Scientific Council workload, which was previously brought up at the meetings of WG-EAFFM and WG-RBMS. The situation is not sustainable. Document SCS 22-05 *Scientific Council 5-year Plan 2022* was recalled highlighting the heavy workload, including among others, the work on the revision of the Precautionary Approach Framework (PAF), the development of the Ecosystem Approach to Fisheries Management (EAF), identification of Vulnerable Marine Ecosystems (VMEs), the determination of Significant Adverse Impact (SAI) to VMEs due to bottom fishing, Management Strategy Evaluations of certain fish stocks (MSE), and the resource gaps in completing the work.

The Commission acknowledged the heavy workload of the Scientific Council is mainly due to the increasing number of requests for advice in the past several years. Accommodating the requests for scientific advice has now required a diverse field of expertise. Additional human resources and support from the Commission are needed.

It was agreed that a joint informal group will be formed to reflect on the problem and explore possible short- and long-term solutions. While there seems to be no simple solution, possibilities to be explored by the group include, but are not limited to, cooperation with other international organizations, additional support of Contracting Parties on science, and identification of resources. Prioritization of tasks and data sharing issues should also be considered. The Chairs of the Commission, Scientific Council, STACFAD, WG-EAFFM and WG-RBMS will constitute this informal group. The group is expected to meet intersessionally and will report and present proposals, including budgetary implications, to the Commission and Scientific Council at the next Annual Meeting.

2. Presentation of the reports and recommendations of the joint Commission–Scientific Council Working Groups

a) Joint Commission–Scientific Council Working Group on Improving Efficiency of NAFO Working Group Process (E-WG), February 2022

The acting Commission Chair referred to COM-SC Working Paper 22-03, which is the recommendation from the Joint Commission-Scientific Council Efficiency Working Group. The Working Group recommended three (3) two-week periods where intersessional meetings by STACTIC and other Working Groups may be held, namely:

- 21 February to 03 March 2023,
- 24 April to 05 May 2023, and
- 17 to 28 July 2023.

Contracting Parties are not obliged to schedule meetings during these periods, but these dates may help in future planning of intersessional meetings. Canada noted that the Seafood Expo Global is scheduled for the week of 24 April 2023.

The recommendations of the Working Group were adopted by the Commission, which also agreed that this Working Group continue in 2023 under the same terms of reference.

b) Joint Commission–Scientific Council Working Group on Risk-based Management Strategies (WG-RBMS), August 2022

The co-Chairs, Fernando González -Costas (European Union) and Ray Walsh (Canada) presented the August 2022 meeting report (Com-SC Doc. 22-04) and the recommendations.

Key items discussed at the Working Group include, among others:

- Review of the Precautionary Approach Framework,
- MSE process and timeline for 3LN Redfish,
- MSE process and timeline for 2+3KLMNO Greenland halibut.

The recommendations of WG-RBMS were adopted by the Commission.

c) Joint Commission–Scientific Council Working Group on Ecosystems Approach Framework to Fisheries Management (WG-EAFFM), August 2022

The co-Chair, Elizabethann Mencher (USA), presented the August 2022 meeting report (Com SC-Doc. 22-02) and the recommendations.

Key items discussed at the Working Group include, among others:

- VME Assessments,
- Ecosystem Roadmap and the Total Catch Index (TCI),
- Review of Chapter II of the NAFO CEM.

All recommendations, except recommendations 3, 6, and 8, were adopted by the Commission at this joint session.

Some Contracting Parties expressed concerns about the three recommendations which pertain to the Ecosystem Roadmap, specifically the application of the TCI to the ecosystem approach to fisheries management. Feedback questions pertaining to TCI were forwarded to Scientific Council for further clarification (see section VI).

d) Joint Commission–Scientific Council Catch Estimation Strategy Advisory Group (CESAG), April 2022

The acting Chair, concurrently the co-Chair of this advisory group, reported that the 2021 catch estimates conducted by the Secretariat were forwarded to Scientific Council in late April 2022 following the usual timeline of catch estimates provision.

The 2021 catch estimates were reviewed by the group by correspondence, whereas in the previous years the review was conducted in an online meeting. For the next cycle of the catch provision (2022 catch estimates), it is intended that the review will be made by correspondence unless new issues (e.g., revision of the *Catch Estimation Strategy*) emerge that would warrant a meeting.

3. Formulation of Request to the Scientific Council for Scientific Advice on the Management in 2024 and Beyond of Certain Stocks in Subareas 2, 3, 4, 6 and Other Matters

In accordance with the procedure outlined in FC Doc. 12-26, a steering committee was formed to assist in the drafting of the Commission Request. The committee consisted of the Scientific Council Coordinator and representatives from Canada and European Union.

The Request, developed with the assistance of the committee, was adopted (COM WP 22-48 Rev. 6) by the Commission. The Commission agreed that items 1, 2, 4 and 7 should be the priority for the June 2023 Scientific Council meeting subject to resources and COVID-related restrictions.

IV. RESEARCH COORDINATION

The Council adopted the Report of the Standing Committee on Research Coordination (STACREC) as presented by the Chair, Diana González-Troncoso. The full report of STACREC is in Appendix I.

V. FISHERIES SCIENCE

The Council adopted the Report of the Standing Committee on Fisheries Science (STACFIS) as presented by the Chair, Mark Simpson. The full report of STACFIS is at Appendix II.

VI. REQUESTS FROM THE COMMISSION

1. Requests deferred from the June Meeting

a) Northern shortfin squid in Subareas 3+4

Scientific Council responded:

Northern shortfin squid in Subareas 3+4 **Advice in September 2022 for 2023 - 2025**

Recommendation for 2023 – 2025

Although the primary stock indices for Div. 4VWX were not available during 2021 and 2022, the 2022 biomass indices for both Divs. 3NO and Div. 3M EU summer surveys were near the lowest levels of their respective time series, suggesting that the stock has returned to a low productivity state.

SC advises catches between 19 000 and 34 000 tonnes per year (two proxies for F_{lim}, the potential yield which the northern stock component may be able to sustain under a low productivity regime).

Management objectives

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

Convention General Principles	*Status*	*Comment/consideration*
Restore to or maintain at B_{msy}	○	B_{msy} inappropriate given life history
Eliminate overfishing	○	Not quantifiable
Apply Precautionary Approach	●	Reference points based on productivity level
Minimize harmful impacts on living marine resources and ecosystems	●	VME closures in effect, no specific measures
Preserve marine biological biodiversity	○	Cannot be evaluated

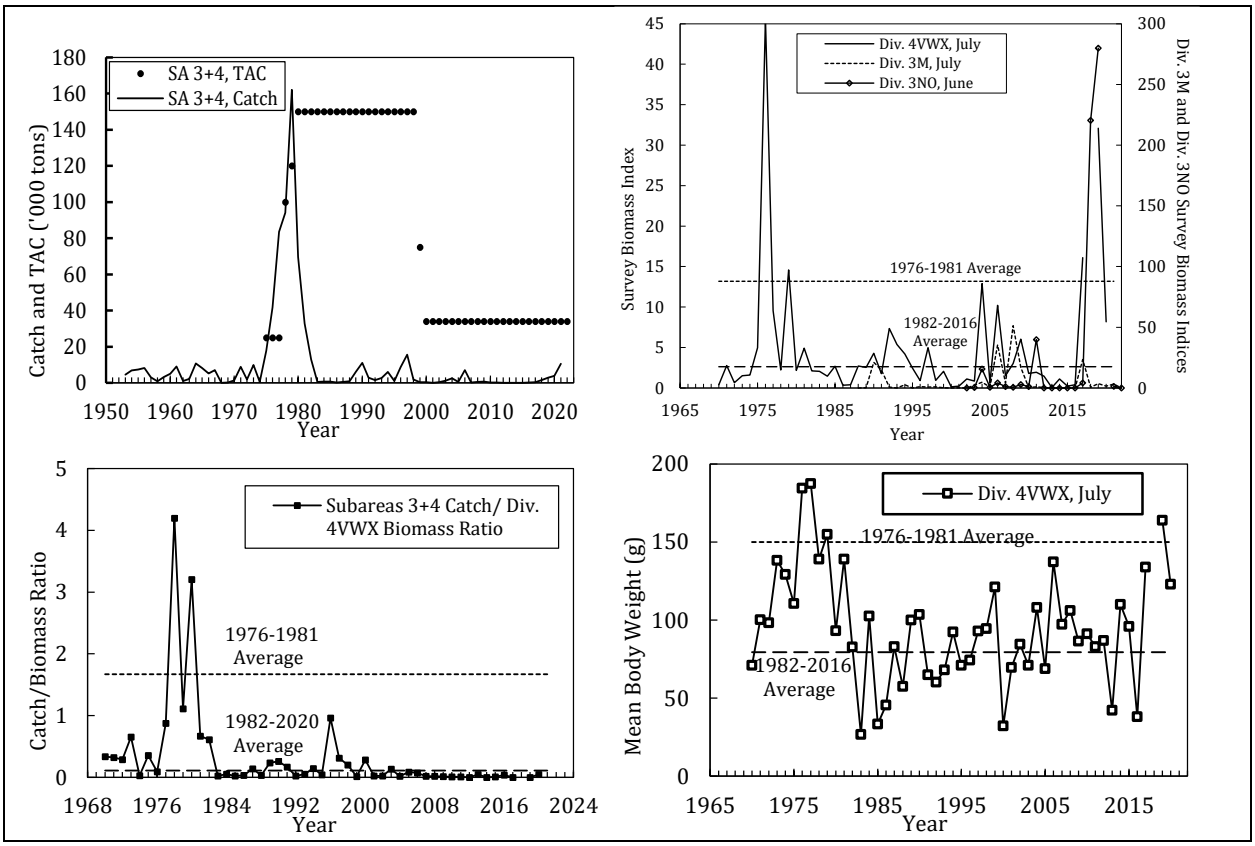
● OK
● Intermediate
● Not accomplished
○ Unknown

Management unit

The species is assumed to constitute a single stock throughout its range in the Northwest Atlantic Ocean, from Newfoundland and Labrador to Florida, including Subareas 2-6, but is managed separately as northern (Subareas 3+4, by NAFO and by Canada and France, in respect of St. Pierre and Miquelon, within their respective EEZs) and southern stock components (Subareas 5+6, by USA within its EEZ). However, fishery removals in relation to the biomass levels of each stock component affect one another.

Stock status

Both biomass and mean body weight indices for Div. 4VWX were well above the high productivity mean during 2019 and near it in 2020, indicating that the stock was in a high productivity state at that time, but these indices were not available during 2021 and 2022. Without these indices for 2021 and 2022, stock status is unknown for the Subareas 3+4 stock component. However, the 2022 biomass indices for both Div. 3NO and Div. 3M EU summer surveys were near the lowest levels of their respective time series, suggesting that the stock has returned to a low productivity state. While there is no relative fishing mortality index for 2021, catches in Subareas 3+4, primarily from the Newfoundland and Labrador squid fisheries in Canadian waters, increased by more than ten-fold between 2018 and 2021.



Reference points

Conventional reference points are inappropriate for squid stocks because of their unique life history. Two reference states, termed "high productivity" or "low productivity" states are defined by trends in the Div. 4VWX biomass indices and mean body weight. Low productivity periods have an estimated potential annual yield of 19 000 t to 34 000 t. The potential yields for a high productivity state have not been determined.

Projections

Projections were not possible because, like most squid stocks, recruitment is highly variable and cannot currently be predicted.

Assessment

No analytical assessment was performed. The Canadian 4VWX survey is considered the primary indicator of the productivity state for this stock component due to its spatial and temporal coverage. One-year stock size forecasts are not currently possible for this subannual species, nor are in-season assessments possible due to data availability issues. As a result, since 2000, the TAC for the northern stock component has been set at 34 000 t, the upper limit of the expected yield during years of low productivity (SCR Doc. 98/75). This TAC was unrestrictive during 2000-2021, but is the only method currently available for fishers to be able to take advantage of sudden interannual increases in stock size.

Due to the short lifespan of this species (less than one year), it is recommended that in-year catch and survey indices and length data, in particular for the Divs. 4VWX July survey, are made available to be used in the stock assessment and monitoring as early as possible prior to the September NAFO Annual Meetings.

The next assessment is scheduled for September of 2025.

Human impacts

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

Biology and Environmental Interactions
Recruitment for this species is highly variable, and the species is semelparous. A sufficient number of spawners must survive the fishery (spawner escapement) each year in order to ensure a high probability of successful recruitment during the subsequent year, to reduce the risk of stock collapse.

Ocean climate effects have a strong influence on the distribution, growth rates, and recruitment of Northern shortfin squid. 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 blooms, and an increase in the proportion of energy-rich copepod species may have positive effects on total ecosystem production in the coming years. A 2018 summary of the state of the fish community in the Flemish Cap (3M) EPU indicated that this ecosystem has not experienced sustained reductions in overall productivity observed in other EPUs. With the exception of a short-lived increase in 2005-2009, total biomass has remained fairly stable over time despite the changes in individual stocks.

This broad-ranging species is an important prey and predator species in the Northwest Atlantic ecosystem. The natural mortality of this prey species, which is consumed by a wide range of cetacean, pinniped, avian, invertebrate, and finfish predators, is very high. Small Northern shortfin squid prey primarily upon crustaceans and larger individuals prey primarily upon finfish, and during the fall, on smaller shortfin squid.

Fisheries
Since 1999, there has been no directed fishery in Subarea 4, but some squid bycatch occurs in the Canadian small-mesh bottom trawl fishery for silver hake. Fisheries for Northern shortfin squid in Subarea 3 consist of Canadian commercial and recreational inshore fisheries (predominately jig fisheries) and a Food, Social and Ceremonial (FSC) fishery, all of which occur off Newfoundland and Labrador. Since 2017, a directed bottom trawl fishery has also occurred within the NRA, primarily in Divs. 3NO. A small-mesh bottom trawl fishery occurs within the USA EEZ in Subareas 5+6.

