PART G: SCIENTIFIC COUNCIL MEETING, 10-17 SEPTEMBER 2014

Contents

SC-NIPAG Participants 2014

Back Row: Brian Healey, Don Stansbury, Dennis Zakharov, Ole Eigaard, Mats Ulmestrand, Rimantas Dapšys

Middle Row: Helle Siegstad, AnnDorte Burmeister, Silver Sirp, Don Power, Carsten Hvingel, Nannette Hammeken-Arboe

Front Row: Miquel Casas, Neil Campbell, Dave Orr, Barbara Marshall, Guldborg Søvik, Michael Kingsley.

SC Chair – Don Stansbury, NIPAG Co-Chairs – Michael Kingsley and Brian Healey
SC Coordinator – Neil Campbell

Report of Scientific Council Meeting

10-17 September 2014

Chair: Don Stansbury Rapporteur: Neil Campbell

I. PLENARY SESSIONS

The Scientific Council met at the Greenland Institute of Natural Resources, Nuuk, Greenalnd during 10-17 September 2014, to consider the various matters in its Agenda. Representatives attended from Canada, Denmark (Greenland), European Union (Denmark, Estonia, Lithuania and Spain), Norway and Russia. The Scientific Council Coordinator was in attendance.

The Executive Committee met at 0900 to discuss a plan of work. The opening session of the Council was called to order at 0930 hours on 10 September 2014.

The Chair welcomed representatives, advisers and experts to the opening session of Scientific Council. The Chair noted that the primary reason for this meeting was to provide advice on shrimp stocks based on the assessments provided by the joint NAFO/ICES *Pandalus* Assessment Group (NIPAG). ICES members of NIPAG were granted observer status at the Scientific Council meeting, and the Chair wished all NIPAG members a productive and successful meeting.

The Scientific Council Coordinator, Neil Campbell, was appointed Rapporteur.

This opening session was adjourned at 1000 hours. Several sessions were held throughout the course of the meeting to deal with specific items on the agenda.

The concluding session was convened at 1000 hours on 17 September 2014. The Council then considered and adopted Sections III.1–4 of the "Report of the NAFO/ICES *Pandalus* Assessment Group" (NAFO SCS Doc. 14/18, ICES CM 2014/ACOM:14). The Council, having considered the results of the assessments of the NAFO stocks, provided advice and recommendations and noted the requests of the Fisheries Commission and Coastal States had been addressed. The Council then considered and adopted its own report of the 10-17 September 2014 meeting.

The meeting adjourned at 1600 hours on 17 September 2014.

The revised Agenda, List of Research (SCR) and Summary (SCS) Documents, and the List of Representatives, Advisers and Experts, are given in Appendix I, II and III, respectively.

II. REVIEW OF RECOMMENDATIONS IN 2013

These were reviewed in the appropriate STACFIS sections below.

III. NAFO/ICES *PANDALUS* ASSESSMENT GROUP

NIPAG has assessed four stocks of relevance to NAFO: Northern shrimp in Div. 3M, Northern shrimp in Div. 3LNO, Northern shrimp in Subareas 0 and 1, and Northern shrimp in Denmark Strait and off East Greenland. The Scientific Council summary sheets and conclusions for these stocks are presented in Section IV of this report. The recommendations to Fisheries Commission, with respect to stock advice, appear in the summary sheets. The full NIPAG report is available in NAFO SCS Doc. 14/18 and ICES CM 2014/ACOM:14

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

1. Request from Fisheries Commission

The Fisheries Commission Request for Advice (Annex 1a) for shrimp in Div. 3M and Div. 3LNO regarding stock assessment (Item 1) is given below.

a) Northern Shrimp in Division 3M

Advice September 2014 for 2015

Recommendation

No directed fishery.

Management objectives

No explicit management plan or management objectives defined by Fisheries Commission. General convention objectives (GC Doc. 08-03) are applied. Advice is based on qualitative evaluation of biomass indices in relation to historic levels, and provided in the context of the precautionary approach framework (FC Doc. 04/18).

