MSC SUSTAINABLE FISHERIES CERTIFICATION

West Greenland Coldwater prawn fishery

Public Certification Report

August 2018

Prepared For: **Sustainable Fisheries Greenland**
Prepared By: Acoura Marine Ltd
Authors: Rod Cappell, Beth Mouat, John Hambrey

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1 Executive Summary

» This report provides details of the MSC assessment process for the fishery for Sustainable Fisheries Greenland. The assessment process began in February 2017 and was concluded on the 31st July 2018.

» A comprehensive programme of stakeholder consultations were carried out as part of this assessment, complemented by a full and thorough review of relevant literature and data sources.

» A rigorous assessment of the wide ranging MSC Principles and Criteria was undertaken by the assessment team and a detailed and fully referenced scoring rationale is provided in the assessment tree provided in **Appendix 1** of this report.

» The Eligibility Date for this assessment is the re-certification date.

The assessment team for this fishery assessment comprised of Rod Cappell, who acted as team leader and primary Principle 3 specialist; Beth Mouat who was primarily responsible for evaluation of Principle 1 and John Hambrey who was primarily responsible for evaluation of Principle 2. Paul MacIntyre was the traceability expert advisor.

Client strengths

» The ongoing development and review of stock assessment approaches.

» The comprehensive catch and effort data available that contribute to enforcement.

» The very limited by-catch of finfish and interaction with ETP species.

Client weaknesses

» The lack of a joint harvest strategy with Canada.

» The fluctuating levels of *P. montaguii* catch within the *P. borealis* fishery.

Determination

» On completion of the re-assessment and scoring process, the assessment team concluded that the West Greenland Coldwater Prawn Fishery should be re-certified under the MSC standards.

Rationale

» There are a number of areas which reflect positively on the fishery:

› The efforts made by the client group to engage with Canada on a joint harvest strategy

› The increased knowledge base that was developed throughout the previous assessment period and is set to be expanded further.

Conditions & Recommendations

» One criteria contributing to the overall assessment score scored less than the unconditional pass mark, triggering a binding condition to be placed on the fishery, which must be addressed in a specified timeframe (within the 5-year lifespan of the certificate). Full explanation of this condition is provided in **Appendix 1.3** of the report, but in brief, the area covered by this condition is:

› 3.1.1 The lack of a joint harvest strategy illustrates shortcomings in international co-operation with Canada. This has resulted in a condition that is consistent with the condition set for the equivalent Canadian shrimp fishery.

» In addition, the assessment team made three recommendations. 1 & 2 relate to PI2.1 retained catch: that the bycatch of P. montaguii continues to be managed and monitored to ensure it remains below 2% of total catch, and that this species be assessed with a view to future assessment as a target species. The 3rd recommendation relates to ensuring threshold levels for move-on rules are aligned with NAFO recommendations. As these are not the result of a failure to meet the unconditional pass mark, they are non-binding; however, in the opinion of the assessment team, they would make a positive contribution to ongoing efforts to ensure the long-term sustainability of the fishery. Details of these recommendations are provided in **Section 5.8** of this report.

For interested readers, the report also provides background to the target species and fishery covered by the assessment, the wider impacts of the fishery and the management regime, supported by full details of the assessment team, a full list of references used and details of the stakeholder consultation process.

Acoura Marine Ltd. confirm that this fishery is within scope.

2 Authorship and Peer Reviewers

2.1 Assessment Team

All team members listed below have completed all requisite training and signed all relevant forms for assessment team membership on this fishery.

Assessment team leader: Rod Cappell
Primarily responsible for assessment under Principle 3
Rod Cappell is Director with Poseidon based in Northern Ireland and has 20 years of experience in the maritime sector. Rod holds degrees in marine biology, marine resource development and a post-graduate qualification in environmental economics. Recent work includes exploring the economic impact of the CFP reform's discard ban. Rod has also worked on a range of European fisheries projects including a review of effort management regimes, Regulatory Impact Assessments and evaluations of EC policy, including CFP reform, cessation measures and EFF funding. Rod's MSC experience has included a variety of UK and European fisheries at pre-assessment and main assessment level. His completed main assessments include Greenland lumpfish fishery, Dutch flatfish fisheries, hand-raked cockles, Scandinavian *Nephrops* fisheries, whitefish in the Barents Sea and various mussel fisheries. His surveillance experience continues with these fisheries extends to Greenland shrimp & North Sea Haddock. Rod is also providing support and benchmarking for Fishery Improvement Plans in the UK and in China.

Expert team member: Beth Mouat
Dr Beth Mouat has over 15 years' experience in shellfish fisheries research, stock assessment and management. Through her work as Joint Head of Marine Science and Technology at the NAFC Marine Centre, she has a key role in the provision of scientific and fisheries management advice to the Shetland Shellfish Management Organisation and is Chair of their Advisory Committee. Her work also includes innovative measures to integrate the use of scientific data and knowledge in active fisheries management plans and processes. She has worked closely with Marine Scotland and Inshore Fisheries Management Groups in Scotland as they progress local management measures and is also a member of the ICES Crab Working Group. Beth has previously carried out MSC pre-assessment work for a fishery in Iceland and has been heavily involved in assisting the Shetland Shellfish Management Organisation as an MSC client in their Accreditation processes, which resulted in a world first for a multi-species accreditation and for a dredge fishery.

Expert team member: John Hambrey
Dr John Hambrey has a first degree in Natural Sciences (University of Cambridge) and a Ph.D in natural resource management (University of Stirling). He has built up more than 30 years' experience as a consultant, advising government, international agencies and the private sector on fisheries and aquaculture development and management, and natural resource/environmental management more generally. Clients have included FAO, the World Bank, the Department for International Development, Marine Scotland, English Nature, Scottish Natural Heritage, Danida, NORAD, several NGOs and the private sector. John has been a major contributor to international guidance on environmental assessment in the aquatic environment, environmental risk analysis, and the ecosystem approach to aquaculture and fisheries. Projects have been undertaken relating to economic and environmental impact assessment, analysis of impacts on ecosystems and ecosystem services, and development of best practice and codes of conduct.

Relevant project experience includes for example: Evaluation of the Code of Conduct for Responsible Fisheries for FAO; facilitation of a series of workshops on the reform of the Common Fisheries Policy; development of environmental indicators for fisheries and aquaculture for the Kiev Report (European Environment Agency); development of environmental impact and environmental quality indicators for Scottish Natural Heritage and the Scottish Government; advice to a group of major supermarket retailers on sourcing responsibly produced shrimp; and analysis of the environmental and economic impacts of fisheries conservation measures for English Nature. More detailed examples can be found on www.hambreyconsulting.co.uk.

2.1.1 Peer Reviewers

Peer reviewers used for this report were Rob Blyth-Skyrme and John Tremblay. A summary CV for each is available in the **Assessment downloads** section of the fishery's entry on the MSC website (https://fisheries.msc.org/en/fisheries/west-greenland-coldwater-prawn/@@assessments).

Rob Blyth-Skyrme has broad fisheries and environmental science, management and policy knowledge, having gained over nearly 20 years of postgraduate work in the marine field. Rob previously led the marine fisheries and aquaculture work of Natural England, the UK Government's statutory advisor on nature conservation in England. Rob has also worked as Deputy Chief Fishery Officer for the Eastern Sea Fisheries Joint Committee, co-managing the activities of a staff of 16 Fishery Enforcement, Research and Environment Officers. He has been involved in assessing numerous MSC fisheries. Rob has passed MSC training and has no Conflict of Interest in relation to this fishery. Full CV available upon request

Dr.John Tremblay has over 35 years of experience in marine fisheries ecology and biology. He has a Ph.D. in Marine Biology from Dalhousie University (1991), and M.Sc. (1982) and B.Sc. Degrees (1979) from the University of Guelph. From 1983 to 2015 he was with the Science Branch of Fisheries and Oceans Canada (DFO). His areas of expertise include the population ecology of invertebrates, stock assessment of decapod crustacea, and communication of fisheries science with stakeholders and peers. He has participated extensively in peer review processes as a team leader and as a reviewer. As head of the Maritimes Region Lobster Unit at the Bedford Institute of Oceanography (BIO) for 10 years, he was responsible for regular assessments of the most valuable commercial species in Canada. John has 32 publications in peer-reviewed journals covering topics such as the early life history of scallops and lobsters, trends in populations of invertebrates and fish in relation to the environment, catchability in traps, and lobster growth and movement. The topics of over 50 technical publications which he co-authored include assessments of lobsters, crabs and scallops, and methods for estimating abundance of decapod crustacea. He retired from DFO in 2015 and is currently a Scientist Emeritus at BIO. John has passed MSC training and has no Conflict of Interest in relation to this fishery. Full CV available upon request

2.1.2 RBF Training

Rod Cappell has been fully trained in the use of the MSC's Risk Based Framework (RBF).
RBF was not used for this fishery assessment.

3 Description of the Fishery

3.1 Final UoC(s)

The final Unit Of Certification for this fishery is as defined below. This has not changed throughout the process.

Species:	This species has a number of common names: Greenland Prawn / Cold Water Prawn / Northern Prawn / Northern Shrimp (*Pandalus borealis)*
Stock:	West Greenland Shrimp (NAFO Division 0A (east of 60°30' W) and Divisions 1A-F)
Geographical area:	West Greenland (Greenland Waters within NAFO Divisions 1A-F)
Harvest method:	Shrimp trawl using otter boards
Client Group:	All Greenland fishers and fishing companies holding a licence for the West Greenland prawn fishery and EU vessels licensed in accordance with the Greenland-EU fisheries agreement.
Other Eligible Fishers:	None

3.1.1 Total Allowable Catch (TAC) and Catch Data

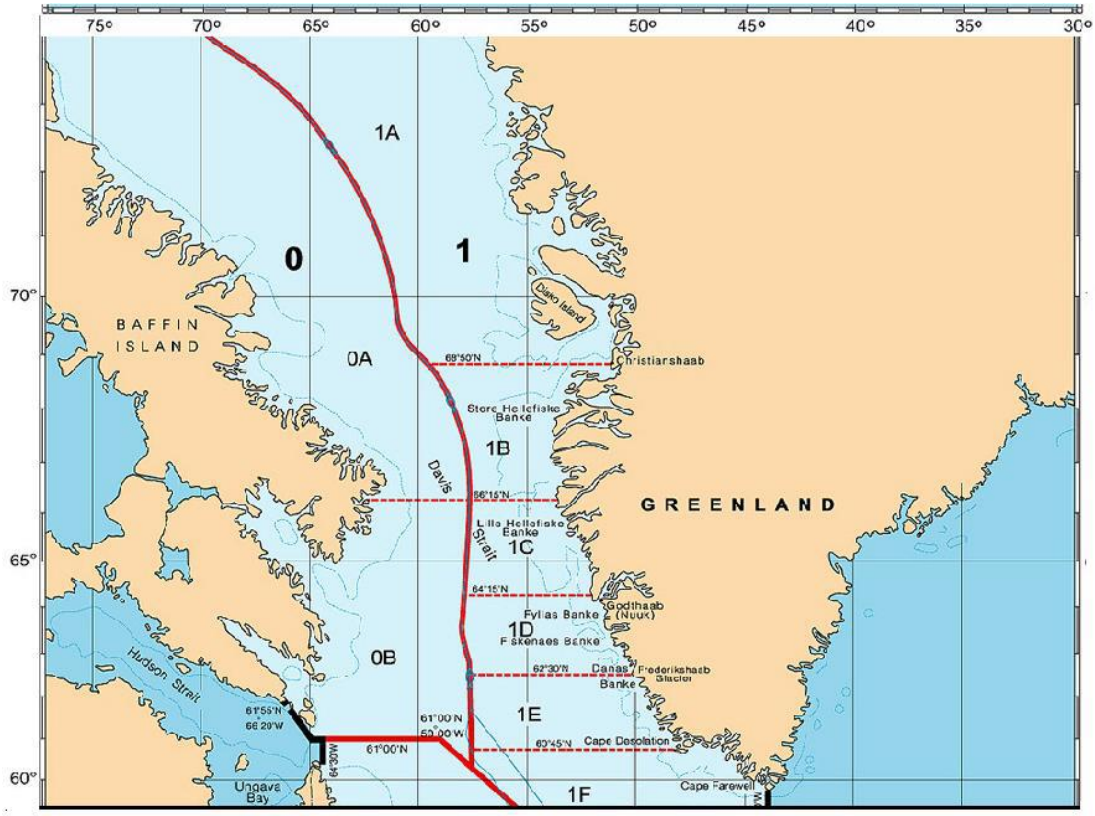
Table 1. TAC and Catch Data

TAC	**Year**	**2016**	**Amount**	**85,000t**
UoA share of TAC	**Year**	**2016**	**Amount**	**97%**
UoC share of total TAC	**Year**	**2016**	**Amount**	**97%**
Total green weight catch by UoC	**Year (most recent)**	**2016**	**Amount**	**82,801t**
	Year (second most recent)	**2015**	**Amount**	**67,016t**

4 Overview of the fishery

The *P. borealis* fishery to the West of Greenland is part of a stock shared with Canada. The major parts of the biomass have most commonly occurred in NAFO Divisions 1B-E at depths between 150-600 m, but in the last few years the fishery has contracted northwards and tends now to be focused in 1B. This stock is well separated from the stock on the Canadian coast in Division 0A as depths in the Davis Strait reach up to 3,000 m. There are no international waters in the Davis Strait and the Canadian Government and the Greenland Home Rule Government each independently establish a Total Allowable Catch (TAC) for Northern shrimp in the Canadian and Greenlandic zones of Division 0A and Subarea 1 respectively.

Figure 4-1 West Greenland (NAFO Divisions 0A and 1A-F)



Source: http://www.nafo.int/about/frames/about.html

From the 1970s, catches rose to an initial peak of 105,000 tonnes (t) in 1992, decreased until 1998, then rose again to a maximum of 157,315 t in 2006 before falling to under 80,000 t in 2015 (with a recent increase in the TAC to 90,000t in 2017).

The Northern shrimp fishery is currently managed by licensing, TACs, and technical measures. A TAC restriction was first imposed in 1977, although the coastal fleet fished outside the TAC until 1997, when coastal vessels were allocated a 43% quota share of the TAC. In the 1990s measures were taken to rationalise fishing capacity and effort in the Greenland offshore fleet, including the implementation of Individual Transferrable Quotas (ITQs) for Greenland shrimp vessels in 1990/91.

All offshore trawlers can process at sea, while the coastal segment is composed of vessels that, except for two factory trawlers, land their entire catch for processing in cooking-and-peeling installations in Greenland. Originally, companies could process 90% of their catch at sea and were required to land 10%. To support the onshore processing sector in Greenland, the amount that can be processed at sea by each company has since been reduced to 75%. The presence of observers on board and this condition has reduced discarding for size.
Most of the coastal vessels land their catch raw and iced in 70 litre boxes. A few land catches, also iced, in 450 litre tubs. One coastal trawler lands her catch frozen in sacks.

All vessels have steel hulls and are built as stern trawlers. Crews range from 5 to 20.

On-board production includes the following:

1. Japan shrimps; which are (large) raw frozen shrimps. Block-frozen in 1-kg cartons after a chemical rinse according to customer requirements.
2. Italian shrimps; which are raw frozen medium-sized shrimps, individually frozen and packed in 5-kg cartons.
3. 'Cooked at sea' shrimps; which are boiled medium-sized individually frozen shrimps packed in 5-kg cartons
4. Industry shrimps; which are small raw individually frozen shrimps packed in synthetic sacks at about 18 kg a sack.

A list of licensed vessels is provided in Table 2. A current vessel list is held by SFG and any changes to the vessel list are reported to the CAB.

All trawlers in the shrimp fishery are required to use a Nordmore sorting grid with a minimum 22mm space between bars, which substantially reduces the by-catch of fish.

Bottom impact by the trawl gear has been reduced through the use of pelagic trawl doors, now in use across the fleet, that operate 10-20m above the seabed. Recently the client group has been working with a gear manufacturer, Vonin, to further reduce bottom contact (and therefore impact) through reduction in chain clump and adaptations to footrope/rockhopper configurations.

Table 2 Vessel list for the West Greenland Coldwater Prawn Fishery as of January 2017

Offshore fishery with 75% on-board processing

Company	Vessel name	Length (m)	Power (kW)	Quota holding (%):
Niisa Trawl ApS Qajaq Trawl A/S	”Regina C” ”Markus”	62.45 62.90	5,570 5,800	13.365* 10.939*
Royal Greenland A/S	”Akamalik”	67.73	4,860	33.333*
	”Qaqqatsiaq”*	62.46	5,520	
Polar Seafood Greenland A/S	“Polar Qaasiut”	63.00	3,640	29.143*
Ice Trawl Greenland A/S	“Nataarnaq”	62.88	4,860	13.223*

Coastal fishery with 75% on-board processing

Company	Vessel name	Length (m):	Power (kW)	Quota holding (%):
Sikuaq Trawl A/S	”Svend C”	74.1	6,960	9.999*
Imartuneq Trawl A/S	”Polar Qaasiut”	58.7	3,640	9.981*
Polar Seafood Greenland A/S	”Polar Qaasiut”	58.7	3,640	3.815*

Coastal fishery without own processing

Company	Vessel name	Length (m)	Power (kW)	Quota holding (%):
Torben R. Johansen	”Bingo III”	14.99	367	2.517*
Gaia Fish A/S	”Lómur”	39.00	975	10.505*
Angunnguaq A/S	”Angunnguaq II”	41.52	1,650	9.898*
	”Karina E”	21.15	477	*
	”Theodora B”	21.04	375	*
Polar Seafood Greenland A/S	”Polar Nataarnaq”	38.26	1,240	5.755*
	”Polar Aassik”*	33.50	1,560	
				*
Brdr. Siegstad	“Pani II”	22.60	599	1.929*
Isortaq Trawl ApS	”Daavi”	22.21	637	4.669*
	”Aleqa”*	21.09	366	
Jørgen Eriksen	”Claudia”	25.22	496	3.591*
Killiat ApS	”Kingigtoq”	21.17	447	2.326*
Savik ApS	”Avataq”	20.41	638	3.041*
Frans Peter Lyberth ApS	”Sara-Dorthe”	20.46	313	1.807*
	”Frans P. Lyberth”*	20.15	368	
Piniartoq Trawl ApS	”Aalisartoq”	19.43	364	2.946*
Nukki Trawl A/S	“Sakkak”	21.60	519	2.579*
Uiloq Trawl A/S	“Aqissiaq II”	23.90	625	9.158*
Royal Greenland A/S	“Sermilik”	25.94	734	7.971*
Maniitsoq RaajatAps	“Maren H”	23.90	599	3.040*

Foreign vessels in offshore fishery

Company	Vessel name	Length (M)	Power (kW)	Quota:
P/R Ocean Tiger	”Ocean Tiger”	60.00	3,960	2,000 tons*

*correct at September 2017

4.1 Principle One: Target Species Background

4.1.1 Biology

The West Greenland coldwater prawn *Pandalus borealis* (also known as the northern shrimp), is a protandrous hermaphrodite, reproducing once or twice as a male before changing sex to become female at an age of around 4-7 years. The biology of the species has been reviewed extensively (e.g. Shumway et al., 1985; Bergsrom, 2000). Following mating the females lay their eggs in the autumn and carry them through the winter with hatching occuring during the spring, the duration of egg incubation being temperature dependent. The larvae are pelagic and remain in the water column for a period of around 2 months, with the duration again dependent on temperature, and during which time they can be transported over large distances. Recruitment has been reported as being dependent on the spawning stock biomass (SSB) with the abundance of one-year-old shrimp being positively correlated with the SSB in the previous year (Aschan & Ingvaldsen, 2009). Other biotic and abiotic factors such as cod predation, the presence of euphausiids, and sea temperature also show significant correlations with shrimp abundance (Aschan & Ingvaldsen, 2009; Jónsdóttir *et al*., 2013).

Pandalus borealis has a discontinuous circumboreal distribution and is generally found on soft sediments, with distribution being further affected by factors such as currents, salinity, depth, light and temperature (Shumway *et al*., 1985). They have been shown to exhibit diurnal vertical migration and the behaviour of the adult population can result in the segregation of different size classes between inshore and offshore areas. These segregations, which may also be seasonal in nature, have been related to temperature preferences and also to reproductive behaviour.

Recent research into the genetic structure of populations of *P. borealis* in Greenland waters has shown that there may be genetically distinct stocks (A. Burmeister, pers. comm.). Differences have been shown between the shrimp found in and offshore to the north of Disko Bay, and those found to the south of Disko Bay (NAFO, 2016a). It is also thought that these shrimp are different from those on the East coast of Greenland, though small sample sizes make this determination uncertain. This work is ongoing, and therefore the data sets and results have not been finalised. Previous studies have reported significant differences between inshore and offshore stocks of *P. borealis* (e.g. Drengstig *et. al.*, 2000) and work using RAPD analysis has shown a high degree of individual variability, which may result in the formation of sub populations as a result of responses to variations in local environmental conditions (Martinez *et al*., 2006). Large scale studies have shown that there are multiple genetically distinct groups over the range of the species in the North Atlantic (Jorde *et al*., 2015). Larval drift has been shown to contribute to genetic homogeneity, with temperature a significant driver with regards to genetic differences between stocks. The fishery is currently assessed as being carried out on a single stock as detailed in section 4.1.2 below, and it may be that the wide dispersal of larvae with a lengthy pelagic phase make it appropriate to consider the stocks in the West Greenland and Canadian fisheries as part of a larger metapopulation (Acoura, 2016a).

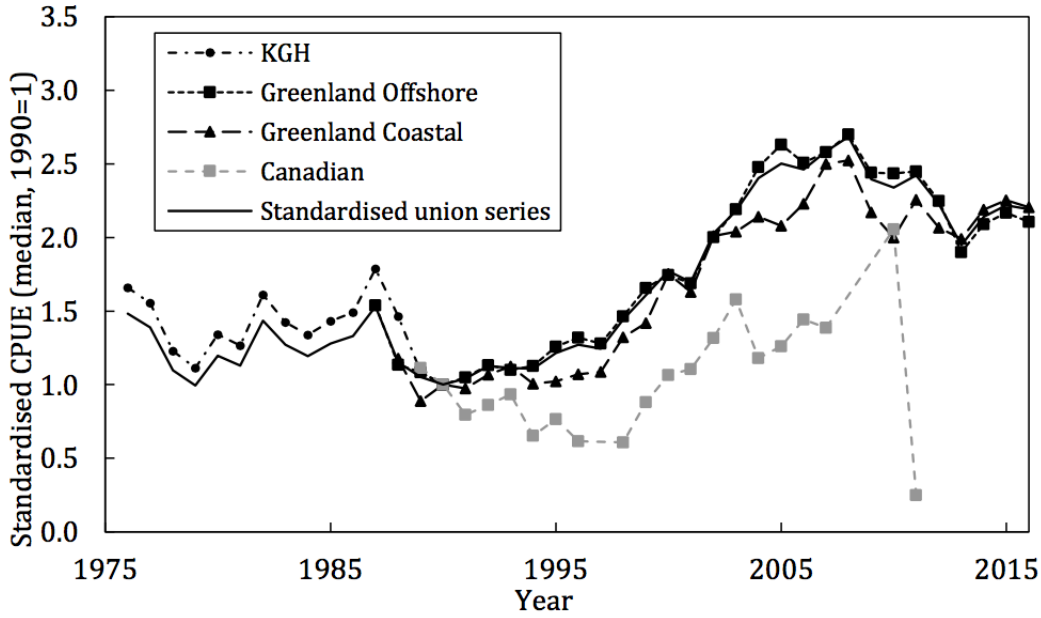
4.1.2 Stock Assessment

Stock assessments for the West of Greenland *P. borealis* stock (along with other stocks from the North Atlantic) are carried out by the Joint NAFO/ICES Pandalus Assessment Working Group (NIPAG). Management advice resulting from these assessments is formulated by the NAFO Scientific Council (SC) The assessment tool is a non-age based quantitative stock-dynamic model, based on a Schafer stock production model. The model was adopted by STACFIC and SC in 2002 and there have been a series of modifications applied in recent years (Kingsley, 2016). These have included measures to reduce uncertainty within the model and improve performance.

The model is fitted to a 30 year time series of data by Bayesian methods and includes a function for cod predation. Input data includes fishing effort and CPUE from logbooks from both the Greenland fleet and Canadian vessels fishing in Div. 0A, and survey data. CPUE data is standardised using linearised multiplicative models including terms for vessel, month, year and statistical area, with the fitted year effects interpreted as a series of annual indices of total stock biomass (NAFO, 2016a). Standardised CPUE data from the different fleet sectors have been combined into a single series (Figure 4-2) and values in recent years remain relatively high following a peak in 2008.

Recent changes in the distribution of the stocks (described in section 3.5.3) have resulted in a contraction of the fishery. It is possible that this could result in an overestimation of CPUE derived biomass, in comparison to previous years when the fishery was more dispersed (NAFO, 2016a).

Figure 4-2 Northern Shrimp in Subarea 1 and Div 0A: Standardised CPUE index series 1976-2016.



Source: NAFO, 2016a

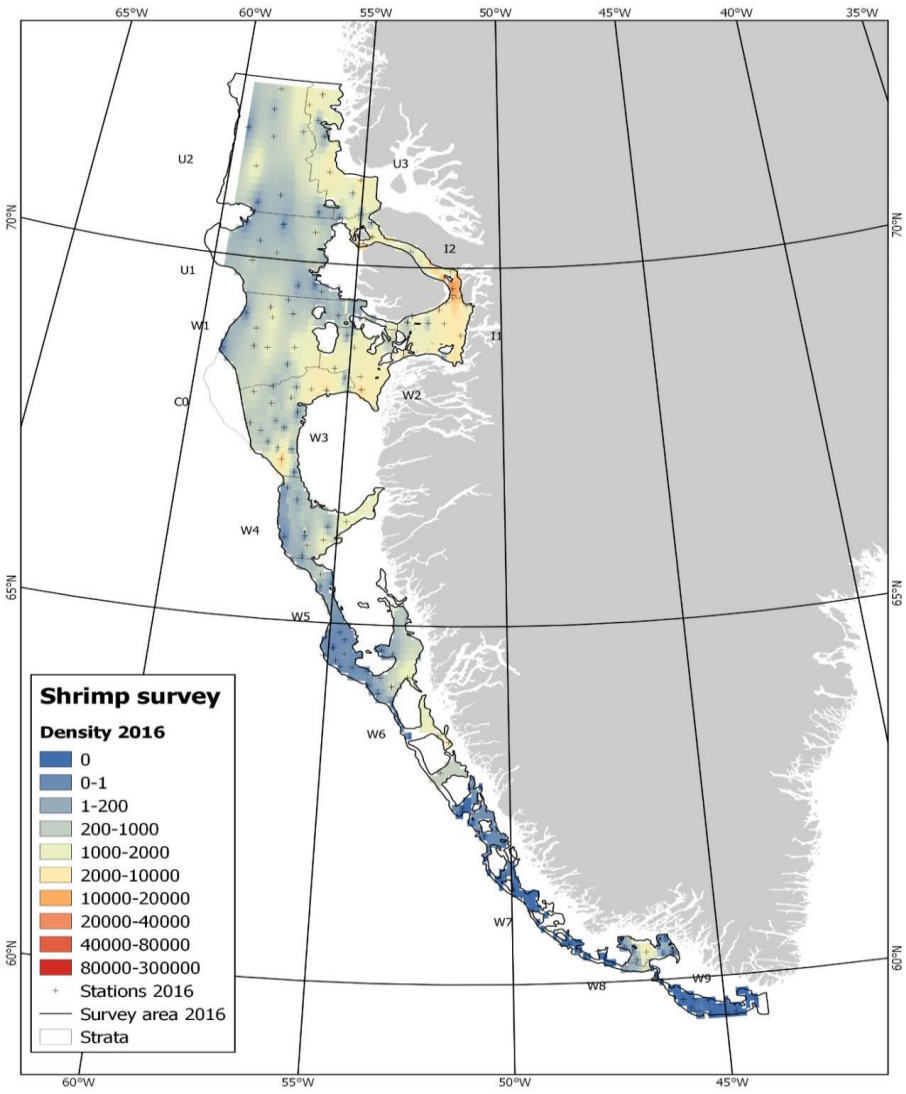
Surveys have been carried out by the Greenland Institute of Natural Resources on an annual basis since 1988 (Burmeister & Kingsley, 2016). The survey is a stratified semi-systematic trawl survey which produces a swept-area index of fishable biomass. The most recent survey data (Burmeister & Kingsley, 2016) has shown that there have been fluctuations in the stock biomass with no clear trends in the data since 2010, though there has been an overall decline since the last peak in 2003. The overall survey biomass decreased by 25.2% in 2015 with the majority of the decline seen in offshore areas where there was a significant reduction of 53.8%. Inshore areas showed a lesser decrease of 17%. This in turn has resulted in a decrease in the fishable biomass. The survey distribution and recorded density of shrimp is shown in Figure 4-3.