The fisheries in Subareas 3+4 and Subareas 5+6 are managed separately by NAFO and the USA, respectively. The Canadian inshore fisheries in Subarea 3 and the small fishery in St. Pierre et Miquelon (France) are not subject to fishery management plans, are not assessed and are not subject to TACs. Catches reported for Subareas 3 are underestimated, because the Canadian recreational and FSC fisheries have no catch reporting requirements.

Recent catch estimates and TACs ('000 t), including those for Subareas 5+6, are as follows:

	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
TAC SA 3+4	34	34	34	34	34	34	34	34	34	34
STATLANT21 SA 3+4	0.1	0.1	<0.1	<0.1	0.4	1.4	2.8	3.9	10.6	
STACFIS SA 3+4	<0.1[1]	<0.1[1]	<0.1[1]	0.1[1]	0.4[1]	1.4[1]	2.9[1]	3.1[1]	10.6[1]	
STACFIS SA 5+6	3.8	8.8	2.4	6.7	22.5	24.1	27.1	28.4	30.9	
STACFIS Total SA 3-6	3.8	8.8	2.4	6.8	22.9	25.5	30.0	31.5	41.4	

[1] Includes amounts, ranging from 0.001-2.6 t, reported as Unspecified Squid from Subarea 4.

Effects of the fishery on the ecosystem
The effects of the directed fisheries on the ecosystem are unknown, but are generally limited to June through November (depending on fishery Subarea) as a result of the species' migration patterns on and off the continental shelves. There has not been a directed fishery in Subarea 4 since 1999 and the catches from the three inshore Canadian fisheries in Subarea 3, the main source of catches in SA 3+4, have increased ten-fold between 2018 and 2021.

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. A number of areas within the Grand Bank (3LNO) and Flemish Cap (3M) EPUs have been closed to fishing to protect corals and sponges.

Northern shortfin squid is a forage species for multiple predators within the wider stock distribution area, so impacts of fishing on the stock could have indirect effects on its predators. The role of squid as prey for the EPUs within the NRA is presently not well known.

Special comments

The assessment of this stock component may not reflect stock conditions during the three years for which management advice is given because the species has a sub-annual lifespan and recruitment is highly variable. In addition, there is a two-year time lag between the data used to conduct the assessment and the year for which TAC advice is requested.

SC has concerns regarding the existing reference points for this stock and plans to re-evaluate them in the near future.

Sources of information
SCR Doc. 98/59,75; 99/66; 06/45; 16/34; 19/42REV; COM-SC Doc. 17/08; SCS Doc. 22/06, 10, 13, 14

2. Requests Received from the Commission during the Annual Meeting

a) From the EU and USA regarding 3M cod:

Feedback Request from the European Union

Regarding 3M Cod assessment, EU would like SC to inform which F would correspond with a 50% probability of SSB2025 being greater than SSB2022 (according to table 2 of the provided assessment).

Feedback Request from the USA

In order to better understand how to support the growth of this stock over the long term, noting the projected total decline of total biomass under all fishing scenarios, what catch level in 2023 would result in a 75-percent probability of an increase in the spawning stock biomass for 3M cod by 2025?

SC Response

Two projections based on Fishing Mortality have been performed to get $P(SSB_{25}>SSB_{22})=50\%$ and $P(SSB_{25}>SSB_{22})=75\%$. Results for these two projections are in Tables 1 and 2 as in the advisory sheet of the 3M cod. Table 1 includes the results for the two new projections, while Table 2 shows the risk results for the projections from the advisory sheet together with the two new ones, sorted by the $P(SSB_{25}>SSB_{22})$. New projections in Table 2 are bolded.

The F that gives a $P(SSB_{25}>SSB_{22})=50\%$ is $0.595*F_{lim}=0.099$. The F that gives a $P(SSB_{25}>SSB_{22})=75\%$ is $0.46*F_{lim}=0.076$.

Table 1. Results of the projections of 3M cod with F_{bar} = 0.595*F_{lim} = 0.099 (giving a P(SSB_{25}>SSB_{22})=50%) and F_{bar} = 0.46F_{lim} = 0.076 (P(SSB_{25}>SSB_{22})=75%).

	B		SSB		Yield
	Median and 80% CI				
F_{bar} = 0.595*Flim (median = 0.099)					
2022	50511	(45475 - 56297)	25994	(23085 - 28992)	4000
2023	48942	(43410 - 55808)	22651	(19983 - 25601)	6364
2024	46841	(40525 - 54987)	23252	(20012 - 26635)	7507
2025	42058	(34385 - 50956)	26175	(21473 - 31560)	
F_{bar} = 0.46*Flim (median = 0.076)					
2022	50511	(45475 - 56297)	25994	(23085 - 28992)	4000
2023	48942	(43410 - 55808)	22651	(19983 - 25601)	5050
2024	48219	(41880 - 56341)	24447	(21252 - 27888)	6207
2025	44583	(36905 - 53473)	28311	(23650 - 33758)	

Table 2. Risk of the projections presented in June together risk of the projections with F_{bar} = 0.595*F_{lim} = 0.099 (giving a P(SSB_{25}>SSB_{22})=50%) and F_{bar} = 0.46F_{lim} = 0.076 (P(SSB_{25}>SSB_{22})=75%). The results are sorted by P(SSB_{25}>SSB_{22}). The new projections are bolded.

	Yield			P(SSB < B_{lim})				P(F_{bar} > F_{lim})			
	2022	2023	2024	2022	2023	2024	2025	2022	2023	2024	P(SSB_{25} >SSB_{22})
F=0	4000	0	0	<1%	<1%	<1%	<1%	<1%	<1%	<1%	100%
F_{2021} = 0.022	4000	3425	4429	<1%	<1%	<1%	<1%	<1%	<1%	<1%	95%
C = 4000t	4000	4000	4000	<1%	<1%	<1%	<1%	<1%	<1%	<1%	94%
C = 5000t	4000	5000	5000	<1%	<1%	<1%	<1%	<1%	<1%	<1%	86%
0.46*F_{lim} = 0.076	**4000**	**5050**	**6207**	**<1%**	**<1%**	**<1%**	**<1%**	**<1%**	**<1%**	**<1%**	**75%**
1/2F_{lim} = 0.083	4000	5446	6610	<1%	<1%	<1%	<1%	<1%	<1%	<1%	67%
F_{sq} = 0.089	4000	5791	6987	<1%	<1%	<1%	<1%	<1%	<1%	<1%	60%
0.595*F_{lim} = 0.099	**4000**	**6364**	**7507**	**<1%**	**<1%**	**<1%**	**<1%**	**<1%**	**<1%**	**<1%**	**50%**
2/3F_{lim} = 0.111	4000	7032	8128	<1%	<1%	1%	1%	<1%	<1%	<1%	39%
3/4F_{lim} = 0.125	4000	7787	8790	<1%	<1%	1%	1%	<1%	<1%	3%	27%
F_{lim} = 0.166	4000	9915	10431	<1%	<1%	3%	6%	<1%	50%	50%	9%

b) From Canada regarding 3M cod:

Feedback Request

Given the different interpretation by Contracting Parties of the total stock biomass trajectory for 3M cod, can the Scientific Council confirm that the total biomass is projected to decline under all fishing scenarios? Can the Scientific Council confirm that the total biomass has decreased in recent years? Can the Science Council advise the range of fishing scenario where total stock biomass is projected to increase?

SC response:

The biomass for 3M cod is projected to decline in the last year projected (2025) under all the fishing scenarios (other than F=0) that were performed during the June SC meeting (Figure 1):

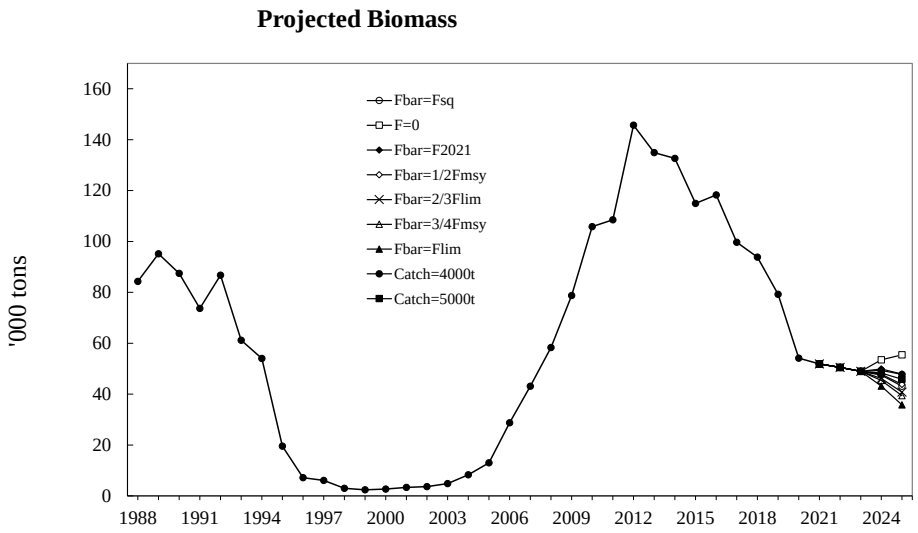


Figure 1. Projections for Total Biomass with different scenarios (STACTFIS report for 3M cod).

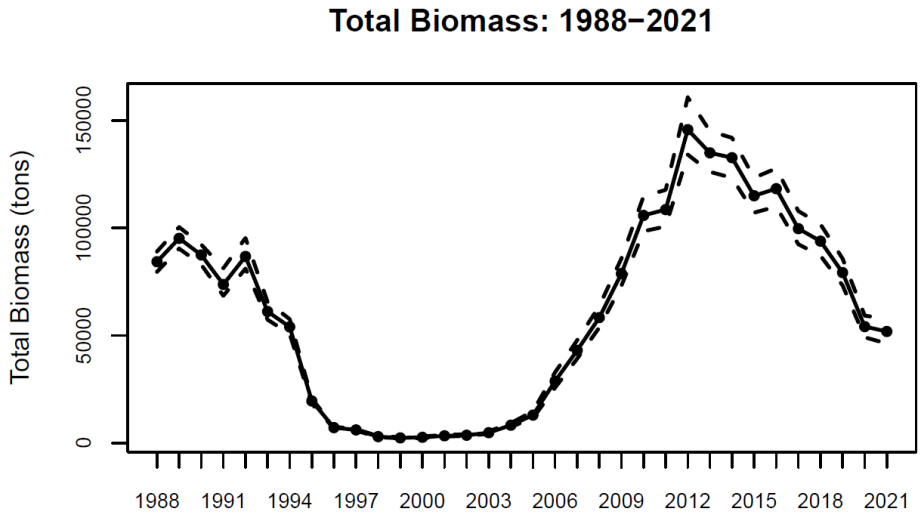


Figure 2. Estimated trends in total biomass. The solid line is the posterior median and the dashed lines show the limits of 80% posterior credible intervals (SCR 22/25).

Projecting F values show that the highest F value for which the Total Biomass of cod is projected to increase in 2025 is F_{bar}=0.03 (Table 3).

Table 3. Results of the projections of 3M cod with several F values.

	B		SSB		Yield
	Median and 80% CI				
$F_{bar} = F_{sq}$ (median = 0.089)					
2022	50511	(45475 - 56297)	25994	(23085 - 28992)	4000
2023	48942	(43410 - 55808)	22651	(19983 - 25601)	5791
2024	47441	(41115 - 55572)	23797	(20536 - 27170)	6987
2025	43101	(35439 - 52003)	27046	(22345 - 32507)	
$F_{bar} = 0$					
2022	50511	(45475 - 56297)	25994	(23085 - 28992)	4000
2023	48942	(43410 - 55808)	22651	(19983 - 25601)	0
2024	53489	(47131 - 61613)	29062	(25841 - 32474)	0
2025	55443	(47659 - 64531)	37876	(33038 - 43336)	
$F_{bar} = 0.033$ (median)					
2022	50511	(45475 - 56297)	25994	(23085 - 28992)	4000
2023	48942	(43410 - 55808)	22651	(19983 - 25601)	2274
2024	51101	(44757 - 59241)	27004	(23750 - 30334)	3044
2025	50329	(42598 - 59287)	33360	(28532 - 38763)	
$F_{bar} = 0.030$ (median)					
2022	50511	(45475 - 56297)	25994	(23085 - 28992)	4000
2023	48942	(43410 - 55808)	22651	(19983 - 25601)	2105
2024	51280	(44938 - 59422)	27112	(23908 - 30578)	2832
2025	50695	(42952 - 59678)	33622	(28843 - 39139)	

It has to be noted that the uncertainty in the projected years is higher than in the assessment years, and so the confidence interval for the Total Biomass for 2025 is higher than the one for 2022.

c) From Denmark (in respect of the Faroe Islands and Greenland) regarding 3M cod

Feedback Request

DFG supports the Catch and Effort Limitation outline in NAFO CEM Article 5.5(j) stating that:

5. Each Contracting Party shall:

(j) close its directed fishery for cod in Division 3M between 00:00 UTC 1 January 2022 and 24:00 UTC 31 March 2022. During this period, all Contracting Parties shall ensure that its vessels limit the catches retained on board and in any one haul of this stock in line with Article 6.3(a) and observe the move-on provisions in Article 6.6(b).

DFG appreciates and supports this temporary protective measuring in Article 5.5(j) concerning Cod in Division 3M during its spawning season.

DFG would like the Scientific Council to provide guidance on the following:

a. Is it scientifically advisable for the stock during the spawning season to reduce the protective measure in Article 5.5(j) from three months (00:00 UTC 1 January 2023 and 24:00 UTC 31 March 2023) to two months (00:00 UTC 1 February 2023 and 24:00 UTC 31 March 2023)?

b. If it is not scientifically advisable to reduce the protective measuring in Article 5.5(j) from three months to two months, is it scientifically advisable to move the three-month protective measure so that its starts 00:00 UTC 1 February 2023 and 24:00 UTC 30 April 2023?

