

Northern Shrimp (*Pandalus borealis*) in Subareas 0 and 1

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

Fishery and Catches: The fishery is prosecuted mostly by Greenland and Canada; since 2004 the EU has had a 4 000 t quota in SA 1. Recent catches from the stock are as follows:

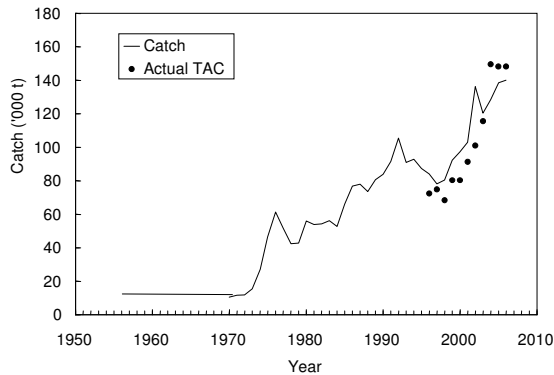
Year	Catch ('000 tons)		TAC ('000 tons)	
	NIPAG	21A ²	Recommended	Actual ⁴
2003	120.3 ¹	80.6	100	115.2
2004	128.5	139.3	130	149.5
2005	138.6	7.9	130	148.2
2006	140.2 ³		130	152.4

¹ Corrected for overpacking;

² Provisional;

³ Estimated to the end of 2006;

⁴ Total of TACs set by Greenland and Canada.



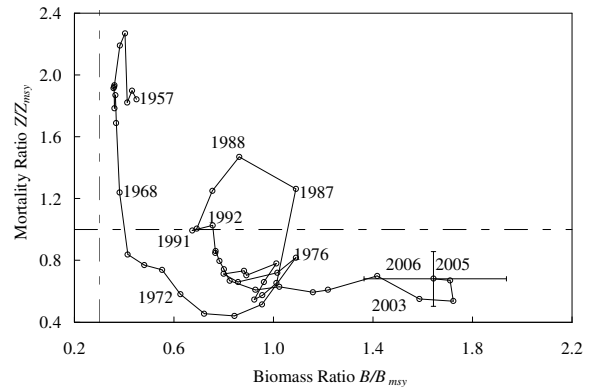
Data: Catch and effort data were available from all vessels. Series of biomass and recruitment indices and size- and sex-composition data were available from research surveys. Series of cod biomass and cod consumption were also available.

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

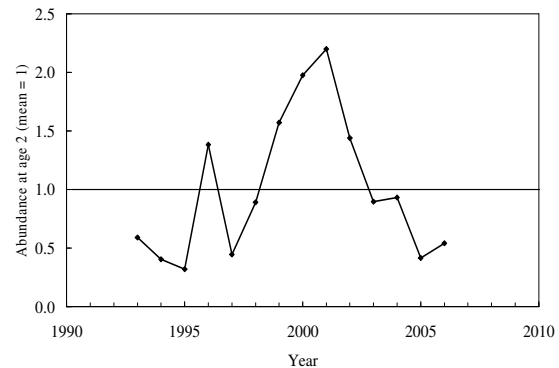
The model used was a stochastic version of a surplus-production model including an explicit term for predation by Atlantic cod, stated in a state-space framework and fitted by Bayesian methods. MSY (Maximum Sustainable Yield) defines maximum

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} .

Mortality: The mortality caused by fishing and cod predation (Z) has been stable below the upper limit reference (Z_{msy}) since 1997. With catches in 2006 projected at 140 200 t the risk that total mortality exceeded Z_{msy} was estimated at about 9%.



Recruitment: The estimated number of age-2 shrimp decreased in 2002, was below average in 2003 and 2004, decreased again in 2005 to near a 10-year low value and stayed very low in 2006.



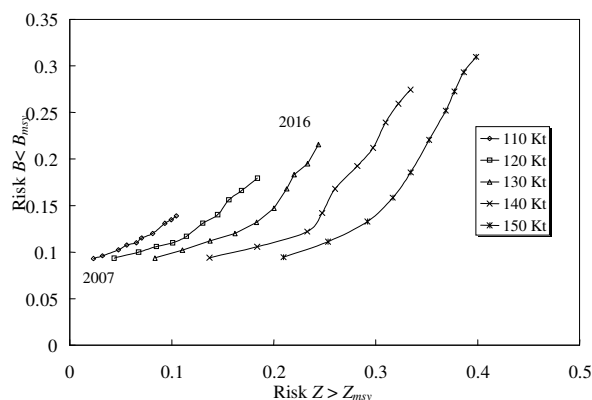
Biomass: Since the late 1990s the fishable stock has increased and the survey index reached high levels in 2003 and 2004. This index then decreased in 2005 and 2006, and CPUE also decreased. The modelled stock biomass reached its hitherto highest value in 2004; the estimated risk of stock biomass being below B_{msy} at end 2006 was 9%, but less than 1% of being below B_{lim} .

State of the Stock: The fishable biomass increased substantially from the late 1990s to historically high levels in 2004, and has then shown a slight decrease to 2006. Biomass at the end of 2006 is estimated to be well above B_{msy} and mortality by fishery and cod predation well below Z_{msy} . Recruitment to the fishable

stock is likely to decrease after 2006 and to stay low for several years.

Recommendations: The stock is estimated to be in the safe zone according to the NAFO PA framework. A total catch of around 130 000 tons in Div. 0A and SA 1 in 2007 will have a low probability of the stock falling outside of the safe zone by the end of 2007.

Medium-term Considerations: Ten-year projections of stock development were made using the assumption that the cod stock will remain at its 2006 level. Catches at 130 000 t/yr may not be sustainable in the longer term. The risk of this is aggravated by the likelihood that recruitment to the fishable stock will decrease after 2006 and to remain low for several years.



If the cod stock were to increase rapidly above the current low level, as it did in the late 1980s, predation could reach the level of the current catches within 3-4 years. Such an occurrence should be detected by routine survey programs and management options could be re-evaluated.

Risk associated with five optional catch levels for 2007 are:

Risk, in 2007, of:	2007 Catch Option ('000 t)				
	110	120	130	140	150
falling below B_{msy}	9.3%	9.4%	9.4%	9.4%	9.5%
falling below B_{lim}	<<1%	<<1%	<<1%	<<1%	<<1%
exceeding Z_{msy}	2.3%	4.4%	8.4%	13.7%	21.0%

Special Comments: The Scientific Council advice is for catch weight, correctly reported, without overpacking.

Sources of Information: SCR Doc. 02/158, 04/75, 76, 06/57, 58, 60, 61, 68, 72; SCS Doc. 04/12.