Survey data is also used within the stock assessment to predict recruitment to the fishery. Despite high numbers of small individuals recorded in previous years, the relative number of pre-recruits to the fishery has been reported as being low; close to the 10-year minimum in the inshore and the 20-year median offshore (NAFO, 2016a), and therefore recruitment to next year's fishable biomass is expected to be low. As there is a correlation between the index of age two shrimp and the fishable biomass

two, three and four years later, reduced numbers of age 2 individuals recorded in the survey data in recent years also predict a continuing decrease in the fishable biomass in coming years (Burmeister & Kingsley, 2016).

The most recent advice from NIPAG has reiterated a recommendation to further investigate the relationship between estimated numbers of small shrimp and later estimates of fishable biomass (NAFO, 2016a). Consequently, a joint research project between Royal Greenland, Polar Seafood and the Greenland Institute of Natural Resources has been proposed which aims to gather quantitative data on the distribution and abundance of small prawns observed in catches. The aim of this data collection is to provide more effective assessment of recruitment and a basis for assessing generational strength.

Figure 4-3 Pandalus borealis in West Greenland: density distribution from 156 trawl-survey stations in 2016

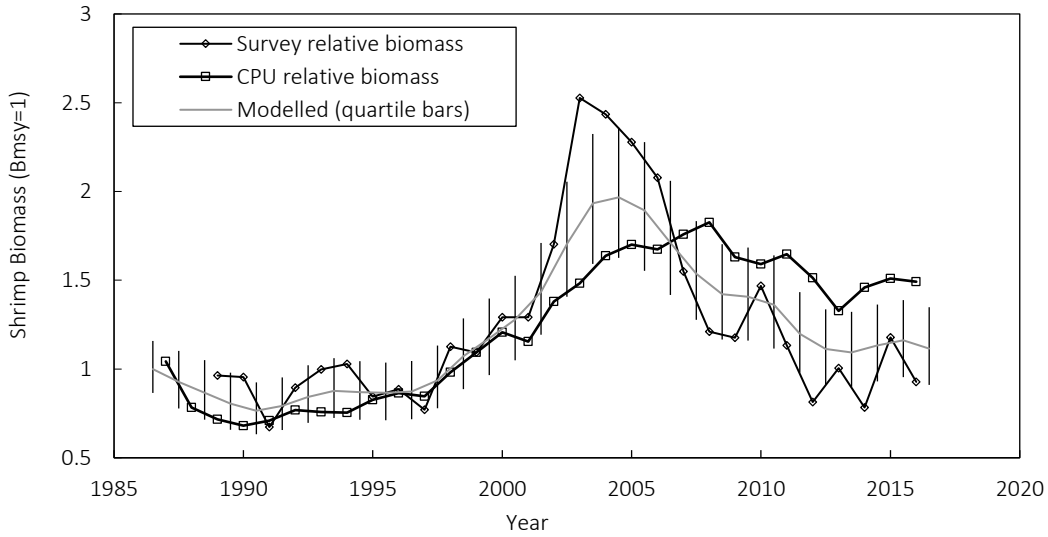


Source: Burmeister & Kingsley, 2016.

The stock assessment reports outputs relative to several reference points; the target reference point is B_{msy}, with B_{lim} set at 30% of B_{msy}, and a mortality reference point (fishery and cod predation) of Z_{msy}. The most recent stock assessment presents the modelled biomass relative to CPUE and survey indices (Figure 4-4). These show a

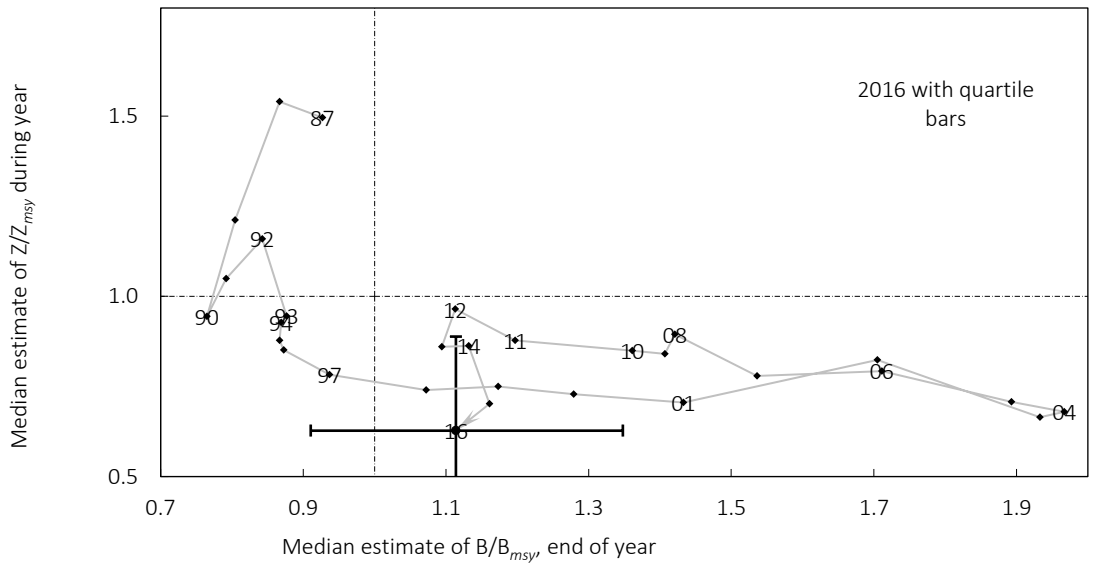
declining trend in stock biomass since 2004 but with relatively stable values in recent years. The stock is currently estimated to be 11% above B_{msy} with the risk of being below B_{lim} less than 1%. Mortality levels have generally been low within the modelled period and below Z_{msy} since the early 1990's (NAFO, 2016a) as can be seen in the trajectory of relative biomass and relative mortality shown in Figure 4-5.

Figure 4-4 Trajectory of the median model estimate of stock biomass relative to Bmsy median commercial CPUE and survey indices.



Source: NAFO, 2016a

Figure 4-5 Trajectory of relative biomass (relative to Bmsy) and relative mortality (relative to Zmsy) 1986 - 2016



Source: NAFO, 2016a

Cod predation is included in the model through an 'effective cod stock' which represents the proportion of the estimated cod biomass which overlaps with the shrimp stock. In 2016 there was in a substantial decrease in the effective cod stock within the model (Kingsley, 2016) due to changes in the estimated cod biomass and a reduction in the overlap with the shrimp stock. A precautionary approach was taken within the assessment, with an average of the previous three years data being used reduce the potential impacts of the low current year effective cod stock on the model

outputs. The resulting risk levels for eight possible catch levels in 2017 with an resulting effective cod stock of 35 000t were predicted (Table 3).

Table 3 Risk associated with eight possible catch levels for 2017 with an 'effective' cod stock at 35 000 t

35 000 t cod	Catch option ('000 tons)							
Risk of:	60	70	75	80	85	90	95	100
falling below Bmsy end 2017 (%)	32.6	33.2	34.2	34.8	35.4	35.0	35.4	36.5
falling below Blim end 2017 (%)	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.0
exceeding Zmsy in 2017 (%)	15.9	20.1	23.0	25.8	28.7	32.0	35.2	38.9
exceeding Zmsy in 2018 (%)	16.3	20.1	22.9	26.1	28.9	31.9	36.1	39.7

Source: Kingsley, 2016

Advice from the NAFO Scientific Council in 2016 indicates that, based on a maintained mortality risk of 35% being low enough to keep stocks safely at or above B_{msy}, that catches in 2017 should not exceed 90 000t. At this level of catch it is estimated that the risk of total mortality exceeding Z_{msy} would be below 35%. This represents no change in the recommended catch from the advice produced in the previous year, though the enacted TAC for 2016 exceeded this value (Table 4). The enacted TAC for the Greenland fishery in 2016 was 82 801t, well below the TAC recommended by the NAFO Scientific Council.

Table 4 Recent catches, projected catches for 2016, and TAC's for the West Greenland Northern Shrimp.

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
TAC											
Advised	130000	130000	110000	110000	110000	120 000	90000	80000	80000	60000	90000
Enacted[1]	152380	152417	145717	132987	132987	139583	114425	98596	94140	79561	93426
Catches (NIPAG)											
SA 1	153188	142245	153707	134940	128104	122523	115931	95286	87358	70650	*80000*[2]
Div. 0A	4127	1945	0	429	5 882	1330	12	2	0	0	*2000*[2]
TOTAL	157315	144190	153707	135369	133985	123853	115943	95288	87358	70650	*82000*[2]
STATLANT 21											
SA 1	153188	142245	148550	133561	123973	122061	114958	91800	88834	70091	
Div. 0A	3788	1878	0	429	5206	1134	12	2	0	0	

[1]Canada and Greenland set independent autonomous TACs (for 2016 this represents 82801t in Greenland waters and 10625 in Canadian waters).
[2]Provisional Total catches for the year as predicted by industry observers.
Source: NAFO, 2016a

4.1.3 Fishery

Northern shrimp occur NAFO divisions 0A and 1A-1F (see Figure 4-1) on the continental shelf off Greenland, with the greatest densities found in depths between 150 – 550m. A review of the fishery between 1970 and 2013 has been carried out by Arboe & Kingsley (2013). The commercial fishery for the species first began in 1935, with the offshore fishery, made up of international vessels developing in the 1970's. The current fishery is carried out by Greenland in Subarea 1 and by Canada in Div. 0A (Figure 4-1). These fishery areas are separated by an area of deep water (>3000m) dividing areas of suitable habitat.

The early fishery was concentrated in Division 1B but spread southwards in the 1980's to divisions 1C-1F, which produced around 70% of the catch. In the mid 1990's the fishery was at its most dispersed (Arboe & Kingsley, 2013). In recent years fishing activity has moved northwards and contracted, with almost half of the catches coming from Div 1B and the proportion caught in Div 1A increasing to around 40%. A new

trial fishery has been permitted focusing on a new fishing grounds to the north of the fishery in Div 1A in Melville Bay. There is interest in this area due to the shrimp stock moving northwards and also to take advantage of increased fishing opportunities resulting from a reduction in the amount of time this area is covered by sea ice. The seasonal nature of access to the northern grounds can lead to further concentration of the fishery when sea ice restricts availability. Recent survey data have also shown that the stocks are being found in shallower areas than previously recorded (Burmeister & Kingsley, 2016).

The Greenland fishery is comprised of two main sectors, an inshore fleet and an offshore fleet, with three licence types covering these areas; trawlers with offshore on-board production licences, vessels with on-board production licences fishing the coastal quota, and non-production licences for the coastal quota, which are mostly restricted to smaller vessels (under 75GRT/120GT). The deep-sea trawlers of which there are six currently licenced, fish from an offshore quota and must operate 3nm outside the baseline, (through they are permitted to fish up to the baseline between 61°N and 65°N from 1st November to 31st March) and they are further excluded from five 'shrimp boxes'. Those vessels fishing on the coastal quota but with an on-board production licence, of which two are currently licenced, may fish up to the baseline, but must remain 3nm from the baseline during summer months from 61°N and 65°N. They are excluded from three of the shrimp boxes. The coastal fleet, comprising 20 vessels, which operate without production licences may fish anywhere including the shrimp boxes and within the baseline. A single EU vessel is also granted quota. The number of licences currently in place has reduced from that reported in the initial certification report (Acoura 2013). There are also various technical measures in place to manage the fishery and these include; trawl gear which has a stretched mesh size of no less than 40 mm, a compulsory sorting grid with bars spaced at no less than 22 mm, and other measures relating to the composition of the gear (Anon, 2015).

There is a Management Plan in place for the fishery (Anon, 2015), which was approved by Naalakkersuisut (Greenland Government) in November 2017, and supersedes the previous version which was agreed in 2010. The revised plan takes into consideration measures taken with respect to management and research, but remains based on the objectives of the Fisheries Act of 1st January 2012:

"In the implementation of this Act the protection and reproduction of the resource shall be emphasised, and fishery effects on the ecosystem shall be kept to an acceptable level. In addition, a rational and seasonally optimal exploitation of the resource, in keeping with normal biological advice and people's recreational requirements, is to be sought."

The management plan sets out, amongst other things, the management responsibilities and procedures and the harvest control strategy and rules. The harvest strategy (Anon, 2015) has four main elements which are:

"To maintain the stock in a condition in which it can most profitably be fished
As a consequence of this harvest control rules should maintain the stock with high probability ABOVE the MSY level.

The secondary objective is to avoid sudden large changes in TAC.
Because of this, the HCR have to be more conservative than they would be if this objective were not present".

The harvest control rules set out the process for managing the resource by controlling catches through the annual setting of a TAC. This is carried out with respect to the risk of fishing mortality exceeding F_{msy} as set out in section 4.1.2.

The current process for setting the TAC begins with the provision of advice by the NAFO Scientific Council based on the stock assessment and the relationship between the model outputs and reference points. The advice is then considered by the Greenland Government in consultation with fishery stakeholders, taking into account a "stabilisation clause" which permits the consideration of social and economic factors. In practice this would restrict any changes in the TAC to within 12.5% between years, thus limiting the impact of changes. This can however be overruled as was the case in 2015 when a strong decline in the biomass was predicted and the resulting quota reduction was increased to 14% (Acoura, 2016b). The Greenland Government then adopts a TAC for the entire shrimp stock on the West Greenland continental shelf, which includes the Canadian EEZ. Following a deduction of a unilaterally calculated set aside of quota for the Canadian fishery, quota is then allocated to the Greenland fleet. Under the Fisheries Act the coastal fleet is allocated 43% of the quota with the offshore fleet allocated the remaining 57%. Quota allocations for 2017 are shown in Table 5. The quota is managed via a system of individual transferable quotas (ITQs), with a quota ceiling of 15% of the TAC in the inshore fleet and 33.3% of the TAC offshore. There is a degree of flexibility within the system, allowing limited carry over of quota, fishing of the following years quota, and permitting some movement of quota between the offshore and inshore sections of the fleet. All of these mechanisms require prior consent via an application to the Fishery Department, where each case is considered individually.

There is no current agreement in place between the Governments of Greenland and Canada with respect to the joint allocation of quota for shared shrimp stocks. Under the recommendations set out in Condition 2 from the previous assessment (Acoura, 2016b) efforts have been made to develop a joint management strategy and harvest control rules. A series of meetings have been held and timetabled. The most recent meeting was arranged for December 2016; however, Canadian delegates were unable to attend due to resource limitations. In their most recent communications with the Canadian Ministry of Fisheries and Hunting SFG have proposed a new approach, based on the United Nations Fish Stock Agreement (UNFSA) – Conservation and management of straddling stocks and highly migratory species (P. Pederson, pers. comm.), but at the time of reporting there had yet to be a response to this.

Recent discussions at the Greenland Fisheries Council have resulted in broad consensus that the proportion of the quota which is allocated to Canada be reduced to a minimum, but that this reduction should be determined on the basis of objective criteria (Anon, 2016). The foremost prerequisite for this being that fishing opportunities should be allocated where the stock biomass occurs. The recommendations from SFG initially proposed to the Fisheries Council were that the biomass estimates used in quota allocation should be based on an average value to reduce the impacts of any large stock fluctuations on the proportion quota to be set aside for Canada. As the most recent stock assessments would most accurately reflect the current stock status they should have a higher weighting than older biomass estimates. The data recommended for these estimates was to be from the surveys undertaken by the Greenland Institute of Natural Resources, and should recognise the difficulties of obtaining data from the Canadian sector due to the frequent presence of

sea ice in this area. When this method for quota allocation was examined however, it was discovered that variations in the data, even when weighted, resulted in a large degree of variance in the potential quota allocation. The preferred approach therefore was to recommend a 60% weighting of the average of the biomass index for the last five years for which data are available. SFG also recommended the inclusion of catch data with a 40% weighting of the last five years, including any zero catches. A final recommendation is that the relationship between the areas covered by the two countries is removed from the distribution model. The reasoning provided for this was that the stocks were not equally distributed across the entire area (Anon. 2016). The results of these proposed methods would be a set aside of 1044 tons for Canada in 2017 (Table 5).

Table 5 Quota allocation set by the Greenland Government for the shrimp fishery in 2017.

Segment	Amount
Coastal Fleet	37,133
Offshore Fleet	49,223
EU	2,600
Canada	1,044
Total	90,000

Source: MFHA, 2016

4.1.4 Lower Trophic Level Considerations

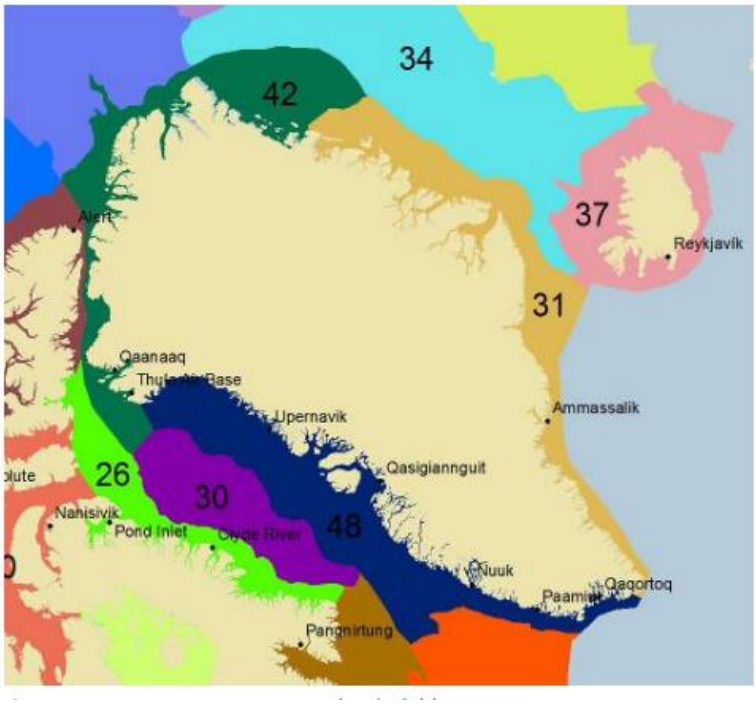
The West Greenland stock of northern shrimp is not considered to be a key lower trophic level (LTL) stock. It is not amongst the species types which are listed as key LTL for the purposes of MSC assessment as set out in the certification requirements (MSC, 2013). It is noted that this species does represent an important prey species for a number of different predators (Parsons, 2005), however, there does not appear to be predator dependence as shrimp make up less than 50% of the diet of species (in many cases substantially less than 50%). Nor are shrimp considered to be the main, or an essential, component of their diet (Parsons, 2005). Predators are therefore able to switch to other prey types. For these reasons, and consistent with other certified *P. borealis* fisheries, the LTL aspect is not considered in this re-assessment.

4.2 Principle Two: Ecosystem Background

4.2.1 The West Greenland Shelf Ecosystem

The West Greenland continental shelf extends 60-200 km to seaward of roughly 2000km of coastline from Cape Farewell, latitude 59°N, to Northern Melville Bay at 75°N. It includes the highly productive Fyllas Bank, Sukkertop Bank, and Store Hellefiske Bank.

Figure 4-6 Marine Arctic Ecoregions.



Source: WWF, 2016 adapted from Spalding et al., 2007. The dark blue area is marine ecoregion M48 – the West Greenland Shelf

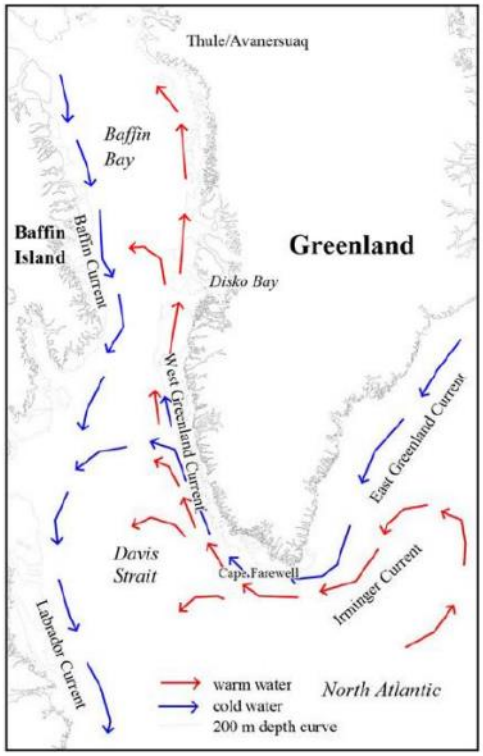
The oceanographic conditions are controlled mainly by the large-scale circulation in the North Atlantic. The dominant current on the west Greenland shelf sets North, originating from the relatively warm North Atlantic current in the Irminger Sea and the cold East Greenland current which meet off east Greenland. The relatively warm oceanic input means that the west Greenland marine ecosystem is Subarctic, and sea ice in winter usually extends no further south than about 66°N[1]. Drift of shrimp and fish larvae on these currents is primarily from south to north. The transport of heat, salt and nutrients, as well as plankton, fish eggs and larvae to west Greenland from these current systems, and their periodic fluctuations, along with freshwater runoff from the land, are the major governing processes for the west Greenland marine ecosystem (Hunt and Drinkwater 2005 cited in ICES 2008).

Primary production ranges from lows of 17gC/m^2/yr in parts of the North to more than 70g/m^2/yr in parts of the SW and Disko Bay. This productivity is spatially very varied, underpinned by upwelling currents and fronts between currents, as well as runoff from land and glaciers. It is also highly seasonal, being concentrated around the Spring plankton bloom because of darkness and sea ice through much of the year, and

[1] ICES Iceland and East Greenland 2.1 Ecosystem overview 2.1.1 Greenland 2.1.1.1 Ecosystem components

supports/attracts a tremendous abundance of wildlife. Open water areas (polynya) within the sea ice are also highly productive.

Figure 4-7: Main currents affecting the West Greenland Shelf.



Source: Sjernholm et al 2011

Investigations in Disco Bay and Young Sound and on the banks off west Greenland have shown that bacterioplankton and unicellular zooplankton play a prominent role (Rysgaard et al., 1999; Levinsen and Nielsen, 2002), and a large part of the primary production may be channeled through these micro-organisms

Three species of copepod are of particular importance higher up the food chain: *Calanus hyperborealis, Calanus glacialis* (arctic species), and *Calanus finmarkius* (North Atlantic species). Capelin and many other fish species as well as shrimp and some seabirds feed on these, especially juvenile stages. Shellfish are also locally important as primary consumers. Benthic habitats are mainly muddy, supporting significant polychaete populations. Both demersal fish and shrimp feed on these, and the shrimp are also preyed on by demersal fish. These organisms in turn support large populations of marine mammals and seabirds.

Cod and capelin are both important components in the marine ecosystem although the centre of distribution of these species lies somewhat south of the West Greenland shelf. Their abundance and relationship with each other and with shrimp has changed significantly over time related to the intensity of fisheries and environmental changes[2]. Sandeel was also of more significance in the past. The Greenland cod stock reached 3m tonnes in the late 40s but has declined since, and today only shrimp and Greenland halibut are commercially important.

[2] http://www.ices.dk/sites/pub/Publication%20Reports/Advice/2008/2008/2.1-2.2%20Greenland%20and%20Iceland%20ecosystem%20overview.pdf

Squids are the most important pelagic macrofauna. Juvenile redfish distributed both demersally and pelagically on the slopes of the banks, compose a substantial resource and probably come from stocks in waters east of Greenland.

At least 3.4 million birds winter in West Greenland, not counting possibly millions of little auks (*Alle alle*). This community is dominated by Brünnich's guillemot, black guillemot, little auk, and bottom-feeding king eiders on the banks and common eiders along the coasts. In summer, the offshore seabird density is lower consisting mainly of surface-feeding fulmar, kittiwake, glaucous gull, and Iceland gull. Hunting has had significant impact on bird populations (Hunt and Drinkwater, 2005).

Minke, fin, sei, and humpback whales occur in west Greenland, feeding mostly on small schooling fish or on large invertebrates. Harbour porpoise, Atlantic white-sided dolphin, white-beaked dolphin, killer whale, long-finned pilot whale, and northern bottlenose whale also occur[3]. More arctic species such as the bowhead occur in west Greenland in winter in low numbers, and belugas and narwhals – commonly associated with ice - are present in the more northerly parts in winter (Hunt and Drinkwater, 2005).

Harp and hooded seals are migratory, and pelagic in summer, when they become numerous in West Greenland. Ringed and bearded seals are restricted to areas with winter sea ice. Harbour seals and walruses are relatively scarce in part as a result of hunting.

4.2.2 Ecology and role of Northern Shrimp and associated species

Northern shrimp occur over very large areas of Northwest Atlantic continental shelves, from Greenland through Davis Strait, Hudson Strait, the Labrador and Newfoundland shelves, the Gulf of St. Lawrence, the Scotian Shelf and the Gulf of Maine. Ocean currents disperse shrimp over large continental shelf areas, particularly at the larval stage.

The West Greenland stock of Northern shrimp (*Pandalus borealis*) is distributed on the continental shelf off West Greenland between about 60°N and about 74°N. Densities are highest in water between 150 and 550 m deep (Arboe and Kingsley 2014) and at temperatures of between 1 and 6°C (Bergstrom 2000). Preferred habitat are channels and basin areas at the edge of the continental shelf.

Both Northern shrimp and striped shrimp (*P. montagui*) are opportunistic predators. At night they migrate into the water column to feed on small crustaceans and other zooplankton. During the day, they usually forage in the bottom sediments on worms, small crustaceans, algae, and detritus[4].