Convention objectives	*Status*	*Comment/consideration*
Restore to or maintain at B_{msy}	🔴	Stock below B_{lim}
Eliminate overfishing	🟢	No directed fishery
Apply Precautionary Approach	🟡	B_{lim} defined. No fishing mortality reference point defined
Minimise harmful impacts on living marine resources and ecosystems	🟢	VME closures in effect, no directed fishery, sorting grids mandatory
Preserve marine biodiversity	⚪	Cannot be evaluated

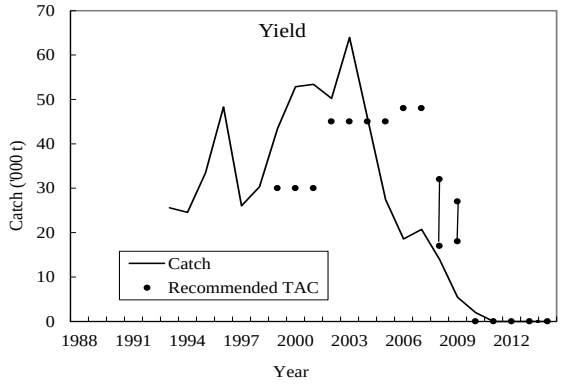
🟢 OK
🟡 Intermediate
🔴 Not accomplished
⚪ Unknown

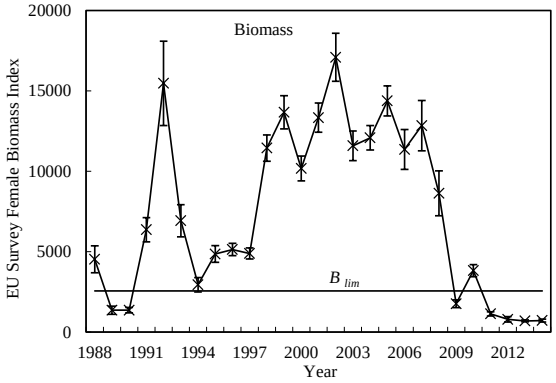
Management unit

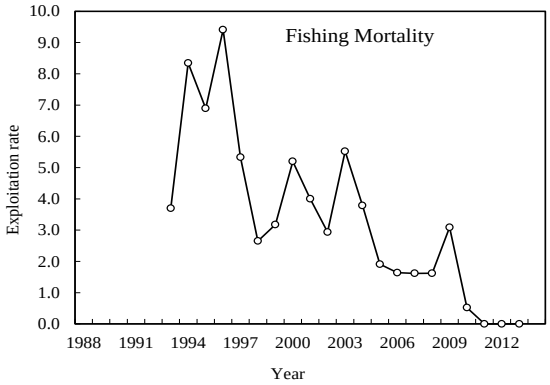
The Northern Shrimp stock on Flemish Cap is considered to be a separate population.

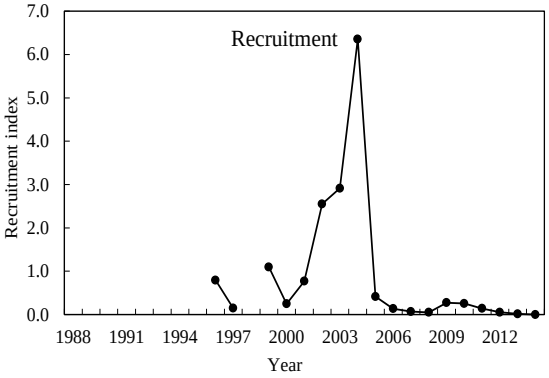
Stock status

Following several years of low recruitment, the spawning stock has declined, and has remained below B_{lim} since 2011. Due to continued poor recruitment there are concerns that the stock will remain at low levels.









Reference points

Scientific Council considers that a female survey biomass index of 15% of its maximum observed level (2564) provides a proxy for B_{lim} (SCS Doc. 04/12).

Projections

Quantitative assessment of risk at various catch options is not possible for this stock at this time.

Assessment

No analytical assessment is available. Evaluation of stock status is based upon fishery and research survey data.

This stock is typically assessed annually. The next full assessment is currently scheduled for 2015. Scientific Council suggests this stock be moved to biennial assessments.

Human impact

Low fishery related mortality due to moratorium and low bycatch in other fisheries. Other sources (e.g. pollution, shipping, oil-industry) are considered minor.

Biological and Environmental Interactions

The drastic decline of shrimp biomass since 2007 correlates with the increase of the cod stock in Div. 3M. It is uncertain whether this represents a causal relationship and/or the result of an environmental factor.

