Northern shrimp in Subareas 0 and 1

Recommendation: Recent catches are not estimated to be sustainable. Scientific Council therefore recommends that catches in 2013 should be substantially lower.

The risk of exceeding Z_{msy} in 2013 at a catch level of 80 000 t with an effective cod stock at the 2012 level (22 700 t) is estimated to be around 34%. Model results estimate catches at that level in the medium term to be associated with an increasing stock above B_{msy}.

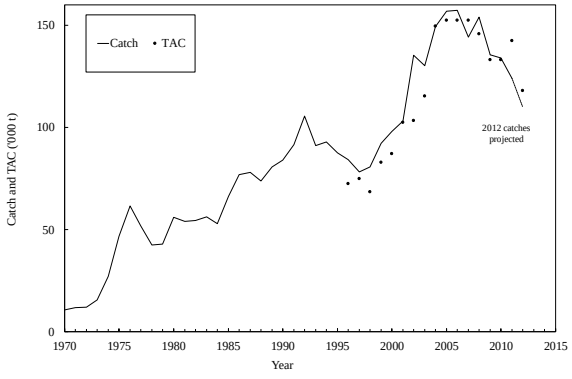
Given the level of risk which was accepted in 2012, Scientific Council recommends that catches in 2013 should not exceed 80 000 t.

Background: The shrimp stock off West Greenland is distributed in Subarea 1 and Div. 0A east of 60°30'W. A small-scale inshore fishery began in SA 1 in the 1930s. Since 1969 an offshore fishery has developed.

Fishery and Catches: The fishery is prosecuted mostly by Greenland in SA 1 and Canada in Div. 0A. Canada did not fish in 2008 and fished little in 2009, but has since resumed fishing. Recent catches are:

Year	Catch ('000 t)		TAC ('000 t)	
	NIPAG	STATLANT 21	Advised	Actual[2]
2009	135.5	134.0	110	133.0
2010	134.0	129.2[1]	110	133.0
2011	124.0	122.1[1]	120	142.4
2012	110.0[3]		90	117.9

[1] Provisional.
[2] Total of TACs set independently by Greenland and Canada.
[3] Predicted to year end by industry observers.



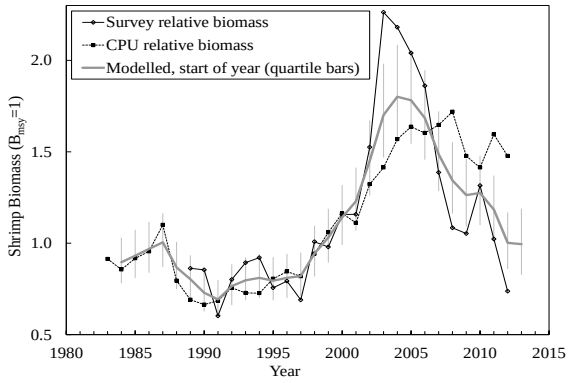
Data: Catch, effort, and position data were available from all vessels. Indices of how widely the stock and the fishery were distributed were calculated from catch positions in the fishery and the survey.

Series of biomass and recruitment indices and size- and sex-composition data were available from research surveys. Series of cod biomass and cod consumption were also available.

Assessment: An analytical assessment framework was used to describe stock dynamics in terms of biomass (B) and mortality (Z) relative to biological reference points.

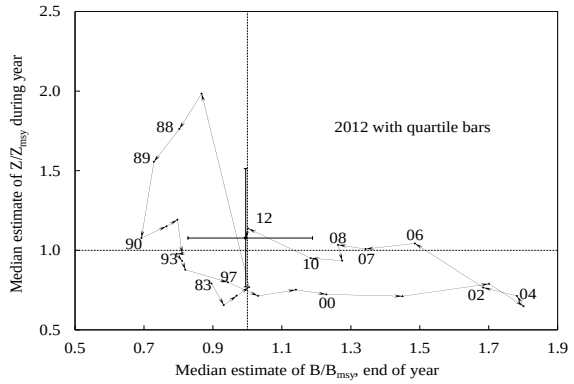
The model used was a stochastic version of a surplus production model including an explicit term for predation by Atlantic cod, stated in a state-space framework and fitted by Bayesian methods. *MSY* (Maximum Sustainable Yield) defines maximum production, and B_{msy} is the biomass level giving *MSY*.

A precautionary limit reference point for stock biomass (B_{lim}) is 30% of B_{msy} and the limit reference point for mortality (Z_{lim}) is Z_{msy}. Recent CPUE values have stayed high, while the area fished has contracted and survey biomass indices have decreased, and CPUE is not now considered a reliable index of biomass. The weight given to it in the model was therefore reduced in 2011. The median estimate of *MSY* in 2012 was 132 000 t/yr.