SC response

During its June 2020 meeting, SC studied the percentage of spawning female cod by month in Div. 3M for the 2010-2018 period (SCR Doc. 20-021, SCS Doc. 20-014Rev.). The results are presented in Table 4:

Table 4. Percentage of spawning female cod by month in Div. 3M for the 2010-2018.

Month	Spawning %	Not Spawning %	n
Jan	88.89	11.11	90
Feb	72.73	27.27	33
Mar	60.12	39.88	1457
Apr	18.35	81.65	1695
May	1.80	98.20	557
Jun	0.11	99.89	950
Jul	8.14	91.86	921
Aug	0.27	99.73	728
Sep	0.40	99.60	506
Oct	0.78	99.22	257

Spawning of 3M cod occurs between January and April, with the highest activity being in the first three months, and January being the month with highest percentage of spawning females (Table 4.). SC concludes that, in order to protect the spawning activity, it is not scientifically advisable to change the duration or timing of the spawning closure and that it should therefore be maintained for the entire first quarter of the year (from 1st January until 31st of March).

d) From Norway regarding 3M shrimp

Feedback Request

The 3M shrimp stock is managed by fishing-days while Scientific Council provides advice in terms of catch ("TAC advice"). This creates ambiguity in using the scientific advice to inform management and promote efficient and sustainable utilization of this resource.

SC advised that they do "*not consider that the management procedure initiated some 25 years ago constitutes effective means of managing the stock*" and that they recommend "*that the management of 3M shrimp be converted from the existing "effort regulation" to "catch regulation" in line with all other stocks in the NRA*" ((SCS 19-23, pp 4-5 and reiterated in the advice for shrimp in 3M for 2023).

In the event of a reopening of the fishery, and the COM has not agreed on a new allocation scheme, the fishing activity will be resumed based on the current effort allocation key. Consequently, there will still be a need for advice in terms of fishing days.

We therefore ask SC to reflect on:

1. *the opportunities for converting "catch advice" into "fishing-day advice" e.g., by applying estimates of average catch rates (catch by fishing-day). As SC noted in SCS 19-23 such estimates may be uncertain for various reasons, nevertheless, in need of other means of providing advice in accordance with the management needs, this might still be the best we can do.*

2. *whether it would be feasible to include both metrics in future advice, i.e., Total Allowable Catch (TAC) and Total Allowable Fishing-days (TAF) – the latter maybe with some indication of the associated uncertainty or range as SC finds appropriate.*

3. *whether such additional information could assist COM in their reiterated aim at ensuring a sustainable management of this stock.*

SC response

SC reiterates the advice provided in SCS 19-23: over the period of this fishery the overall effort allowed has always been high and has not posed much constraint on fishing activity, and it is difficult to standardize "effort units" (e.g. fishing days) in terms of pressure on the stock due to creep in fishing efficiency and the diversity of the individual vessels participating in the fishery. This increases the uncertainty of advice given in fishing days. Therefore, SC recommended that the management of 3M shrimp be converted from the existing "effort regulation" to a "catch regulation" in line with all other stocks in the NRA.

However, when the catch/days fishing (df, Table 5) from any year from 2000-2010 (effort data from STATLANT 21B) and 2020-2021 (From SC shrimp meeting 2022) is applied to the recommended TAC from 2019, the range of total days fished to be allocated ranges from 193 to 1448 total days (Table 6). This is much lower than the 2640 allocated in 2020 and 2021.

Given the range in days fished arising from Table 5, it would be difficult to give advice on total allowable days.

Table 5. Calculation of tonnes per fishing day based on catches and effort used in the years 2000 to 2021.

	NIPAG Catch (000s t)	Recommended TAC (000s mt)	Allocated Effort (days)	Effort Used (days)	tonnes/days fishing
2000	50	30		3200	15.6
2001	54	30		5445	9.9
2002	49	45		4237	11.6
2003	63	45		5243	12.0
2004	45	45		4042	11.1
2005	32	48		2155	14.8
2006	18	48	10555	1049	17.2
2007	21	48	10555	1335	15.7
2008	13	17-32	10555	1069	12.2
2009	5	18-27	10555	447	11.2
2010	2	ndf	5277	71	28.2
2020	0.079	5.448	2640	21	3.8
2021	6.042	5.448	2640	440	13.7

Table 6. Fishing effort that would have been advised for a TAC of 5448 tonnes using observed catch rates from table 5.

Tonnes/days fishing	Days fishing for a recommended catch of 5448 tonnes
15.6	349
9.9	549
11.6	471
12.0	453
11.1	489
14.8	367
17.2	317
15.7	346
12.2	448
11.2	487
28.2	193
3.8	1448
13.7	397

Scientific Council reiterates that management by TAC is the most appropriate way to manage the fishery. Nevertheless, setting the allocated days to those close to the values shown in the last column of table 6 could assist in managing this fishery better than it is currently. SC notes that these values would be a factor of 10 lower than the currently allocated days.

e) From Norway regarding From the Russian Federation regarding TCI (Total Catch Index)

The TCI (Total Catch Index) is proposed by the Scientific Council as a supplementary control measure in addition to the existing TAC and quota system. Having reviewed the proposal, the Russian Federation has several questions:

1. TCI approach implies the aggregation of fish stocks into the following trophic guilds: benthivores, planktivores, piscivores, etc. Can the SC provide a clarification on the distribution of stocks according to that approach, i.e., which stock (as outlined in the quota table) goes to which guild?
2. The SC is requested to clarify if there are separate TCI values for different guilds within the same ecosystem.
3. The TACs within an ecosystem are supposed to be reduced to prevent the exceeding of 2xTCI if their sum exceeds the 2xTCI when compared.

   Can the SC give an example of such comparison for a known ecosystem and stocks inhabiting it?

4. The SC is requested to give an explanation on a situation when the sum of TACs for several stocks within an ecosystem exceeds the 2xTCI for that ecosystem.

   Are there any principles for selecting a stock for which TAC should be reduced to prevent the 2xTCI exceeding?

5. Some stocks (e.g., 3LMNO Greenland halibut) are distributed over a large area encompassing several ecosystems.

   The SC is requested to explain if there are any principles for assigning the TACs of such stocks, in whole or in part, to different ecosystems to compare the TACs with the ecosystems' 2xTCI values?

SC Response:

The TCI-framework and related 2TCI ecosystem reference point are intended to implement the Tier 1 component of the Roadmap, and as such, complement existing management measures by providing information relevant to ecosystem overfishing.

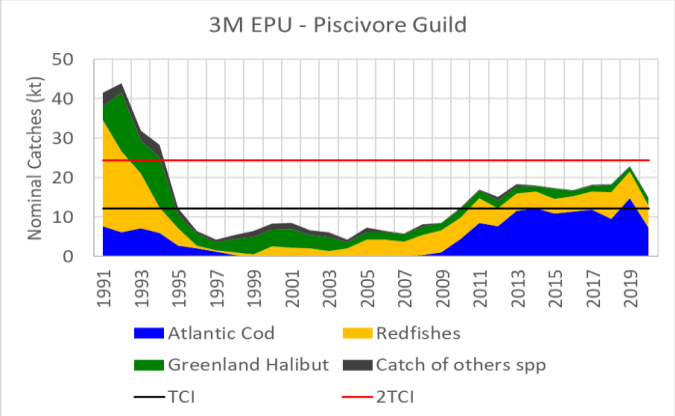
1. Mapping stocks to functional guilds is dependent on the trophic level at which production takes place. In most cases this mapping directly assigns species to functional guilds, but for some commercial species (i.e. those that contribute the most to the catches), the consideration of their life history and general diet composition has allowed splitting their production into different guilds. With this in mind, NAFO managed species within currently delineated Ecosystem Production Units (EPUs) are mapped to functional guilds as follow:

Species	Functional guild
Atlantic cod	Planktivore (small fish) and Piscivore (large fish)
Redfish	Planktivore (small fish) and Piscivore (large fish)
Greenland halibut	Piscivore
White hake	Piscivore
American plaice	Benthivore
Witch flounder	Benthivore
Thorny Skate	Benthivore
Shrimp	Benthivore
Capelin	Planktivore
Squid	Planktivore

2. Yes. There is a TCI value per functional guild within an EPU.

3. The implementation of the TCI framework and 2TCI ecosystem reference point provides information to the Commission regarding how aggregated catches relate to ecosystem productivity and the risk of ecosystem overfishing, but the proposed framework does not prescribe any specific action in the case that catches are approaching or exceeding 2TCI. How this information is used in the process of setting TACs is a matter for the Commission to consider as part of its discussions.

   Catches exceeding 2TCI are a rare occurrence in recent times, but in occasions, cumulative TACs could have allowed catches to exceed 2TCI if the TACs had been fully taken. One example of this situation was used during the August 2022 WGEAFFM Workshop to explore how the TCI framework and 2TCI reference points could be used in practice. This example corresponds to the piscivore guild in the Flemish Cap (3M) EPU in 2019. The following figure shows the piscivore guild catches since 1991. If all TACs had been fully taken, catches would have exceeded 2TCI in 2019.



4. The proposed framework does not prescribe any specific action in the case that catches are approaching or exceeding 2TCI. How this information is used in the process of setting TACs is a matter for the Commission to consider as part of its discussions.

5. For stocks like Greenland halibut which distribute over more than one EPU the TAC can be partitioned among EPUs, for instance based on the proportion of catches actually taken from each EPU, but this will be assessed on a case-by-case basis.

Reference links:

Koen-Alonso et al., Review and Assessment of the Ecosystem Production Potential (EPP) model structure, sensitivity, and its use for fisheries advice in NAFO. NAFO SCR Doc. 22/002 .

Koen-Alonso. Supporting material for the independent scientific review of the estimation of fisheries production potential and total catch indices, and their adequacy for their proposed used within the NAFO Roadmap. NAFO SCR Doc. 22/003.

Scientific Council response to Commission Request 5: *Continue work on the sustainability of catches aspect of the Ecosystem Roadmap*. NAFO SCS Doc. 22/18.

3. Further progress on items related to COM requests (in SCS Doc. 22-01)

a) COM request #8: NAFO PA Framework review

Fernando González-Costas (PA-WG and WG-RBMS co-chair) presented the outcomes of the workshop for NAFO Scientists and Managers on the Precautionary Approach (15-16 August 2022, Halifax). The workshop was attended by 45 participants including NAFO scientists, external experts, managers and the representatives from the fishing industry.

The main conclusions and recommendations made by the SC Precautionary Approach Working Group (PA-WG) are detailed in SCS Doc. 22-02 and SCS Doc. 22-15. Alternative PA Frameworks that reflect the main recommendations and conclusions of the PA-WG were discussed during the meeting of SC in July 2022 (SCS Doc. 22-19).

The workshop conclusions were collected in the COM-SC RBMS-WP 22-05 document and they were summarized by WG-RBMS as follows:

- The current NAFO PAF can deliver on many NAFO objectives, however, there may be improvements to better align with the revised NAFO Convention.
- The workshop supports current definition of boundary reference points (B_{lim} and F_{lim}) as well as pre-agreed managed actions linked to stock and fishing status.
- The workshop discussed possible revision, clarification, and/or addition of reference points:
    - The establishment of a F_{target}.
    - Possible implementation of intermediate biomass reference points between B_{lim} and B_{msy}.
- It was recognized that stock recovery plans may be needed in some cases, however, these should not be an explicit component of the PAF.
- Different approaches will be needed to apply the PAF for stocks with sporadic/episodic recruitments.

WG-RBMS agreed that further work is required in order to formalize proposals on what a revised NAFO PA Framework could look like. This follow-up work, building upon the results from the 1st PA Framework workshop, would:

Develop a small set of revised PA Frameworks based on the conclusions of the workshop.

- Apply the revised PA Framework to selected NAFO stocks for illustration purposes.
- Determine elements of the revised PA Framework for simulation testing.

WG-RBMS revised the current workplan and a new timeline was developed. Key points in the revised workplan are:

- PAF review will be the primary focus for July 2023 WG-RBMS meeting.
- This will be informed by any progress emerging from the intersessional WG-RBMS meeting in the spring of 2023, as well as the work done by SC and its PA-WG.
- Provisional draft framework to be considered by the NAFO Commission in September, 2023 (prior to simulation testing).
- WG-RBMS 2024, review the results of SC simulation testing and recommend revised PA Framework to Commission
- Revised PAF presented for Commission decision - September 2024

SC noted that it is essential that managers should come to the next workshop adequately prepared in order that they are able to fully understand the concepts being discussed, and SC members are encouraged to thoroughly brief their managers in advance.

The SC agreed that there should be a PA-WG meeting at the end of 2022 to study and schedule the tasks to be carried out until July 2023..

SC agreed that cod in 3M, yellowtail flounder in 3LNO, and redfish in 3M would be appropriate stocks to include as illustrative examples as they have very different characteristics and assessment methods.

VII. REVIEW OF FUTURE MEETING ARRANGEMENTS

1. Scientific Council meetings

a) WG-ESA, 15 - 24 November 2022

The Working Group on Ecosystem Science and Assessment will meet at the NAFO Secretariat, Halifax, Nova Scotia, Canada, 15 - 24 November 2022.

b) Scientific Council inter-sessional meeting, January 2023

SC will meet by Webex in January 2023 to finalize data series for MSEs.

c) STACREC survey presentation virtual meeting, during one day 1-10 May (day to be confirmed)

d) Scientific Council, 2 - 15 June 2023

The Scientific Council June 2023 meeting will be held at Saint Mary's University, Halifax.

e) Scientific Council (in conjunction with NIPAG), 2023

Dates and location to be determined.

f) Scientific Council, 18 – 22 September 2023

Scientific Council noted that the Annual meeting will be held in Santiago de Compostela, Spain.