Results of modelling suggest that, in unexploited conditions, cod would be expected to be a highly dominant component of the system, and high shrimp stock sizes, like the ones observed in the 1998 – 2007 period, would not be a stable feature in the Flemish Cap.

Fishery

This fishery is effort-regulated. The effort allocations were reduced by 50% in 2010 and a moratorium was imposed in 2011. Catches are expected to be close to zero in 2014.

Recent catches were as follows:

	2007	2008	2009	2010	2011	2012	2013	2014
NIPAG	21 000	13 000	5 000	2 000	0	0	0	0[1]
STATLANT 21	17642	13431	5374	1976	0	0	0	
Effort (Agreed Days)	10555	10555	10555	5227	0	0	0	
[1] To September 2014								

Effects of the fishery on the ecosystem

No fishery.

Special comments

None

Source of Information

SCR Doc. 14/049, 050

b) Northern Shrimp in Divisions 3LNO

Advice September 2014 for 2015

Recommendation

No directed fishery as there is a very high probability that the stock is below B_{lim}.

Management objectives

No explicit management plan or objectives defined by Fisheries Commission. General convention objectives (GC Doc. 08/3) are applied. Advice is based on qualitative evaluation of biomass indices in relation to historic levels, and provided in the context of the precautionary approach framework (FC Doc. 04/18).

Convention objectives	*Status*	*Comment/consideration*
Restore to or maintain at B_{msy}		Stock below B_{lim}
Eliminate overfishing		Current exploitation rate not sustainable
Apply Precautionary Approach		Only B_{lim} is defined
Minimise harmful impacts on living marine resources and ecosystems		Nordmøre Grate mandatory; bycatch protocols; VME closures in effect
Preserve marine biodiversity		Cannot be evaluated

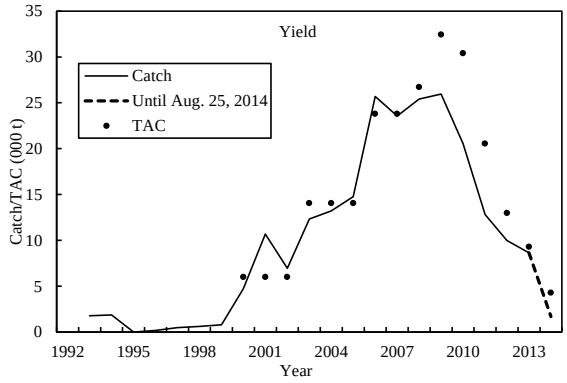
OK
Intermediate
Not accomplished
Unknown

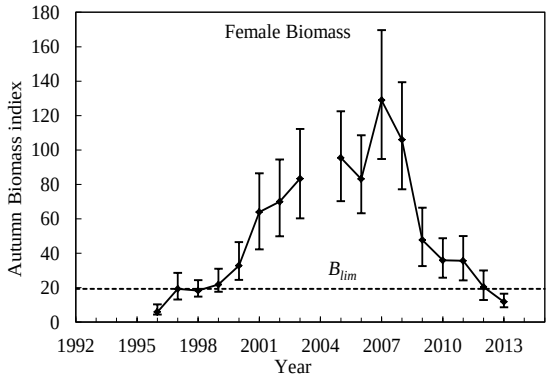
Management Unit

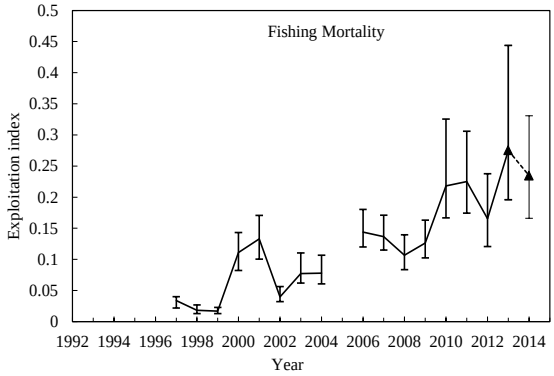
The stock in Div. 3LNO is assessed and managed as a discrete population (see special comment).