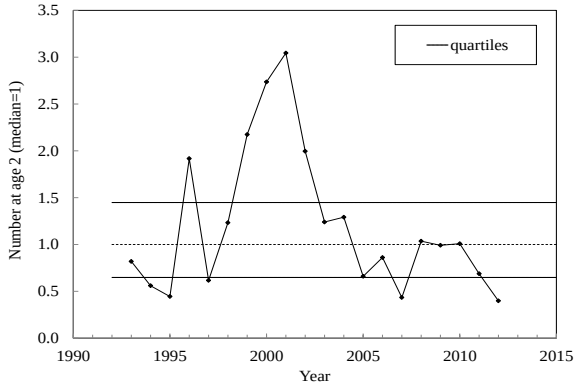


Biomass. A stock-dynamic model showed a maximum biomass in 2003 with a continuing decline since; the probability that biomass will be below B_{msy} in 2012 with projected catches at 110 000 t was estimated at 51%; of its being below B_{lim} at 1–2%.

Mortality. The mortality caused by fishing and cod predation (Z) is estimated to have stayed below the upper limit reference (Z_{msy}) from 1996 to 2005, but is estimated to have averaged 2.6% over the limit value in 2006 - 2012. With catches projected at 110 000 t the risk that total mortality in 2012 would exceed Z_{msy} was estimated at about 56%. Atlantic cod is, in 2012, more concentrated in southerly areas where shrimps are now scarce, and predation is expected to be moderate or low.



Recruitment. The stock structure in 20121 is deficient in shrimps of intermediate size 15–22 mm CPLfishable males, presaging poor short-term recruitment to both the fishable and spawning stocks. . Shrimps at 14–16.5 mm CPL are abundant relative to survey biomass, promising some short-term recruitment to the fishable biomass.Pre-recruits (CL 14–16.5 mm), expected to enter the fishery in 2013, have been lowfew since 2008 in absolute terms. ; Nnumbers at age 2 in 2011 2012 have declined from the level of the 3 foregoing years to 55% of the series meantheir lowest-ever level, so medium-term recruitment is also also expected to be poor.



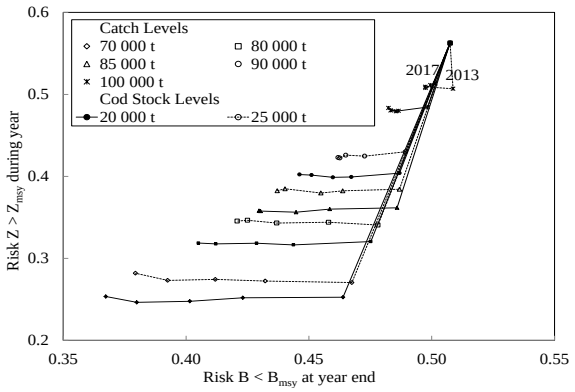
State of the Stock. Modelled biomass is estimated to have been declining since 2004. At the end of 2012 biomass is projected to be close to B_{msy}. Total mortality is projected to exceed Z_{msy}. Recruitment to the fishable and spawning stock in the short- and medium-term is expected to remain low.

Short-term predictions: Estimated risks for 2013 with an "effective" (the amount of cod biomass overlapping the shrimp biomass) 25 000 t cod stock are:

25 000 t cod	Catch option ('000 t)						
Risk of transgressing (%):	70	75	80	85	90	95	100
Bmsy, end 2013	47	48	48	49	49	50	51
Blim, end 2013	1	1	1	1	1	1	2
Zmsy, in 2013	27	31	34	38	43	47	51
Zmsy, in2014	27	31	34	38	42	47	51

Medium-term Predictions: Projected probabilities of transgressing precautionary reference levels after 3 years in the fishery for Northern Shrimp on the West Greenland shelf with 'effective' cod stocks assumed at 20 000 t (20Kt) and 25 000 t (25Kt) were estimated at:

Catch (Kt/yr)	Prob. biomass < B_{MSY} (%)		Prob. biomass < B_{lim} (%)		Prob. mort > Z_{msy} (%)	
	20 Kt	25 Kt	20 Kt	25 Kt	20 Kt	25 Kt
70	40	41	2	3	25	27
75	41	43	2	3	28	31
80	43	44	2	3	32	34
85	44	45	3	3	36	38
90	46	47	3	3	40	43
95	47	49	3	3	44	46
100	48	50	3	3	48	51



Special Comments: Scientific Council notes that the fishable biomass offshore comprises a high proportion of females, so fishing on this stock in this state will disproportionately reduce the spawning stock biomass. Recruitment in absolute terms is expected to be low in both the short and medium term.

Scientific Council notes that there are indications of factors other than fishery that may be involved in the current decline of the stock.

Sources of Information: SCR Docs 04/75, 04/76, 08/62, 12/44, 12/45, 12/46, 12/48, 12/57, SCS Doc. 04/12.