At least 26 species are known to prey on northern shrimp (Parsons 2005a, b). They are an important part of the diet of juvenile and adult cod, redfish, and Greenland halibut and also occur in the diet of flatfishes, rays and wolfish. However, capelin and other fishes are preferred by groundfish. Since the mid-2000s, the percentage of shrimp in diets of four groundfish species (American plaice, Atlantic cod, Greenland halibut, and redfishes) has been declining. Shrimp may also be occasional prey for marine mammals including harp seals (Pedersen and Zeller 2001. These predators

[3] ICES Advice2008 Book 4

[4] http://www.adfg.alaska.gov/index.cfm?adfg=northernshrimp.main

also consume other prey such as small pelagic fishes, so Northern shrimp does not appear to be a limiting prey species in this ecosystem, although key predators may limit the abundance of Northern shrimp. The rapid increase in Northern shrimp abundance in the 1980s coincided with rapid declines in cod abundance, and mortality due to cod predation is now explicitly included in the assessment model for west Greenland shrimp (Kingsley 2007). The relative importance of Northern shrimp in the cod diet varies, being higher in northern shelf areas where capelin is scarce. Fish may be preferred to shrimp as prey since body condition of cod is higher in areas where fish are more important than shrimp in the diet.

The relations between cod and shrimp population dynamics are relatively complex driven by both predation and differing temperature optima (Wieland and Hovgard 2009). Pandalid shrimp populations are known to be sensitive to changes in marine conditions, and changes in abundance may be rapid (Anderson 2000; Clark et al 2000, Parsons and Colbourne 2006). Considerable variability has been observed in the Greenland shelf area over the past 50 years in atmospheric, oceanographic, and sea-ice conditions, and in commercial fish stocks (Buch et al 2005). In this area cod and redfish recruitment are positively related to temperature, while shrimp and Greenland halibut recruitment are negatively related. Cod and redfish, abundant in the relatively warm water period until the 1970s, declined to very low levels during a colder period that followed, while shrimp and Greenland halibut increased to high levels. More recently catches of northern shrimp in the waters of East Canada, West Greenland and NAFO Sub-areas 0 and 1 varied from 133,990 to 157,315 tonnes between 2006 and 2011, and then gradually decreased to 88,765 t in 2014[5]. The 2010 NAFO assessment of this stock (NAFO/ICES 2010) included a summary of environmental conditions relevant to stock dynamics. Although no explicit links to abundance levels are made, this represents an important step toward including environmental fluctuations in the assessment. The relationship between shrimp and cod is now explicitly included in the shrimp stock models but much uncertainty remains.

4.2.3 Retained species

The striped shrimp, *Pandalus montagui* is a regular bycatch in the fishery. Depending on markets accessible to the fishing vessel, it can vary from being unwanted bycatch, to retained bycatch. It represents a highly variable proportion of catch of different vessels (Kingsley 2011).Because *P. montagui* is not easily separated from *P. borealis* in either the fishing or processing operation, an application to allow *P. montagui* to be an IPI stock for this fishery was made to and accepted by MSC at the original certification.

P. montagui is widely distributed in coastal and shelf waters of the northwest Atlantic (Figure 4-8) ranging from Greenland and Iceland, the Arctic Ocean, and the northern Atlantic Ocean, south to Rhode Island and the British Isles (Kingsley 2011; Kanneworff 2003) and usually found in shallower waters than *P. borealis*. It is most common at depths between 20 and 100 m though may occasionally occur as deep as 700m (FAO). While 83% on average (from 2001-2015) of the biomass of *P. montagui* was recorded in depths less than 200 m, 10% or less of the *P. borealis* biomass was found is these depths within the fishery area, although large variations in the depth distribution and in estimated biomass from year to year have been recorded (Siegstad

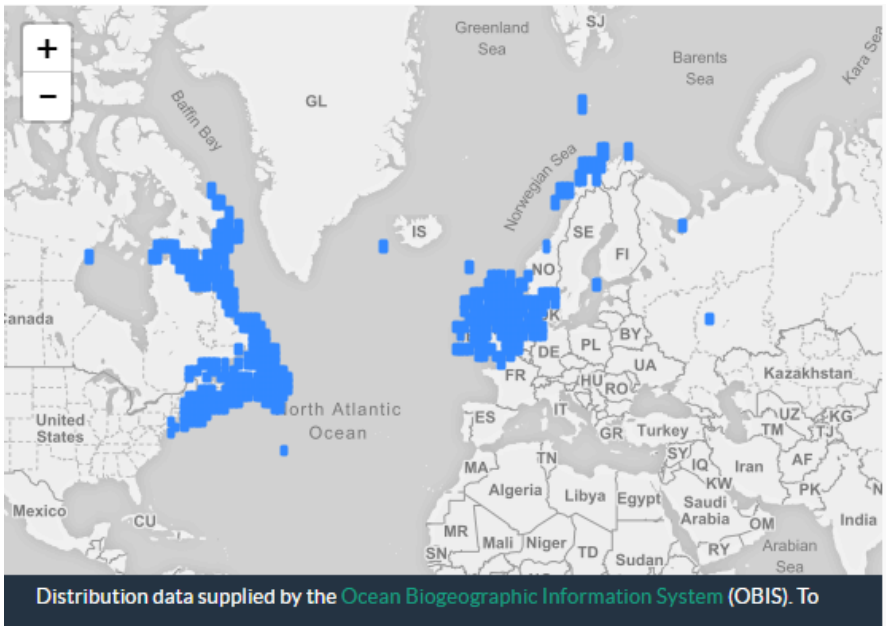
[5] http://www.seafish.org/rass/index.php/profiles/northern-shrimp-pandalus-borealis-in-east-canada-west-greenland-and-international-waters-in-nafo-sub-areas-0-and-1-demersal-otter-trawl/?ps=management

2015). *P montagui* also prefers hard substrates while *P borealis* prefers mud, although it can be found on rock, gravel, sand, and mud.

Catches of *P. montagui* have been reported annually since 1995 and were originally based on logbook returns and observer reports (Siegstad 2015). The coastal fleet tends not to report *P. montagui* separately in log-books, but the catch is sampled by processors and information on catches of *P. montagui* in the coastal fishery is therefore available from sales sheets. On trawlers with on-board processing, *P. montagui* and *P. borealis* are not weighed separately, but the catch is sampled from the holding tank at least 5 times a day, and if *P montagui* is found, more samples are taken to get an accurate estimate of the proportions of the two species. Given the limitations on the quality of log book data from the coastal fleet, a new method was developed in 2017 that combines sales records for inshore vessels with log book data for offshore vessels. This is now considered to provide a more accurate reflection of the catch proportion and quantity of the two species landed.

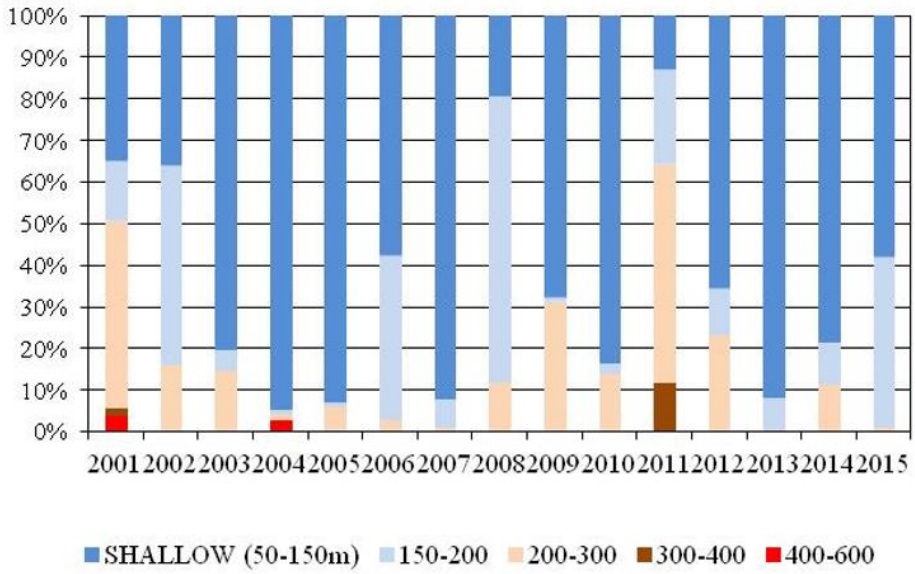
Catches have generally been less than 2 % of the total catch, but reached 5.3% in 2013, probably responding to the fall in catch of *P borealis* in that year (Table 6). However, the species occasionally comprises a much larger proportion of catch, especially in hotspot areas shown in Figure 4-8. Catch of *P borealis* is higher for the offshore fleet (reaching 7% in 2013 and 6.6% in 2016) compared with the inshore fleet (peaking at 3.2% in 2015). The most recent official analysis and data provided by GFLK and GINR (Tables 6 & 7) show a significant fall in the proportion of *P montagui* in 2017 down to 1.1%. This is thought to be related, at least in part, to more effective implementation of existing move on rules and the management plan described below.

Figure 4-8: Recorded distribution of *P. montagui*



Source: MARLIN

Figure 4-9: Percentage of *P montagui* caught at different depths through time



Source: Siegstad 2015

Table 6 Total catches of *P borealis* and *P montagui* 1997-2016

Table 1. *Pandalus montagui* in the West Greenland shrimp fishery: annual reported catches of *P. borealis* and *P. montagui* in 1997–2016 by all vessels in the West Greenland fishery.

Year	Catch P borealis	Catch P montagui	Sales slips	Total catch	Proportion Montagui
1997	63913	348		64261	0.54
1998	54356	856		55212	1.58
1999	70098	3		70101	0.00
2000	76349	241		76591	0.32
2001	81060	720		81780	0.89
2002	105474	184		105658	0.17
2003	100963	793		101756	0.79
2004	135212	789		136002	0.58
2005	147687	504		148191	0.34
2006	150533	1419		151952	0.94
2007	139657	1966		141623	1.41
2008	153888	89		153977	0.06
2009	135028	53		135082	0.04
2010	128108	1168		129276	0.91
2011	122659	2324		124983	1.89
2012	115964	3121	203	119288	2.69
2013	95379	4944	114	100437	5.18
2014	88764	1357	58	90179	1.53
2015	72254	2027	757	75038	2.81
2016	84356	3176	182	87713	3.76

Source: Burmeister and Riget 2017

Table 7: Catches (kg) of *P. borealis* (PRA) and *P. montagui* (AES) 2012-2017, coastal and offshore

	Logbooks				Landings			
Production vessels	YEAR	PRA	AES	AES pct of total	YEAR	PRA	AES	AES pct of total
	2010	74,741,117	497,733	0.7%	2010	16,927,484	103,870	0.6%
	2011	70,236,583	2,269,504	3.1%	2011	19,394,013	1,625,603	7.7%
	2012	65,731,317	2,808,076	4.1%	2012	17,320,722	944,337	5.2%
	2013	55,165,016	4,769,098	8.0%	2013	14,695,153	1,328,936	8.3%
	2014	51,146,009	1,053,531	2.0%	2014	11,093,774	267,970	2.4%
	2015	44,258,495	1,111,239	2.4%	2015	10,146,000	358,010	3.4%
	2016	46,645,744	2,672,256	5.4%	2016	10,453,659	593,779	5.4%
	2017	53,013,984	469,790	0.9%	2017	10,352,256	233,568	2.2%
Non-production vessels	YEAR	PRA	AES	AES pct of total	YEAR	PRA	AES	AES pct of total
	2010	49,354,906	659,306	1.3%	2010	40,790,247	282,971	0.7%
	2011	47,151,145	60,177	0.1%	2011	46,708,564	571,586	1.2%
	2012	46,637,856	318,248	0.7%	2012	46,381,455	789,098	1.7%
	2013	37,178,696	138,373	0.4%	2013	35,770,927	279,961	0.8%
	2014	34,271,254	327,929	0.9%	2014	33,994,553	434,274	1.3%
	2015	26,070,100	912,615	3.4%	2015	26,558,311	482,027	1.8%
	2016	34,963,159	510,468	1.4%	2016	35,499,966	440,943	1.2%
	2017	33,157,933	202,406	0.6%	2017	32,941,862	493,170	1.5%

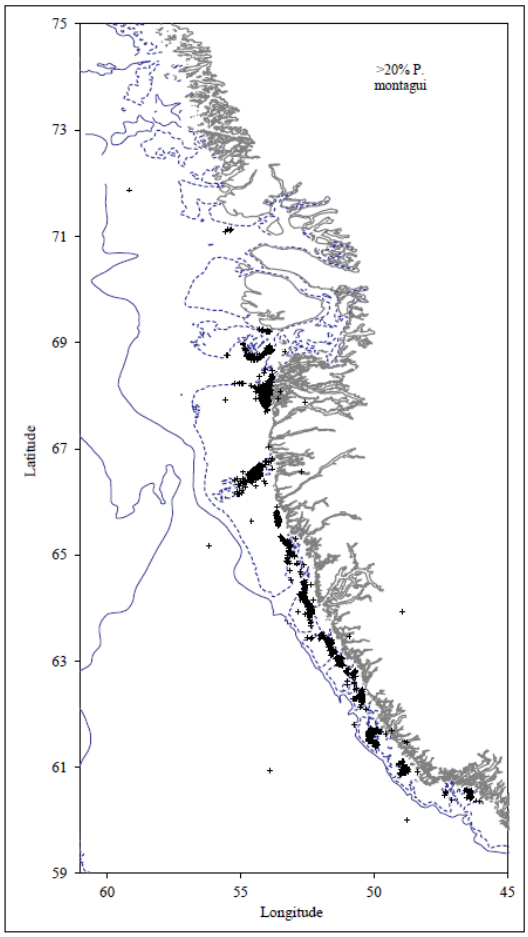
Source: GFLK/GINR

Table 8: Summary catch (kg) and proportion by shrimp species all vessels 2010-2017

YEAR	*P. borealis*	*P. montagui*	*P.montagui* % of total
2010	115,531,364	780,704	0.7%
2011	116,945,147	2,841,090	2.4%
2012	112,112,772	3,597,174	3.1%
2013	90,935,943	5,049,059	5.3%
2014	85,140,562	1,487,805	1.7%
2015	70,816,806	1,593,266	2.2%
2016	82,145,710	3,113,199	3.7%
2017	85,955,846	962,960	1.1%

Source: GFLK/GINR

Figure 4-10: Locations where *P montagui* has comprised >20% of catch



Source: SFG

The catches with significant fractions of *P. montagui* are distributed between Kangaatsiaq at 68°15'N and south to about 61°N. There is a marked area of concentration of catches near shore off Kangaatsiaq, in the gully between north-east Store Hellefiskebanke and the coast. The catch of *P. montagui* also tends to be seasonal – primarily May and June but can be highly variable (Kingsley 2011).

Biomass estimates for *P. montagui* were calculated by Siegstad (2015) based on survey designed to collect stock data for *P. borealis*. Given the localised and relatively shallow-water distribution of *montagui*, the survey catches for this species were sporadic, and survey results are considered inadequate to measure trends in biomass, or determine whether the stock of *P. montagui* is within safe biological limits. *P montagui* is not generally regarded as vulnerable (see for example Kingsley 2011 and Siegstad 2015), although equivalent Canadian assessments (CSAS, 2016) note wide fluctuations in biomass indices and suggest that its status should be considered uncertain; and caution is warranted when dealing with future harvests.

Directed management is not currently undertaken for *P montagui*. At the present time the stock is managed by default – through quota limits on the partially associated *P borealis*. Although the fishery for *montagui* has been unregulated for decades, it is still possible for vessels to catch over 10 tons of *montagui* in a single haul.

Because *P. montagui* is not easily separated from *P. borealis* in either the fishing or processing operation, an application to allow *P. montagui* to be an IPI stock for this fishery was made to and accepted by MSC at the original certification. As a result, Annex CH of the MSC Certification Requirements v1.3 must be followed. The main points to note are:

1. Because the proportion of *P. montagui* has historically been between 2 and 15%, IPI status for *P. montagui* may only be applied for one assessment. In order for the product to continue to use the MSC logo the client must either (CH6 1.1):
    a. have *P. montagui* assessed under Principle 1 at a re-assessment; or,
    b. develop techniques to effectively separate catches of *P. montagui* from *P. borealis*, or
    c. develop measures to reduce the proportion of *P. montagui* to ≤ 2% so as to achieve an exemption from the requirements for IPI stocks (CR 27.4.10.3).

In order to meet the requirements set out under CH6 1.1 and CR 27.4.10.3 with a variation allowing them to market *P montagui* (or mixed *P montagui* and *P borealis*) as certified product, the UoC has initiated a precautionary management plan for *P montagui*. The key elements of this plan include:

- Setting of a TAC for *P montaguii* at 2% of P borealis TAC, and allocated between offshore and inshore fleets in the ratio 57:43
- Encouragement of quota trading between inshore and offshore fleet
- Graduated restriction of fishing activity in the known hotspot areas (as in map below) as companies approach their quota limits.
- Increased observer coverage in “hotspot” areas?

The UoC is currently seeking official approval and implementation of the plan, and in the meantime is encouraging full and effective implementation of the existing move on rule and avoidance of known hotspots. The latest figures for 2017 (Table 8) catch show that the proportion of *P montagui* in the total catch has fallen to 1.1%. This provides some evidence that the strategy is working, although given the historic variation in the proportion of *P. montagui*, this cannot yet be regarded as a clear long-term trend.

The status of *P. montagui* stocks are being assessed in more detail by GINR (with a view to future full assessment – see recommendation), but scientists confirm that the catch levels are at a level that would not create a significant impact on the IPI stocks as a whole.

Less complex proposals for management have been made by others in past. For example, Kingsley (2011) suggested it might be possible to reduce catch and pressure on *P. montagui* simply by restricting the depth at which offshore trawl fleet could operate. The proposed “handlingsplan” may be seen as a refinement of this approach.

4.2.4 **Bycatch species**

This is a relatively clean fishery, and probably increasingly so, because shrimp can be effectively targeted due to their particular behaviour and habitat preferences. Furthermore, a fish excluding device with a 22 mm spacing is mandatory on all

vessels (since 2000); and offshore vessels use toggle chains which act to keep netting off the bottom, further reducing bycatch of species closely associated with the bottom. Vessels are required to move 5 km if fish bycatch exceeds 10% of shrimp catch. As a result, bycatch has reduced substantially in recent years.

Estimated bycatch of redfish and of 10 other commercial species (combined) is recorded in logbooks and by observers, and reported to authorities. Bycatch estimates in logbooks and by observers are generally consistent. Observers are carried on >80% of offshore trips and on <10% of coastal trips (Mads Nedergaard, pers. comm). Accordingly, more confidence can be given to bycatch and discard estimates from offshore than from inshore.

Based on estimates in captains' logbooks and by observers, bycatch of all fish species combined for the period 2002-2016 is reported as between 453 (2016) and 1,425 (2010) t/yr., or 0.56 - 1.49% of shrimp catches (Table 9) and appears to be declining. According to Sunksen (2007) figures based on logbook returns underestimated actual catches by up to 10-20%, though the reason is not clear and this may no longer be the case. Bycatch in that study, based on investigations in in 2006 and 2007 (Sunksen 2007), averaged 2.6% or below in the four sub-areas of the west Greenland fishery area. Even allowing for a possible 20% under-reporting it is likely that total bycatch was less than 1.2% over the last 5 years.

Table 9 Fish bycatch 2002-2016

	P. borealis	Fish	
Year	Catch from logbooks	discard (tons)	discard (%)
2002	104,345	1,272	1.22
2003	100,111	1,291	1.29
2004	135,212	1,044	0.77
2005	147,687	982	0.66
2006	150,533	1,178	0.78
2007	139,657	2,085	1.49
2008	153,707	1,114	0.72
2009	134,939	1,320	0.98
2010	128,104	1,425	1.11
2011	122,528	1,106	0.90
2012	115,932	1,038	0.90
2013	95,286	816	0.86
2014	87,357	873	1.00
2015	70,651	566	0.80
2016	81023	453	0.56

Source: GINR, 2017

A variety of coldwater fish species were recorded as bycatch in 39 commercial shrimp hauls in west Greenland. Redfish (a mixture of more than one species) accounted for about half the bycatch, followed by capelin, American plaice, cod and Greenland halibut (Sunksen 2007). Data on the bycatch from the Canadian shrimp fishery is also relevant here. There is 100% observer coverage in this fishery and detailed records are kept. The only significant bycatch (other than *P. montagui*) are capelin, which reaches 5% of catch in SE Newfoundland (Sea Fishery Are (SFA) 7), and redfish

which reaches 0.3% of the catch in the same area. Very small quantities (<=0.1%) of cod, American Plaice and wolffish also occur[6].

Given that the total of all fish species recorded in the W Greenland fishery was maximum of 1.5% (2007) and more generally below 1% (Table 9), no individual fish species would approach the MSC definition for a “main” bycatch species (>5%). Capelin, though occasionally abundant, tends to have a more southerly and easterly distribution with major concentrations in NAFO SA2 and 3 rather than NAFO 1. There is no commercial fishery for this species in West Greenland, although it is occasionally caught if a shrimp trawler accidentally encounters a shoal.

Despite the very low levels of catch, the following bycatch species are considered to be depleted or vulnerable and are discussed further below:

- Atlantic cod
- redfishes
- American plaice
- Atlantic wolffish
- thorny skate

Populations of **cod, redfishes, American plaice, and Atlantic wolffish**, collapsed or declined substantially in the late 1980s, reaching extremely low levels in the early 1990s relative to their historical abundance coupled with increased total mortality and lowered productivity. All remain at low levels, but trawl surveys suggest recent increase in abundance of all these species. While the catch may be regarded as insufficient to have significant impact on stock, it is possible that rebuilding of populations of these species could lead to greater bycatch, and impact of bycatch mortality on rebuilding might be a concern[7].

The two **redfish** species sometimes encountered in the Greenland shrimp fishery are *S. mentella* (deepwater or beaked redfish) and *S. norvegicus (ex. marinus)* (Golden redfish or rosefish). Both species are close to limit of natural distribution around Disko bay in W Greenland and information on stock status is limited. There was a directed fishery for these fish which reached 60,000t in 1962 , but catches have remained below 1,000t since 1986. Sorting grids mandatory since 2001 (inshore by 2012), limit bycatches of redfish smaller than 13 cm. In 2015, 5 t were reported as by-catch in the shrimp fishery (NAFO 2016b). Surveys in West Greenland suggest that the biomass of both species is increasing, but indices are still far below historic levels, and recruitment is still failing.

Canadian trawl surveys (Acoura 2016a) indicate that both redfish species (*Sebastes mentella* and *Sebastes norvegicus* are increasing in abundance from northern Labrador to the Grand Banks - for some areas since the early 1990s, for others since the early 2000s (DFO 2011). For the ‘northern’ population of deepwater redfish which overlaps all SFAs/UoCs of the fishery area, 2010 biomass was 54,000 t and projections indicate that the population would be likely to increase with annual catches of 3,000 t (DFO 2011). NAFO (2010a) recommended that better information be obtained on quantity and species composition of the redfish species bycatch. According to NAFO 2016b, the (NAFO) stock has increased since 1996 and has

[6] Acoura 2016. Canada Northern and Striped Shrimp Fishery. MSC Certification report .
[7] Siegstad et al 2005. Assessment of Demersal Redfish in NAFO Subarea 1. NAFO Scientific Council meeting – June 2005 Serial No. N5126 NAFO SCR Doc. 05/40

remained at a relatively high level in recent years. Fishing mortality has remained stable at low level since the late 1990s. Recruitment has declined in the past five years.

Figure 4-11: Figures on redfish stock status

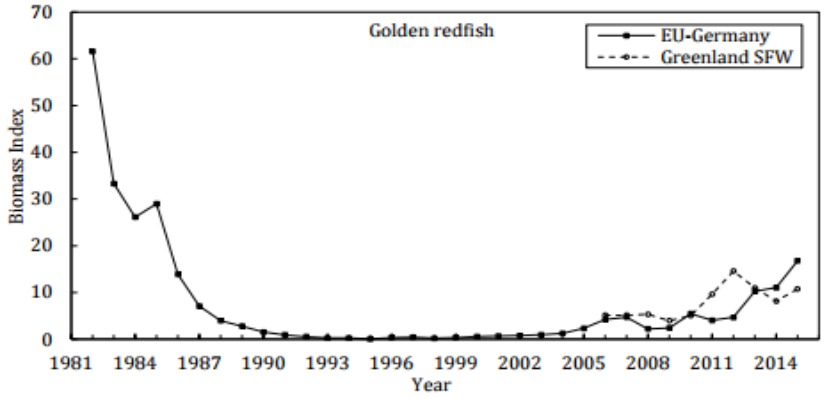


Fig. 4.2. Golden redfish biomass indices in the EU-Germany survey (1C-F) and the Greenland shrimp and fish survey (1A-F).

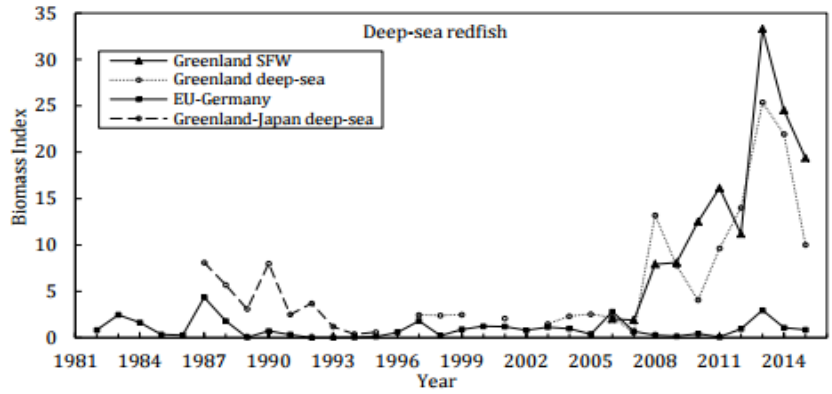


Fig. 4.3. Demersal deep-sea redfish survey biomass from the Greenland shrimp and fish survey (1A-F), the Greenland deep-sea survey (1CD), the EU-Germany survey (1C-F) and the Greenland-Japan deep-sea survey (1B-D).

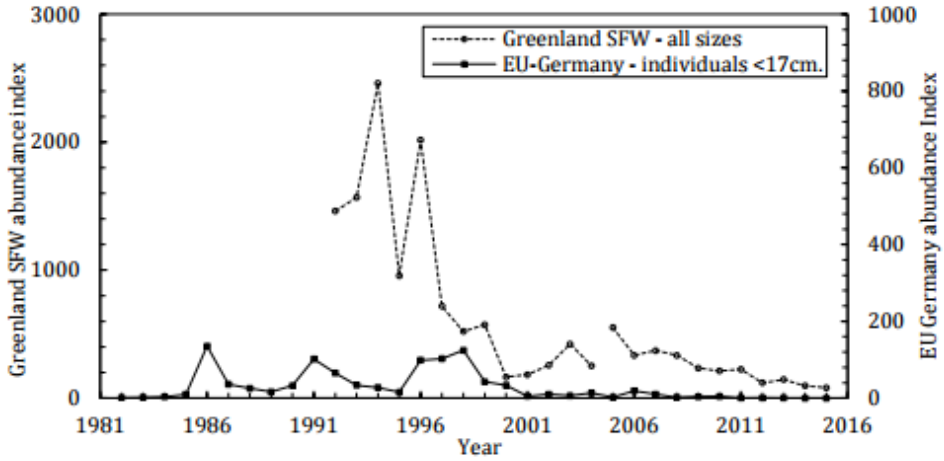


Fig. 4.4. Juvenile redfish abundance indices (deep-sea and golden redfish) for the EU-Germany survey (1C-F), and the Greenland Shrimp and Fish survey (1A-F, all sizes).