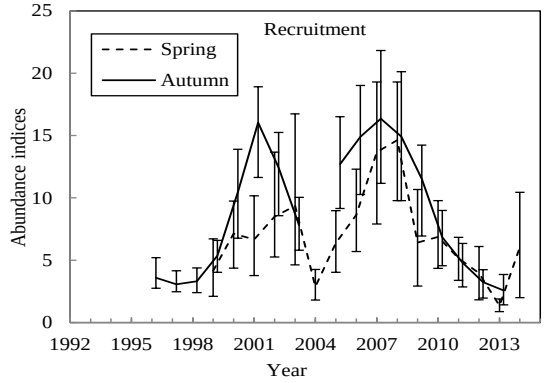
Stock Status

The stock has declined since 2007 and in 2013 the risk of being below B_{lim} is greater than 95%. Given expectations of poor recruitment and relatively high fishing mortality, the stock is not expected to increase in the near future.









Reference points

Scientific Council considers that a female survey biomass index of 15% of its maximum observed level (19 330) provides a proxy for B_{lim} (SCS Doc. 04/12).

Projections

Quantitative assessment of risk at various catch options is not possible for this stock at this time.

Assessment

Based upon a qualitative evaluation of trends in stock biomass, fishing mortality proxy and recruitment. Input data are research survey indices and fishery data.

Next full assessment is planned for 2015.

Human impact

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

Biological and Environmental Interactions

Both stock development and the rate at which changes might take place can be affected by changes in predation, in particular by cod, which has been estimated to consume large amounts of shrimp. The size of the cod stocks in Div. 2J3KL and Div. 3NO have increased but remain at low levels and therefore the impact of cod predation is considered to be small. Some other groundfish which consume shrimps are known to have increased, but the impact on the shrimp stock has not been quantified.

Temperature in the stock area has been warming over the past decade. Effects of warmer temperatures on shrimp distribution, recruitment, growth and survival are unknown.

Fishery

Northern Shrimp is caught in a directed bottom trawl fishery and there is little or no bycatch in other trawl fisheries. The Northern Shrimp fishery is regulated by quota.

	2007	2008	2009	2010	2011	2012	2013	2014
Enacted TAC[1]	23784	26718	32438	30396	20557	12975	9297	4300
STATLANT 21	21140	24855	25609	17575	12598	9994	8197	
NIPAG[2]	23570	25407	25900	20536	12900	10108	8647	1688[3]

[1] Includes autonomous quotas
[2] NIPAG catch estimates have been updated using various data sources (see p. 13, SCR Doc. 14/048)
[3] Provisional catches up to August 25, 2014

Effects of the fishery on the ecosystem

No specific information available. General impacts of fishing gear on the ecosystem should be considered.

Special Comments

Genetic analysis has been completed. Shrimp in Div. 3LNO are genetically distinct from those in Div. 3M and the Gulf of Maine, but not from those further north. Additional work is ongoing to investigate the contribution of stocks north of Div. 3L to the production of Div. 3LNO shrimp.

Sources of information

SCR Doc. 14/047, 048; http://www.dfo-mpo.gc.ca/Library/352955.pdf

2. Requests from Coastal States

a) Northern Shrimp in Subarea 1 and Div. 0A

Advice September 2014 for 2015

Recommendation

Previous work has shown that a maintained mortality risk of 35% is low enough to keep stock levels safely at or above B_{msy}. A catch of 60 000 t in 2015 would entail an estimated mortality risk below 35% and is projected to allow stock growth. Scientific Council therefore advises that catches in 2015 should not exceed 60 000 t.

Management Objectives

Scientific Council is aware of the Greenland management plan for shrimp and of general management objectives specified in the Greenland Fisheries Act; however the contents of these have not been conveyed to the Council. Canada requested Scientific Council to provide advice on this stock within the context of the NAFO Precautionary Approach Framework (SCS Doc. 13/04).

Advice is based on risk analysis coming from a quantitative model, and on qualitative evaluation of biomass and stock-composition indices.