2. NAFO/ICES Joint Groups

a) ICES – NAFO Working Group on Deep-water Ecosystem

Dates and location to be determined.

b) WG-HARP, 2023

Dates and location to be determined.

c) NAFO/ICES *Pandalus* Assessment Group (NIPAG), 2023

Dates and location to be determined.

3. Commission- Scientific Council Joint Working Groups

a) WG-EAFFM 2023

Dates and location to be determined likely during 17 - 28 July in Halifax, Nova Scotia, unless an invitation to host the meeting is extended by a Contracting Party.

b) WG-RBMS 2023

There will be two WG-RBMS meetings in 2023. Dates and location to be determined, likely during 24 April - 5 May and 17 - 28 July in Halifax, Nova Scotia, unless an invitation to host the meeting is extended by a Contracting Party.

c) CESAG 2023

Dates and location to be determined.

VIII. FUTURE SPECIAL SESSIONS

1. Discussion of proposed topics

a) Flatfish symposium 2022 and 2023

Due to the COVID-19 pandemic, the in-person flatfish symposium will be postponed until 2023, however a multi-time zone, e-session geared towards students and young professionals is planned for autumn 2022. Laura Wheeland (Canada) will the in-person symposium in 2023.

b) Other proposed topics

FAO is planning a symposium as part of the ABNJ fisheries project and would like NAFO to be a partner. This will be discussed by WG-ESA in November before any decision is made.

IX. OTHER MATTERS

1. Meeting reports

a) ICES/NAFO Working Group on Deep-water Ecology (WG-DEC)

This meeting was attended by Ellen Kenchington (Canada). The presentation of the meeting report was deferred to June 2023.

b) ICES/NAFO/NAMMCO Working Group on Harp and Hooded Seals (WG-HARP)

No NAFO scientist attended this meeting due to the retirement of Garry Stenson. SC will consider a replacement in June 2023.

c) Any other business

i) FAO ABNJ Deep Sea Fisheries (DSF) Project

Anthony Thompson (FAO) presented proposed activities under the FAO ABNJ Deep Sea Fisheries (DSF) Project (2022-2027) (following on from the ABNJ Deep Sea Project (2014-2019)) with relevance to NAFO. The project includes, among other actions, the following::

i) A symposium on ecosystem and stock productivity models (late 2023 or 2024)

This will be focused around NAFO's EAF road map and ecosystem-level impacts, with topics similar to items presented and discussed at NAFO's 2022 WG-EAFFM meeting. Participation will be global in scope covering all ABNJ marine regions. The following sessions are proposed:

Session 1: Ecosystem models for fisheries management,
Session 2: Integrating productivity state, multispecies and stock assessments,
Session 3: Unidirectional trends – long-term oscillations and climate-related changes,
Session 4: Economic benefits (and trade-offs) of implementing a TCI approach,
Session 5: Global application of ecosystem productivity models for EAFM and data requirements,
Posters: Technical material providing additional information.

The Symposium is planned for late 2024. Publication will be in the *Journal of Northwest Atlantic Fisheries Science*.

NAFO is requested to consider agreeing to partner this symposium, and if appropriate, suggest forming an organising committee consisting of NAFO representatives from the science, management and compliance committees and FAO who can assist in the planning of the symposium. NAFO is also requested to consider approaching ICES as a symposium organiser to join FAO and NAFO.

ii) Rapid assessment methodologies for assessing stock status

FAO has been developing a rapid assessment method. The project would like to work with designated stock experts to help test the methodology. This activity will include all regions.

FOA would like to invite NAFO designated stock experts to work with FAO to assist in the evaluation of the rapid-assessment methodologies

iii) Review implementation of FAO Deep Sea Fisheries (DSF) Guidelines

Following on from the first review of the DFS guidelines in 2010, FAO is conducting a second review. The review will be carried out by Keith Reid and Anthony Thompson (FAO) who will be contacting NAFO experts for input.

A meeting to review the draft report will be held 29 Nov – 2 Dec 2022 at the NEAFC HQ in London, UK.

SC thanked Dr. Thompson for his presentation and welcomed the proposal for a symposium, noting that a lot of work will be required, and that SC scientists currently have a very high workload. Dr. Thompson replied that the symposium could be pushed back to 2025 if that makes things easier. FAO are considering inviting ICES to be a partner in this symposium.

It was also noted that the proposed meeting to discuss the review of implementation the DSF guidelines follows almost immediately after the NAFO WG-ESA meeting.

X. ADOPTION OF REPORTS

1. Committee Reports of STACFIS and STACREC

The report of STACREC was considered by SC and adopted on 22 September 2022 and the STACFIS report was adopted on 21 September 2022 subject to editorial revision following this meeting.

2. Report of Scientific Council

The SC report was adopted on 23 September 2022 subject to editorial revision following this meeting.

XI. ADJOURNMENT

The meeting was adjourned at 16:00 h on 23 September 2022.

APPENDIX I. REPORT OF STANDING COMMITTEE ON RESEARCH COORDINATION (STACREC)

Chair: Diana González-Troncoso Rapporteur: Tom Blasdale

1. Opening

The Committee met at the Palacio da Bolsa (Oporto, Portugal) during 19-23 September 2022, with additional participants joining the meeting by Webex. Representatives attended from Canada, Denmark (in respect of the Faroes and Greenland), the European Union, France (in respect of St. Pierre et Miquelon), Japan, Norway, the Russian Federation, Ukraine, the United Kingdom and the United States of America. The Scientific Council Coordinator and other members of the Secretariat were in attendance.

2. Appointment of Rapporteur

The Scientific Council Coordinator, Tom Blasdale, was appointed as rapporteur for this meeting.

3. Fisheries statistics

a) Progress Reports on Secretariat Activities

There were no new items to report at this meeting.

b) Review of STATLANT21 Research Activities

The following table updates the situation with the submission of STATLANT. All the STATLANT 21A data have been submitted. There are still a few outstanding submissions for STATLANT 21B, and the Secretariat will follow up with the data providers.

Table 1. Dates of receipt of STATLANT 21A reports for 2019-2021 and 21B reports for 2019-2021 received prior to 03 June 2022.

Country/component	STATLANT 21A (deadline, 1 May)			STATLANT 21B (deadline, 31 August)		
	2019	2020	2021	2019	2020	2021
CAN-CA	9 Jun 20					
CAN-SF	17 Apr 20	30 Apr 21	6 Jun 22	2 Jul 20		
CAN-G	14 May 20	5 May 21	27 May 22			6 Sep 22
CAN-NL	30 Apr 20	30 Apr 21	26 May 22	31 Aug 20	31 Aug 21	
CAN-Q						
CUB						
E/BUL						
E/EST	30 Apr 20	30 Apr 21	28 Apr 22	29 Jun 20	23 Aug 21	26 Aug 22
E/DNK	26 May 20	27 May 21	30 Mar 22	21 Aug 20	21 Jul 21	15 Aug 22
E/FRA						
E/DEU	18 May 20	30 Apr 21	7 Apr 22	29 Jun 20	30 Aug 21	25 Aug 22
E/LVA		26 Apr 21	21 Apr 22			
E/LTU			31 May 22		3 Jul 21	
EU/POL			24 Jun 22			
E/PRT	29 May 20	26 Apr 21	19 Apr 22	31 Aug 20	28 Aug 21	30 Sep 22
E/ESP	14 May 20	31 May 21	14 Jun 22	24 Jun 20	7 Jun 21	15 Jun 22
GBR						
FRO	3 Jun 20	12 Jan 21	6 Apr 22	15 Dec 20	12 Jan 21	6 Apr 22

GRL	24 Apr 20	3 May 21	6 May 22	25 Aug 20	30 Aug 21	25 Aug 22
ISL						
JPN	8 May 20	28 Apr 21	27 Apr 22	28 Aug 20	24 Aug 21	30 Aug 22
KOR						
NOR	27 May 20	10 May 21	22 Apr 22	4 Sep 20	1 Sep 21	2 Sep 22
RUS	27 May 20	30 Apr 21	27 Apr 22		30 Aug 21	25 Aug 22
USA	4 Mar 22	4 Mar 22	25 May 22			
FRA-SP	8 May 20	21 Jun 21	26 Apr 22			25 Aug 22
UKR						

4. Research Activities

a) Surveys Planned for 2022 and early 2023

SCS documents 22/23 and 22/24 will be finalized by the Secretariat.

It was noted that no Canadian survey in 3NO was performed in Spring 2022.

b) Biological Sampling for 2021 and early 2022

The list of biological Sampling Data for 2021 was compiled by the Secretariat as SCS Document 22/11. STACREC reviewed the document, which had entries from EU-Spain, EU-Spain and Portugal, EU-Estonia and EU-Portugal. Question about why the rest of the countries have not submitted the data was raised. No answer at this moment, this will be raised again in June 2023.

5. Other Matters

a) Review of SCR and SCS Documents

No new documents were presented at this meeting.

b) Other Business

i) Reviewers for June 2023: topics (e.g., data poor stocks, MSE processes)

Two different topics were identified as interesting to be reviewed, data limited stock assessments and MSE processes. As during the next two-three years two different MSE processes are going to be carried out by the Scientific Council, it was considered that inviting a reviewer for these MSE processes would be very useful. The STACREC chair will take the lead in arranging this invitation.

ii) Data availability (open access, Share Point access, etc.) and format (submission of data, NAFOdown)

A first attempt of a common protocol to submit fisheries information to the Designated Experts was presented by the STACREC chair. Information about catches, effort, length distribution and age distribution is included in the document. Although SC considered that this protocol is a good starting point, some concerns, mainly about the calculation of the total (weighted) length distribution for the commercial vessel, were raised. It was agreed that the National Representatives and the STACREC chair will continue working in this protocol intersessionally to present an agreed protocol to be revised during the June 2023 Scientific Council meeting.

iii) Data recompilation for Illex illecebrosus

Data from the July Divs. 4VWX research bottom trawl surveys that are conducted by the Canada Department of Fisheries and Oceans (Maritimes Region) are used by the NAFO Scientific Council (SC) as the primary set of survey indices used to determine the status of Northern shortfin squid (*Illex illecebrosus*) in Subareas 3+4. The timing of the assessment was changed in 2019 from the June meeting to the September.

Therefore, it is necessary to include survey and catch data from the current year in the assessment in order for the SC to provide catch advice to the NAFO Commission for the subsequent year. These data were previously requested informally by the *Illex illecebrosus* Designated Expert.

Owing to survey data for the 2022 assessment not being received in time, SC requests that the Secretariat send a data request in May each year, to the Maritimes Region DFO office.

The following data from the July Divs. 4VWX survey are to be requested :

- annual stratified mean kg per tow and numbers per tow,
- swept-area biomass and abundance and
- annual stratified mean numbers-at-length, at 1-cm intervals, for strata 440-495.

The request is for the complete set of results from the STRATISFY software run. The requested data should be emailed directly to the NAFO Designated Expert for *Illex* squid in Subareas 3+4 as soon as possible following the completion of the survey.

6. Adjournment

This report was presented and accepted on September 22, and the STACREC meeting closed at 18:00 h.

APPENDIX II. REPORT OF STANDING COMMITTEE ON FISHERIES SCIENCE (STACFIS)

I. OPENING

The Committee met at the Palácio da Bolsa, Porto, with additional participants joining the meeting by Webex, from 19 to 23 September 2022 to consider the various matters in its agenda. Representatives attended from Canada, Denmark (in respect of the Faroes and Greenland), the European Union, France (in respect of St. Pierre et Miquelon), Japan, Norway, the Russian Federation, Ukraine, the United Kingdom and the United States of America. The Executive Secretary, Scientific Council Coordinator and other members of the Secretariat were in attendance. Anthony Thompson (FAO) attended the meeting as an observer. The Scientific Council Coordinator and other members of the Secretariat were in attendance. The Chair, Mark Simpson (Canada) opened the meeting by welcoming participants. The agenda was reviewed and a plan of work developed for the meeting in accordance with the Scientific Council plan of work. The provisional agenda was adopted with minor changes.

II. ASSESSMENTS DEFERRED FROM THE JUNE 2022 MEETING.

1. Northern Shortfin Squid (*Illex illecebrosus*) in Subareas 3+4

(SCR Doc. 98/59, 75; 06/45; 16/21, 34REV; 19/15, 20, 42; COM-SC Doc. 17/08; SCS Doc. 22/06, 10, 13, 14)

a) Introduction

Northern shortfin squid (*Illex illecebrosus*) is a semelparous species (spawns once during its lifespan then dies shortly thereafter) which has a lifespan of less than one year (SCR Doc. 98/59). It is a nerito-oceanic squid species which undergoes annual migrations on and off the continental shelf, between Cape Hatteras, North Carolina and the Grand Bank off Newfoundland and Labrador, during spring/early summer and late fall, respectively. The migrations progress from south to north in the spring and north to south in the fall.

Age data indicate that spawning occurs throughout the year. The only documented spawning area is located near the edge of the USA shelf and upper slope in the Mid-Atlantic Bight, where spawners (mated females) have been caught during May-September, and likely provide the primary source of recruitment to the northern fishing grounds on the Scotian Shelf and off Newfoundland and Labrador because only a few mature females have been caught in these northern fishery regions (SCR Doc. 16/34REV).

Environmental factors have a major influence on the distribution, growth, maturation rates and recruitment of this highly migratory species. When conditions are favourable, it can lead to a sudden shift from a low to a high productivity period that can last from one to six years.

Though *I. illecebrosus* is assumed to constitute a single stock throughout its range from Newfoundland and Labrador to Florida, in NAFO Subareas 2-6 it is managed as northern (Subareas 3+4) and southern (Subareas 5+6) stock components by NAFO and the USA, respectively (SCR Doc. 98/59). Consequently, fishery removals in relation to the biomass levels of each stock component affect one another.