Source: NAFO, 2016c

West Greenland (Atlantic) cod spawn in many of the West Greenland Fjords. The fishable and spawning components of the stock are thought to have reached more than 3 and 4 million tonnes respectively in the 1940s (Figure 4-12). The stock collapsed in the 1970s because of adverse climate conditions and overfishing. ICES note the "bycatch of small cod in the increased fishery for northern shrimp" may have been a factor suppressing cod recovery. However, the bycatch of Atlantic cod was considered to be "insignificant" in population terms. Survey biomass indices for west Greenland cod have been increasing since the early 2000s (ICES 2014) and there was record recruitment in 2011/2012. ICES precautionary advice for 2017 for cod in NAFO subarea 1[8] (West Greenland) is for a catch of no more than 12 379 tonnes. Assuming an average cod bycatch of 0.05% the fleet would catch around 50t of cod in total, amounting to 0.4% of the total precautionary catch.

Figure 4-12: Cod status and trends.

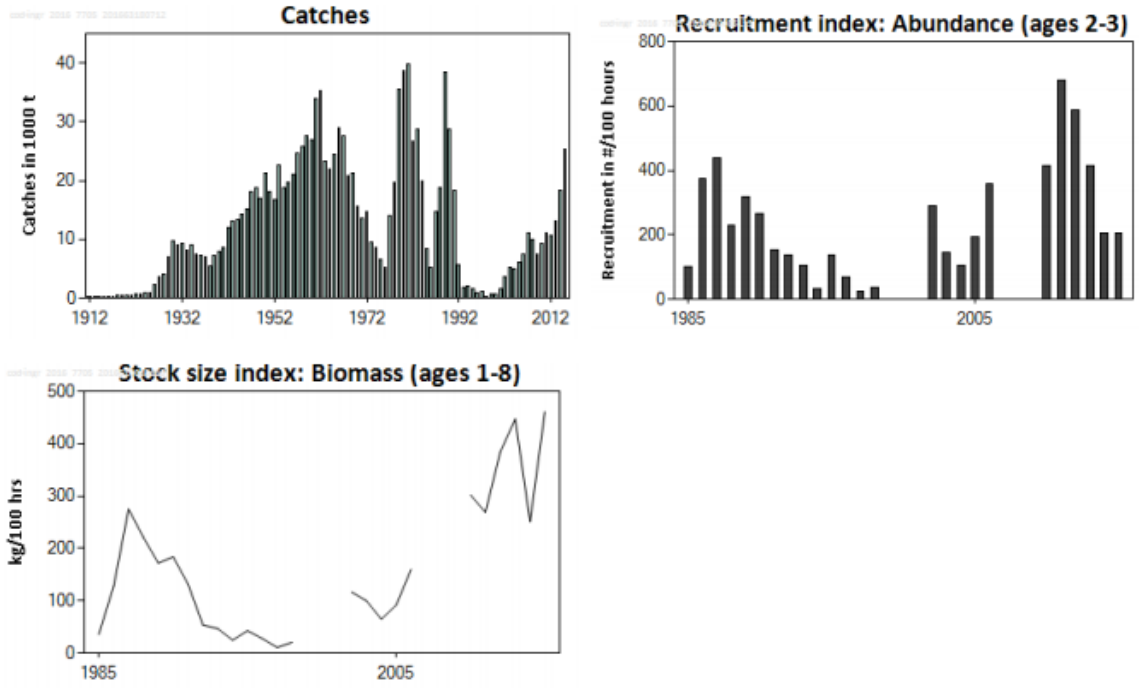


Figure 2.3.4.1 Cod in NAFO Subarea 1, inshore. Catches, recruitment index from the gillnet survey (abundance in numbers/100 hours, ages 2 and 3), and the stock size index from the gillnet survey (kg/100 hours, for ages 1–8+).

Source ICES 2016

Three species of **wolffish** are found in Atlantic and Arctic waters: *Anarhichas denticulatus* (Northern wolffish), *A. minor* (Spotted wolffish), and *A. lupus* (Atlantic wolffish). They are found on a wide range of bottom habitats from 25 to 600m or more. Only spotted wolffish is normally found on the soft mud habitats in which the shrimp fishery concentrates (Kulka et al 2008), and the distribution of all three species is generally more southerly (with higher concentrations off Labrador and the Norwegian coast) than that of the UoC fishery, although all can be found as far north as Disko Bay. A directed trawl fishery for wolfish in W Greenland shelf occurred from 1974-1976 with reported landings around 3000 tons per year. There continues to be a small inshore fishery although advice is for no directed fishery. For Atlantic wolfish biomass and abundance indices are slowly increasing, but below average levels in the southern

[8] ICES Advice 2016, Book 2 1. 2.3.4 Cod (Gadus morhua) in NAFO Subarea 1, inshore (West Greenland cod).

regions. Biomass indices for Spotted wolfish are increasing, and the stock remains in an increasing trend (NAFO 2016c).

A denticulatus and *A minor* were designated as "threatened" by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) in 2001, while *A. lupus* was designated as *Special Concern.* A review by NOAA in 2009 assessed all three to be species of concern. They are characterised by internal fertilization, the production of relatively few large eggs cared for by the male, and by the loss of an entire set of teeth annually. Although all three species may be found in West Greenland waters, the main centres of population lie further south – in Canadian, Norwegian and Russian waters, and no recent assessments have been made of the status of wolffish in W Greenland waters. It is notable that in the Canadian shrimp fishery (Acoura 2016a) catches of northern and spotted wolffish are much higher in the more southerly SFAs (5 and 6) with very low catches in SFA 1 – closest to the Greenland fishery. In Canada, licence conditions for shrimp fishing vessels, require no targeting of wolffish fish and live release of any specimens caught in the best condition possible (DFO licence conditions, DFO 2015h). Abundance indices for all three wolffish species throughout Canadian Atlantic and Arctic waters have been stable or at higher values since the mid-2000s compared to the 1990s; and the decline in wolffish abundance has not continued but rather reversed in many areas, which suggests that the current fishing pressure is sustainable and protection measures at least partially effective.

Figure 4-13: Biomass and abundance indices for wolfish

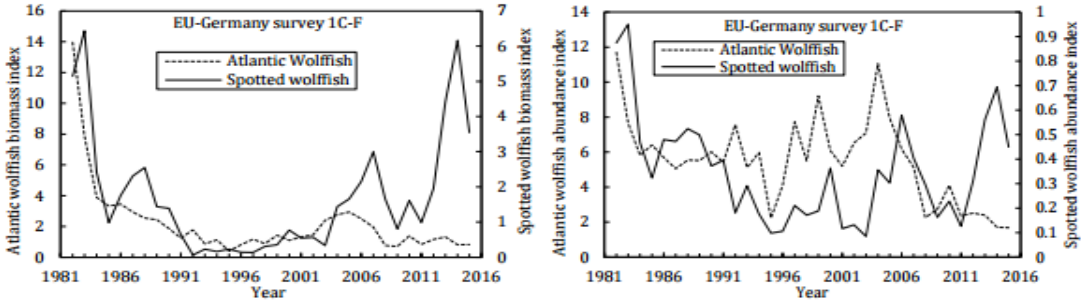


Fig. 5a.2. The EU-Germany survey in SA1: Biomass indices (left) and abundance indices (right).

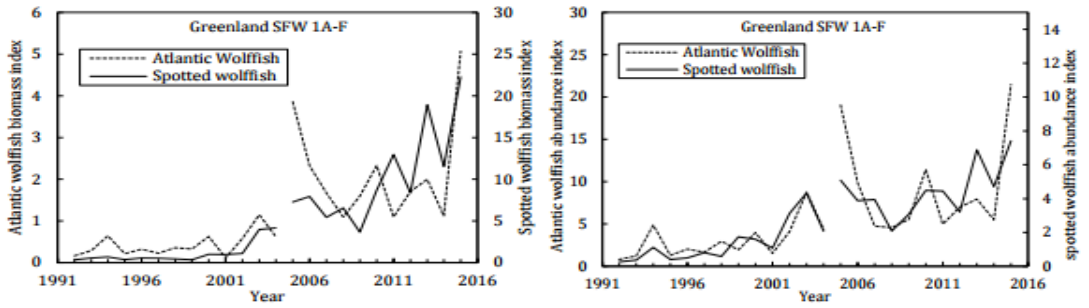


Fig. 5a.3. The Greenland shrimp and fish survey: biomass indices (left) and abundance indices (right).

Source: NAFO, 2016c

American plaice (*Hippoglossoides platessoides*) is widely distributed across the North Atlantic from the Barents Sea to Rhode Island with particular concentrations off Newfoundland and Labrador. Depth range is from 10 to 3000m but most abundant between 90 and 250m on soft bottoms (Fishbase). American plaice have been taken as a by-catch in Subarea 1 since the 1980s - in fisheries targeting cod, redfish and shrimp and reported as unspecified by-catch. To reduce the number of juvenile fish

discarded in the trawl fishery targeting shrimp, sorting grids have been mandatory since October 2000 (fully implemented offshore in 2002). In 2015, 1 ton of American plaice was reported in trawl logbooks from Division 1A. The biomass of the stock in Subarea 1 is higher than it was in the 1990s, but remains below the levels of the 1980s (NAFO 2016b). It is notable that

a) "STACFIS reiterated the recommendation that the species composition and quantity of American plaice discarded in the shrimp fishery in SA1 be further investigated.- *No progress*

a) STACFIS reiterated the recommendation that the distribution of these species in relation to the main shrimpfishing grounds in SA1 be investigated, in order to further discover means of reducing the amount of discarded American plaice in the by-catch. *No progress*

. Figure 4-14: Biomass trend for American plaice

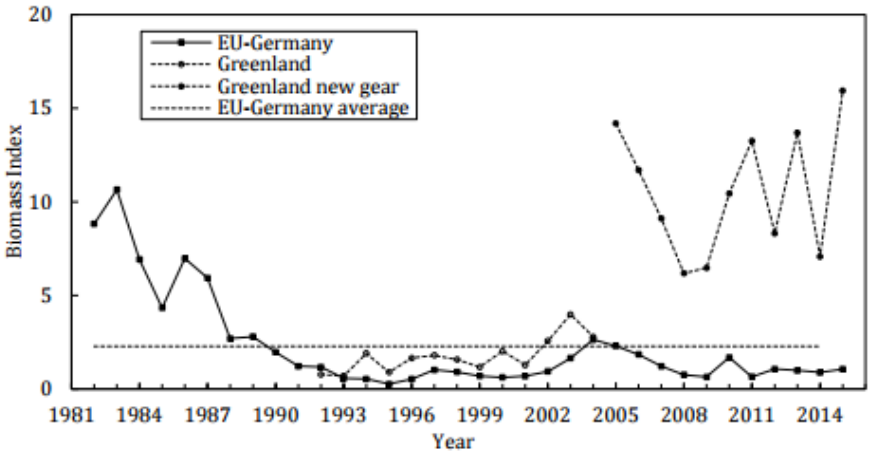


Fig. 5b.2. American plaice in Subarea 1: Biomass indices from the EU-Germany survey and the Greenland Shrimp and fish survey (SFW).

Source: NAFO, 2016d

Thorny skate (*Amblyraja radiata*). Widely distributed in the N Atlantic with significant overlap with the fishery. Main concentration is in SA3 the only area for which a recent assessment exists (NAFO 2016b). This stock is currently above Blim (probability 0.99) and stock biomass has been increasing very slowly from low levels since the mid-1990s. Recruitment declined below average in 2014-2015. Fishing mortality is currently low.

For the **other fish species** (such as blacksmelt, eelpout etc.), no assessments of the importance of bycatch mortality relative to other sources of mortality have been made but there appears to be no reason to consider these outside safe biological limits.

No **invertebrates** other than *P. montagui* and squid were recorded as bycatch in this study. Bycatch of invertebrates in the Canadian shrimp fishery on the same stock, in adjacent waters, using similar gear, was also extremely low (less than 500 kg per year for all species combined over a 10+ year period) (Siferd 2010). Estimated catches in the shrimp fishery in Canadian SFA 1 in the period 1999-2007 included sea stars (Asteroidea) at 0-154 kg/yr., sea urchins (*Strongylocentrus droebachiensis*) at 0-7 kg/yr., and bivalve molluscs at 0-3 kg/yr. Cnidarians (jellyfishes) (0-616 kg/yr.) kg/yr.), scyphozoans (jellyfishes) (0-244 kg/yr.) and squids were taken in larger amounts up to a few hundred kgs/yr. (combining all species).

Discards
Discarding of shrimp was prohibited at the beginning of 2011 (Management Plan). The small quantity of fish bycatch as described above is routinely discarded.

4.2.5 ETP species

Greenland lacks endangered species legislation, and has not identified endangered, threatened or protected species as defined by the MSC requirements.

A regional red list for Greenland including the surrounding seas within the Exclusive economic zone was been developed by Boertmann (2008)[9] in conformity with IUCN guidelines. No species of marine fishes are included on this list. The Fisheries Council of Greenland requested the Ministry of Internal Affairs, Nature and the Environment to prepare a list of endangered fish species with a view to strengthening management of environmental impacts of the fishery. In the absence of formal identification of ETP species, any species on the Red List would be considered "depleted" under the MSC requirements, rather than ETP species.

CITES-listed species found in west Greenland include all large whales (except for the west Greenland population of minke whales) (Appendix I) and several small whales (Appendix II). Observations of fishermen and scientists, and knowledge of the mode of operation of the fishery, indicate that interactions of the fishery with these species are effectively non-existent.

Several demersal fish species found in the fishery area are currently at very low abundance levels and might be considered depleted species; these include both commercial species (Atlantic cod, redfish) and non-commercial species (American plaice, Atlantic wolffish, spotted wolffish, thorny skate, grenadiers). The simultaneous declines in abundance over a broad range of species occurred at the same time as changes in environmental conditions (Buch et al 2004), and it is possible that environmental conditions rather than human impacts were the primary reason for the declines and subsequent lack of recovery. There may accordingly be some doubt as to whether these should be considered "depleted" species, especially since there is increasing evidence of recovery for several of these species (see bycatch section 4.2.4 above). Fisheries for the commercial species are currently closed. Status of commercial and non-commercial species is monitored by the annual surveys undertaken by the Greenland Institute of Natural Resources and an annual German groundfish survey.

4.2.6 Habitats

At 1st assessment information on benthic habitat was relatively limited. Sejr et al (2010)[10] describes a relatively diverse benthic environment in terms of depth, silt/clay fraction, and *chlorphyl a* content of the sediment, resulting in large differences in species composition. They also found species richness and diversity to be lowest at

[9] Boertmann, D. 2008. Grønlands Rødliste – 2007. Danmarks Miljøundersøgelser, Aarhus Universitet, og Grønlands Hjemmestyre. 156 s. http://dce.au.dk/udgivelser/udgivelser-fra-dmu/div/2008/abstracts/roedliste_gr_uk/

[10] Sejr, M.K., Włodarska-Kowalczuk, M., Legeżyńska, J. et al. Macrobenthic species composition and diversity in the Godthaabsfjord system, SW Greenland. Polar Biol (2010) 33: 421. doi:10.1007/s00300-009-0717-z

sites exposed to sediment disturbance, referring in particular to the impact of glaciers and burrowing sand-eel. They did not address the impacts of fisheries specifically.

Substantial research designed to improve the scientific basis for assessment under principle 2 was carried out between 2012 and 2017 by the Institute of Zoology (IoZ), the Zoological Society of London (Dr. Kirsty Kemp, Dr Chris Yesson), and through funding of Ph.D. research (Helle Jorgensbye) on "vulnerable marine habitats (VME)" at the National Institute of Aquatic Resources, Copenhagen. The greater part of this research was funded by the client in response to conditions raised under the first assessment. Much of this research is now written up in peer reviewed scientific publications (Kemp and Yesson 2014, Yesson et al 2015, 2016; and Gougeon et al 2017). Although most of this research will be coming to an end shortly, the Greenland Institute of Natural Resources has received substantial new funding to continue work on benthic habitats, working in close association with Russian PINRO. The research findings (supported by online data and maps) are highly relevant to the re-assessment and may be summarized as follows:

Epibenthos

Studies on composition of benthic communities in some nearshore areas have been published (e.g. Sejr et al 2007; Sejr et al 2010). Commercial demersal fish and invertebrate species have been studied in support of fisheries management. Atlantic cod, redfish, Greenland halibut and snow crab are commercial species which are or have been important off west Greenland. In the past sand eel was an important forage species for fishes, seabirds and marine mammals but it appears this species is now less abundant and its current importance is uncertain (ICES 2008). Yesson et al (2015) undertook a detailed study of epibenthos focused primarily on the UoC fishing area. Their findings may be summarized as follows:

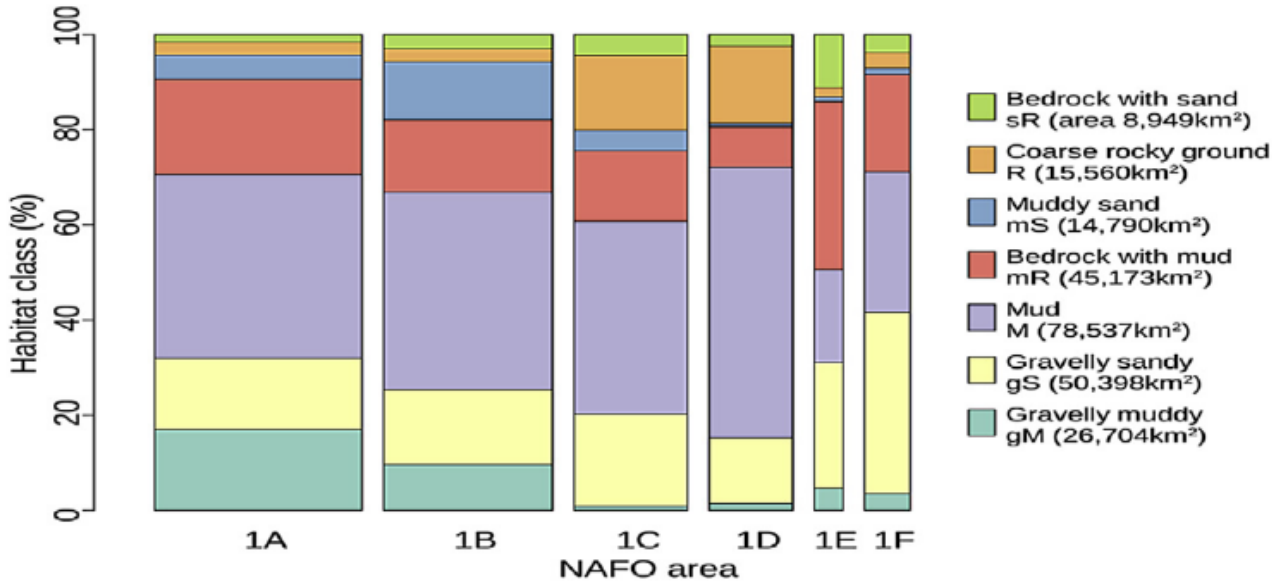
- 29 classes of epibenthic taxa have been identified from benthic camera surveys conducted at 119 sites (64 "soft" and 55 "hard") spanning 1,400 km of the West Greenland continental shelf at depths from 61–725 m but concentrated mainly between 100–500 m. *P borealis* was seen at 61 stations.
- Polychaeta, Ophiuroidea and Ascidiacea are most commonly encountered (generalist) taxa
- More specialist taxa were found at hard bottom sites including sessile, attached fauna such as Porifera, Bryozoa, Hydrozoa and Anthozoa
- Hard-substrate communities are relatively diverse with higher abundances. They are characterized by sessile, attached groups such as Hydrozoa, Anthozoa, Bryozoa and Porifera. Soft-sediment sites are less diverse, dominated by Polychaeta, and are associated with specialist Malacostraca such as the commercially exploited shrimp, *Pandalus borealis*. Harder substrates tend to be more dominant in the South and softer are more common in the north.
- In general, species density peaks at 200-300m, on intermediate slopes, and subject to intermediate currents
- 4 "cluster" communities were detected:
    - Clusters 1 and 2 are relatively similar and usually associated with deeper and softer bottoms and colder water;

- Clusters 3 and 4 are mainly associated with harder bottom shallower communities in areas with stronger currents and warmer water.

- Cluster 1 is distinguished by the presence of Ascidiacea; cluster 2 by Anthozoa and encrusting Bryozoa; cluster 3 by the relative abundance of Gastropoda and Malacostraca; cluster 4 has the greatest abundance of Polychaeta.
- Large organisms attached to rock, such as gorgonians are unusual but *Paragorgia arborea* is found at some southern stations

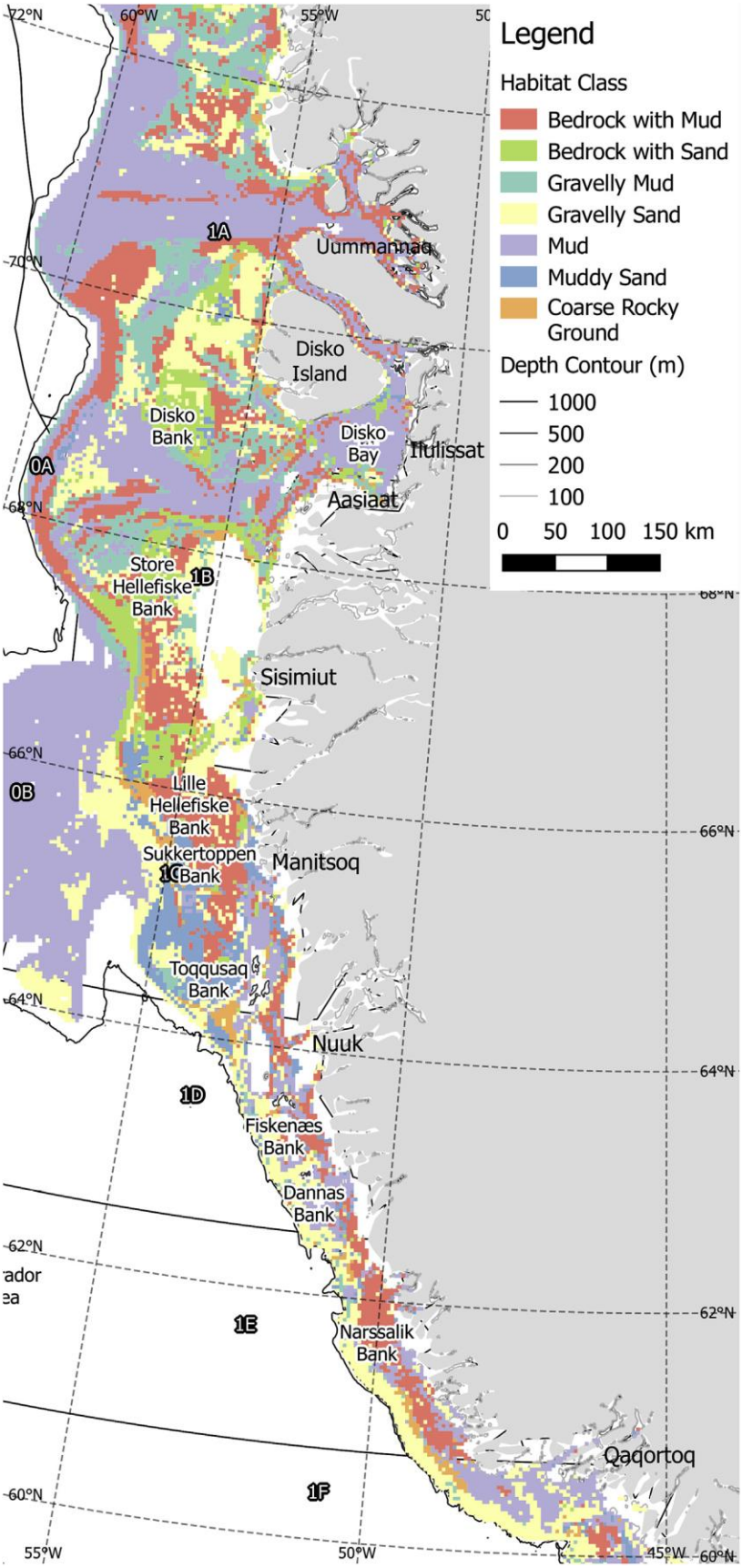
Mapping and classifying the seabed of the West Greenland continental shelf Gougean et al (2017) built on previous work on benthic habitat, using both modelling and sampling to map the fishery area. This study sampled, modelled and mapped 7 benthic habitat classes in the region of the West Greenland shrimp trawl fishery from 60^0N to 72^0N in depths of 61 to 725 m. Muddy sediments appear in northern and colder areas whereas sandy and rocky areas dominate in the south. Southern regions are also warmer and have stronger currents. The Mud habitat is the most widespread, covering around a third of the study area. There is a mosaic of deep channels and basins dominated by muddy sediments, many of which are fed by glacial sedimentation and outlets from fjords, and shallow banks and shelf with a mix of more complex habitats.

Figure 4-15: habitat class proportion by NAFO regions. Bar widths proportional to NAFO area



Source: Gougeon 2017

Figure 4-16: West Greenland habitat map



Source: Goegeon et al 2017

Impact of trawling on epibenthos

Passage of trawl gear such as is used in this fishery may impact bottom habitats, species and communities (Rice 2006; Lokkeborg 2005; Watling and Simpson 2007). Shrimp trawling has the potential to damage coldwater corals, which are slow-growing and thus may recover slowly from damage caused by trawling operations (Edinger et al 2007).

Northern shrimp are considered to be primarily a species of softer bottoms (mud and/or sand) (Bergstrom 2000), whose communities are generally considered to be more resilient to trawl impacts than those of harder bottoms, and recovery times are generally shorter (Rice 2006). However, the habitat fished by the prawn fleet includes a wider range of habitat: mud, rocky shelf break, and bands of shell sediments (possibly evidencing previous sea levels). Early trawling was restricted to mud areas – now with rockhopper gear it's possible to go over rougher ground. The Disco Bank remains the most productive and intensively fished area.

Moritz et al (2015) found little impact of northern shrimp trawling over periods of 4, 10 and 20 years in the Gulf of St. Lawrence on benthic biodiversity, biomass and community structure. However, Hixon and Tissot (2007) studying the impact of a pandalid fishery off Oregon, observed substantial differences between fauna richness and species groups between trawled and untrawled grounds, and concluded that slow-growing sea pens, in particular, could be impacted by repeated shrimp trawling.

Shrimp trawl gear used in the West Greenland shrimp fishery is relatively light, and the impacts may not be as great as with heavier fish trawl gear. Bottom impact is reduced through the widespread use of pelagic trawl doors (sparrow) that operate 10-20m above the seabed, although these do not work well when fishing on irregular bottoms (Management Plan 2014). Rolling rockhopper gear is increasingly adopted which ensures that foot gear rolls over bottoms rather than digging in, and toggle chains, which lift the netting off bottom, are used in the offshore fleet. Sizes of trawls used have been decreasing recently to reduce fuel usage. The main impacts would be from (non-pelagic) trawl doors (weighing 3.3 tons) and from "shoes" (weight 4-9 tons) used in twin trawling - though some vessels use rolling shoes which reduce impacts on bottom habitats and organisms. Recently the client group has been working with a gear manufacturer Vonin to further reduce bottom contact (and therefore impact) through reduction in chain clump and adaptations to footrope/rockhopper configurations.