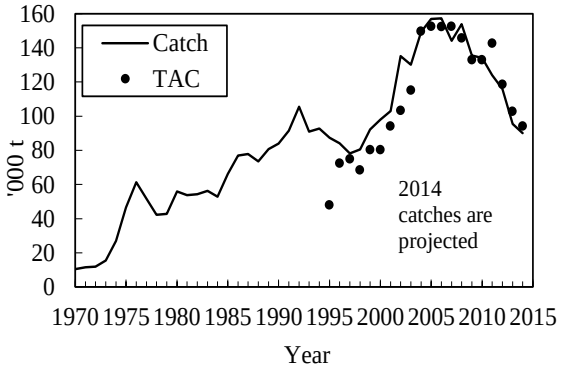
Objective	*Status*	*Comment/consideration*		
Apply Precautionary Approach		Stock status is both estimated and forecast relative to precautionary reference points		OK

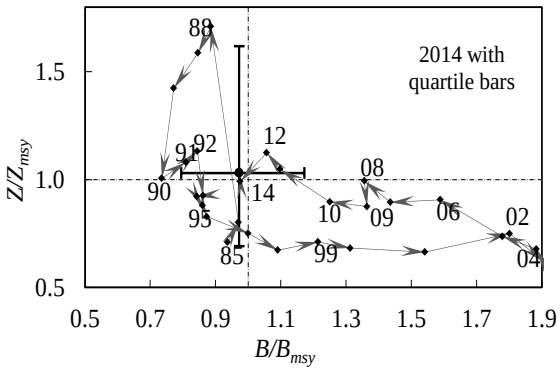
Management unit

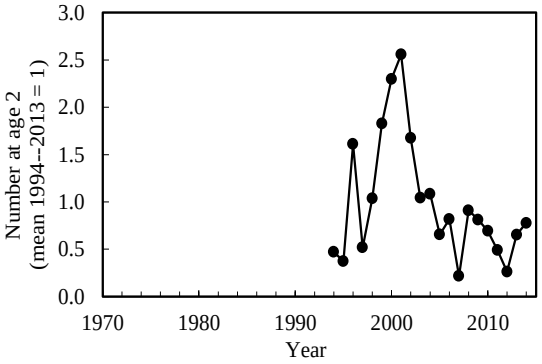
The stock, considered distinct from all others, is distributed throughout Subarea 1, extends into Div. 0A east of 60°30'W, and is assessed as a single stock.

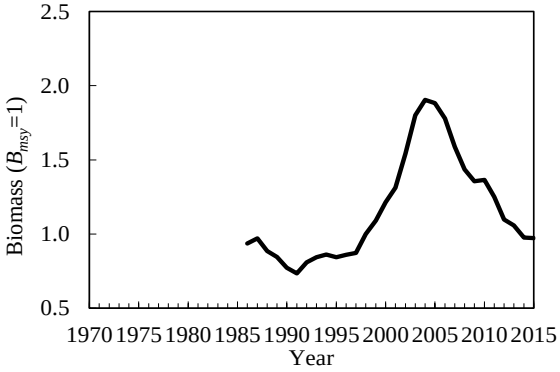
Stock status

Biomass is estimated to have been declining since 2004, and at the end of 2014 is projected to be near B_{msy} with a risk of being below B_{lim} of <2%. The risk that total mortality in 2014 will exceed Z_{msy} is estimated at 53%.









Reference points

B_{lim} is 30% of B_{msy} and the limit reference point for mortality is Z_{msy} (FC Doc. 04/18).

Projections

Projections for 2015 were made with catch levels ranging from 50 to 90 Kt/yr and a cod stock biomass at 50 Kt.

50 000 t cod	Catch option ('000 t)						
Risk (%) of transgressing:	50	55	60	65	70	80	90
B_{msy}, end 2015	50	51	51	52	52	53	54
2016	47	47	48	49	49	52	53
2017	45	46	47	48	49	52	54
B_{lim}, end 2015	3	3	3	3	3	3	3
2016	3	4	4	4	4	4	4
2017	5	5	5	5	5	5	6
Z_{msy} during 2015	27	30	32	36	39	47	53
2016	28	30	33	37	40	47	54
2017	28	31	34	37	41	47	55

Assessment

The analytical assessment was run with the same methods as in 2011–13, with the exception that cod-stock biomass index series were combined within the model, and with updated data series.

The next assessment is scheduled for 2015.

Human impact

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

Biological and Environmental Interactions

Cod is an important predator on shrimps. This assessment incorporates this interaction.