The two stock components have separate annual catch quotas which are computed using different methods. For Subareas 3+4, a TAC of 150 000 tons was in place during 1980-1998. The TAC was 75 000 tons in 1999 and since 2000, the TAC for the northern stock component has been set at 34 000 t, the upper limit of the expected yield during years of low productivity (SCR Doc. 98/75). This TAC was unrestrictive during 2000-2021, but is the only method currently available for fishers to be able to take advantage of sudden interannual increases in stock size. The northern stock component (Subareas 3+4) was last assessed in 2019 (SCR Doc. 19/42).

i) Description of Fisheries and Catches

The onset and duration of the fisheries in each Subarea generally reflect the timing of squid migrations through each fishing area. Fisheries in the south start and end earlier than those in the north; generally during June-October in Subareas 5+6 and Subarea 4 and during July-November in Subarea 3 (SCR Doc. 16/34REV). Fisheries for Northern shortfin squid in Subarea 3 consist of Canadian commercial and recreational inshore fisheries (predominately jig fisheries), a Food, Social and Ceremonial (FSC) fishery that occurs off Newfoundland and Labrador, and as of 2017, some directed commercial fishing by international fleets has occurred within the NRA. Prior to 1999, an international bottom trawl fishery for silver hake, shortfin squid and argentine operated

in Subarea 4 in Canadian waters. In 1999, this fishery was prohibited, and since then, only small amounts of squid bycatch (averaging 37 t during 2000-2021) have been harvested in Subarea 4 from Canadian small-mesh bottom trawl fisheries (e.g., silver hake). Total catches from Subareas 3-6 were primarily from Subareas 3+4 during 1976-1981 and from the USA bottom trawl fishery in Subareas 5+6 since then (Figure 1.1). Prior to the mid-1980s, international bottom trawl and midwater trawl fleets participated in directed squid fisheries in Subareas 3, 4 and 5+6.

For Subareas 3+4, a TAC of 150 000 tons was in place during 1980-1998. The TAC was 75 000 tons in 1999, and has been 34 000 tons since then; the latter being the maximum expected yield when this stock component is in a low productivity state.

Occasionally, very low catches occur in Subarea 2 and these catches have been included with Subarea 3 for convenience. Subareas 3+4 catches were highest during 1976-1981, with a peak of 162 100 tons in 1979, but then rapidly decreased to only 400 tons in 1983. Following this collapse of the northern stock component, total catches from the Subareas 3+4 fishery remained very low for 35 years, and with the exception of 1997 (15 600 t) averaged only 1 800 t during 1983-2016 (Figure 1.1). Despite a consistent decrease in effort (i.e., the number of active Newfoundland and Labrador commercial squid fishing licenses), Newfoundland and Labrador commercial catches of shortfin squid increased from 300 tons in 2017 to 10 550 tons in 2021 (Figure 1.2). During the same time period, total catches from Subarea 3 (including the Newfoundland and Labrador commercial catches) increased from 400 tons to 10 600 tons in 2021; the highest catch since 1997.

Catches from Subarea 3 are underestimated because squid catches from the Canadian recreational fishery (SCR Doc. 19/42) and the FSC fishery have no catch reporting requirements (Krista Baker, pers. comm.). During 2000-2021, most (75%) of the catches in Subareas 3+4 have been harvested by the Canadian commercial inshore jig fishery, yet this fishery is not subject to a TAC, is not assessed and has no fishery management plan in place to ensure its sustainability.

Since this species is considered to constitute a single stock throughout Subareas 2 to 6 (SCR Doc. 98/59), catch trends in Subareas 3+4 must be considered in relation to those in Subareas 5+6. During 1972-1982, the period of highest catches by the international squid fishing fleets in Subareas 5+6, catches ranged from 24 900 tons in 1977 to 15 600 tons in 1981. After 1982, these international fleets were phased out and an offshore, domestic bottom trawl fishery for Northern shortfin squid was developed in Subareas 5+6. Domestic fishery catches averaged 11 500 tons during 1983-2015. Thereafter, catches for Subareas 5+6 increased from 6 700 tons in 2016 to a record high catch of 30 900 t in 2021.

Since 2000, the TAC for the northern stock component has been set at 34 000 t, the upper limit of the expected yield during years of low productivity (SCR Doc. 98/75). This TAC was unrestrictive during 2000-2021 but is the only method currently available for fishers to be able to take advantage of sudden interannual increases in stock size.

Recent nominal catches and TACs ('000 tons) are as follows:

	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
TAC SA 3+4	34	34	34	34	34	34	34	34	34	34
STATLANT21 SA 3+4	0.1	0.1	<0.1	<0.1	0.4	1.4	2.8	3.9	10.6	
STACFIS SA 3+4	<0.1	<0.1	<0.1	0.1	0.4	1.4	2.9	3.1	10.6	
STACFIS SA 5+6	3.8	8.8	2.4	6.7	22.5	24.1	27.1	28.4	30.9	
STACFIS Total SA 3-6	3.8	8.8	2.4	6.8	22.9	25.5	30.0	31.5	41.4	

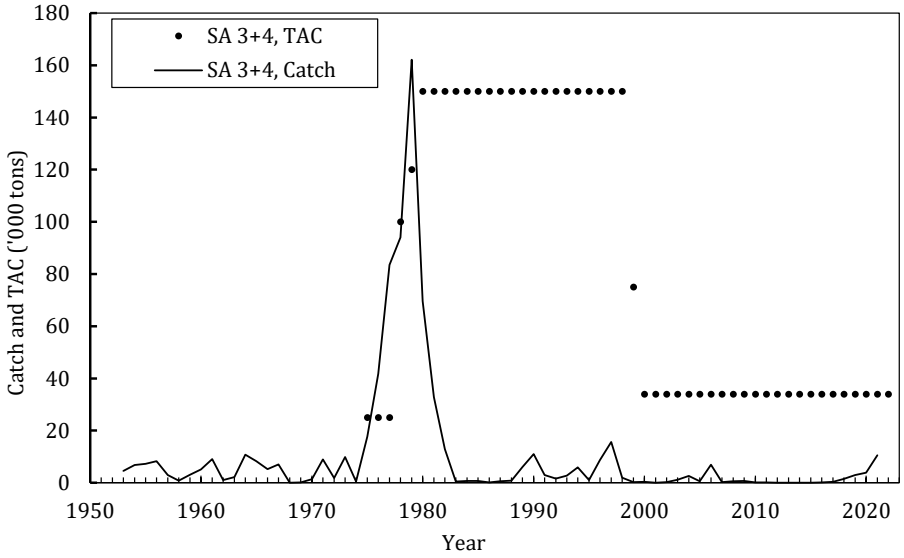


Figure. 1.1. Northern shortfin squid in Subareas 3+4: Nominal catches and TACs for the northern stock component (Subareas 3+4) of northern shortfin squid.

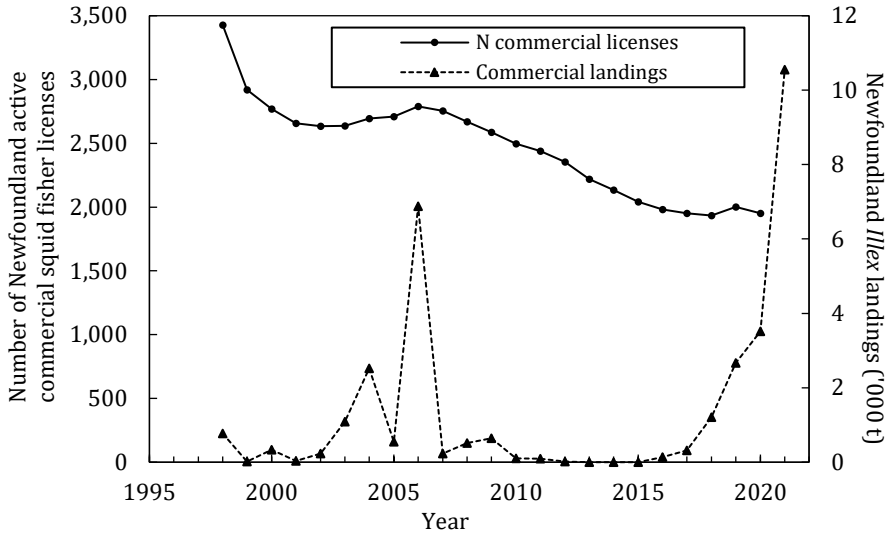


Figure. 1.2. Northern shortfin squid in Subareas 3+4: Newfoundland and Labrador commercial fishery nominal catches ('000 tons) and number of Newfoundland and Labrador active commercial shortfin squid fishing licenses.

b) Data Overview

i) Commercial fishery data

Nominal catches were available for Subareas 3+4, during 1953-2021, and for Subareas 5+6 during 1963-2021. Catches from Subareas 5+6, prior to 1976, may not be accurate because international fleets did not report all squid catches by species, and therefore, shortfin squid catches were prorated. The accuracy of the Subareas 3+4 catches prior to the mid-1970s is unknown. Subarea 4 catches include catches obtained by the Canadian Observer Program Database, during 1987-1998, a period of 100% fishery coverage, plus catches from the Canadian MARFIS Database (SCR Doc. 16/34). Catches in Subarea 3 are underestimated because catch reporting for the Canadian recreational fishery and the FSC fishery are not required (SCR Doc. 19/042). STACFIS catches from 2018 onward are estimated using the method developed by the joint Com-SC Catch Estimations Strategy Advisory Group (CESAG, Annex 1 of COM-SC Doc. 17/08).

ii) Research survey data

Biomass indices were available from various research bottom trawl surveys, with different depth and area coverage. There is no single synoptic survey that covers the entire distribution of the stock. Biomass indices for the Div. 3M (EU, July), Div. 3NO (EU-Spain, June), Div. 4VWX - July, Div. 4T - September, Div. 4RS August (Canada), and SA 5+6 (USA, Sept-Oct) surveys were included in the assessment. Relative biomass indices were derived for the northern stock component using data from the Canadian and EU surveys in Subarea 3 and Subarea 4 while indices for the southern stock component were from the USA. All of the surveys incorporated stratified-random sampling designs with stratification based on depth. Sampling during all surveys was conducted around-the-clock with the exception of the EU surveys and the 1971-1984 Div. 4T surveys which were conducted solely during the daytime, the latter which was standardized for diel effects on catches (SCR Doc. 19/042).

The Div. 4VWX survey indices are the best indicator of biomass for the northern stock component because the survey covers the largest area of Northern shortfin squid habitat and occurs during July, a time when the species has migrated onto the continental shelf and is most available to the survey, and because the survey is a measure of pre-fishery biomass (SCR Doc. 19/042). As a result, these indices are used to assess whether the Subareas 3+4 stock component is at a low or high productivity level, however in 2021 and 2022 the indices are not currently available.

The Canadian spring and fall surveys in Div. 3LNO are very low because they occur when the species is migrating on and off the Grand Banks, respectively (SCR Doc. 06/45). As a result, they are not considered a reliable indicator of biomass trends and so these indices were not included in the assessment.

Summer surveys: Biomass indices were derived for Canadian research bottom trawl surveys conducted during July on the Scotian Shelf and Bay of Fundy (Div. 4VWX, 1970-2020) for the EU-Spain/Portugal research bottom trawl surveys conducted primarily during July (Div. 3M, 1988-2022) and the EU-Spain research bottom trawl surveys conducted primarily during June on the "tail" of the Grand Bank (Div. 3NO, 2002-2022; Figure 1.3). The 2022 biomass indices for Div. 3M and Div. 3NO are preliminary. The summer surveys occur before or near the start of the shortfin squid fisheries in all Subareas, so the indices are assumed to represent pre-fishery measures of relative biomass.

Different vessels were used to conduct the Div. 4VWX surveys during the periods of 1970 to 2019. A survey gear change occurred in 1982, but there are no gear or vessel conversion coefficients available with which to standardize the shortfin squid biomass indices prior to 2004. However, a comparative fishing experiment, conducted during July of 2005, found no significant vessel effect between the CCGS *Teleost* and CCGS *Needler*. Due to survey vessel mechanical problems, large areas of Northern shortfin squid habitat were not sampled in Div. 4VWX during 2018 and 2020, so biomass indices for this year was not computed (SCR Doc. 19/042). During 2021 and 2022, a new research vessel, the CCGS *Capt. Jaques Cartier* (with new gear), conducted comparative fishing experiments during the surveys with the former survey vessel, the CCGS *Needler.* However, the CCGS *Needler* could not complete the 2020 experiment due to mechanical problems and the vessel/gear correction factors have not been computed yet from the 2022 experiment, and therefore, there are no biomass indices available for 2021 and 2022.

Swept-area biomass indices for the July Div. 3M surveys were derived (SCR Doc. 16/21; SCR Doc. 19/042). The biomass time series was standardized for the vessel change that occurred in 2003. Analyses that utilized data from comparative fishing experiments indicated that the vessel currently used to conduct the Div. 3M surveys is 28% more efficient at catching Northern shortfin squid, in terms of biomass, than the previous survey vessel that conducted most of the surveys during 1988 and 1991-2002 (biomass conversion factor = 1.279, SCR Doc. 16/21). Swept-area biomass indices for the June Div. 3NO surveys included all strata, but the time series was limited to 2002 onward because there are no shortfin squid vessel/gear conversion factors for the vessel that conducted the surveys during 1995-2001. Due to the COVID-19 pandemic, the Div. 3NO survey was not conducted during 2020.