Yesson et al (2016) looked specifically at the impact of trawling by the UoC on different habitats (hard and soft) and functional groups (mobile free-swimming taxa; mobile crawling; mobile slow moving; sessile epifauna, demersal, or flat; sessile epifauna, protruding*).* Analysis of trawling pressure by habitat type was measured at resolution of 3.5km squares. Annual grids of cumulative minutes trawled were constructed for the period 1986–2013. The quarter-century of data available for the Greenlandic shrimp-fishing fleet is an unusually detailed and lengthy time series that provides an opportunity to examine longer term patterns. For each site a "recovery" metric/parameter was defined as years since last trawled, and also cumulative minutes trawled over 10 years. Environmental data was also collected and predicted: depth, slope, rugosity (height variation), temperature, salinity, current speed, and sea ice coverage and iceberg concentration. Main points are summarized as follows:

- Trawling takes place from the narrow rockier shelf of the south, up to deeper, muddy areas around Disko Bay. It is notable that the rockhopper gear, which allows trawling over somewhat rougher ground, was introduced to the fishery

in 1992. 221 sites (133 soft and 88 hard) were sampled between 60–72^{0}N and depths of 61–725m.

- The communities in the south are characterized by a more diverse group of hard-substrate specialist taxa, while further north (extending up to c. 72N), there are more soft-sediment specialists and more of the commercially exploited shrimp species *Pandalus borealis*. More diversity and abundance of epibenthos was found on harder bottoms and in lower latitudes.
- Western Greenland is subject to natural disturbance from iceberg scouring, which has been observed at depths up to 600 m (Gutt 2001). Icebergs can plough sediments and break, crush, or displace seabed fauna (Conlan et al., 1998). The survey found natural disturbance to be greater in the North in terms of both sediment load and ice scour (commonly to 200m).
- Abundance was highly variable from 6 to 2,951 taxonomic observations. 50% of observations were polychaeta; 10% Ophiuroidea. Some studies have shown scavenging Ophiuroidea to benefit from trawling. Encrusting bryozoans may also benefit from trawling (rapid recolonization and spread)
- Corals and sponges are susceptible to trawling because of slow growth rates, sedentary habit, and vulnerable emergent structures. The soft corals observed in the area are predominantly Octocorallia from the family Nephtheidae, and this group is relatively insensitive to trawling. Barnacles seem to thrive with intermediate levels of trawling.
- 86% of study area and depth (200-500m) has been subject to some trawling impact since 1986. Trawling intensity from zero to more than 100h/yr. (per 3.5km square) was established from historic data. Over most of the survey area, less than 50% of sample squares was affected in any one year, but over a period of four or more years up to 65% of habitat was trawled at some point.
- Trawling intensity on soft habitat (median trawl time of 110 h) was more than double that on hard sediments (40 h). Furthermore, trawl time on hard sediments is likely to be inflated due to square resolution and edge habitat bias. Fishermen do not like coarse rock ground.
- Frequently trawled hard bottoms are characterized by fewer anthazoa, bryozoans, hydrozoa, maxilipoda, polychaeta and Porifera; frequently trawled soft bottoms are characterized by fewer Anthazoa, ascidians, bryozoans, Ophiura etc.
- Trawling intensity is the most important factor determining the overall abundance of benthic organisms, accounting for 12 to 16% of variance. Abundance is significantly negatively correlated with cumulative trawling time, and positively correlated with time since trawled. The impact is greater on protruding taxa compared with encrusting taxa. Sessile erect organisms such as Anthozoans (corals & anenomes) as well as some Ophiuroidea (brittle stars) show a significant negative response to trawling.

Although only data for 2014-15 is available, both abundance and diversity are higher in the new fishing areas. It may be concluded that:

- Trawling has a significant negative impact on the overall abundance and diversity of epibenthic organisms on the West Greenland shelf – possibly as much as 50% loss of diversity. Recovery time differs according to sediment type. There is no evidence of loss of function (filtration, recycling, carbon capture).
- Recovery time based on significant difference between trawled and untrawled is around 5 years for soft bottoms and 10 years for hard bottoms. However,

median values remain different over longer time periods (at least 25 years on harder substrates), and more comprehensive sampling would be required to harden up the evidence. Furthermore, the "untrawled sites" may include areas that were trawled prior to 1984, and may not represent a "pristine" baseline.

- The impacts of trawling are continuous but not cumulative. There has been no significant change in abundance since 1984. There is however a detectable reduction in size of some species.

A review of coral and sponge bycatch collected during experimental trawls between 2010 and 2012 notably included few corals collected from depths of less than 500 m. Only one high diversity coral area was identified between 63 and 64ºN and at 1000–1500 m (Jørgensen et al. 2013).

The seapen *Umbellula*, which has multi-decadal lifespan and can form a VME type aggregation vulnerable to trawling, was not encountered in the Yesson et al survey, but is seen as regular bycatch in some areas in West Greenland (Jørgensen et al., 2013).

Trawl pressure on VMEs (primary source: presentation by Helle Jorgensbye and follow-up discussion)

- VMEs in the NAFO area are described in a recent NAFO publication[11].
- Cold-water coral communities have been found at similar latitudes in the western part of Davis Strait (DFO 2007), which may be particularly sensitive to trawl damage (Edinger et al 2007). The main fishing banks were mapped in 60s and 70s.
- Most of the VMEs that occur in these water occur outside the normal fishing depth (150-600m, and mainly 150-400). For example
    - maerl occurs primarily in shallower water (20-50m);
    - *Lophelia* occurs in deeper water (800-1000m) in the S/SW.
    - Cup corals occur mostly between 800 and 1200m on soft bottoms, but these are not particularly vulnerable: they can move, and survive trawling activity.
    - Bamboo coral is found mainly 800-900m on the lower shelf. Some of these may be up to 4000yrs old.
    - The Tree/bubblegum corals *Paragorgia* favour 500-900m (typically at the bottom of shelf break) may partially overlap with fleet activities. Some other hard corals are restricted to deeper water in the south.
    - The soft corals *Octocorallia* are commonly found in the target depth (50-500m; mostly 200-300m). However they are small, fast growing, and relatively resistant to trawling. They are persistent in heavily trawled areas.
- Large discrete sponges (*Ostur*) are rare on the west Greenland shelf. It is thought that it is probably too cold (4^0C) although it is possible that the historic fishery has cleared some of these. A few *Geodia* have been found but never in significant quantities. Monitoring the new fishing area in the North should provide some evidence as to the nature of more pristine habitat.
- Smaller encrusting sponges and bryozoans are generally faster growing and resistant to trawling.

[11] Kenchington, E., L. Beazley, F. J. Murillo, G. Tompkins MacDonald, E. Baker. 2015. Coral, Sponge, and Other Vulnerable Marine Ecosystem Indicator Identification Guide, NAFO Area. NAFO Sci. Coun. Studies, 47: 1–74. doi:10.2960/S.v47.

- *Umbellula* is sometimes found in the catch, especially further north between 500 and 1,000m. This needs to be assessed and monitored.

It is also notable that a recent MSC assessment of the Canadian Northern and striped shrimp fishery (Acoura 2016a) with the same target species and gear (operating on the other side of the Davis Strait in Canadian waters) also found limited overlap with VME habitats, stating that *"in general, there appears to be little overlap between the shrimp fishery and sensitive sponge and coral areas, as these are typically found at greater depths than commercial concentrations of shrimp (CAPP 2015)".*

Environmental management
The marine environment within 3 miles of the coast is the responsibility of the Greenland Government. From 3 to 200 miles the Danish Government is responsible, although fisheries management remains the responsibility of the Greenland Government. .
They key institution for advising the government on fisheries issues is the Fisheries Council. Since 2014 SFG has been co-opted to the Fishery Council.

The Management Plan for the Shrimp Trawl Fishery of W Greenland states that the principal objective with respect to biodiversity and ecology in the West Greenland marine areas is *to maintain a productive ecosystem with many trophic levels, and to introduce an ecosystem-based management of the resources*.

Protected areas
A coastal strip with coral gardens occurs in the area between Nuuk and Maniitoq. This is now protected from 64°10'N and 65°15'N and out to 3 n.m. from the baseline (650 square nm in total). Fishing with trawls or other bottom-contact gear is not permitted in this area (Shrimp Fishery Management Plan 2014).

An area has been closed to fishing for Greenland halibut in western Davis Strait to protect narwhal habitat and cold-water coral communities (DFO 2007).

At the start of 2014, the Fishery Council was asked to advise the government on relevant protection measures for a coral reef that was discovered in the area off south Greenland by a Canadian cruise in 2013.

VME Encounter protocols
Fishing vessels are required to move-on if bycatch of coral exceeds 60 kg, or of live sponges exceeds 800 kg, and must report any such catches to the licensing authority. It is notable that these thresholds are higher than those currently recommended by NEAFC[12] in exploratory fishing areas (30 kg of live coral and/or 400 kg of live sponge). NAFO made more demanding recommendation relating to encounter thresholds for reporting and move-on in 2012 (box 1). These values have been recommended by SFG and the Fisheries Council but are not yet part of the Executive Order.

[12]NEAFC Recommendation 19 2014: Protection of VMEs in NEAFC Regulatory Areas as Amended by Recommendation 09:2015 http://www.neafc.org/system/files/Rec_19-2014_as_amended_by_09_2015_fulltext_0.pdf

Technical measures are being developed for the Melville Bay Fishery where Sea pens are found and may be affected by trawling activities (e.g. footrope damage) without necessarily being retrieved in the catch.

Box 1: NAFO 2012 Recommendations regarding VME

4.1. The WG recommends 60 kg of corals excluding sea pens, inside and outside the footprint.
4.2. The WG recommends that FC consider adopting revised encounter thresholds outside the fishing footprint of 7 kg of sea pens and 300 kg for sponges.
4.3. The WG recommends that the FC, considering the distribution of sea pens and the practical considerations associated with a value of 7 kg for a threshold, consider additional area closures to significant concentration of sea pens, and/or introduce a 7 kg threshold inside the footprint.
4.4. The WG recommends 300 kg threshold for sponges inside the fishing footprint. This measure should be reviewed if refinements to the existing closures take place.

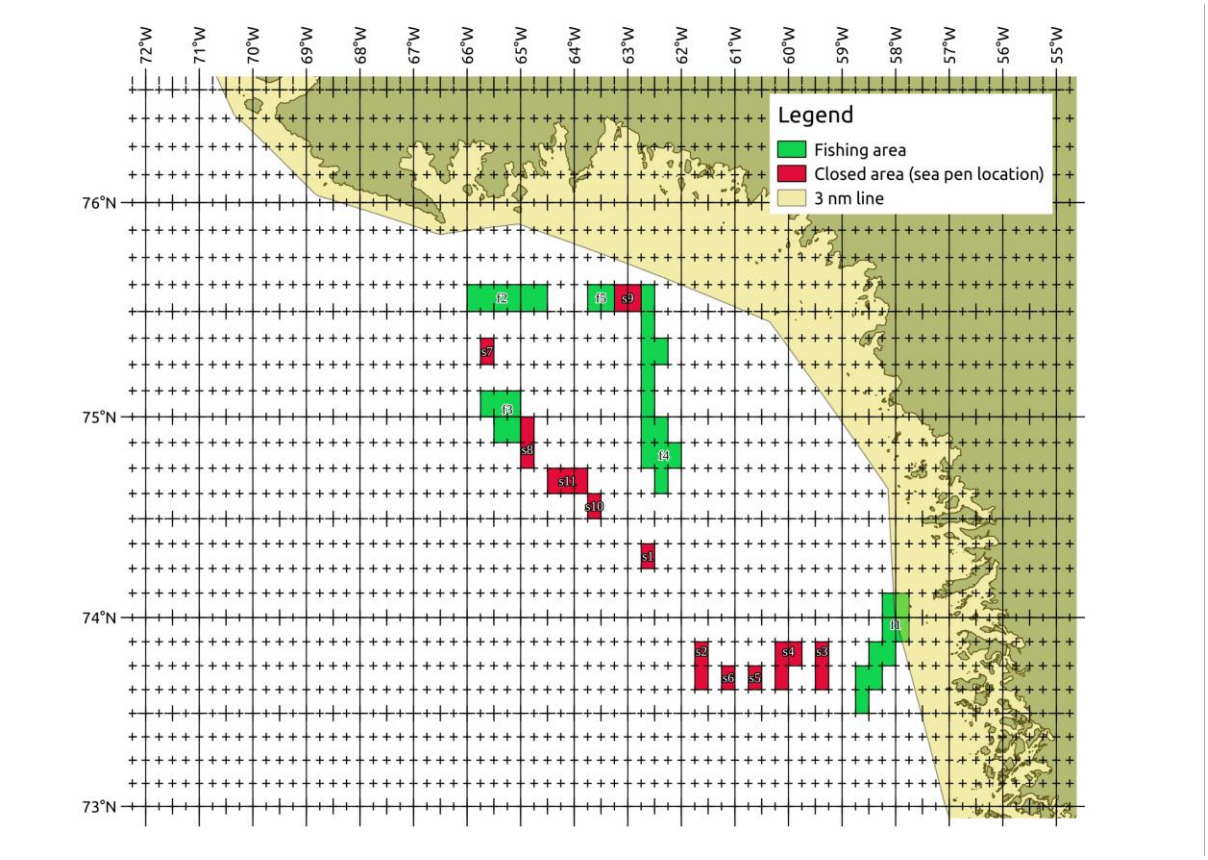
Source: Northwest Atlantic Fisheries Organization
Serial No. N6080 NAFO/FC Doc. 12/6 (Adopted)
34th Annual Meeting - September 2012 Recommendations from the WGFMS-VME to the Fisheries Commission

Special measures taken to protect potential vulnerable marine ecosystems (pVMEs) in the Melville Bay North of 73°30' N.

In the period 2014-16 shrimp fisheries in Melville Bay have taken place inside or close to areas with potential vulnerable marine ecosystems (pVMEs), which have not previously been exposed to bottom fisheries to any significant degree. Continued unregulated shrimp fisheries could endanger VMEs in these areas, and new precautionary measures have been introduced accordingly by the Department of Fisheries and Hunting at the beginning of 2018 (http://naalakkersuisut.gl/da/Naalakkersuisut/Nyheder/2018/01/2301_melvillebugten)

- Closure of a number of pVME areas for bottom fishing entirely in the Melville bay based on significant observations of sea pens, an indicator species for vulnerable marine ecosystems, from scientific surveys of the sea bottom flora and fauna in the Melville Bay conducted by the Greenland Institute of Natural Resources in 2016. The area closure is implemented in respect of Government of Greenland regulation on technical conservation measures §13 / *Selvstyrets bekendtgørelse nr. 4 af 30. marts 2017 om tekniske bevaringsforanstaltninger i fiskeriet (http://lovgivning.gl/lov?rid=%7bCB5A3A48-3C1F-42ED-8395-9886BD403C52%7d&sc_lang=da-DK)*
- In addition, fisheries in "new" areas not previously exposed to bottom fishing North of 73°30' N or surveyed with respect to bottom flora and fauna, can henceforth only take place following application to the Ministry for Fisheries and Hunting. Thus, an observer may be placed on board the vessel, or other actions initiated to monitor habitats and the presence of pVME's. These are implemented as additional license conditions in the West Greenland shrimp fisheries.
- Some areas where bottom trawling for shrimps has taken place in previous years, and where damage to bottom areas is likely to have occurred already have been left open to fishing, designated "fishing area".

Figure 4-17: Designated fishing areas and closed areas as of January 2018



Source: GINR

Ecosystem monitoring and management

The Kingdom of Denmark has developed an environmental strategy for the Arctic: Denmark, Greenland and the Faroe Islands 2011-2020[13]. Greenland Institute of Natural Resources has obtained resources for setting up a genuine benthic division at the Institute and it has been agreed that funding should be used to develop a protocol for long-term monitoring in Greenland, so that at some future time it can become an integral part of the institute's traditional annual surveys of fish and shrimps.

A series of about 40,000 35-mm pictures were taken with an underwater camera by Per Kanneworff, a scientist with Grønlands Naturinstitut, between 1975 and 1986. These were originally intended to contribute to the assessment of the shrimp stock, which was not successful, but they are now a unique source of knowledge and baseline on bottom conditions three to four decades ago, and have recently been compared with up to date photos at the same locations. While biodiversity appears to be much the same there is some evidence that the size of organisms has declined.(Yesson pers. com)

In the longer term the Fisheries management plan commits to:

- Fishery managers and fishermen will work together with Grønlands Naturinstitut to develop a strategic research plan that will include benthic investigations and monitoring of the effect of the trawl fishery;
- The Department for Fishery, Hunting and Agriculture will take the fishery's effect on ecosystems into consideration and where it is necessary will introduce regulations to the end that the integrity of the benthic environment is assured

[13] file:///C:/Users/John/Downloads/Arctic%20strategy.pdf

to a sufficient degree that the structure and function of the ecosystem is maintained.

The main constraints to implementing several of the environmental management protocols and initiatives appears to be very high staff turnover in the responsible government departments and the long lead times required to convert voluntary to regulatory initiative.

Most VMEs are not under threat and there are initiatives being developed to protect them. There is potential for damage to tree coral and seapens in newly opened fishing areas in the North, and current precautionary protocols should be maintained to avoid such damage.

4.2.7 **Cumulative impacts (other UoAs)**

There are no other UoAs operating in the fishing area. The West Greenland lumpfish fishery is certified and the Greenland offshore halibut fishery is currently in assessment. However, the fisheries do not overlap (lumpfish fishery is coastal and the halibut fishery operates in deeper water). Therefore, no cumulative impacts with other UoAs are identified.

4.3 Principle Three: Management System Background

The West Greenland shrimp fishery is part of a shared stock with Canada within NAFO Subareas 0 (A and B) and 1 (A, B, C, D, E, F). Fishing within the Canadian EEZ by Greenlandic vessels is not permitted.

4.3.1 General fisheries management system

Greenland although part of Denmark has extended autonomy which was most recently expanded in 2009 (Greenlandic: Naalakkersuisut, Danish: selvstyre = self-government). Greenland is not part of the EU and hence the EU Common Fisheries Policy does not apply. The fishery operates under the Greenland Self-Government's regulatory and legal system with the first fisheries act passed through the parliament (Danish: Landstinget) and entered into force in October 1980. The legal framework for the management of Greenland's fisheries resources is provided primarily by Landsting Act No. 18 of 31 October 1996 on Fisheries (the 'Fisheries Act'), amended by ten subsequent Acts14. Executive Orders, E.O.s, define specific management elements. This has undergone subsequent review and revision with the latest amendment to the general fisheries act was in 2012.

Greenland is represented in a number of international organisations by Denmark. These include United Nations Convention on Law of the Sea, UNCLOS; the North Atlantic Fisheries Organisation, NAFO; Convention on the International Trade in Endangered Species, CITES; and the International Whaling Commission, IWC.

The North West Atlantic Fisheries Organisation (NAFO) is a regional fisheries management authority composed of 12 states, including the coastal states of Canada, and Greenland. NAFO was formed on January 1, 1979 through its founding document the *Convention on Future Multilateral Cooperation in the Northwest Atlantic Fisheries* (the Convention; NAFO. 1979). NAFO is responsible for the management of all fisheries in the NAFO Regulatory Area (NRA).

The Ministry of Fisheries, Hunting and Agriculture (MFHA) has overall responsibility for fisheries policy and the management of fish resources in Greenland, with the Greenland Institute of Natural Resources (GINR) responsible for providing the biological basis for fisheries management advice to the MFHA.
The Greenland Fishery License Control Authority (GFLK), now under the Ministry of Finance, is another key institution. GFLK takes responsibilities for monitoring control and surveillance. GFLK manages the fisheries observer programme, including within the offshore halibut fishery, the receipt and verification of logbooks, and the Vessel Monitoring System VMS, which is installed in all offshore vessels.

The observer programme managed by GFLK is estimated to currently cover around 5 per cent of fishing activities, which is lower than the intended coverage rate but follows a risk-based approach to coverage. An electronic logbook is being implemented from 2017 onwards. Offshore inspection duties are performed by the Royal Danish Navy's Arctic Command (AKO) by agreement with GFLK.

14 Greenland Fisheries Act, 1996 (amended): Act No. 12 of 6 November 1997, Act No. 6 of 20 May 1998, Act No. 15 of 12 November 2001, Act No. 5 of 21 May 2002, Act No. 28 of 18 December 2003, Act No. 5 of 12 November 2008, Act No. 17 of 3 December 2009, Act No, 8 of 22 November 2011, Act No. 5 of 4 June 2012, Act No. 12 of 3 December 2012.

In Canada the Conservation and Protection Branch (C&P) of the Department for Fisheries and Oceans (DFO) enforces regulations for those fishing in Canadian waters (Greenlandic vessels do not fish in Canadian waters and all the catch is currently taken in the Greenland EEZ).

Greenland's fisheries sector makes a very significant social and economic contribution and the Government's long-term objectives for the sector include[15]:

- The framework for the fishing industry must, as far as possible, be stable, make it possible to provide security for investments and promote efficient fisheries, so that the industry can maintain and renew a modern fishing fleet and up-to-date land-based plants.
- The management of fisheries must support both the need for a long-term sustainable conservation of stocks as well as helping to create a stable basis for achieving good earnings in the industry and among its practitioners.
- The framework for the industry must make generational change in fishing possible as well as making it possible for new fishermen to get access to fishery. This must be accomplished, for example, by creating both good conditions for obtaining financing and as well as for the achievement of the necessary competences to carry out effective and viable fishery.
- The Fisheries Act contains the legal basis for the Fisheries Council, which is the main formal mechanism for consultation within the general fisheries framework, including for consultation and review of the shrimp management plan. With a relatively small number of stakeholders in the sector, there is also regular informal discussion and consultation on matters arising.

The Fisheries Council meets monthly or more regularly at the request from a member organisation for an extraordinary meeting. It is composed of fishing industry representatives with two voting members: Greenland Business Association (GA) and The Association of Fishermen and Hunters (KNAPK). The following additional parties are permanently represented at the council, having the right to speak, but not to vote:

- The Ministries covering the resorts of: fisheries, finance, nature and environment, industry and labour,
- Greenland Fisheries License Control Authority, GFLK;
- Greenland Institute of Natural Resources, GINR;
- Association of Municipalities, KANUKOKA;
- Employee's Union, SIK;
- Employer's Association, NUSUKA; and
- Nature Protection Association, AVATAQ.

The Fisheries Council provides an opportunity for the represented stakeholders to suggest new policy initiatives or revisions to existing legislation. The Fishery Council's responses to government proposals are published on a web-page set up by the government and on the self-government web-site www.nanoq.gl.

Furthermore, the Fisheries Council has the authority to address specific fisheries-related issues that do not require the presence of government, with the scope of this authority explicitly outlined in the Fisheries Act. The Fisheries Council therefore plays an important role in facilitating interaction between fisheries stakeholders and the Government of Greenland, including identification of management priorities.

[15] Department of Finance and Internal Affairs, Greenland Politics and Economics Report, 2014

4.3.2 Fishery-specific management

The shrimp fishery under assessment is within the Greenland EEZ and not within the NAFO Regulatory Area (NRA), with the stock straddling the EEZs of Canada and Greenland. NAFO contributes to management through providing a single stock assessment under the NAFO/ICES Pandalus Assessment Group that reports to the NAFO Scientific Committee (NAFO SC). Canada and Greenland then set their own harvest strategies and associated TACs based on the NAFO SC advice.

Within the Canadian management system, Integrated Fishery Management Plans (IFMP) are developed that outline the fisheries objectives and management measures by stock and area. The Northern Shrimp IFMP became operational in 2007 and is a comprehensive document covering all shrimp fishery areas. The Department revised the IFMP in 2016. A summary of the management plan is available online: http://www.dfo-mpo.gc.ca/fm-gp/peches-fisheries/ifmp-gmp/shrimp-crevette/shrimp-crevette-2007-eng.htm This sets out the overarching strategies and specific management measures applied in the fishery.

In Greenland the shrimp fishery is subject to the general fisheries operational and reporting requirements as laid out in the Fisheries Act and relevant Executive Orders. For example, Executive order no. 12 of 2011 sets out technical regulations to be applied in the fishery:

Attachments to fishing nets

9.-*(1)* In fishing for shrimps, a sorting grid with a bar spacing of no more than 22 mm shall be used. The grid shall be made of stable, including dimensionally stable, material, and shall be placed and fitted so as to ensure the best possible sorting out of bycatches. The bar spacing of a sorting grid shall be determined as described in the annex to this Executive Order.

(2) Irrespective of the provisions on mesh sizes set out in section 7, it shall be permitted to attach the materials referred to in subsections (5) – (7) to the top side as well as the bottom side of the trawl net to reduce wear and tear or increase the strength of the trawl net.

(3) Shrimp trawls shall be furnished with rotating rockhopper gear with a toggle chains of at least 72 cm.

(4) The use of bobbins is prohibited in connection with shrimp trawls. However, it shall be permitted to start on and finish the rockhopper gear by using a steel bobbin in either side of the trawl opening. In addition, it shall be permitted to attach one steel bobbin between each length of rockhopper. Attached steel bobbins shall have the same diameter as attached rockhoppers.

The Management Plan for the Shrimp Trawl Fishery in West Greenland (MFHA, 2015) was first developed in 2010 and later revised as version 2 in 2015. The management plan describes how the objectives that are generally formulated in §2 of the *Fisheries Act* are implemented in respect of the bottom-trawl fishery for shrimps *Pandalus borealis* in West Greenland, i.e. that part of the Greenland EEZ in NAFO Subarea 1 (Divs 1A–1F) [the fishery under assessment].

The management plan also sets out specific management measures in relation to P1 (TAC setting and HCRs) and P2 aspects (minimising environmental impact e.g. through move-on rules and improving knowledge and co-operation between fishers and scientists).

Evaluation Procedure

4.4 Harmonised Fishery Assessment

In accordance with FCR 7.4.16 and Annex PB, the re-assessment harmonized with the following certified fisheries:

- Canada Northern and Stripped Shrimp Fishery (one UoC is a shared stock with this fishery and therefore P1 and P3 aspects were considered in harmonisation)
- Greenland Lumpfish fishery (some P3 aspects as a shared jurisdiction with this fishery but no spatial overlap)
- Greenland offshore halibut fishery (some P3 aspects as a shared jurisdiction, but no spatial overlap)

The team leader, Rod Cappell, was also team leader for the lumpfish and halibut assessments enabling comprehensive harmonisation with the assessments of these fisheries. Additionally, the assessment team of the Canadian fishery were contacted to discuss harmonisation with this fishery. Consistent outcomes were determined, including the one condition under 3.1.1.

4.5 Previous assessments

This fishery was first certified in 2012 and this resulted in 10 conditions (Table 10). The four annual surveillance audit reports describe the progress made and give a detailed justification for closing each condition.