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:

	2007	2008	2009	2010	2011	2012	2013	2014
NIPAG	144 190	152 749	135 458	133 990	123 985	115 975	95 380	90 000[1]
STATLANT 21	144 123	148 550	133 990	129 179	123 195	115 080	91 802	-
Enacted TAC[2]	152 417	145 717	132 987	132 987	142 597	118 596	102 767	94 140

[1] provisional—projected to year end;

[2] sum of TACs autonomously set by Canada and Greenland.

Effects of the fishery on the ecosystem

Measures to reduce effects of the fishery on the ecosystem include area closures and moving rules to protect sponges and cold-water corals and to reduce bycatch, and gear modifications to reduce damage to benthic communities, and, again, to reduce bycatch.

Special comments

The future trajectory of the stock is likely to depend on the evolution of the stock of cod, which has recently been increasing and is difficult to predict.

The stock comprises a low proportion of males, and recruitment to both the fishable and the spawning stocks in the short term are expected to remain low.

Source of Information

SCR Docs 04/75, 04/76, 08/6, 11/053, 11/058, 12/44, 13/54, 14/52, 58, 59, 61, 62, 67 SCS Doc. 04/12.

b) Northern Shrimp in Denmark Strait and off East Greenland

Advice September 2014 for 2015

Recommendation

In 2013 Scientific Council advised that catches should not exceed the current catch level of 2 000 t, and there is no basis to change this advice.

Management objectives

Scientific Council is aware of general management objectives specified in the Greenland Fisheries Act; however the contents of these have not been conveyed to the Council.

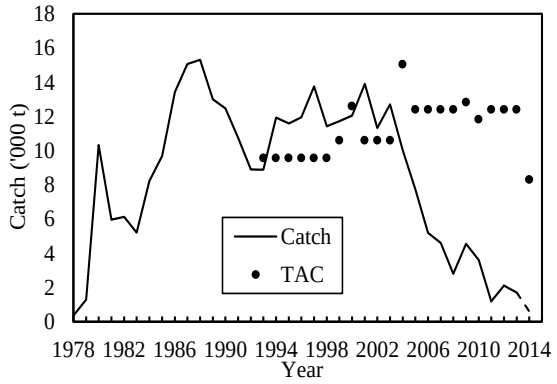
Advice is based on qualitative evaluation of biomass indices in relation to historic levels.

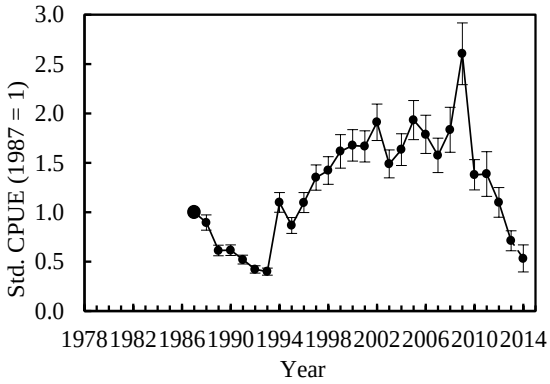
Management unit

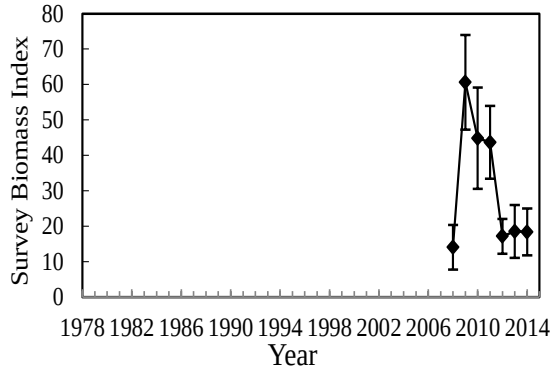
The shrimp stock is distributed off East Greenland in ICES Div. XIVb and Va and is assessed as a single population

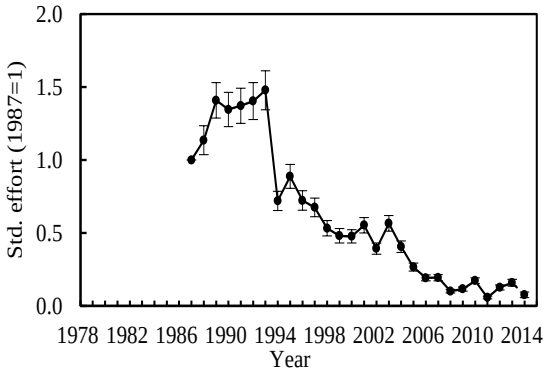
Stock status

The stock size remained at a very low level in 2014 despite several years of very low exploitation rates.