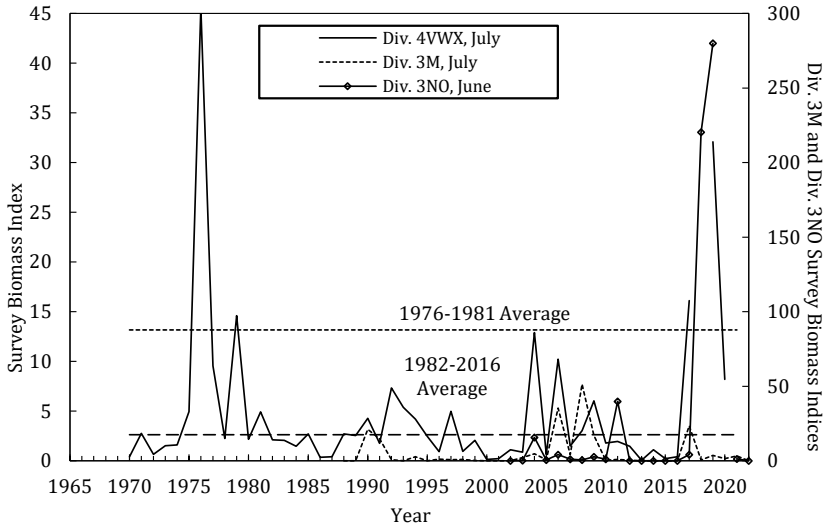


Figure 1.3. Northern shortfin squid in Subareas 3+4: summer biomass indices for Div. 4VWX (with biomass averages for high and low productivity periods), Div. 3M and Div. 3NO.

Fall surveys: Biomass indices were derived for Canadian research bottom trawl surveys conducted in the southern Gulf of St. Lawrence during September (Div. 4T, 1971-2021) and in the northern Gulf of St. Lawrence during August (Div. 4RS, 1990-2021) and for USA research bottom trawl surveys conducted during September-October on the USA continental shelf between Cape Hatteras, North Carolina and the Gulf of Maine (Subareas 5+6, 1967-2021; Figure 1.3). Due to survey vessel mechanical problems, large areas of Northern shortfin squid habitat were not sampled in Subareas 5+6 during 2017 and the 2020 survey was not conducted due to the COVID-19 pandemic, so no indices were computed for these two years.

Biomass indices for the Subareas 5+6, Div. 4RS and Div. 4T surveys were standardized for all vessel and gear changes. The Div. 4T and 4RS biomass indices were also standardized for diel changes in catchability. The Div. 4T and Subareas 5+6 surveys occur at or near the end of the shortfin squid fisheries and are assumed to represent post-fishery measures of relative biomass.

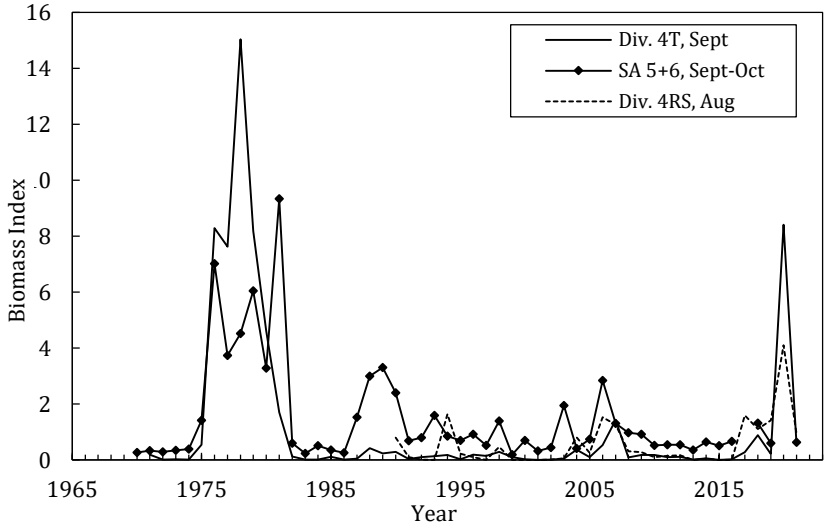


Figure 1.4. Northern shortfin squid in Subareas 3+4 in relation to Subareas 5+6: fall survey biomass indices in Div. 4T, Div. 4RS and Subareas 5+6.

Summary of research survey data trends. The Div. 4VWX biomass indices showed a high degree of inter-annual variability. However, a period of high productivity occurred during 1976-1981, averaging 13.2, and low

productivity periods occurred during 1970-1975 and 1982-2016, averaging 2.0 and 2.6, respectively (Figure 1.3). Biomass indices generally declined after 2004 and were below the 1982-2016 low productivity period average (2.6) during most years for 2007-2016. However, the 2017 and 2019 indices were above the high productivity average, with the 2019 index (32.1) being the second highest on record. The 2020 biomass index decreased to a level between the high and low productivity periods. Because the post-2020 biomass indices are not available for the Div. 4VWX surveys, no conclusion regarding productivity state can be drawn from this time series. The Div. 3M and Div. 3NO indices were near the lowest levels of their respective biomass time series during 2022.

Trends in the Div. 3M biomass indices were much more variable than the Div. 3NO biomass indices. This suggests that the Flemish Cap represents marginal *Illex* habitat in July during most years and that the Div. 3NO indices are a more useful biomass indicator for Subareas 3+4, especially because the latter seems to follow the Div. 4VWX trend during 2017-2020.

Similar to the Div. 4VWX survey biomass indices, biomass indices for both the Div. 4T and Subareas 5+6 fall surveys were much higher during 1976-1981 than thereafter, with the exception of the very high biomass index in 2019 (Figure 1.4). Biomass indices for both surveys were correlated, despite the fact that the 4T survey area covers only a small portion of shortfin squid habitat in Subarea 4. There were no *Illex* catches in the Div. 4T survey during 2015 and biomass indices during 2013 and 2014 were very low, similar to the 2013 and 2015 biomass indices for Div. 4VWX. Trends in the biomass indices for Div. 4T, Div. 4RS and SA 5+6 were similar from 2005 onward and both the Div. 4T and Div. 4RS biomass indices were at or near the higher levels of their respective time series in 2020.

iii) Biological studies

Trends in mean body size reflect the combined effects of emigration/immigration, recruitment, growth and mortality of the overlapping microcohorts which occur as a result of continuous recruitment throughout the year for this semelparous species. For *I. illecebrosus*, these factors are primarily influenced by environmental conditions (SCR Doc. 16/34). Mean body weights of Northern shortfin squid caught in the July Div. 4VWX surveys were highest during 1976-1981, averaging 150 g, and much lower, averaging 80 g, during 1982-2016 (Figure 1.5). Since 1982, the mean body weight of squid caught in the Div. 4VWX surveys fluctuated widely around the 1982-2016 low productivity period average, and during 1982-1996, was generally below the average (although increasing) and during 1997-2017 was generally above the average. Mean body size during 2017, 2019 and 2020 were above or near the high productivity period average, with the 2019 mean body size (164 g) being the highest since 1977.

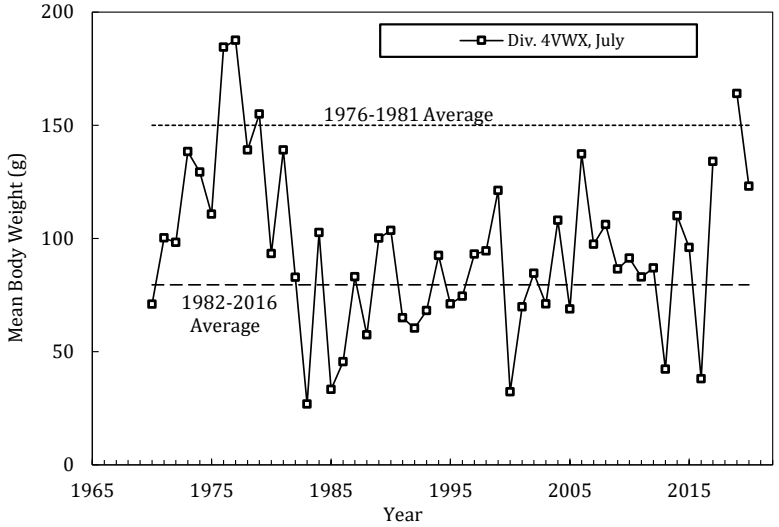


Figure 1.5. Northern shortfin squid in Subareas 3+4: mean body weight of squid in the Div. 4VWX surveys during July and average body weights during the low and high productivity periods.

iv) Relative fishing mortality indices

Relative fishing mortality indices for Subareas 3+4 were computed as the Subareas 3+4 nominal catch divided by the Div. 4VWX July survey biomass index (SCR Doc. 98/75). The indices were highest during 1977-1982, reaching a peak of 4.20 in 1978 and averaging 1.69 (Figure 1.6). During 1982-2020, relative fishing mortality indices were much lower, averaging 0.11, with a peak of 0.96 in 1996. Relative fishing mortality indices have consistently been below 0.11 since 2004, and during 2007-2019, were the lowest values in the time series. There was no index for 2018 or 2021.

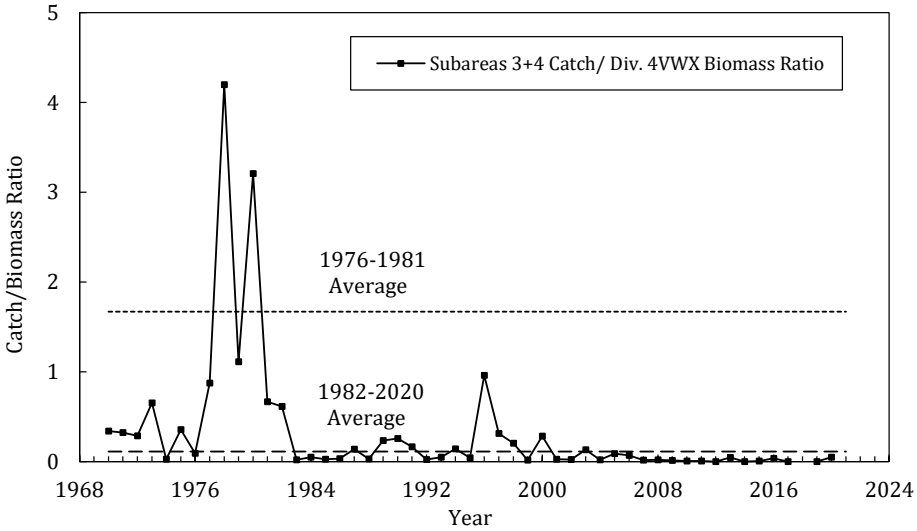


Figure. 1.6. Northern shortfin squid in Subareas 3+4: relative fishing mortality indices – SA 3+4 Catch/Div.4VWX survey biomass.

c) Assessment Results

No analytical assessment was performed. The Canadian 4VWX survey is considered the primary indicator for this stock due to its spatial and temporal coverage. One-year stock size forecasts are not currently possible for this subannual species, nor are in-season assessments possible due to data availability issues.

Biomass and Mean Body Size: During 2010-2012, relative biomass indices from the Division 4VWX surveys remained at levels ranging from 1.5-1.9 kg per tow, which were well below the average for the 1982-2016 low productivity period. During 2013 and 2015 the Div. 4VWX biomass indices were the two lowest values in the time series. The biomass index was unknown for 2018, 2021 and 2022. The 2019 biomass index was the second highest in the time series but returned to a low level in 2020. However, preliminary 3NO and 3M biomass indices indicate a low productivity state during 2022.

For squid caught during the Div. 4VWX surveys, the high productivity period was associated with a larger mean body size (averaging 150 g) than the 1982-2016 low productivity period (averaging 80 g). Mean body size during 2017, 2019 and 2020 were above or near the high productivity period average, with the 2019 mean body size (164 g) being the highest since 1977.

Fishing Mortality: Relative fishing mortality indices for Subareas 3+4 were highest during 1977-1982 and have been much lower since then. There were no catches of *Illex* in Subarea 3 during 2013-2015 and there has not been a directed fishery in Subarea 4 since 1999. During 2007-2017 and 2019, relative fishing mortality indices were at the lowest levels on record. While there is no relative fishing mortality index in 2021, catches increased by a factor of three in 2021 relative to 2020.

Recruitment: Recruitment occurs throughout the year and is strongly influenced by environmental conditions, resulting in low and high productivity states and the lack of a stock-recruitment relationship (SCR Doc. 98/75).

State of the Stock: Both biomass and mean body weight indices for Div. 4VWX were above or near the high productivity mean in 2019 and 2020. Without the 2021 and 2022 biomass and mean body weight indices for the Div. 4VWX surveys, stock status is unknown for the Subareas 3+4 stock component. However, the 2022 biomass for both Div. 3NO and Div. 3M summer surveys were near the lowest levels of their respective time series suggesting that the stock has returned to a low productivity state.

d) Reference Points

Conventional reference points are inappropriate for squid stocks because of their unique life history. Two reference states, "high productivity" or "low productivity" states, are defined by trends in stock biomass and mean body weight in the July Div. 4VWX bottom trawl surveys. Two proxies for F_{lim}, the potential yield which the northern stock component may be able to sustain under the current low productivity regime, are 19 000 tons and 34 000 tonnes (SCR Doc. 98/75). The potential yield during a high productivity state has not been determined.

The method used to compute potential yield only applies to the low productivity period, does not account for effects of environmental conditions on squid yield, and assumes that the high relative fishing mortality indices which occurred during 1976-1981 (which were followed by a rapid decline in the Div. 4VWX biomass indices) are appropriate for the current time period.

e) Research Recommendations

STACFIS **recommends** *investigation of reference points and assessment frameworks for this stock including evaluation of time-series variability.*

STACFIS **recommends** *development of in-year catch and survey indices. Catch data should include all sources of information including inshore recreational and FSC fisheries catch.*

STACFIS **recommends** that *gear/vessel conversion factors be computed to standardize the 1970-2003 relative abundance and biomass indices from the July Div. 4VWX surveys.*

STATUS: No progress. STACFIS reiterates this research recommendation.

III. OTHER MATTERS

1. Nomination of Designated Experts (DE)

SC reviewed the current DE list.
Kevin Hedges will replace Margaret Treble as DE for Greenland halibut in SA 0+1 (to be confirmed).
Irene Garrido will replace Diana González-Troncoso as DE for 3M cod in 2023 - 2025.