Table 10 Summary of Previous Assessment Conditions

Condition number	Performance indicator (PI)	Status	PI original score	Revised score	Justification
1	1.2.1	Closed yr. 4	70	(80)	Harvest strategy determined to achieve required stock outcome
2	1.2.2	Closed yr. 3	80	(80)	New HCR defined.
3	2.4.1	Closed yr. 4	60	(85)	Additional information through commissioned research to confirm outcome.
4	2.4.2	Closed yr. 4	70	(80)	Additional management evident
5	2.4.3	Closed yr. 3	70	(80)	Additional information through commissioned research.
6	2.5.1	Closed yr. 4	70	(85)	Additional information through commissioned research to confirm outcome.
7	2.5.2	Closed yr. 4	75	(80)	Additional management evident
8	2.5.3	Closed yr. 3	75	(80)	Additional information through commissioned research.
9	3.2.1	Closed yr. 2	70	(90)	Decision-making improved
10	3.2.4	Closed yr. 2	70	(80)	Research plan developed

4.6 Assessment Methodologies

This re-assessment was conducted using the MSC Fishery Certification Requirements (FCR) Version 1.3. This report is based on the reporting template version 2.0.

The version 1.3 default assessment tree was used throughout.
Stakeholder comments and CAB responses are included in Appendix 3.

4.7 Evaluation Processes and Techniques

4.7.1 Site Visits

The re-assessment site visit was conducted in Vodskov, Denmark over 6th and 7th March 2017.
A meeting involving the client group, Sustainable Fisheries Greenland (Polar Seafoods & Royal Greenland).
The scientists responsible for the research on habitats and VMEs were also present at the meeting to present final results and answer questions from the assessment team.
The Polar Seafoods and Royal Greenland Quality Assurance team were also interviewed on traceability matters.
A separate teleconference was held with MFHA and GFLK officials and with GINR staff (without the presence of the client).

Individuals interviewed were:

- Peder Munk Pederson (Polar Seafood)
- Kristina Guldbaek (Polar Seafood)
- Lisbeth Schoenemann-Paul (Royal Greenland)
- Chris Yesson (Zoological Society London)
- Helle Yorgensbye (PhD student)
- Bent Sørensen (KNAPK & SFG board member)
- Jens Kleist (Polar Seafood)
- Esben Ehlers (MFHA – remote)
- Mads Nielsen (GFLK –remote)
- AnnDorte Burmeister (GINR – remote)

4.7.2 Consultations

A total of 21 stakeholders were consulted and no written responses were received.

4.7.3 Evaluation Techniques

Stakeholder announcements were made by emailing stakeholders the announcement of fishery entering assessment and ways to participate, as well as being featured on the MSC's own email newsletter.

Scoring was undertaken by the whole assessment team during a scoring meeting over Skype based on group consensus of scoring outcomes.

Table 11 Scoring elements

Component	Scoring elements	Main/Not main	Data-deficient or not
2.1 Retained	*Pandalus montaguii*	main	not
	Capelin	minor	not
2.2 Bycatch	West Greenland arctic cod	minor	not
	Sebastes norvegicus	minor	not
	Sebastes mentella	minor	not
	Anarhichas minor	minor	dd
	A. denticulata	minor	dd
	A. lupus	minor	dd
	Thorny skate	minor	dd
2.4 Benthic Habitat	Mud	Commonly encountered	dd
	Muddy sand	Commonly encountered	dd
	Gravelly mud	Commonly encountered	dd
	Gravelly sand	Commonly encountered	dd
	Bedrock with mud	Commonly encountered	dd
	Bedrock with sand	Commonly encountered	dd
	Coarse rocky ground	Commonly encountered	dd
	Maerl	VME	dd
	Lophelia reef	VME	dd
	Bamboo coral	VME	dd
	Ostur/*Geodia* sponges	VME	dd
	Paragorgia tree coral	VME	dd
	Umbellula sea pens	VME	dd

5 Traceability

5.1 Eligibility Date

The eligibility date is the date of re-certification.

5.2 Traceability within the Fishery

Table 12 Traceability Factors within the Fishery:

Traceability Factor	**Description of risk factor if present. Where applicable, a description of relevant mitigation measures or traceability systems (this can include the role of existing regulatory or fishery management controls)**
Potential for non-certified gear/s to be used within the fishery	It is very unlikely for non-certified gears to be used as these would be ineffective for catching shrimp. The use of a grid is mandatory. The size of vessels & gear makes it impractical to remove grids and GFLK undertake regular inspections of vessels to confirm compliance**.**
Potential for vessels from the UoC to fish outside the UoC or in different geographical areas (on the same trips or different trips).	The UoC includes all W Greenland waters and UoC vessels are not permitted to fish in Canadian waters. Vessels are required to have VMS that is monitored by GFLK to ensure no fishing in Canadian waters occurs.
Potential for vessels outside of the UoC or client group fishing the same stock.	Vessels outside the UoC with any likelihood of fishing for shrimp are Canadian vessels operating in Canadian waters. These do fish the same stock, but not within the UoC, i.e. Greenland waters.
Risks of mixing between certified and non-certified catch during storage, transport, or handling activities (including transport at sea and on land, points of landing, and sales at auction)	All P. borealis catch in Greenland is included under the UoC. There is therefore no risk of mixing non-certified catch. By-catch of all but P. montaguii is minimized with the mandatory use of a sorting grid. See section 5.4 below regarding *P. montaguii* bycatch. The by-catch levels are monitored per haul and reported to GFLK using the e-logbooks (for offshore vessels) and with control via at sea inspection with a further copy to the companies for collation and review. GFLK also corroborates by-catch levels using sales notes. All catch is certified, with the P. montaguii by-catch eligible under IPI allowances (see section 4.4). The amount of P. montaguii by-catch is determined per haul (offshore) and per landing (coastal). Sampling and labelling identifies the amount of P. montaguii as the market price is determined in part by the proportion of P.montagui bycatch within the batch. The offshore vessels processing at sea and the processing factories taking 25% of the offshore

	catch and the coastal catch operate full traceability systems with each haul (offshore) and sale (coastal) labelled uniquely and tracked.
Risks of mixing between certified and non-certified catch during processing activities (at-sea and/or before subsequent Chain of Custody)	75% of processing occurs at sea (see above), with 25% landed to shore-based processors. No non-certified shrimp is landed by vessels in Greenland or handled by these processors. No borealis is imported and all borealis landings are strictly monitored (for traceability within the supply chain and to ensure the 75/25 rule is complied with).
Risks of mixing between certified and non-certified catch during transhipment	No transshipment occurs in the fishery.
Any other risks of substitution between fish from the UoC (certified catch) and fish from outside this unit (non-certified catch) before subsequent Chain of Custody is required	None identified.

5.3 Eligibility to Enter Further Chains of Custody

The limit of identification of landings is the landing of *P. borealis* by member vessels at recognised ports where appropriate recording and monitoring of landings takes place. Landings are in ports equipped with freight terminals of Royal Arctic Line, with cooking and peeling plants and sufficient cold storage capacity. Presently the main ports of landing are Nuuk, Ilulissat, Aasiaat, Sisimiut, and Maniitsoq, where vessels undergo rigorous inspection and catch validation. While there is no processing plant in Maniitsoq, factory vessels carrying frozen product will use this port to avoid wait time in Nuuk.

There are no known risk factors after the point of landing that may influence subsequent CoC assessments. CoC should begin from the first point of sale, upon landing. Product that is processed at sea may be sold directly from the vessel to exporting companies, whereas industrial product, which requires further processing will be sold following an evaluation of quality at the processing plant within 24 hours of landing. In either case, the first point of sale is associated with the landing, either to brokers or processing plants.

P. borealis products landed by any of the vessels owned by any of the member companies are eligible to enter further CoCs. Companies buying directly from this fishery are required to have CoC certification. Any companies buying from the vessels owned by any of the member companies must also seek CoC certification in order to sell product as MSC.

5.4 Eligibility of Inseparable or Practicably Inseparable (IPI) stock(s) to Enter Further Chains of Custody

7.4.14.2 of version 2.0 of the FCR states that CABs may allow fish or fish products considered as coming from IPI stocks to enter chains of custody, with an exemption to the additional assessment requirements for IPI stocks given in PA4.2.
The following rationale for that exemption is provided below:

1. In relation to the criteria outlined in 7.4.13.1:

P. montaguii is a closely related species to *P. borealis* with variable overlap in distribution during normal fishing operations. While distinguishable during sampling, it is not commercially feasible to separate out the species during fishing operations.

The most recent catch data provided to the assessment team (see section 3.2.3) illustrates that *P. montaguii* catches have dropped below 2% (at 1.1% for 2017). The status of *P. montagui* stocks are being assessed in more detail by GINR (with a view to future full assessment – see recommendation), but scientists confirm that the catch levels are at a level that would not create a significant impact on the IPI stocks as a whole.

It is therefore determined that the fishery is exempt from the requirements under Annex PA.

The by-catch levels and status of *P. montaguii* will be monitored at each surveillance.

Evaluation Results

5.5 Principle Level Scores

Table 13 Final Principle Scores

Final Principle Scores	
Principle	**Score**
Principle 1 – Target Species	91.9
Principle 2 – Ecosystem	87.3
Principle 3 – Management System	83.3

5.6 Summary of PI Level Scores

Table 14 Summary of PI scores

Prin-ciple	Component	PI No.	Performance Indicator (PI)	Score
One	Outcome	1.1.1	Stock status	100
		1.1.2	Reference points	90
		1.1.3	Stock rebuilding	
	Management	1.2.1	Harvest strategy	80
		1.2.2	Harvest control rules & tools	80
		1.2.3	Information & monitoring	100
		1.2.4	Assessment of stock status	95
Two	Retained species	2.1.1	Outcome	80
		2.1.2	Management	80
		2.1.3	Information	85
	Bycatch species	2.2.1	Outcome	80
		2.2.2	Management	100
		2.2.3	Information	80
	ETP species	2.3.1	Outcome	100
		2.3.2	Management	100
		2.3.3	Information	100
	Habitats	2.4.1	Outcome	90
		2.4.2	Management	80
		2.4.3	Information	80
	Ecosystem	2.5.1	Outcome	90
		2.5.2	Management	85
		2.5.3	Information	80
Three	Governance and policy	3.1.1	Legal & customary framework	75
		3.1.2	Consultation, roles & responsibilities	95
		3.1.3	Long term objectives	80
		3.1.4	Incentives for sustainable fishing	80
	Fishery specific management system	3.2.1	Fishery specific objectives	90
		3.2.2	Decision making processes	85
		3.2.3	Compliance & enforcement	85
		3.2.4	Research plan	80
		3.2.5	Management performance evaluation	80

5.7 Summary of Conditions

All previous conditions under the first certification were closed prior to re-assessment. One new condition on 3.1.1 is raised.

Table 15 Summary of conditions

Condition number	Condition	Performance Indicator	Related to previously raised condition? (Y/N/NA)
1	Ensure effective co-operation with Canada to deliver management outcomes consistent with MSC Principle 1.	**3.1.1**	**N**

5.8 Recommendations

Three recommendations are given in relation to by-catch of *P. montaguii* and threshold levels for VME indicator species in move-on rules

1. (PI 2.1.2) Continue to actively manage and monitor *P. montaguii* through official adoption and implementation of the action plan. This will provide clear evidence that the partial strategy is being implemented successfully.

2. (PI 2.1.3) Information on the *Pandalus montaguii* stock continues to be improved upon to enable its assessment as a target species under Principle 1.

3. (PI 2.4.2) Ensure move on rules, including threshold levels, are at a minimum fully aligned with NAFO/NEAFC recommendations.

5.9 Determination, Formal Conclusion and Agreement

The assessment team have determined that the fishery meets the requirements of the MSC standard and recommends MSC certification.

Following this assessment team's work, and review by stakeholders and peer-reviewers, the determination will be presented to Acoura's decision making entity that this fishery has passed its assessment and should be certified.

Acoura's decision making entity confirm that the fishery is re-certified.

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Appendices

Appendix 1a – MSC Principles & Criteria

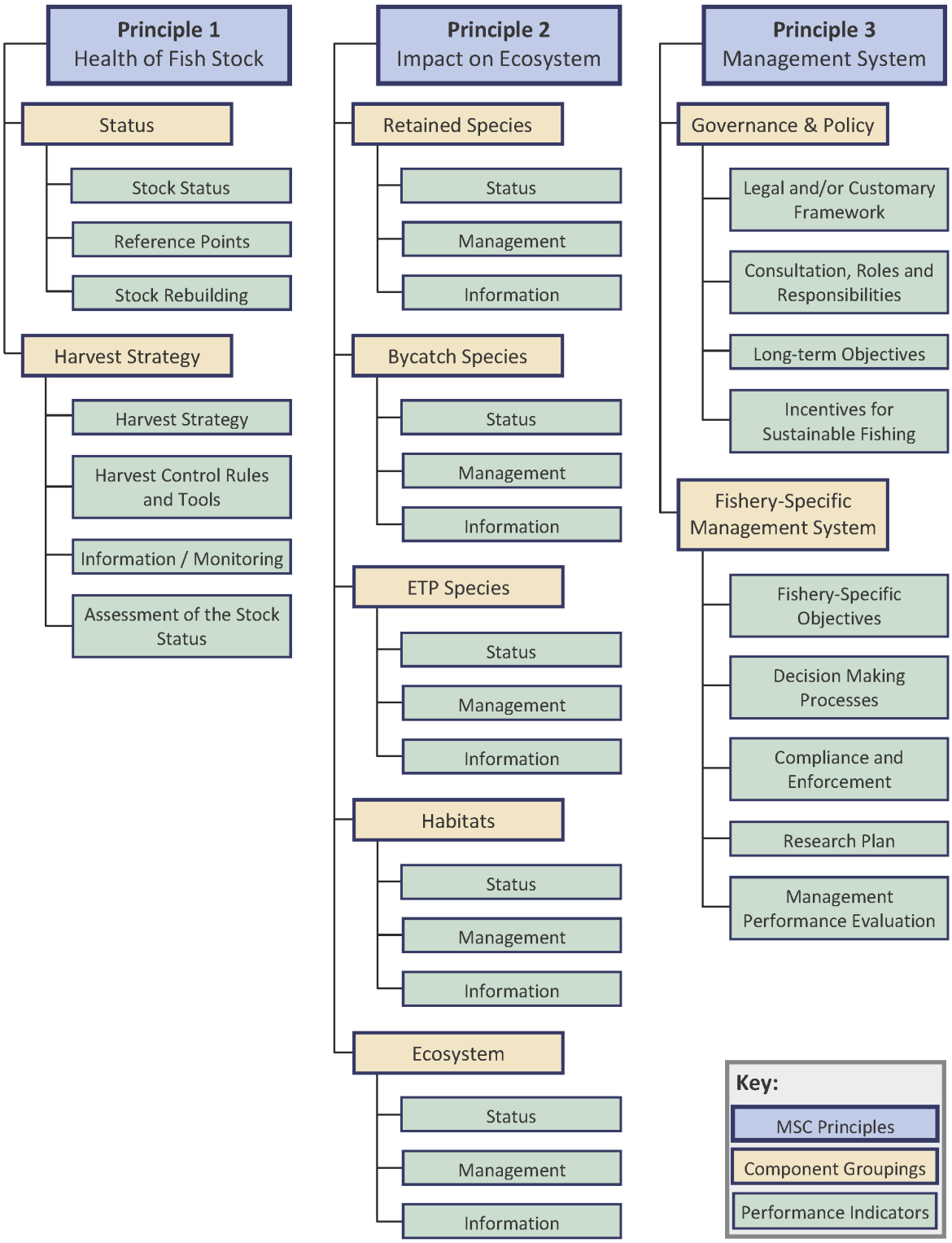


Figure A1 – Graphic of MSC Principles and Criteria

Below is a much-simplified summary of the MSC Principles and Criteria, to be used for over-view purposes only. For a fuller description, including scoring guideposts under each Performance Indicator, reference should be made to the full assessment tree, complete with scores and justification, contained in **Appendix 1.1** of this report. Alternately a fuller description of the MSC Principles and Criteria can be obtained from the MSC website (www.msc.org).

Principle 1

A fishery must be conducted in a manner that does not lead to over-fishing or depletion of the exploited populations and, for those populations that are depleted, the fishery must be conducted in a manner that demonstrably leads to their recovery.

Intent:

The intent of this Principle is to ensure that the productive capacities of resources are maintained at high levels and are not sacrificed in favour of short-term interests. Thus, exploited populations would be maintained at high levels of abundance designed to retain their productivity, provide margins of safety for error and uncertainty, and restore and retain their capacities for yields over the long term.

Status

» The stock is at a level that maintains high productivity and has a low probability of recruitment overfishing.

» Limit and target reference points are appropriate for the stock (or some measure or surrogate with similar intent or outcome).

» Where the stock is depleted, there is evidence of stock rebuilding and rebuilding strategies are in place with reasonable expectation that they will succeed.

Harvest strategy / management

» There is a robust and precautionary harvest strategy in place, which is responsive to the state of the stock and is designed to achieve stock management objectives.

» There are well defined and effective harvest control rules in place that endeavour to maintain stocks at target levels.

» Sufficient relevant information related to stock structure, stock productivity, fleet composition and other data is available to support the harvest strategy.

» The stock assessment is appropriate for the stock and for the harvest control rule, takes into account uncertainty, and is evaluating stock status relative to reference points.

Principle 2

Fishing operations should allow for the maintenance of the structure, productivity, function and diversity of the ecosystem (including habitat and associated dependent and ecologically related species) on which the fishery depends

Intent:

The intent of this Principle is to encourage the management of fisheries from an ecosystem perspective under a system designed to assess and restrain the impacts of the fishery on the ecosystem.

Retained species / Bycatch / ETP species

» Main species are highly likely to be within biologically based limits or if outside the limits there is a full strategy of demonstrably effective management measures.

» There is a strategy in place for managing these species that is designed to ensure the fishery does not pose a risk of serious or irreversible harm to retained species.

» Information is sufficient to quantitatively estimate outcome status and support a full strategy to manage main retained / bycatch and ETP species.

Habitat & Ecosystem

» The fishery does not cause serious or irreversible harm to habitat or ecosystem structure and function, considered on a regional or bioregional basis.

» There is a strategy and measures in place that is designed to ensure the fishery does not pose a risk of serious or irreversible harm to habitat types.

» The nature, distribution and vulnerability of all main habitat types and ecosystem functions in the fishery area are known at a level of detail relevant to the scale and intensity of the fishery and there is reliable information on the spatial extent, timing and location of use of the fishing gear.

Principle 3

The fishery is subject to an effective management system that respects local, national and international laws and standards and incorporates institutional and operational frameworks that require use of the resource to be responsible and sustainable.

Intent:

The intent of this principle is to ensure that there is an institutional and operational framework for implementing Principles 1 and 2, appropriate to the size and scale of the fishery.

Governance and policy

» The management system exists within an appropriate and effective legal and/or customary framework that is capable of delivering sustainable fisheries and observes the legal & customary rights of people and incorporates an appropriate dispute resolution framework.

» Functions, roles and responsibilities of organisations and individuals involved in the management process are explicitly defined and well understood. The management system includes consultation processes.

» The management policy has clear long-term objectives, incorporates the precautionary approach and does not operate with subsidies that contribute to unsustainable fishing.

Fishery specific management system

» Short and long-term objectives are explicit within the fishery's management system.

» Decision-making processes respond to relevant research, monitoring, evaluation and consultation, in a transparent, timely and adaptive manner.

» A monitoring, control and surveillance system has been implemented. Sanctions to deal with non-compliance exist and there is no evidence of systematic non-compliance.

» A research plan provides the management system with reliable and timely information and results are disseminated to all interested parties in a timely fashion.

Appendix 1.1 Performance Indicator Scores and Rationale

Evaluation Table for PI 1.1.1

PI 1.1.1		The stock is at a level which maintains high productivity and has a low probability of recruitment overfishing		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guidepost**	It is likely that the stock is above the point where recruitment would be impaired.	It is highly likely that the stock is above the point where recruitment would be impaired.	There is a high degree of certainty that the stock is above the point where recruitment would be impaired.
	Met?	Y	Y	Y
	Justification	There is a comprehensive stock assessment programme in place which estimates the stock to be 11% above B_{msy} with a less than 1% chance of being below B_{lim} in 2016 (NAFO, 2016). This represents a high degree of certainty that the stocks are above the point where recruitment would be impaired so SG 100 is met as well as the SG 60 and 80 levels.		
b	**Guidepost**		The stock is at or fluctuating around its target reference point.	There is a high degree of certainty that the stock has been fluctuating around its target reference point, or has been above its target reference point, over recent years.
	Met?		Y	Y
	Justification	The West Greenland Stock of *P. borealis* is currently above the target reference point and the fitted trajectory of stock biomass shows that the stock has been above B_{msy} since the late 1990s, though it is acknowledged that the lower quartile bars from the modelled biomass have fallen just below B_{msy} in the last five years. The relative stock biomass has been stable in recent years following a period of decline from particularly high levels in 2003-05. There is therefore a high degree of certainty that the stock has been fluctuating around or been above the target reference point in recent years and SG 100 is met, as well as the SG 80 level.		
References		» **NAFO 2016a.** NAFO/ICES *Pandalus* Assessment Group Meeting, 7-14 September 2016. NAFO SCS Doc. 16/17 Serial No. N6611ICES CM 2016/ACOM:15. 93pp		

Stock Status relative to Reference Points			
	Type of reference point	**Value of reference point**	**Current stock status relative to reference point**
Target reference point	B_{msy}	Median estimate 127Kt (with quartiles at 96 and 158Kt)	11% above B_{msy}

PI 1.1.1	The stock is at a level which maintains high productivity and has a low probability of recruitment overfishing		
		Mode 131Kt	
Limit reference point	B_{lim}	30% B_{msy}	Risk of being below B_{lim} is <1%
OVERALL PERFORMANCE INDICATOR SCORE:			**100**
CONDITION NUMBER (if relevant):			

Evaluation Table for PI 1.1.2

PI 1.1.2		Limit and target reference points are appropriate for the stock		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guidepost**	Generic limit and target reference points are based on justifiable and reasonable practice appropriate for the species category.	Reference points are appropriate for the stock and can be estimated.	
	Met?	Y	Y	
	Justification	Estimation of parameters within the stock assessment is carried out using a Shaefer surplus-production model which is fitted to a series of CPUE, catch and survey biomass indices. The target reference point is B_{msy} with a limit reference B_{lim} set at 30% of B_{msy}. In this case the value of 30% has been set within a precautionary approach, and estimations assessing the risk of transgressing this limit against varying catch scenarios are estimated (Kingsley, 2016). The reference point for mortality Z_{msy} includes fishing mortality and also predation by cod (NAFO, 2016). Reference points are appropriate for the stock and can be estimated and therefore the scoring guidepost at 60 and 80 are met.		
b	**Guidepost**		The limit reference point is set above the level at which there is an appreciable risk of impairing reproductive capacity.	The limit reference point is set above the level at which there is an appreciable risk of impairing reproductive capacity following consideration of precautionary issues.
	Met?		Y	Y
	Justification	B_{lim} is a level of stock biomass below which unknown or low recruitment is expected. A precautionary approach has been taken to setting B_{lim}, and estimations assessing the risk of transgressing this limit against varying catch scenarios are estimated (Kingsley, 2016). The risks of B_{lim} being reached are considered to be very low (≤0.1%). The limit reference point is therefore set above the level at which there is an appreciable risk of impairing reproductive capacity. The nature of the model used in the assessment results in outputs which include probabilities, this permits consideration of precautionary issues. The inclusion of projections of predicted possibilities of transgressing precautionary reference points relating to different levels of cod predation within the model, also indicates that precautionary measures are being considered (NAFO, 2016). This guidepost is therefore scored at 100, as well as meeting the SG 80.		