Reference points

No reference points have been established for this stock

Projections

Quantitative assessment of risk at various catch options is not possible for this stock at this time.

Assessment

No analytical assessment is available. Evaluation of stock status is based upon interpretation of commercial fishery and research survey data.

Human impact

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

Biological and Environmental Interactions

Cod is an important predator on shrimp. The cod stock has been increasing in East Greenland waters in recent years.

Fishery

Shrimp is caught in a directed trawl fishery. The fishery is regulated by TAC and bycatch reduction measures include move on rules and Nordmøre grates.

Recent catches were as follows:

	2007	2008	2009	2010	2011	2012	2013	2014[1]
NIPAG	4 600	2 794	4 555	3 735	1 235	2 109	1 706	609
SC Recommended TAC	12 400	12 400	12 400	12 400	12 400	12 400	12 400	2 000
Enacted TAC	12 400	12 400	12 835	11 835	12 400	12 400	12 400	8 300

[1] To July 2014

Effects of the fishery on the ecosystem

Measures to reduce effects of the fishery on the ecosystem include move-on rules to protect sponges and cold-water corals, and gear modifications to reduce damage to benthic communities.

Source of Information

SCR Doc. 14/057, 14/060

c) Harvest Control Rule (Item 7 of Annex II)

7. In connection with the certification of the West Greenland Cold Water Prawn Trawl Fishery, Denmark (on behalf of Greenland) asks the NAFO Scientific Council to view the below suggested Harvest Control Rules to be applied in the context of the present risk-based management of the fishery:

1. *The management of the fishery must be based on long-term goals.*
2. *The total TAC should be set in such a way as to ensure that the estimated risk of the overall stock mortality exceeding Fmsy does not exceed 35%.*
3. *The above 35% risk level must be maintained regardless of the estimated size of the stock relative to Bmsy.*
4. *Efforts must be made to ensure that the TAC does not vary by more than a maximum of 12.5% from year to year, either up or down.*

Scientific Council is asked to assess whether the above proposed HCR, in relation to the management of the West Greenland prawn fishery, are likely to maintain biomass in a safe zone above B_{msy}, and to recommend research studies that would improve its ability to make such an assessment.

The Council responded:

Scientific Council is presently unable to determine whether the proposed HCR is sustainable over the long term.

In order to address this matter, SC **advises** that simulation studies can be undertaken that can determine whether this and/or other candidate management plans will meet management goals, but, before undertaking such studies, management goals need to be established and an acceptable risk of not attaining them defined. These goals could include metrics of stock sustainability, fishery performance and socio-economic factors *inter alia*.

For example, if a long-term goal is to maintain biomass above the B_{msy} level, then the risk of the stock being below B_{msy} after some predefined period must be agreed to and explicitly tested against the above rule or any rules that could become part of the stock management plan.

Initial work was presented to Scientific Council in 2013 (SCR Doc 13/055). Preliminary conclusions from these experiments were:

- Catch smoothing costs. Keeping the inter-annual change in catch small appears to reduce mean catches and reduces mean biomass—i.e. is less safe. Even worse is unsymmetrical catch smoothing, a policy under which catches can be increased when things look good but cannot be brought down when they don't. Such a policy tends to drive the stock into a hole from which it is eternally trying to climb out.
- Responsive HCRs aren't so much the good idea that they appear to be at first sight. It looks as though an unresponsive HCR which keeps to a fixed mortality risk regardless of the biomass risk is, under most circumstances, at least as good if not better.
- Conservative levels of mortality risk do give more safety and higher mean levels of biomass, but carry a cost in lower mean catches. They appear to bring the CV of catch down a little bit. A conservative level of mortality risk looks like something of a palliative to unsymmetrical catch smoothing, reducing its worst effects. The effect of changing mortality risk is greater if assessments are imprecise, less if assessments are precise. Might it therefore be useful to change the allowable mortality risk according to the perceived level of uncertainty associated with the assessment?

