

#### IV. FORMULATION OF ADVICE (SEE ANNEXES 1, 2 AND 3)

##### 1. Request from the Commission

Advice for shrimp in Division 3M was provided by the Scientific Council in September 2020. No further requests were considered in October 2020.

##### 2. Requests from Coastal States

###### a) Northern shrimp in Subarea 1 and Div. 0A

*Advice November 2020 for 2021*


##### Recommendation

In line with Greenland's stated management objective of maintaining a mortality risk of no more than 35% (subject to a risk of biomass being below  $B_{lim}$  of less than 1%), Scientific Council advises that catches in 2021 should not exceed 115 000 t.

With regard to the Canadian harvest strategy, Scientific Council notes that catches of 115 000 t in each of the years 2021 to 2023 would result in less than 35% risk of exceeding  $Z_{msy}$  in 2021 and 2022 and exactly 35% risk of exceeding  $Z_{msy}$  in 2023.

##### Management Objectives

A management plan and management objectives have been defined by the Government of Greenland in 2018. The objective is to maintain a mortality risk of no more than 35% of exceeding  $Z_{msy}$  (subject to a risk of biomass being below  $B_{lim}$  of less than 1%). Canada has a harvest strategy with the objective to maintain the stock in the Healthy Zone (>80% of  $B_{msy}$ ); when the biomass is above 80% of  $B_{msy}$ , the risk of being above  $Z_{msy}$  should be less than 35%, based on the 3-year projections. Advice was also drafted to be consistent with the NAFO precautionary approach (FC Doc. 04-12).

<i>Objective</i>	<i>Status</i>	<i>Comment/consideration</i>
Apply Precautionary Approach		Stock status is both estimated and forecast relative to precautionary reference points

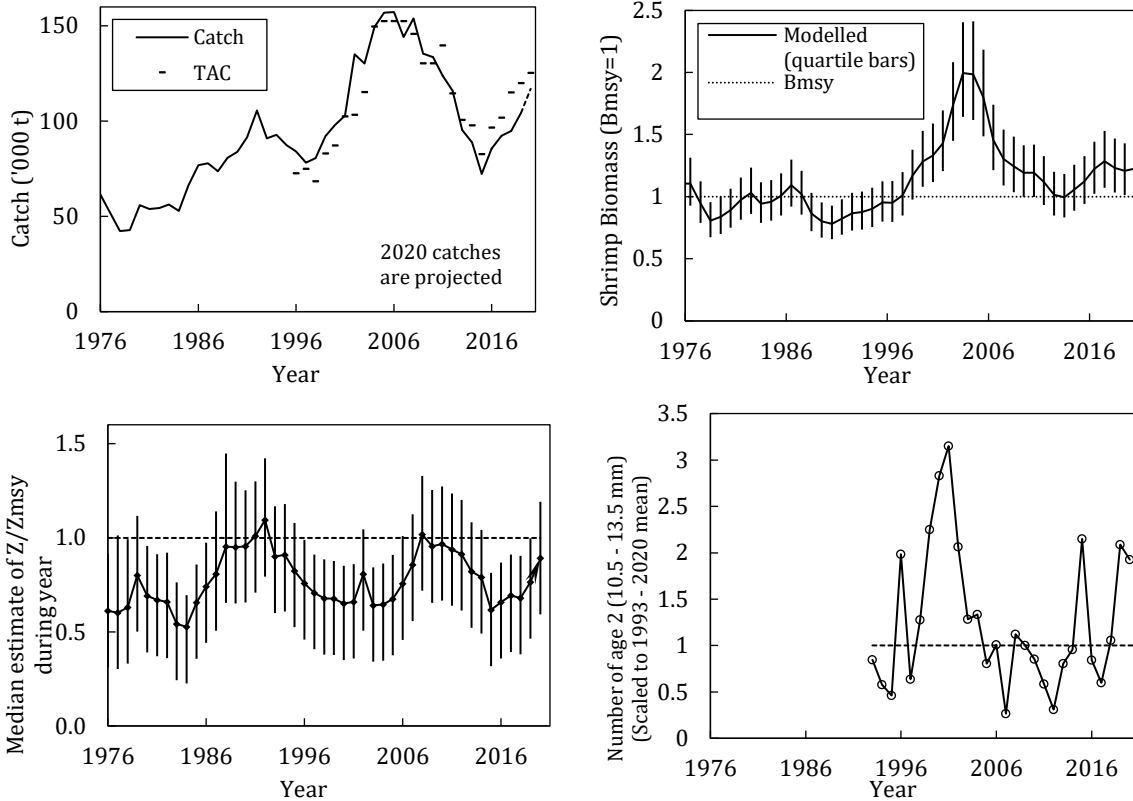
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##### Management unit

The stock, considered distinct from all others, is distributed throughout Subarea 1, extends into Div. 0A east of 60°30'W, and is assessed as a single stock. In 2019, 98% of the landings were from Greenland.