PI 1.1.2		Limit and target reference points are appropriate for the stock		
c	Guidepost		The target reference point is such that the stock is maintained at a level consistent with B_{MSY} or some measure or surrogate with similar intent or outcome.	The target reference point is such that the stock is maintained at a level consistent with B_{MSY} or some measure or surrogate with similar intent or outcome, or a higher level, and takes into account relevant precautionary issues such as the ecological role of the stock with a high degree of certainty.
	Met?		Y	N
	Justification	The target reference point is B_{msy} and the model takes into account precautionary measures through forward predictions of the stock, taking into consideration potential catch rates and likely values for the biomass of cod (Kingsley, 2016) so SG 80 is met. There is not a wider precautionary consideration of the ecological role of the stock however, which results in a SG100 not being met.		
d	Guidepost		For key low trophic level stocks, the target reference point takes into account the ecological role of the stock.	
	Met?		(Not relevant)	
	Justification			
References		» **Kingsley, M. C. S. (2016).** A stock dynamic model of the West Greenland stock of Northern Shrimp. NAFO SCR Doc. 16/047. » **NAFO (2016).** NAFO/ICES *Pandalus* Assessment Group Meeting, 7-14 September 2016. NAFO SCS Doc. 16/17 Serial No. N6611ICES CM 2016/ACOM:15. 93pp ……		
OVERALL PERFORMANCE INDICATOR SCORE:				**90**
CONDITION NUMBER (if relevant):				

Evaluation Table for PI 1.1.3 **not scored as 1.1.1 over 80**

Evaluation Table for PI 1.2.1

PI 1.2.1		**There is a robust and precautionary harvest strategy in place**		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guidepost**	The harvest strategy is expected to achieve stock management objectives reflected in the target and limit reference points.	The harvest strategy is responsive to the state of the stock and the elements of the harvest strategy work together towards achieving management objectives reflected in the target and limit reference points.	The harvest strategy is responsive to the state of the stock and is designed to achieve stock management objectives reflected in the target and limit reference points.
	Met?	Y	Y	N
	Justification	The harvest strategy states that the harvest control rules should maintain the stock at a level which has a high probability of being above B_{msy}, with catch rates prescribed to manage fishing mortality in line with stock status objectives. Stock assessment advice relative to target and limit reference points produced by NIPAG are approved by the NAFO Scientific Committee who also provide TAC recommendations. Both the Greenland and Canadian components of the fishery have harvest strategies which are responsive to the status of the stocks, taking into account annual assessment outputs and catch rates relative to the TAC. In this respect the harvest plans work together, collectively achieving the management goals and therefore a score of 80 is justified, and hence there is justification for also meeting SG 60. While each county's harvest strategy has shared objectives there is no joint management plan for the areas of shared resources. This could result in combined landings which exceed the recommended TAC. The lack of a joint harvest strategy means that it is not therefore specifically designed to meet the stock management objectives relative to target and limit reference points and a score of 100 is not met.		
b	**Guidepost**	The harvest strategy is likely to work based on prior experience or plausible argument.	The harvest strategy may not have been fully tested but evidence exists that it is achieving its objectives.	The performance of the harvest strategy has been fully evaluated and evidence exists to show that it is achieving its objectives including being clearly able to maintain stocks at target levels.
	Met?	Y	Y	N

PI 1.2.1		There is a robust and precautionary harvest strategy in place		
	Justification	The annual NIPAG stock assessment programme provides ongoing evidence that the harvest strategy is achieving its objectives by indicating that the stock remains above target and limit reference points. The enacted TAC, i.e. the landings recorded show that that the harvest strategy is contributing to these objectives by managing fishing mortality. Therefore SG 60 is met and a score of 80 is therefore justified. While the harvest strategy is shown to be achieving its objectives, it has not been fully evaluated and therefore SG 100 is not met.		
c	Guidepost	Monitoring is in place that is expected to determine whether the harvest strategy is working.		
	Met?	Y		
	Justification	There is a comprehensive stock assessment programme which incorporates data from logbooks and annual surveys and provides an assessment of the stocks in relation to the harvest strategy (and specifically the reference points). In year monitoring of catches permits ongoing evaluation of catches relative to the TAC for the year. Therefore, the SG60 scoring guidepost is met.		
d	Guidepost			The harvest strategy is periodically reviewed and improved as necessary.
	Met?			N
	Justification	There has been a recent review of the harvest strategy, and clearly documented efforts are being made to combine the harvest strategy with the Canadian fishery, however, these have not been successful to date. While there are plans to update the harvest strategy when an agreement can be reached, it is not possible to state that the harvest strategy, as a whole, is being improved as necessary so SG 100 is not met.		
e	Guidepost	It is likely that shark finning is not taking place.	It is highly likely that shark finning is not taking place.	There is a high degree of certainty that shark finning is not taking place.
	Met?	(Not relevant)	(Not relevant)	(Not relevant)

PI 1.2.1		There is a robust and precautionary harvest strategy in place
	Justification	The target species is not a shark.
References		» **Anon (2015)**. Management Plan for the Shrimp Trawl Fishery in West Greenland. Version 2, January 2015. » **Powles *et al*. (2016)**. MSC Sustainable Fisheries Certification Canada Northern and Striped Shrimp Fishery. https://fisheries.msc.org/en/fisheries/canada-northern-and-striped-shrimp/@@assessments……
OVERALL PERFORMANCE INDICATOR SCORE:		**80**
CONDITION NUMBER (if relevant):		

Evaluation Table for PI 1.2.2

PI 1.2.2		There are well defined and effective harvest control rules in place		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guidepost**	Generally understood harvest rules are in place that are consistent with the harvest strategy and which act to reduce the exploitation rate as limit reference points are approached.	Well defined harvest control rules are in place that are consistent with the harvest strategy and ensure that the exploitation rate is reduced as limit reference points are approached.	
	Met?	Y	Y	
	Justification	The harvest control rules are set out in the current management plan (Anon, 2015) and are well defined. They state that: - The most important long-term objective for the fishery is that the resource should be maintained at or near its economic optimum level; which implies that the resource should be above its maximum productivity level $B_{msy.}$ - The most important tactical measure for management of the resource is the setting of a TAC to control catches. It is acknowledged that the short term regulation of catches is not sufficient in and of itself to maintain stocks at a level above Bmsy, and that long term objectives are met by keeping mortality levels under $F_{msy.}$ - Management is based on the setting of at TAC such that the risk that total mortality would exceed F_{msy} should be a value below 50%, with current mortality risk levels of <35% in place as the criterion for the advised TAC. The harvest strategy states that sudden large changes in the TAC should be avoided and that the harvest control rules can specify how significant a change in TAC can be tolerated in any given year. This is applied in a conservative manner to reduce risk to the primary goal of maintaining the stock at a level above B_{msy}. The TAC that is set corresponds to a level of fishing mortality which is explicitly designed to maintain the risk of F_{msy} being exceeded to below 35%, and to ensure that stocks are above B_{msy}. It can therefore be seen that the harvest control rules are consistent with the harvest strategy and there is a mechanism in place to reduce fishing effort as reference points are approached.SG 60 is met. As the harvest control rules in place are not coordinated between Greenland and Canada, it is possible for total catches to exceed the recommended TAC. The impacts of this are likely to be limited, however, as the proportion of the stock which is present in the Canadian sector of the fishery is low, representing 3% of the stock area (Kingsley, 2016). Quota uptake by the Canadian fleet has been historically low and part of this area has been closed to fishing through the implementation of marine protected areas. Therefore, the harvest		

		control rules would still be effective in reducing the exploitation rate as the reference points are approached, and SG 80 is met.		
b	**Guidepost**		The selection of the harvest control rules takes into account the main uncertainties.	The design of the harvest control rules takes into account a wide range of uncertainties.
	Met?		Y	N
	Justification	The stock assessment process takes into consideration the main uncertainties relating to the underlying data and uncertainties are acknowledged and included in the model (NAFO, 2016). The assessment process provides predictions of the risk of transgressing precautionary reference points under different catch options. The reference points link the stock assessment and harvest control rules taking into account the uncertainties therefore SG 80 is met. There are however acknowledged uncertainties relating to the geographical concentration of the fishery and the potential impacts on CPUE related biomass estimates, and also regarding the genetic make-up of the stock. These wider uncertainties are not currently taken into consideration within the harvest control rules and SG 100 is not met.		
c	**Guidepost**	There is some evidence that tools used to implement harvest control rules are appropriate and effective in controlling exploitation.	Available evidence indicates that the tools in use are appropriate and effective in achieving the exploitation levels required under the harvest control rules.	Evidence clearly shows that the tools in use are effective in achieving the exploitation levels required under the harvest control rules.
	Met?	Y	Y	N
	Justification	The results of the stock assessment show that the harvest control rules have resulted in a fishery which is prosecuting a stock that has been consistently above B_{msy} in recent years. Mortality rates, which include both fishing mortality and cod predation, show that mortality rates have been consistently below the mortality reference point Z_{msy} since 1993. This provides evidence that the tools in use are appropriate and effective at maintaining the stock levels relative to the reference points – SG 60 and 80 are met. The setting of a TAC to limit fishery removals is subject to some flexibility however, in that there has been additional quota allocated to the exploratory fishery in Division 1A, over and above the TAC recommended by the Scientific Council. In addition, there is the potential, albeit limited, for the Canadian fishery to fish a greater share of the TAC than allocated by Greenland when setting their quota allocations. SG 100 is not therefore met.		
References				

	» **Anon (2015)**. Management Plan for the Shrimp Trawl Fishery in West Greenland. Version 2, January 2015. » **Kingsley, M. C. S. (2016).** A stock dynamic model of the West Greenland stock of Northern Shrimp. NAFO SCR Doc. 16/047. » **NAFO (2016).** NAFO/ICES *Pandalus* Assessment Group Meeting, 7-14 September 2016. NAFO SCS Doc. 16/17 Serial No. N6611ICES CM 2016/ACOM:15. 93pp ……
OVERALL PERFORMANCE INDICATOR SCORE:	**80**
CONDITION NUMBER (if relevant):	

Evaluation Table for PI 1.2.3

PI 1.2.3		Relevant information is collected to support the harvest strategy		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guidepost**	Some relevant information related to stock structure, stock productivity and fleet composition is available to support the harvest strategy.	Sufficient relevant information related to stock structure, stock productivity, fleet composition and other data is available to support the harvest strategy.	A comprehensive range of information (on stock structure, stock productivity, fleet composition, stock abundance, fishery removals and other information such as environmental information), including some that may not be directly related to the current harvest strategy, is available.
	Met?	Y	Y	Y
	Justification	The assessments are carried out on a 30-year data set comprising fisheries information on catch and effort from logsheets and data from an annual trawl survey. This provides information on the stock structure (including differences between the coastal and offshore fisheries). Fleet information is available and fishery removals monitored relative to the TAC. It can therefore be seen that there is a comprehensive range of information and data to support the harvest strategy. Indications that the stocks may be moving to occupy a more northerly range has resulted in a trial fishery being carried out in a new area to provide additional information on the stocks in this new fishery area. NIPAG has requested that this trial area be included in the assessments for 2017. Environmental factors are taken into consideration during the annual survey where bottom temperature is recorded and used to calculate a mean bottom temperature weighted for the areas of the survey strata. The survey area is divided into regions defined by bottom temperature gradients as detailed by Burmester & Kingsley (2016). Recent genetic research being carried out at the recommendation of NIPAG has shown that there may be more than one stock of *Pandalus borealis* in the West of Greenland area (NAFO, 2016). This research is at an early stage, however, and has not yet been included in the current stock assessments nor does it influence the current harvest strategy.		

		The range of information available and used in the harvest strategy, along with new information being considered, results in SG 60, 80 and 100 being met.		
b	**Guidepost**	Stock abundance and fishery removals are monitored and at least one indicator is available and monitored with sufficient frequency to support the harvest control rule.	Stock abundance and fishery removals are regularly monitored at a level of accuracy and coverage consistent with the harvest control rule, and one or more indicators are available and monitored with sufficient frequency to support the harvest control rule.	All information required by the harvest control rule is monitored with high frequency and a high degree of certainty, and there is a good understanding of inherent uncertainties in the information [data] and the robustness of assessment and management to this uncertainty.
	Met?	Y	Y	Y
	Justification	CPUE and survey data is collected and analysed via the assessment process on an annual basis, which is considered to be a high degree of frequency. The survey design is reviewed and revised as required to continually improve outputs as detailed in Burmeister & Kingsley (2016). There is an understanding of the inherent uncertainties in this data, and this is incorporated into both the modelling process and the subsequent advice relating to management (Kingsley 2016; NAFO, 2016). SG 60, 80 and 100 are therefore justified.		
c	**Guidepost**		There is good information on all other fishery removals from the stock.	
	Met?		Y	
	Justification	The Greenland and Canadian fisheries represent all removals from this stock. Data for both the Greenland and Canadian sectors of this fishery are good and both fishery and predation removals from the stock are incorporated in the assessment methodology. There are no indications of any further fishery removals from the stock so SG 80 is met.		
References		» **Burmeister, A. & Kingsley, M. C. S. (2016)**. The West Greenland trawl survey for Pandalus borealis, 2016, with reference to earlier results. NAFO SCR Doc. 16/041. » **Kingsley, M. C. S. (2016).** A stock dynamic model of the West Greenland stock of Northern Shrimp. NAFO SCR Doc. 16/47.		

	» **NAFO (2016).** NAFO/ICES *Pandalus* Assessment Group Meeting, 7-14 September 2016. NAFO SCS Doc. 16/17 Serial No. N6611ICES CM 2016/ACOM:15. 93pp ……	
OVERALL PERFORMANCE INDICATOR SCORE:		**100**
CONDITION NUMBER (if relevant):		

Evaluation Table for PI 1.2.4

PI 1.2.4		There is an adequate assessment of the stock status		
Scoring Issue		SG 60	SG 80	SG 100
a	Guidepost		The assessment is appropriate for the stock and for the harvest control rule.	The assessment is appropriate for the stock and for the harvest control rule and takes into account the major features relevant to the biology of the species and the nature of the fishery.
	Met?		Y	Y
	Justification	The assessment of the stocks carried out using a quantitative stock-dynamic model, which is fitted by Bayesian methods to a 30-year time series of data, including logbook information on fishery effort and catches and data from a research trawl survey. The model has been shown to fit reasonably well to the observed data and also includes the impact of predation by cod (Kingsley, 2016). SG 80 & 100 are therefore justified.		
b	Guidepost	The assessment estimates stock status relative to reference points.		
	Met?	Y		
	Justification	The stock assessment estimates stock status relative to both target and limit reference points. SG60 is met.		
c	Guidepost	The assessment identifies major sources of uncertainty.	The assessment takes uncertainty into account.	The assessment takes into account uncertainty and is evaluating stock status relative to reference points in a probabilistic way.
	Met?	Y	Y	Y
	Justification	The assessment takes into account uncertainty and the model refined to take this into account, for example in 2013 to include the uncertainty of projecting current year's catches, and in 2016 when a modification relating to predation estimates was made to reduce uncertainty in calculating future TACs (Kingsley, 2016). The assessment of stock status is carried out using a probabilistic model and therefore the requirements for SG 60, 80 & 100 have been met.		

PI 1.2.4		**There is an adequate assessment of the stock status**		
d	**Guidepost**			The assessment has been tested and shown to be robust. Alternative hypotheses and assessment approaches have been rigorously explored.
	Met?			N
	Justification	The methodologies used in the stock assessment are tested and improved upon by NIPAG, as detailed by Kingsley (2015). A recent example of this is the recent changes in error terms relating to cod predation within the model. Rigorous exploration of alternative methods has not, however, been formally documented and therefore SG 100 is not met.		
e	**Guidepost**		The assessment of stock status is subject to peer review.	The assessment has been internally and externally peer reviewed.
	Met?		Y	Y
	Justification	The process of carrying out assessments via the NAFO/ICES Pandalus Working Group (NIPAG) ensures that the assessment is subject to peer review. NIPAG is composed of leading scientists from Europe and North America, and this is therefore considered to be a level of scrutiny consistent with internal and externally peer review and SG 80 & 100 are met.		
References		» **Hvingel, C . & Kingsley, M. C. S. (2006).** A framework to model shrimp (Pandalus borealis) stock dynamics and to quantify the risk associated with alternative management options, using Bayesian methods. ICES Journal of Marine Science, 63:68-82. » **Kingsley, M. C. S. (2016).** A Stock-Dynamic Model of the West Greenland Stock of Northern Shrimp. NAFO SRC Doc. 16/047. » **NAFO (2016).** NAFO/ICES *Pandalus* Assessment Group Meeting, 7-14 September 2016. NAFO SCS Doc. 16/17 Serial No. N6611ICES CM 2016/ACOM:15. 93pp ……		
OVERALL PERFORMANCE INDICATOR SCORE:				**95**
CONDITION NUMBER (if relevant):				

Evaluation Table for PI 2.1.1

PI 2.1.1		The fishery does not pose a risk of serious or irreversible harm to the retained species and does not hinder recovery of depleted retained species		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guidepost**	Main retained species are likely to be within biologically based limits (if not, go to scoring issue c below).	Main retained species are highly likely to be within biologically based limits (if not, go to scoring issue c below).	There is a high degree of certainty that retained species are within biologically based limits and fluctuating around their target reference points.
	Met?	Y	Y	N
	Justification	This is a very clean fishery with very little bycatch, especially of fish species. However, the distribution of another shrimp species, *Pandalus montaguii,* overlaps with that of *P. borealis,* and it is caught locally in significant quantities in the fishery. Furthermore, *P montaguii* may be classed as IPI because of the similarity in appearance and difficulty of separating it mechanically during processing. This presents certification problems if the catch exceeds 2%. Although historically total catch of this species has been recorded as less than 2% (Siegstad 2015), and it was recorded at just 1.1% in 2017, it has exceeded 2% in several years between 2012 and 2016, peaking at 5.3% in 2013. Furthermore, the proportion may be higher than this in certain locations and seasons (Burmeister and Riget 2017). Total recorded catch of *P montagui* between 2010 and 2017 has ranged from 780 tonnes in 2010 to 5,049t in 2013. Downward pressure on the *P borealis* TAC could result in more pressure on this species. For these reasons, and because of the IPI issue, we have chosen to designate it as a *main* retained species. *P. montagui* is widely distributed in coastal and shelf waters of the northwest Atlantic ranging from Greenland and Iceland, the Arctic Ocean, and the northern Atlantic Ocean, south to Rhode Island and the British Isles (Komai 1999, Kingsley 2011; Kanneworff 2003; DFO 2010) and usually found in shallower waters than *P. borealis*. It is most common at depths between 20 and 100 m though may occasionally occur as deep as 700m (FAO). While 83% on average (from 2001-2015) of the biomass of *P. montagui* was recorded in depths less than 200 m, 10% or less of the *P. borealis* biomass was found is these depths within the fishery area (Siegstad 2015). *P montagui* also prefers hard substrates while *P borealis* prefers mud, although it can be found on rock, gravel, sand, and mud. The *montagui* stock is relatively localised, highly variable from year to year, and understanding of the stock is more limited than that available for *P. borealis*. Catch and survey data as well as industry sources indicate distinct discrete areas where *P. montagui* may be more likely be caught: Kangaatsiaq, the Holsteinsborg Deep and the Arsuk Hole – in descending order of importance. Abundance appears to be highly variable (Kingsley 2011, Siegstad 2015) and arguably “episodic” (Kingsley 2011). Stratified random bottom trawl surveys have been		

		carried out since 1988 in NAFO Subarea 1 and a small part of NAFO Division 0A (East of 59°30'W) as part of the assessment of the stock of *P. borealis*. These have been reported by Kanneworff (2003), Kingsley (2011) and Siegstadt (2015). These studies suggest that survey biomass of *P. montagui* is typically less than 1% of *P. borealis*, although this may in occasional years go as high as 8% (Siegstad 2015). *P. montagui* biomass estimates from the survey are highly variable from year to year, ranging from near zero to 16,000 t in the period 1988-2009 (Siegstad 2015), probably reflecting changes in distribution of survey effort relative to distribution of the species, rather than changes in abundance. However, it should be noted that the survey design was focused on *P borealis,* does not include data from depths less than 150m and so likely underestimates *P montaguii.* Given the low catches relative to likely biomass, its widespread North Atlantic distribution, and the differences in depth preference of the two species, it is highly likely that *P montagui* is within biologically based limits (SG60 and 80 are met)[16]. However, lack of robust data means that it cannot be said that there is a high degree of certainty that this retained species is within biologically based limits and fluctuating around its target reference points (SG100 is not met). The GINR has stated that it expects to have collected enough data to draw up proper scientific advice for the stock in the next few years. The total of all **fish bycatch** recorded in the W Greenland fishery was 1.1% or less of weight of shrimp caught (Arboe and Kingsley 2010), so none of the fish species listed in section 4.2.4 and Table 9 would meet the MSC criterion for "main" bycatch species. **Capelin**, though occasionally abundant and retained, tends to have a more southerly and easterly distribution with major concentrations in NAFO SA2 and 3 rather than NAFO 1. No assessments of stock status are available for West Greenland, and information is limited for the main areas of natural distribution around Newfoundland where a moratorium on directed fishing has been in place since 1993 (NAFO 2016c). It cannot therefore be said with a high degree of certainty that this retained species is within biologically based limits and fluctuating around its target reference point, so a score of 80 for this element is appropriate. SG60 and 80 are met.		
b	**Guidepost**			Target reference points are defined for retained species.
	Met?			N
	Justification	The only retained species is *P montagui*, and occasionally capelin. Target reference points are not available for either capelin or *P montagui*. SG100 is not met		

[16] Note that this is a precautionary assessment: where catches of a non-vulnerable bycatch are less than 5%, 80 is the default score.

c	**Guidepost**	If main retained species are outside the limits there are measures in place that are expected to ensure that the fishery does not hinder recovery and rebuilding of the depleted species.	If main retained species are outside the limits there is a partial strategy of demonstrably effective management measures in place such that the fishery does not hinder recovery and rebuilding.	
	Met?	NA	NA	
	Justification	There is no evidence to suggest that *P montagui* (the only main retained species) is outside safe biological limits.		
d	**Guidepost**	If the status is poorly known there are measures or practices in place that are expected to result in the fishery not causing the retained species to be outside biologically based limits or hindering recovery.		
	Met?	Y		
	Justification	The status of capelin in the fishery area is poorly known. The fish excluder grid and the very low overall catches are expected to result in the fishery not causing retained species to be outside biologically based limits or hindering recovery – SG 60 is met.		
References		» Arboe H.H., Kingsley M.C.S., 2010, The Fishery for Northern Shrimp (Pandalus borealis) off West Greenland, 1970-2010. NAFO/ICES WG Pandalus Assessment Group – October 2010 » Burmeister, A, and Riget, F. 2017. Pandalus montagui in the West Greenland Offshore shrimp fishery 2011 to 2016. NAFO/ICES WG *Pandalus* Assessment Group. Serial No N6722. NAFO SCR Doc. 17/053 » DFO 2010 » FAO Species fact sheets. *Pandalus montagui* (Leach 1814) . http://www.fao.org/fishery/species/3426/en		

	» Kanneworff P., 2003, Occurrence of (*Pandalus montagui*) in Trawl Survey Samples from NAFO Subareas 0+1. NAFO SCR Doc. 03/70 Scientific Council Meeting – November 2003 » Kingsley M.C.S. 2011. *Pandalus montagui* in the West Greenland shrimp fishery, 2001–2010Serial No. N5978 NAFO SCR Doc. 11/053. NAFO/ICES WG *Pandalus* assessment group—October 2011 Greenland Institute of Natural Resources » Komai T. (1999). A revision of the genus Pandalus (Crustacea: Decapoda: Caridea: Pandalidae) . Journal of Natural History. 33 (9): 1265–1372. doi:10.1080/002229399299914 » NAFO/ICES Pandalus Assessment Group Meeting, 7–14 September 2016. NAFO SCS Doc. 16/17 Serial No. N6611 ICES CM 2016/ACOM:15. Institute of Marine Research, Bergen, Norway » NAFO 2016c. Capelin factsheet. https://www.nafo.int/Portals/0/PDFs/Species/Capelin.pdf?ver=2016-08-08-100129-963 » Siegstad, H. 2012. Results of the Greenland Bottom Trawl Survey for Northern shrimp (Pandalus borealis) Off East Greenland (ICES Subarea XIV b), 2008-2012. NAFO/ICES *Pandalus* assessment group meeting – October 2012. Northwest Atlantic Fisheries Organization. Serial No. N6124 NAFO SCR Doc. 12/62 » Siegstad, H. 2015. Occurrence of *Pandalus montagui* in Trawl Survey Samples from NAFO Subareas 0+1 2000-2015.NAFO/ICES *Pandalus* Assessment Group Meeting – September 2015 . Serial No. N6481NAFO SCR Doc. 15/046. GNIR Greenland » Tretyakov I.S. 2013. Capelin Stock Assessment in NAFO Divisions 3NO Based on Data from Trawl Surveys. NAFO Scientific Council Meeting – June 2013 Serial No. N6201 NAFO SCR Doc. 13/046
OVERALL PERFORMANCE INDICATOR SCORE:	**80**
CONDITION NUMBER (if relevant):	

Evaluation Table for PI 2.1.2

PI 2.1.2		There is a strategy in place for managing retained species that is designed to ensure the fishery does not pose a risk of serious or irreversible harm to retained species		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guidepost**	There are measures in place, if necessary, that are expected to maintain the main retained species at levels which are highly likely to be within biologically based limits, or to ensure the fishery does not hinder their recovery and rebuilding.	There is a partial strategy in place, if necessary, that is expected to maintain the main retained species at levels which are highly likely to be within biologically based limits, or to ensure the fishery does not hinder their recovery and rebuilding.	There is a strategy in place for managing retained species.
	Met?	Y	Y	N
	Justification	The only main retained species is *P. montagui* (see 2.1.1). No licences are issued for directed fishing of *P. montaguii* (SCR Doc. 16/43); and since 2012, it has been included among the species protected by a precautionary 'move-on rule' to limit bycatch. Vessels are required to move 5 km if bycatch exceeds 10% of target shrimp catch. Catch and response is recorded in logbooks to improve stock monitoring and assessment data. *P montagui* is now the subject of a specific and directed voluntary management plan developed by the UoC that includes the following elements (SG60 is met): • Setting of a TAC for *P montaguii* at 2% of *P borealis* TAC, and allocated between offshore and inshore fleets in the ratio 57:43 • Encouragement of quota trading between inshore and offshore fleet • Graduated restriction of fishing activity in the known hotspot areas as companies approach their quota limits. • Intensified MCS by Greenland's Fishery Licence Control (GFLK) The Coastal vessel association has agreed to support and implement the plan, as have offshore fishing companies. The UoC would like to see the plan adopted officially and reinforced through government regulation and monitoring as soon as possible This initiative amounts to *a partial strategy, if necessary, that is expected to maintain the main retained species at levels which are highly likely to be within biologically based limits, or to ensure the fishery does not hinder their recovery and rebuilding*. It furthermore addresses the need to maintain catch of IPI *P montaguii* below 2%. A score of 80 is therefore met for main retained species.		

		With respect to retained species more generally, the shrimp are found in aggregations, and cameras and other technology such as sensors are making it easier to target the prawns and make a clean efficient catch. The gear is also highly selective for shrimp. A fish excluding device with a 22 mm spacing is mandatory on all vessels (since 2000); and offshore vessels use toggle chains which act to keep netting off the bottom, further reducing bycatch of species closely associated with the bottom. As a result, bycatch has reduced substantially in recent years. These measures may be regarded as a partial strategy to exclude all fish species, but not a strategy because the measures are not associated explicitly with objectives and monitoring of the retained species. SG100 is not met.		
b	**Guidepost**	The measures are considered likely to work, based on plausible argument (e.g., general experience, theory or comparison with similar fisheries/species).	There is some objective basis for confidence that the partial strategy will work, based on some information directly about the fishery and/or species involved.	Testing supports high confidence that the strategy will work, based on information directly about the fishery and/or species involved.
	Met?	Y	Y	N
	Justification	The success of the proposed measures to maintain *montaguii* catch below 2% depends on both motivation and enforcement. The fishing industry association reports that high proportions of *P. montagui* in catches of the target species *P. borealis* can exclude the product from markets for high-quality shrimp and can reduce price paid in other markets by 15-20%, so there is limited incentive to harvest this species. However, this incentive varies from year to year and may be outweighed by the cost of moving on, or the incentive to catch *montaguii* when quota for *borealis* is limiting. Kingsley (2011) indicates that the ability to market *P. montagui* depends on arrangements between harvesters and purchasers. The quota trading provision in the proposed measures should encourage inshore fishers to avoid *P montagui*, and allow for better recording and control. It should also facilitate an optimal or rational allocation of a more limited resource. Increased targeted observer coverage in hotspot areas, and/or on vessels approaching their quota allocation, should underpin effective monitoring and enforcement. The partial strategy is likely to work, and SG80 is met as well as the lower SG 60 level. Since these measures are new there has been no testing to support high confidence and a score of 100 is not met		

c	**Guidepost**		There is some evidence that the partial strategy is being implemented successfully.	There is clear evidence that the strategy is being implemented successfully.
	Met?		Y	N
	Justification	The coastal and offshore fishery representative organisations have agreed to promote the plan, and discussions with the client and a limited number of skippers indicate that this plan is being implemented, at least by some of the fleet. The latest (2017) catch statistics show a decline in the catch of *montaguii* to less than 1%, providing evidence that this voluntary approach, coupled with existing move on rules, may be working. There is some evidence that the partial strategy is being implemented successfully (**SG80 is met**). However, the proportion of *montaguii* has varied significantly in recent years and the latest data provides only very limited and preliminary evidence of implementation, especially given the mixed and variable incentives, and the limited enforcement with official approval of the plan still pending. There is no fully independent verification of strategy implementation, and the reduced catch of *P montagui* in 2017 may be due to chance and natural variation. With just one year of data, clear evidence is lacking and **SG100 is not met.** A recommendation is given to continue management and monitoring efforts.		
d	**Guidepost**			There is some evidence that the strategy is achieving its overall objective.
	Met?			N
	Justification	There is no evidence that the proposed strategy is achieving its overall objective; although an objective is in place, and evidence should be collected relatively easily from both vessel log books and processor records.		
References		» Burmeister, A, and Riget, F. 2017. *Pandalus montagui* in the West Greenland Offshore shrimp fishery 2011 to 2016. NAFO/ICES WG *Pandalus* Assessment Group. Serial No N6722. NAFO SCR Doc. 17/053 » Home Rule executive order no. 32 (14 December 1995) on Fishery by-catches (Compulsory move-on' in case of large (10% by weight) by-catches » Kingsley, M.C.S. 2011. Pandalus montagui in the West Greenland shrimp fishery, 2001–2010. NAFO SCR Doc. 11/053. NAFO/ICES WG Pandalus Assessment Group—October 2011		

	» NAFO 2011. Scientific Council Meeting 19-26 October 2011. Serial Number N5999, NAFO SCS Doc. 11/21: 28 pp. » Management plan for the Shrimp Fishery in West Greenland, Nuuk January 2015	
OVERALL PERFORMANCE INDICATOR SCORE:		**80**
CONDITION NUMBER (if relevant):		