Designated Experts for 2022:

From the Science Branch, Northwest Atlantic Fisheries Centre, Department of Fisheries and Oceans, St. John's, Newfoundland & Labrador, Canada

Cod in Div. 3NO	Rick Rideout	rick.rideout@dfo-mpo.gc.ca
Redfish Div. 3O	Laura Wheeland	laura.wheeland@dfo-mpo.gc.ca
Redfish Div. 3LN	Bob Rogers	bob.rogers@dfo-mpo.gc.ca
American Plaice in Div. 3LNO	Laura Wheeland	laura.wheeland@dfo-mpo.gc.ca
Witch flounder in Div. 3NO	Dawn Maddock Parsons	dawn.parsons@dfo-mpo.gc.ca
Yellowtail flounder in Div. 3LNO	Dawn Maddock Parsons	dawn.parsons@dfo-mpo.gc.ca
Greenland halibut in SA 2+3KLMNO	Paul Regular	paul.regular@dfo-mpo.gc.ca
Northern shrimp in Div. 3LNO	Katherine Skanes	katherine.skanes@dfo-mpo.gc.ca

From the Department of Fisheries and Oceans, Winnipeg, Manitoba, Canada

Greenland halibut in SA 0+1	Kevin Hedges*	kevin.hedges@dfo-mpo.gc.ca

From the Instituto Español de Oceanografia, Vigo (Pontevedra), Spain

Roughhead grenadier in SA 2+3	Fernando González-Costas	fernando.gonzalez@ieo.csic.es
Splendid alfonsino in Subarea 6	Fernando González-Costas	fernando.gonzalez@ieo.csic.es
Cod in Div. 3M	Irene Garrido Fernández	irene.garrido@ieo.csic.es
Northern Shrimp in Div. 3M	Jose Miguel Casas Sánchez	mikel.casas@ieo.csic.es

From the Instituto Nacional de Recursos Biológicos (INRB/IPMA), Lisbon, Portugal

American plaice in Div. 3M	Ricardo Alpoim	ralpoim@ipma.pt
Golden redfish in Div. 3M	Ricardo Alpoim	ralpoim@ipma.pt
Redfish in Div. 3M	Ricardo Alpoim	ralpoim@ipma.pt

From the Greenland Institute of Natural Resources, Nuuk, Greenland

Demersal Redfish in SA1	Rasmus Nygaard	rany@natur.gl
Wolfish in SA1	Rasmus Nygaard	rany@natur.gl
Greenland halibut in Div. 1 inshore	Rasmus Nygaard	rany@natur.gl
Northern shrimp in SA 0+1	AnnDorte Burmeister	anndorte@natur.gl
Northern shrimp in Denmark Strait	Tanja B. Buch	TaBb@natur.gl

From Knipovich Polar Research Institute of Marine Fisheries and Oceanography (PINRO), Russian Federation

Capelin in Div. 3NO	Konstantin Fomin	fomin@pinro.ru

From National Marine Fisheries Service, NEFSC, Woods Hole, Massachusetts, United States of America

Northern Shortfin Squid in SA 3 & 4	Lisa Hendrickson	lisa.hendrickson@noaa.gov
Thorny skate in Div. 3LNO	Katherine Sosebee	katherine.sosebee@noaa.gov
White hake in Div. 3NO	Katherine Sosebee	katherine.sosebee@noaa.gov

*To be confirmed

Vacant positions:

Ecosystem DE 3LNO

Ecosystem DE 3M

2. Other matters

a) Review of SCR and SCS Documents

No SCRs were submitted to this meeting.

b) FIRMS Classification for NAFO Stocks

STACFIS reiterates that the Stock Classification system is not intended as a means to convey the scientific advice to the Commission, and should not be used as such. Its purpose is to respond to a request by FIRMS to provide such a classification for their purposes. The category choices do not fully describe the status of some stocks. Scientific advice to the Commission is to be found in the Scientific Council report in the summary sheet for each stock.

Stock Size (incl. structure)	Fishing Mortality			
	None–Low	Moderate	High	Unknown
Virgin–Large	3LNO Yellowtail Flounder			
Intermediate	3LN Redfish 3LNOPs Thorny skate	SA0+1 Northern shrimp[1] 3M Redfish[1] SA2+3KLMNO Greenland halibut 3M cod	East Greenland Northern shrimp	SA1 American Plaice SA1 Spotted Wolffish
Small	3NOPs White hake 3NO Witch flounder			
Depleted	3M American plaice 3LNO American plaice 3NO Cod 3LNO Northern shrimp 3M Northern shrimp[2] 6G Alfonsino			SA1 Redfish SA1 Atlantic Wolffish
Unknown	SA2+3 Roughhead grenadier 3NO Capelin 3O Redfish SA 0+1 (Offshore) Greenland halibut Greenland halibut in Disko Bay Greenland halibut in Uummannaq Greenland halibut in Upernavik	1B-C Greenland halibut Inshore	1D Greenland halibut Inshore 1E-F Greenland halibut Inshore	SA3+4 Northern shortfin squid

[1] Fishing mortality may not be the main driver of biomass for Div. 3M Shrimp and Redfish
For many stocks, lack of surveys in recent years has impacted assessments.

3. Other business

No other items were discussed.

XIV.ADJOURNMENT

The meeting was adjourned on 21 September 2022.

APPENDIX III. AGENDA

Scientific Council Agenda, September 2022

I. Plenary Session

1. Opening
2. Appointment of Rapporteur
3. Adoption of Agenda
4. Plan of Work

II. Review of Scientific Council Recommendations

III. Joint Session of Commission and Scientific Council

1. Implementation of 2018 Performance Review Panel recommendations
2. Presentation of scientific advice by the Chair of the Scientific Council
   a. Response of the Scientific Council to the Commission's request for scientific advice
   b. Feedback to the SC regarding the advice and its work during this meeting
   c. Other issues as determined by the Chair of the Commission and of the Scientific Council
3. Meeting Reports and Recommendations of the Joint Commission–Scientific Council Working Groups
   a. Working Group on Improving Efficiency of NAFO Working Group Process (E-WG), 2022
   b. Joint Commission–Scientific Council Working Group on Risk-based Management Strategies (WG-RBMS), August 2022
   c. Joint Commission–Scientific Council Working Group on Ecosystems Approach Framework to Fisheries Management (WG-EAFFM), August 2022
   d. Joint Commission–Scientific Council Catch Estimation Strategy Advisory Group (CESAG), 2022
4. Formulation of Request to the Scientific Council for Scientific Advice on Management in 2023 and beyond of Certain Stocks in Subareas 2, 3 and 4 and Other Matters

IV. Research Coordination (STACREC Chair: Diana González-Troncoso)

1. Opening
2. Appointment of Rapporteur
3. Fisheries Statistics
   a. Progress Reports on Secretariat Activities
   b. Review of STATLANT21Research Activities
4. Research Activities
   a. Surveys Planned for 2023 and 2024
5. Other Matters
   a. Review of SCR and SCS Documents
   b. Review of Survey SCS Document
   c. Other Business
      i. Reviewers for June 2023: topics (eg, data poor stocks, MSE processes)
      ii. Data availability (open access, Share Point access, etc) and format (submission of data, NAFOdown…)
6. Adjournment

V. Fisheries Science (STACFIS Chair: Mark Simpson)

1. Opening
2. Nomination of Designated Experts
3. Other Matters
   a. Review of SCR and SCS Documents
   b. Assessments deferred from the June meeting

i) Northern shortfin squid in SA 3+4

c. Review of FIRMS classification of NAFO stocks

d. Other Business

VI. Requests from the Commission

1. Requests/advice deferred from the June Meeting
    a. Scientific Council budget for 2022
    b. Requests arising from Working Groups in 2021
2. *Ad hoc* Requests from Current Meeting
3. Further progress on items related to COM requests (in SCS Doc. 22-01)
    a. COM request #8: NAFO PA Framework review

VII. Review of Future Meeting Arrangements

VIII. Future Special Sessions

1. Discussion of proposed topics
    a. Flatfish symposium 2022 and 2023
    b. Other proposed topics

IX. Other Matters

1. Implementation of 2018 Performance Review Panel recommendations
2. Meeting reports
    a. ICES/NAFO Working Group on Deep-water Ecology (WG-DEC)
    b. ICES/NAFO/NAMMCO Working Group on Harp and Hooded Seals (WG-HARP)
3. Any other business

X. Adoption of Reports

1. Committee Reports of STACFIS and STACREC
2. Report of Scientific Council

XI. Adjournment

ANNEX 1. THE COMMISSION'S REQUEST FOR SCIENTIFIC ADVICE ON MANAGEMENT IN 2022 AND BEYOND OF CERTAIN STOCKS IN SUBAREAS 2, 3 AND 4 AND OTHER MATTERS

(from SCS Doc. 22/01)

Following a request from the Scientific Council, the Commission agreed that items 1, 2, 4, 7, and 9 should be the priority for the June 2022 Scientific Council meeting subject to resources and COVID-related restrictions.

1. The Commission requests that the Scientific Council provide advice for the management of the fish stocks below according to the assessment frequency presented below. In keeping with the NAFO Precautionary Approach Framework (FC Doc. 04/18), the advice should be provided as a range of management options and a risk analysis for each option without a single TAC recommendation. The Commission will decide upon the acceptable risk level in the context of the entirety of the SC advice for each stock guided and as foreseen by the Precautionary Approach.

Yearly basis	Two-year basis	Three-year basis
Cod in Div. 3M Northern shrimp in Div. 3M	Redfish in Div. 3M Thorny skate in Div. 3LNO Witch flounder in Div. 3NO Redfish in Div. 3LN White hake in Div. 3NO Yellowtail flounder in Div. 3LNO Northern shrimp 3LNO	American Plaice in Div. 3LNO American Plaice in Div. 3M Northern shortfin squid in SA 3+4 Redfish in Div. 3O Cod in Div. 3NO

To implement this schedule of assessments, the Scientific Council is requested to conduct a full assessment of these stocks as follows:

- In 2022, advice should be provided for 2023 for Cod in Div. 3M and Northern shrimp in Div. 3M. With respect to Northern shrimp in Div. 3M, Scientific Council is requested to provide its advice to the Commission prior to the 2022 Annual Meeting based on the survey data up to and including 2022.

- In 2022, advice should be provided for 2023 and 2024 for: Thorny skate in Div. 3LNO, Redfish in Div. 3LN, Witch flounder in Div. 3NO.

- In 2022, advice should be provided for 2023, 2024 and 2025 for: SA 3+4 Northern shortfin squid, Redfish in Div. 3O.

Advice should be provided using the guidance provided in **Annexes A or B as appropriate**, or using the predetermined Harvest Control Rules in the cases where they exist (currently Greenland halibut 2+3KLMNO).

The Commission also requests the Scientific Council to continue to monitor the status of all other stocks annually and, should a significant change be observed in stock status (*e.g.*, from surveys) or in bycatch in other fisheries, provide updated advice as appropriate.

2. The Commission requests the Scientific Council to monitor the status of Greenland halibut. Conditional on the absence of other reasons for Exceptional Circumstances arising (other than the missing Canadian spring 3LNO survey), to calculate in 2022 the HCR adjusting the TAC advised for 2022 using four survey indices (Canadian fall 2J3K, Canadian fall 3LNO, EU 3M 0-1400m, and EU-Spain 3NO surveys) to provide TAC advice for 2023. If other reasons for exceptional circumstances are occurring, the EC protocol will provide guidance on what steps should be taken.

3. The Commission requests that Scientific Council continue its evaluation of the impact of scientific trawl surveys on VME in closed areas and the effect of excluding surveys from these areas on stock assessments.

4. Scientific Council initiate the first steps in both the 2+3KLMNO Greenland halibut and 3LN redfish MSE processes during 2021-2022, namely:

   a. Compile catch and survey data and any additional sources of information used in the current models;

   b. Review and finalize the data inputs for review at the June 2022 Scientific Council meeting when conducting both the 3LN redfish assessment and the assessment of Greenland Halibut Exceptional Circumstances/ Provision of TAC advice

   c. Time permitting, further work on the respective MSE work plans by the SC-GHL and SC-Redfish subgroups for presentation to WG-RBMS or SC.

5. The Commission requests that Scientific Council continue work on the sustainability of catches aspect of the Ecosystem Roadmap, including:

   a. In consultation with WG-EAFFM via co-Chairs, convene independent experts to do a scientific review of; a) the estimation of fisheries production potential and total catch indices, and b) the adequacy of this analysis for their proposed use within the NAFO roadmap (Tier 1), while considering how species interactions are expected to be addressed in the future (Tier 2) within the overall Roadmap structure. The outcomes of this review would need to be tabled in June at Scientific Council to be available in advance of the planned workshop in 2022.

   b. Work to support the WG-EAFFM workshop in 2022, which will explore ecosystem objectives and further develop how the Roadmap may apply to management decision making.

   c. Continue its work to develop models that support implementation of Tier 2 of the EAFM Roadmap.

6. The Commission requests that Scientific Council, in relation to VME analyses:

   a. Conduct a re-assessment of its previously recommended closures of 7a, 11a, 14a and 14b, incorporating catch and effort data for fisheries of shrimp from 2020 and 2021 into the fishing impact assessments. This work is to be completed by the 2023 Scientific Council meeting.

   b. Review the effectiveness of NAFO CEM, Chapter 2 from a scientific and technical perspective and report back to the WG-EAFFM. WG-EAFFM would subsequently in 2022 consider whether any modifications to this Chapter should be recommended.

7. The Commission requests Scientific Council to continue progression on the review of the NAFO PA Framework in accordance to the PAF review work plan approved in 2020 (NAFO COM-SC Doc. 20-04).

8. The Commission requests Scientific Council to continue to develop a 3-5 year work plan, which reflects requests arising from the 2021 Annual Meeting, other multi-year stock assessments and other scientific inquiries already planned for the near future. The work plan should identify what resources are necessary to successfully address these issues, gaps in current resources to meet those needs and proposed prioritization by the Scientific Council of upcoming work based on those gaps.