##### Stock status

Biomass at the end of 2020 is above  $B_{msy}$  and the probability of being below  $B_{lim}$  is very low (<1%). The probability of mortality in 2020 being above  $Z_{msy}$  is 40%. Recruitment (number of age-2 shrimp) in 2020 is above average.



### Reference points

$B_{lim}$  has been established as 30%  $B_{msy}$ , and  $Z_{msy}$  (fishery and cod predation) has been set as the mortality reference point (FC Doc. 04-18).  $B_{msy}$  and  $Z_{msy}$  are estimated directly from the assessment model.

### Projections

Predicted probabilities of transgressing precautionary reference points in 2021 – 2023 under eight catch options and subject to predation by a cod stock with an effective biomass of 7 Kt.

7 000 t cod	Catch option ('000 tons)								
	Risk of:	95	100	105	110	115	120	125	130
falling below $B_{msy}$ end 2021 (%)	24	24	25	27	26	27	27	27	28
falling below $B_{msy}$ end 2022 (%)	25	25	27	28	29	29	29	30	31
falling below $B_{msy}$ end 2023 (%)	25	26	28	30	31	32	32	33	33
falling below $B_{lim}$ end 2021 (%)	0	0	0	0	0	0	0	0	0
falling below $B_{lim}$ end 2022 (%)	0	0	0	0	0	0	0	0	0
falling below $B_{lim}$ end 2023 (%)	0	0	0	0	0	0	0	0	0
exceeding $Z_{msy}$ in 2021 (%)	19	22	26	30	33	37	40	44	44
exceeding $Z_{msy}$ in 2022 (%)	19	22	27	31	34	39	42	45	45
exceeding $Z_{msy}$ in 2023 (%)	20	23	28	32	35	39	43	46	46
falling below $B_{msy}$ 80% end 2021 (%)	8	8	9	9	9	9	10	9	9
falling below $B_{msy}$ 80% end 2022 (%)	9	10	11	11	11	12	13	13	13
falling below $B_{msy}$ 80% end 2023 (%)	10	10	12	12	13	14	16	17	17

## Assessment

Advice is based on risk analysis coming from a quantitative model. The analytical assessment was run in 2020 with revised treatment of the input data (SCR Doc. 20-56, 20-58) and with updated data series.

The next assessment is scheduled for 2021.

### *Human impact*

Mortality related to the fishery has been documented. Other human sources (e.g. pollution, shipping, oil-industry) are considered minor.

### *Biological and Environmental Interactions*

Cod is an important predator on shrimp. This assessment incorporates this interaction. Other predation is likely but not explicitly considered. Shrimps might be important predators on, for example, fish eggs and larvae.

## Fishery

Shrimps are caught in a directed trawl fishery. Bycatch of fish in the shrimp fishery is around 1% by weight. The fishery is regulated by TAC.

Recent catches and TACs (t) have been as follows:

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
<b>Enacted TAC<sup>1</sup></b>	139 583	114 425	100 596 <sup>1</sup>	97 649 <sup>1</sup>	82 561 <sup>1</sup>	96 426 <sup>1</sup>	101 706 <sup>1</sup>	114 876 <sup>1</sup>	119 875 <sup>1</sup>	125 229 <sup>1</sup>
<b>STATLANT 21</b>	123 195	114 970	91 802	88 834	71 779	84 303	91 725	91 869	102 706	
<b>NIPAG</b>	123 989	115 977	95 381	88 765	72 256	85 527	92 584	94 878	104 314	117 000 <sup>2</sup>

<sup>1</sup> Sum of TACs autonomously set by Canada and Greenland.

<sup>2</sup> Projected to year end

## Effects of the fishery on the ecosystem

Measures to reduce effects of the fishery on the ecosystem include area closures, moving rules and gear modifications to reduce damage to benthic communities and reduce bycatch.

## Special comment

From 1993 to 2010 the Greenlandic survey in the Canadian area (SFA1) was conducted annually. In that period, average biomass in that area was 2% of the total biomass estimated in Subarea 1 and Div. 0A. Since 2011, due to ice cover, there has only been sporadic information from the Greenlandic survey in the Canadian area (SFA1). The area was surveyed only in 2013 and 2017. In 2013, the biomass in that area (SFA1) was less than 1% of the total estimated biomass in Subarea 1 and Div. 0A, whereas it was about 2% in 2017.

**Source of Information SCS Doc 13/04, FC Docs 04-18, SCR Docs 20-53, 54, 55, 56, 57, 58.**