A maintained mortality risk of 35% appeared to be low enough to keep stock levels safely at or above B_{msy}.

Scientific Council advises that work continues and that experience gained elsewhere in NAFO could be considered in this context.

V. OTHER MATTERS

1. Scheduling of Future Meetings

Scientific Council felt that the timing of the SC/NIPAG meeting worked well and planned to continue with this schedule.

a) Scientific Council, 22 – 26 Sep 2014

Scientific Council noted the Scientific Council meeting will be held in the Palacio de Congresos Mar de Vigo (Congress Centre) in Vigo, Spain, 22-24 September 2014.

b) Scientific Council, 29 May – 11 June 2015

Scientific Council agreed that its June meeting will be held on 29 May – 11 June 2015, at St Mary's University, Halifax.

c) Scientific Council (in conjunction with NIPAG), 9 – 16 Sep 2015

An invitation to host the meeting was given by Canada to be held in St. John's, NL, Canada. This invitation was accepted by the meeting. The agreed dates are 9 – 16 September, 2015.

d) Scientific Council, September 2015

Scientific Council noted that the Annual meeting will be held in September in Halifax, Nova Scotia, Canada, unless an invitation to host the meeting is extended by a Contracting Party.

e) NAFO/ICES Joint Groups

i) NIPAG, 9 – 16 September 2015

This meeting will be held 9 – 16 September 2015, St Johns, Newfoundland, Canada.

ii) WGDEC, March 2015

The next meeting of the ICES – NAFO Working Group on Deepwater Ecosystems is scheduled to take place at ICES Headquarters, Copenhagen, Denmark, during March 2015.

f) NAFO SC Working Groups

i) WGESA (formerly SC WGEAFM), 19 - 27 November, 2014

The Working Group on Ecosystem Science and Assessment will meet at the NAFO Secretariat, Dartmouth, Nova Scotia, Canada, 19 - 27 November, 2014.

2. Topics for Future Special Sessions

No special sessions were proposed.

3. Other Business

a) SC/NIPAG Intersessional Workshop on Recruitment Signals

Scientific Council will hold an intersessional meeting by correspondence to investigate the approporiate recruitment signal which can be used in prediction, taking into account environmental and trophic factors. This was proposed to be hosted by the NAFO Secretariat using Webex.

b) Genetic population structure of northern shrimp, *Pandalus borealis*, in the Northwest Atlantic

Scientific Council received a short presentation on a recently published study (Canadian Technical Report of Fisheries and Aquatic Sciences, 3046). This is a report on genetic variability patterns of northern shrimp sampled along the Northwestern Atlantic coast, from the Hudson Strait to the Gulf of Maine.

A total of 1 384 female shrimp from 14 sample locations were genotyped at 10 microsatellite loci for the purpose of identifying potential population structure of relevance for the management of Canadian shrimp fisheries. Highly significant genetic structuring was detected between parts of the sampled area, with genetically distinct shrimp in the Gulf of Maine and on the Flemish Cap. These locations were therefore concluded to harbour separate shrimp populations. The Newfoundland and Labrador shelf areas appeared much more genetically homogenous, which we attributed to population intermixing as a result of the Labrador Current.

Some genetic differences were detected among samples from these areas, but this putative structuring was comparable in magnitude to that observed among temporal replicates, and was therefore not considered robust evidence for population subdivisions.

VI. ADOPTION OF SCIENTIFIC COUNCIL AND NIPAG REPORTS

The Council at its session on 17 September 2014 considered and adopted Sections III.1-4 of the "Report of the NAFO/ICES *Pandalus* Assessment Group" (SCS Doc. 14/18, ICES CM 2014/ACOM:14). The Council then considered and adopted its own report of the 10-17 September 2014 meeting.

VII. ADJOURNMENT

The Chair thanked the participants for their hard work and contribution to the success of this meeting, and welcomed the peer review and constructive comments received in formulating the scientific advice. The Chair thanked the Scientific Council Coordinator, Neil Campbell, and Barbara Marshall, Information Officer for their support during the meeting. The Chair then thanked the ICES and NAFO Secretariats for their support in general. All participants were then wished a safe journey home and the meeting was adjourned at 1600 hours.