9. The Commission requests that Scientific Council do a full assessment for Div. 3LN redfish and provide advice based on the projection for various harvest levels for two-years (2023 and 2024) to evaluate the impacts according to the performance statistics from NAFO CEM Annex I.H.

10. The Commission requests that any new results from stock assessments and the scientific advice of Cod 2J3KL (Canada), Witch 2J3KL (Canada) and Pelagic *Sebastes mentella* (ICES Divisions V, XII and XIV; NAFO 1) to be presented to the Scientific Council and request the Scientific Council to prepare a summary of these assessments to be included in its annual report.

11. The Commission requests Scientific Council, jointly with the Secretariat, to conduct ongoing analysis of the Flemish Cap cod fishery data by 2022 in order to:

    a. monitor the consequences of the management decisions (including the analysis of the redistribution of the fishing effort along the year and its potential effects on ecosystems, the variation of the cod catch composition in lengths/ages, and the bycatch levels of other fish species, benthos in general, and VME taxa in particular), and

    b. carry out any additional monitoring that would be required, including Div. 3M cod caught as bycatch in other fisheries during the closed period.

12. The Commission requests Secretariat and the Scientific Council with other international organizations, such as the FAO and ICES to inform the Scientific Council's work related to the potential impact of activities other than fishing in the Convention Area. This would be conditional on CPs providing appropriate additional expertise to Scientific Council.

13. The Commission request that Scientific Council proceed with developing the ecosystem summary sheets for 3M and 3LNO move toward undertaking a joint Workshop with ICES (International Council for the Exploration of the Sea) as part of a peer review of North Atlantic ecosystems.

ANNEX A: Guidance for providing advice on Stocks Assessed with an Analytical Model

The Commission request the Scientific Council to consider the following in assessing and projecting future stock levels for those stocks listed above. These evaluations should provide the information necessary for the Fisheries Commission to consider the balance between risks and yield levels, in determining its management of these stocks:

1. For stocks assessed with a production model, the advice should include updated time series of:

- Catch and TAC of recent years
- Catch to relative biomass
- Relative Biomass
- Relative Fishing mortality
- Stock trajectory against reference points
- And any information the Scientific Council deems appropriate.

Stochastic short-term projections (3 years) should be performed with the following constant fishing mortality levels as appropriate:

- For stocks opened to direct fishing: 2/3 F_{msy}, 3/4 F_{msy}, 85% F_{msy}, 90% F_{msy},95% F_{msy}, F_{msy} 0.75 X $F_{status\ quo}$, $F_{status\ qu}$,1.25 X Status quo, F=0; TAC Status quo, 85% TAC Status quo, 90% TAC Status quo, 95% TAC Status quo
- For stocks under a moratorium to direct fishing: $F_{status\ quo}$, F = 0.

The first year of the projection should assume a catch equal to the agreed TAC for that year.

Results from stochastic short-term projection should include:

- The 10%, 50% and 90% percentiles of the yield, total biomass, spawning stock biomass and exploitable biomass for each year of the projections
- The risks of stock population parameters increasing above or falling below available biomass and fishing mortality reference points. The table indicated below should guide the Scientific Council in presenting the short-term projections.

				Limit reference points														
				$P(F>F_{lim})$			$P(B<B_{lim})$				$P(F>F_{msy})$			$P(B<B_{msy})$				$P(B2024 > B2021)$
F in 2022 and following years*	Yield 2022 (50%)	Yield 2023 (50%)	Yield 2024 (50%)	2022	2023	2024	2022	2023	2024		2022	2023	2024	2022	2023	2024		
2/3 Fmsy	t	t	t	%	%	%	%	%	%		%	%	%	%	%	%		%
3/4 Fmsy	t	t	t	%	%	%	%	%	%		%	%	%	%	%	%		%
85% Fmsy	t	t	t	%	%	%	%	%	%		%	%	%	%	%	%		%
90% Fmsy																		
95% Fmsy																		
Fmsy	t	t	t	%	%	%	%	%	%		%	%	%	%	%	%		%
0.75 X Fstatus quo	t	t	t	%	%	%	%	%	%		%	%	%	%	%	%		%
Fstatus quo	t	t	t	%	%	%	%	%	%		%	%	%	%	%	%		%
1.25 X Status quo	t	t	t	%	%	%	%	%	%		%	%	%	%	%	%		%
F=0	t	t	t	%	%	%	%	%	%		%	%	%	%	%	%		%
TAC Status quo																		
85% TAC Status quo																		
90% TAC Status quo																		
95% TAC Status quo																		

2. For stock assessed with an age-structured model, information should be provided on stock size, spawning stock sizes, recruitment prospects, historical fishing mortality. Graphs and/or tables should be provided for all of the following for the longest time-period possible:
    - historical yield and fishing mortality;
    - spawning stock biomass and recruitment levels;
    - Stock trajectory against reference points
    - And any information the Scientific Council deems appropriate

Stochastic short-term projections (3 years) should be performed with the following constant fishing mortality levels as appropriate:

- For stocks opened to direct fishing: $F_{0.1}$, F_{max}, 2/3 F_{max}, 3/4 F_{max}, 85% F_{max}, 75% $F_{status\ quo}$, $F_{status\ quo}$, 125% $F_{status\ quo}$,
- For stocks under a moratorium to direct fishing: $F_{status\ quo}$, F = 0.

The first year of the projection should assume a catch equal to the agreed TAC for that year.

Results from stochastic short-term projection should include:

- The 10%, 50% and 90% percentiles of the yield, total biomass, spawning stock biomass and exploitable biomass for each year of the projections
- The risks of stock population parameters increasing above or falling below available biomass and fishing mortality reference points. The table indicated below should guide the Scientific Council in presenting the short-term projections.

				Limit reference points													
				P(F.>F_{lim})			P(B<B_{lim})			P(F>F0.1)			P(F>F_{max})			P(B2024 > B2021)
F in 2022 and following years*	Yield 2022	Yield 2023	Yield 2024	2022	2023	2024	2022	2023	2024	2022	2023	2024	2022	2023	2024	
F0.1	t	t	t	%	%	%	%	%	%	%	%	%	%	%	%	%
F_{max}	t	t	t	%	%	%	%	%	%	%	%	%	%	%	%	%
66% F_{max}	t	t	t	%	%	%	%	%	%	%	%	%	%	%	%	%
75% F_{max}	t	t	t	%	%	%	%	%	%	%	%	%	%	%	%	%
85% F_{max}	t	t	t	%	%	%	%	%	%	%	%	%	%	%	%	%
0.75 X F_{2018}	t	t	t	%	%	%	%	%	%	%	%	%	%	%	%	%
F_{2018}	t	t	t	%	%	%	%	%	%	%	%	%	%	%	%	%
1.25 X F_{2018}	t	t	t	%	%	%	%	%	%	%	%	%	%	%	%	%

ANNEX B. Guidance for providing advice on Stocks Assessed without a Population Model

For those resources for which only general biological and/or catch data are available, few standard criteria exist on which to base advice. The stock status should be evaluated in the context of management requirements for long-term sustainability and the advice provided should be consistent with the precautionary approach.

The following graphs should be presented, for one or several surveys, for the longest time-period possible:

a. time trends of survey abundance estimates
b. an age or size range chosen to represent the spawning population
c. an age or size-range chosen to represent the exploited population
d. recruitment proxy or index for an age or size-range chosen to represent the recruiting population.
e. fishing mortality proxy, such as the ratio of reported commercial catches to a measure of the exploited population.
f. Stock trajectory against reference points

And any information the Scientific Council deems appropriate.

APPENDIX IV. LIST OF SUMMARY (SCS) DOCUMENTS

Summary Documents (SCS)

SCS Doc. No.	Serial No.	Author(s)	Title
SCS Doc. 22/22	N7363	NAFO	Scientific Council September Meeting, 19-23 September 2023, Porto, Portugal
SCS Doc. 22/23	N7364	NAFO	A Compilation of Research Vessel Surveys on a Stock-by-stock Basis
SCS Doc. 22/24	N7365	NAFO	Available Data from the Commercial Fisheries Related to Stock Assessment (2021) and Inventory of Biological Surveys Conducted in the NAFO Area in 2021 and Biological Surveys Planned for 2022 and Early-2023

APPENDIX V. LIST OF PARTICIPANTS, SEPTEMBER 2022

SCIENTIFIC COUNCIL CHAIR	
Dwyer, Karen	Science Branch, Fisheries & Oceans Canada, P.O. Box 5667, St. John's, NL. A1C 5X1 Tel.: +709-772-0573 - E-mail: karen.dwyer@dfo-mpo.gc.ca
CANADA	
Koen-Alonso, Mariano	Science Branch, Fisheries & Oceans Canada, P.O. Box 5667, St. John's, NL. A1C 5X1 E-mail: Mariano.Koen-Alonso@dfo-mpo.gc.ca
Krohn, Martha	Senior Science Advisor, Fisheries & Oceans Canada, 200 Kent Street, Ottawa, ON K1A 0E6, Tel.: +613-998-4234 – E-mail: martha.krohn@dfo-mpo.gc.ca
Simpson, Mark Chair of STACFIS	Science Branch, Fisheries & Oceans Canada, P.O. Box 5667, St. John's, NL. A1C5X1 Tel.: +709-772-4841 - E-mail: mark.r.simpson@dfo-mpo.gc.ca
DENMARK (IN RESPECT OF FAROE ISLANDS AND GREENLAND)	
Ridao Cruz, Luis	Nóatún 1, P.O. Box 3051, FO-110 Tórshavn, Faroe Islands Tel.: +298 353900 - E-mail: luisr@hav.fo
EUROPEAN UNION	
Alpoim, Ricardo	Instituto Português do Mar e da Atmosfera, I. P., Av. de Brasilia, 1449-006 Lisbon, Portugal Tel.: +351 21 302 7000 - E-mail: ralpoim@ipma.pt
Caetano, Miguel Chair of STACFEN	Instituto Português do Mar e da Atmosfera (IPMA), Division of Oceanography and Marine Environment, Rua Alfredo Magalhães Ramalho, 6, 1495-165 Algés, Portugal Tel: +351 21 302 7070 – Email: mcaetano@ipma.pt
Durán Muñoz, Pablo	Instituto Español de Oceanografia, Aptdo 1552, E-36280 Vigo (Pontevedra), Spain E-mail: pablo.duran@ieo.csic.es
Garrido Fernández, Irene	Instituto Español de Oceanografia, Aptdo 1552, E-36280 Vigo (Pontevedra), Spain E-mail: irene.garrido@ieo.csic.es
González-Troncoso, Diana Vice-Chair of Scientific Council and Chair of STACREC	Instituto Español de Oceanografia, Aptdo 1552, E-36280 Vigo (Pontevedra), Spain Tel.: +34 9 86 49 2111 - E-mail: diana.gonzalez@ieo.csic.es
González-Costas, Fernando	Instituto Español de Oceanografia, Aptdo 1552, E-36280 Vigo (Pontevedra), Spain Tel.: +34 9 86 49 2111 - E-mail: fernando.gonzalez@ieo.csic.es
Näks, Liivika	Head of the Unit of Ocean Fisheries, Estonian Marine Institute, University of Tartu. E-mail: liivika.naks@ut.ee
Merino Buisac, Adolfo.	DG MARE, Unit C.3 – Scientific advice and data collection, J99 03/003, B-1049 Brussels/Belgium Tel: +32 2 29 590 46 – Email: adolfo.merino-buisac@ec.europa.eu
Mar Sacau	Instituto Español de Oceanografía, Vigo, Spain Email: mar.sacau@ieo.csic.es
FRANCE (IN RESPECT OF ST. PIERRE ET MIQUELON)	
Goraguer, Herlé.	French Research Institute for Exploitation of the Sea(IFREMER), Quai de l'Alysse, BP 4240, 97500, St. Pierre et Miquelon Tel: +05 08 41 30 83 – Email: herle.goraguer@ifremer.fr
JAPAN	
Taki, Kenji	Associate Scientist, National Research Institute of Far Seas Fisheries, Agency, 5-7-1, Orido, Shimizu-Ward, Shizuoka-City, Shizuoka, Japan E-mail: takisan@affrc.go.jp

NORWAY	
Hvingel, Carsten	Institute of Marine Research, P.O. Box 1870, N-5817 Bergen, Norway Tel: +47 95980565 E-mail: carsten.hvingel@imr.no
RUSSIAN FEDERATION	
Fomin, Konstantin	Knipovich Polar Research Institute of Marine Fisheries and Oceanography (PINRO), 6 Knipovich St., Murmansk 183763 Tel.: +7 8152 436 177 E-mail: fomin@pinro.ru
Melnikov, Sergey	Federal Research Institute of Fisheries & Oceanography (VNIRO) Email: melnikov@vniro.ru
UNITED KINGDOM	
Readdy, Lisa	CEFAS, Lowestoft Laboratory, Lowestoft, UK E-mail: lisa.readdy@cefas.co.uk
UNITED STATES OF AMERICA	
Hendrickson, Lisa	National Marine Fisheries Service, NEFSC, 166 Water St., Woods Hole, MA 02543 E-mail: lisa.hendrickson@noaa.gov
Sosebee, Katherine	National Marine Fisheries Service, NEFSC, 166 Water St., Woods Hole, MA 02543 Tel.: +508-495-2372 - E-mail: katherine.sosebee@noaa.gov
FAO	
Reid, Keith	E-mail: keith.reid@rossanalytics.com.au
Thompson, Anthony	E-mail: Anthony.Thompson@fao.org
NAFO SECRETARIAT	
Bell MacCallum, Dayna	Scientific Information Administrator, NAFO Secretariat, Halifax, Canada E-mail: dbell@nafo.int
Blasdale, Tom	Scientific Council Coordinator, NAFO Secretariat, Halifax, Canada E-mail: tblasdale@nafo.int