Evaluation Table for PI 2.1.3

PI 2.1.3		Information on the nature and extent of retained species is adequate to determine the risk posed by the fishery and the effectiveness of the strategy to manage retained species		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guidepost**	Qualitative information is available on the amount of main retained species taken by the fishery.	Qualitative information and some quantitative information are available on the amount of main retained species taken by the fishery.	Accurate and verifiable information is available on the catch of all retained species and the consequences for the status of affected populations.
	Met?	Y	Y	N
	Justification	*P. montagui* the only main retained species in this fishery, and Capelin is the only minor retained species. Qualitative and quantitative information are available on the amount of *P montagui* taken by the fishery (SG 60 and 80 are met). Catches of *P. montagui* in the commercial fishery are reported annually, based on observer and logbook reports, beginning in 1995 (Arboe and Kingsley 2010; Arboe and Seigstad in prep.; Kingsley 2011; Burmeister and Riget 2017) and as reported in section 4.2 and 5.4. Instructions for reporting P. *montagui* in logbooks were changed in 2012, to improve the reporting of these catches. *P. montagui* survey catches are concentrated in the shallower strata (less than 250 m depth), while *P. borealis* survey distribution is generally deeper than 200 m. This is consistent with knowledge of *P. montagui* biology and distribution from other areas (e.g. the area off the entrance to Hudson Strait in Canada, DFO 2010). Accurate and verifiable information is not available on the catch of all retained species and the consequences for the status of affected populations. SG100 is not met. NAFO (2011) indicated that obtaining better information on catches of *P. montagui* is a high priority and GINR believes that they should have reasonable data to serve as the basis for stock management within 3 years.		
b	**Guidepost**	Information is adequate to qualitatively assess outcome status with respect to biologically based limits.	Information is sufficient to estimate outcome status with respect to biologically based limits.	Information is sufficient to quantitatively estimate outcome status with a high degree of certainty.
	Met?	Y	Y	N

PI 2.1.3		**Information on the nature and extent of retained species is adequate to determine the risk posed by the fishery and the effectiveness of the strategy to manage retained species**		
	Justification	Information of distribution, depth and preferred habitat is adequate to estimate outcome status with respect to biologically based limits, SG60 and 80 are met. *P montagui* is regarded as common and widely distributed, with limited overlap with the fishery in terms of preferred depth. It is furthermore a less preferred species and forms a very small percentage of the total catch. Biomass estimates within the fishery area (which only partially overlaps the natural distribution of this species are highly variable (195t to 15,332t) implying that outcome status cannot be estimated with a high degree of certainty and SG100 is not met.		
c	**Guidepost**	Information is adequate to support measures to manage main retained species.	Information is adequate to support a partial strategy to manage main retained species.	Information is adequate to support a strategy to manage retained species, and evaluate with a high degree of certainty whether the strategy is achieving its objective.
	Met?	Y	Y	N
	Justification	Information on distribution (depth, preferred areas) within the fishery area is good and is adequate to support a partial strategy based on controlled avoidance so SG 60 and 80 are met. Given the limited and variable overlap between this species and the main target species and the limited data on the main stock of P montaguii it will not be possible to evaluate with a high degree of certainty whether the strategy is achieving its objective – SG 100 is not met.		
d	**Guidepost**		Sufficient data continue to be collected to detect any increase in risk level (e.g. due to changes in the outcome indicator score or the operation of the fishery or the effectiveness of the strategy)	Monitoring of retained species is conducted in sufficient detail to assess ongoing mortalities to all retained species.
	Met?		Y	Y

PI 2.1.3		Information on the nature and extent of retained species is adequate to determine the risk posed by the fishery and the effectiveness of the strategy to manage retained species
	Justification	Improving information from scientific stock survey (focused on *P borealis*) plus log book data, plus data from processing operations is adequate to assess risk posed by the strategy and effectiveness of strategy Observer reports and monitoring of landings continue to collect sufficient data to detect any increase in risk level. SG 80 and 100 are met.
References		» Arboe H.H., Kingsley M.C.S., 2010, The Fishery for Northern Shrimp (Pandalus borealis) off West Greenland, 1970-2010. NAFO/ICES WG Pandalus Assessment Group – October 2010 » Arboe, N.H. and Kingsley, M.C.S. 2014. Pandalus assessment group—September 2013. The Fishery for Northern Shrimp (Pandalus borealis) off West Greenland, 1970–2013. Serial No. N6219 NAFO SCR Doc. 013/058 NAFO/ICES Greenland Institute of Natural Resources » Burmeister, A, and Riget, F. 2017. *Pandalus montagui* in the West Greenland Offshore shrimp fishery 2011 to 2016. NAFO/ICES WG Pandalus Assessment Group. Serial No N6722. NAFO SCR Doc. 17/053 » Greenland Institute of Natural Resources 2017. By catch in the West Greenland Shrimp Fishery. Information provided to the assessment team. » DFO 2010. Assessment of northern shrimp (Pandalus borealis) in SFA 0, 2, and 3 and striped shrimp (Pandalus montagui) in SFA 2, 3 and 4 west of 63°W. Can. Sci. Adv. Sec. Sci. Adv. Rep. 2010/024: 20 pp. » Kanneworff P., 2003, Occurrence of (*Pandalus montagui*) in Trawl Survey Samples from NAFO Subareas 0+1. NAFO SCR Doc. 03/70 Scientific Council Meeting – November 2003 » Kingsley, M. C. S. 2011. Pandalus montagui in the West Greenland shrimp fishery, 2001-2010. NAFO SCR Doc. 11/053: 13 pp. » NAFO 2011. Scientific Council Meeting 19-26 October 2011. Serial Number N5999, NAFO SCS Doc. 11/21: 28 pp. » Siegstad, H. 2015.Occurrence of Pandalus montagui in Trawl Survey Samples from NAFO Subareas 0+1 2000-2015. NAFO/ICES Pandalus assessment group meeting – September 2015. Serial No. N6481 NAFO SCR Doc. 15/046
OVERALL PERFORMANCE INDICATOR SCORE:		**85**
CONDITION NUMBER (if relevant):		

Evaluation Table for PI 2.2.1

PI 2.2.1		The fishery does not pose a risk of serious or irreversible harm to the bycatch species or species groups and does not hinder recovery of depleted bycatch species or species groups		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guidepost**	Main bycatch species are likely to be within biologically based limits (if not, go to scoring issue b below).	Main bycatch species are highly likely to be within biologically based limits (if not, go to scoring issue b below).	There is a high degree of certainty that bycatch species are within biologically based limits.
	Met?	Y	Y	N
	Justification	All bycatch species are very small fishes which have passed through the *Nordmore* selector grate and are discarded at sea. They have no commercial value, and indeed represent a cost to the fishery business in terms of time to sort and discard. Total (discarded) bycatch of all species is low, ranging from 0.56 - 1.49% of shrimp catches between 2002-2016 and appears to be declining. No individual species comes close to the 5% of the weight of the target species which is the first criterion for identifying a "main" bycatch species, nor the 2% threshold normally applied where species are considered vulnerable. Total weight of bycatch by species has been estimated at 453-2085 t/yr. in 2002-2016 (GINR 2017). Redfish typically make up about half the bycatch. Although not estimated by Greenland observers, bycatch of invertebrates is likely to be negligible based on information from the adjacent Canadian shrimp fishery using similar gear (Siferd 2010), so impacts on benthic invertebrates are considered in 2.5. Use of toggle chains helps to reduce invertebrate bycatch as does the increasingly used light "sparrow door". Several 'minor' bycatch species (golden and deepwater redfish, Atlantic cod, American plaice, Atlantic wolffish and thorny skate) can be considered vulnerable because their populations are depleted. Reported bycatch levels are low (well below 2% and therefore classed as minor) in part because populations are at low abundance, but bycatch could increase if large year-classes of these species were produced. The **West Greenland Atlantic cod** (0.1% of catch) stock collapsed in the 1970s because of adverse climate conditions and overfishing. ICES notes the "bycatch of small cod in the increased fishery for northern shrimp" may have been a factor suppressing cod recovery. However, the impact of bycatch on Atlantic cod has been more recently assessed to be insignificant by ICES (2009) especially since the introduction of the grid. Survey biomass indices for west Greenland cod have been increasing since the early 2000s (ICES 2014) and there was record recruitment in 2011/2012. ICES precautionary advice for 2017 for cod in NAFO subarea 1 (West Greenland) is for a catch of no more than 12 379 tonnes. Assuming an average cod bycatch of 0.05% the		

		fleet would catch around 50t of cod in total, amounting to 0.4% of the total precautionary catch. Mortality due to bycatch has not been assessed relative to other causes of mortality for other species in the bycatch. Survey biomass indices of several species (redfishes, American plaice, Atlantic wolffish) have shown some signs of increase in recent years, although these remain very low compared to historical levels (NAFO 2011).
		Both **redfish** species (deepwater (*Sebastes mentella*) and Golden (*S norvegicus*) (together 0.8% of shrimp catch) are close to limit of natural distribution around Disko Bay in W Greenland and information on stock status is limited. Canadian trawl surveys (Acoura 2016) indicate that both species are increasing in abundance - from northern Labrador to the Grand Banks in recent years (DFO 2011). For the 'northern' population of deepwater redfish which overlaps the UoCs fishery area, 2010 biomass was 54,000 t and projections indicate that the population would be likely to increase with annual catches of 3,000 t (DFO 2011). Nonetheless, redfish is of particular concern because it is the principal species in the fish bycatch; and the most recent NAFO assessment (NAFO 2010) recommends obtaining better information on quantity and species composition of the redfish bycatch. According to Kingsley (2011), "the proportion of bycatch identified as being of commercially fished species is now about 20%, or about 0.2% of shrimp catch; this proportion has steadily decreased for the last two decades, but has little room to decrease anymore; nearly all of it has been redfish in most recent years, with an exception in 2010". 0.2% of a total catch of 50-100,000t would be 100-200t. The latest assessment by NAFO (2016) for Golden and Deepwater redfish is "steadily increasing biomass" based on two independent surveys. Three species of **wolffish** (0.01% of catch) are found in Atlantic and Arctic waters: *Anarhichas denticulatus* (Northern wolffish), *A. minor* (Spotted wolffish), and *A. lupus* (Atlantic wolffish). They are found on a wide range of bottom habitats from 25 to 600m or more. Only spotted wolffish is normally found on the soft mud habitats in which the shrimp fishery concentrates (Kulka et al 2008), and the distribution of all three species is generally more southerly (with higher concentrations off Labrador and the Norwegian coast) than that of the UoC fishery, although all can be found as far north as Disko Bay. The life history of these species makes them vulnerable (NOAA 2009). There are no recent assessments of these species for West Greenland, but assessments throughout Canadian Atlantic and Arctic waters suggest that previous declines in abundance have reversed, suggesting that protection measures (live release and no directed fishing) are working. In 2015, 1 ton of **American plaice** (0.2% of catch) was reported in trawl logbooks from Division 1A. The biomass of the stock in Subarea 1 is higher than it was in the 1990s, but remains below the levels of the 1980s (NAFO 2016d)

		Thorny skate (0.03% of catch) is caught in very small amounts. There is currently no assessment. Since there are no main bycatch species the default minimum score of 80 applies. However, since there is limited understanding of the current status of the more vulnerable (minor) bycatch species listed above it cannot be stated that there is a high degree of certainty that these bycatch species are within biologically based limits. The 100 guidepost is not met.		
b	**Guidepost**	If main bycatch species are outside biologically based limits there are mitigation measures in place that are expected to ensure that the fishery does not hinder recovery and rebuilding.	If main bycatch species are outside biologically based limits there is a partial strategy of demonstrably effective mitigation measures in place such that the fishery does not hinder recovery and rebuilding.	
	Met?	Y	Y	
	Justification	**NA**		
c	**Guidepost**	If the status is poorly known there are measures or practices in place that are expected to result in the fishery not causing the bycatch species to be outside biologically based limits or hindering recovery.		
	Met?	Y		
	Justification	The fishing strategy, method and gear all ensure a very low bycatch, and the quantity of any individual bycatch species caught is highly unlikely to cause the species to be outside biologically based limits or hinder recovery – SG 60 is met.		
References		» Arboe H.H., Kingsley M.C.S., 2010, The Fishery for Northern Shrimp (Pandalus borealis) off West Greenland, 1970-2010. NAFO/ICES WG Pandalus Assessment Group – October 2010 » Burmeister, A, and Riget, F. 2017. Pandalus montagui in the West Greenland Offshore shrimp fishery 2011 to 2016.		

	NAFO/ICES WG Pandalus Assessment Group. Serial No N6722. NAFO SCR Doc. 17/053 » Greenland Institute of Natural Resources 2017. By catch in the West Greenland Shrimp Fishery. Information provided to the assessment team. » ICES Advice 2016, Book 2 1. 2.3.4 Cod (Gadus morhua) in NAFO Subarea 1, inshore (West Greenland cod). » Kingsley, M. C. S. 2007. The fishery for northern shrimp (Pandalus borealis) off west Greenland, 1970-2007. NAFO SCR Doc. 07/69, Ser. N5455: 42 pp. » NAFO 2017 Scientific Council Reports 2016. » NAFO Species/area advice sheets. » Siferd, T. 2010. By-catch in the shrimp fishery from Shrimp Fishing Areas 0-3, 1079 to 2009. Can. Sci. Adv. Sec. Res. Doc. 2010/037: vi + 77 pp. » Sunksen, Kaj 2007. Discarded by-catch in shrimp fisheries in Greenlandic offshore waters 2006-2007. NAFO SCR Doc. 07/88, Ser. N5474: 12 pp.
OVERALL PERFORMANCE INDICATOR SCORE:	**80**
CONDITION NUMBER (if relevant):	

Evaluation Table for PI 2.2.2

PI 2.2.2		There is a strategy in place for managing bycatch that is designed to ensure the fishery does not pose a risk of serious or irreversible harm to bycatch populations		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guidepost**	There are measures in place, if necessary, that are expected to maintain the main bycatch species at levels which are highly likely to be within biologically based limits, or to ensure the fishery does not hinder their recovery and rebuilding.	There is a partial strategy in place, if necessary, that is expected to maintain the main bycatch species at levels which are highly likely to be within biologically based limits, or to ensure the fishery does not hinder their recovery and rebuilding.	There is a strategy in place for managing and minimizing bycatch.
	Met?	Y	Y	Y
	Justification	A fish excluding device with a 22 mm grate spacing ("Nordmore" grate) is mandatory for all vessels in the fleet. When bycatches make up 10% or more of the shrimp catch, vessels are required to move 5 km. Seabed contact and benthic bycatch is reduced in the offshore fleet through the use of toggle chains on the footrope of trawls. Sparrow (light) trawl doors are increasingly in use. Electronic sensors and photographic detectors allow for constantly improved targeting of shrimp aggregations, and efficient highly selective fishery. Trawlers are excluded from coastal bays. Taken together these measures represent a strategy to manage and minimize bycatch, SG60, 80 and 100 are met. It is based on knowledge of the fishery and species, and has been designed specifically to deal with the bycatch component. Efficacy has been tested through comparison of bycatch before and after introduction of the grate for this fishery and similar shrimp fisheries in other locations and supports high confidence that the strategy will work. The grid is designed to be effective with all demersal fishes, and measures to reduce weight and bottom contact are also applicable to invertebrates. Move-on rule is applicable to all bycatch organisms. It is therefore unnecessary and impractical to score for all individual species.		

PI 2.2.2		**There is a strategy in place for managing bycatch that is designed to ensure the fishery does not pose a risk of serious or irreversible harm to bycatch populations**		
b	**Guidepost**	The measures are considered likely to work, based on plausible argument (e.g. general experience, theory or comparison with similar fisheries/species).	There is some objective basis for confidence that the partial strategy will work, based on some information directly about the fishery and/or species involved.	Testing supports high confidence that the strategy will work, based on information directly about the fishery and/or species involved.
	Met?	Y	Y	Y
	Justification	The measures are specifically designed to address bycatch, and declining bycatch recorded from this and other Pandalid fisheries demonstrate that the measures work, so all three SG are met.		
c	**Guidepost**		There is some evidence that the partial strategy is being implemented successfully.	There is clear evidence that the strategy is being implemented successfully.
	Met?		Y	Y
	Justification	There is clear evidence that the strategy is being implemented successfully (inspectors checks on gear; introduction of new targeting and selection technology; observers reports) so SG 80 and 100 are met.		
d	**Guidepost**			There is some evidence that the strategy is achieving its overall objective.
	Met?			Y

PI 2.2.2		There is a strategy in place for managing bycatch that is designed to ensure the fishery does not pose a risk of serious or irreversible harm to bycatch populations
	Justification	The objective associated with the introduction of the grate was to reduce finfish bycatch, and cod and redfish in particular. There is good evidence that it is achieving its objective (Sunksen 2007; GINR 2017)) – that bycatch was reduced following introduction and has remained low. There is also evidence that the higher-level objective – to allow cod and redfish recovery – is being achieved. The cod bycatch has been estimated as "insignificant" in the most recent assessment (ICES 2009), and several bycatch species including American plaice, redfishes, Atlantic wolffish) have shown recent increases in survey biomass indices (NAFO 2016d), although still at a very low level. While there is no direct evidence on invertebrate bycatch, evidence from the adjacent Canadian shrimp fishery using similar gear indicates that invertebrate bycatch is negligibly low in this area using similar gear (Siferd 2010, Acoura 2016). SG 100 is met.
References		» Acoura 2016. Canada Northern and Striped shrimp. MSC Sustainable Fisheries Certification. Final Report » Management Plan For The Shrimp Trawl Fishery In West Greenland 2015. » NAFO 2017. Scientific Council Reports 2016. » Sunksen, Kaj 2007. Discarded by-catch in shrimp fisheries in Greenlandic offshore waters 2006-2007. NAFO SCR Doc. 07/88, Ser. N5474: 12 pp. » Siferd, T. 2010. By-catch in the shrimp fishery from Shrimp Fishing Areas 0-3, 1079 to 2009. Can. Sci. Adv. Sec. Res. Doc. 2010/037: vi + 77 pp.
OVERALL PERFORMANCE INDICATOR SCORE:		**100**
CONDITION NUMBER (if relevant):		

Evaluation Table for PI 2.2.3

PI 2.2.3		Information on the nature and the amount of bycatch is adequate to determine the risk posed by the fishery and the effectiveness of the strategy to manage bycatch		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guidepost**	Qualitative information is available on the amount of main bycatch species taken by the fishery.	Qualitative information and some quantitative information are available on the amount of main bycatch species taken by the fishery.	Accurate and verifiable information is available on the catch of all bycatch species and the consequences for the status of affected populations.
	Met?	Y	Y	N
	Justification	On-board observers and captains' logbooks record quantity of fish bycatch broken down as "redfish" and "other commercial fish" (Kingsley 2007) in both offshore and inshore fleets. Observer coverage is high in the offshore (>50% of trips) and relatively low in the coastal fleet (<10%). Observers and logbooks generally agree on quantities, but may systematically underestimate bycatch by a small amount (Sunksen 2007). Non-commercial fish or invertebrate bycatch is not systematically recorded. Information on species composition is not available for the inshore fleet, however all vessels now use the Nordmore grate, and fish similar habitats to that targeted by the offshore fleet, so amounts and species composition is likely to be similar to those on offshore vessels. Collection of data on bycatch is currently constrained by the design of logbooks which does not allow more than three "species" of bycatch. An electronic logbook system allowing for unlimited number of bycatch species entries has been tested, but further development and introduction is being constrained through problems of compatibility and conformity between NAFO and EU requirements. There are no main bycatch species so the default minimum score of 80 is applicable. For the vulnerable bycatch species (Redfishes, American Plaice, Atlantic cod, Thorny Skate and Atlantic Wolffish) qualitative information and some quantitative information are available on bycatch; but it cannot be asserted that accurate and verifiable information is available on the catch of all bycatch species and the consequences for the status of affected populations. SG100 is not therefore met. Information on bycatch of invertebrates in this fishery is very limited, although it can be inferred that this is likely to be very low, given that gear and rigging used are similar to those used in Canadian fisheries for which bycatch has been well documented and where invertebrate bycatch is considered to be negligible (Siferd 2010). There is also now substantial evidence, arising from research commissioned by the UoC relating to trawl impacts on benthic invertebrate communities. This is scored under 2.4.3.		

b	**Guidepost**	Information is adequate to broadly understand outcome status with respect to biologically based limits	Information is sufficient to estimate outcome status with respect to biologically based limits.	Information is sufficient to quantitatively estimate outcome status with respect to biologically based limits with a high degree of certainty.
	Met?	Y	Y	N
	Justification	Bycatch of all fish species combined for the period 2002-2016 is reported as between 453 (2016) and 1,425 (2010) t/yr., or 0.56 - 1.49% of shrimp catches and appears to be declining (GINR, 2017). These figures are based on estimates in captains' logbooks and by observers, and while these may underestimate by 10-20% (Sunksen 2007) this would still mean bycatch has been less than 1.2% over the last 5 years. The proportion of bycatch of commercially fished species is about 20%, or about 0.2% of shrimp catch and this is mainly redfish. This proportion has decreased over the last two decades. While there are no main bycatch species several may be considered vulnerable: redfishes (two species combined, 0.8% of the target species catch); American plaice (0.2%); Atlantic cod (0.1%); thorny skate (0.03%); Atlantic wolffish (0.01%). All other bycatch species are far below the 5% guideline to identify "main" bycatch species, there is no indication that they are vulnerable, and none have commercial value since all specimens are well below commercial size after passage through the Nordmore grate. Estimates of redfish bycatch have been included in total catch estimates for NAFO redfish assessments since 2007. In 2015, 5 t were reported as by-catch in the shrimp fishery, 21 tonnes were taken as by-catch in the offshore fishery targeting cod and Greenland halibut and 228 t were landed to factories, mostly from small vessels operating inshore (NAFO 2016) meaning that the shrimp fishery contributed 8% of fishing mortality on a stock whose status appears to be improving. Assuming an average cod bycatch of 0.05% the fleet would catch around 50t of cod in total, amounting to 0.4% of the total precautionary catch (12,379 tonnes) recommended by ICES (2016b). For Atlantic cod, the offshore component has been considered severely depleted since 1990, while there are signs of improving recruitment in fjord stocks in West Greenland (ICES 2009) and catch is now at its highest level in 25 years. Estimated catch of wolffish (mainly small inshore vessels) in SA1 2015 decreased to 400 tons. Bycatch in the shrimp fishery at 0.01% of total catch would amount to 5-10 tonnes/yr. and would rate as insignificant. In 2015, 1 ton of American plaice was reported in trawl logbooks from Division 1A. The biomass of the stock in Subarea 1 is higher than it		

		was in the 1990s, but remains below the levels of the 1980s (NAFO 2016d). Estimates for other species have not been made, and no estimates of bycatch by number have been made. No estimate of bycatch weight or numbers by species for the inshore fleet would be possible because species composition has not been sampled in this area. For vulnerable bycatch species Redfish and American plaice, Thorny skate and Atlantic Wolffish information is adequate to estimate outcome status, that is, that bycatch is insignificant in biological terms, and there have been signs of recent recovery of Redfish, cod and American plaice under the recent bycatch regime. However, this cannot be assessed with a high degree of certainty because of limitations in the data collection protocols and uncertainties in the assessments. Therefore SG 60 and SG 80 are met but SG100 is not.		
c	**Guidepost**	Information is adequate to support measures to manage bycatch.	Information is adequate to support a partial strategy to manage main bycatch species.	Information is adequate to support a strategy to manage retained species, and evaluate with a high degree of certainty whether the strategy is achieving its objective.
	Met?	Y	Y	N
	Justification	Since there are no main bycatch species, a default minimum score of 80 is applicable. Historic data on bycatch, on the effectiveness of the bycatch reduction strategy, and on stock status has been sufficient to demonstrate the effectiveness of the strategy, but the role of this strategy relative to other factors in the fishery is likely small and difficult to evaluate with a high degree of certainty. SG100 is not therefore met.		
d	**Guidepost**		Sufficient data continue to be collected to detect any increase in risk to main bycatch species (e.g., due to changes in the outcome indicator scores or the operation of the fishery or the effectively of the strategy).	Monitoring of bycatch data is conducted in sufficient detail to assess ongoing mortalities to all bycatch species.
	Met?		Y	N
	Justification	Since there are no main bycatch species, a default minimum score of 80 is applicable. For vulnerable bycatch species (Redfish, American Plaice, Cod, Thorny skate and Atlantic wolffish), sufficient information continues to be collected by the fleet, GNIR, NAFO and ICES to determine any changes in risk status, but monitoring of bycatch data is not conducted in sufficient detail to assess ongoing mortalities to all bycatch species. SG100 is not met.		

References	» Arboe, N. H. and M. C. S. Kingsley. 2010. The fishery for northern shrimp (P. borealis) off West Greenland, 1970-2010. NAFO SCR Doc. 10/53: 38 pp. » ICES 2009. Cod in ICES Subarea XIV and NAFO Subarea 1 (Greenland cod). ICES Advice 2009, Book 2, pp 1-8 » ICES 2016. ICES Advice on fishing opportunities, catch, and effort Iceland Sea and Greenland Sea Ecoregions » Kingsley, M. C. S. 2007. The fishery for northern shrimp (Pandalus borealis) off west Greenland, 1970-2007. NAFO SCR Doc. 07/69, Ser. N5455: 42 pp. » Kingsley, C.S. 2011. Bycatch rates in the West Greenland shrimp fishery, 1975–2010 NAFO Serial No. N5982 NAFO SCR Doc. 11/057 NAFO/ICES WG Pandalus Assessment Group » NAFO 2011. NAFO Scientific Council Meeting – 3-16 June 2011. Greenland halibut pp 101-113; demersal redfish p. 115-120; other finfish pp 120-125 including American plaice, thorny skate, Atlantic and spotted wolffishes. » Siferd, T. 2010 By-catch in the shrimp fishery from Shrimp Fishing Areas 0-3, 1979-2009. Can. Sci. Adv. Sec. Res. Doc. 2010/037: 83 pp. » Sunksen, Kaj 2007. Discarded by-catch in shrimp fisheries in Greenlandic offshore waters 2006-2007. NAFO SCR Doc. 07/88, Ser. N5474: 12 pp.
OVERALL PERFORMANCE INDICATOR SCORE:	**80**
CONDITION NUMBER (if relevant):	

Evaluation Table for PI 2.3.1

PI 2.3.1		The fishery meets national and international requirements for the protection of ETP species The fishery does not pose a risk of serious or irreversible harm to ETP species and does not hinder recovery of ETP species		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guidepost**	Known effects of the fishery are likely to be within limits of national and international requirements for protection of ETP species.	The effects of the fishery are known and are highly likely to be within limits of national and international requirements for protection of ETP species.	There is a high degree of certainty that the effects of the fishery are within limits of national and international requirements for protection of ETP species.
	Met?	Y	Y	Y
	Justification	Greenland does not have national endangered species legislation and as such, no species are identified as endangered, threatened or protected (ETP) species as defined in the MSC Certification Requirements based on national legislation. However, Greenland/Denmark is signatory to CITES . All species of large whales occurring in Greenland (except the west Greenland population of minke whales) are on Appendix I of CITES (Convention on International Trade in Endangered Species of Fauna and Flora), while some species of small whales in Greenland are on CITES Appendix II. The former would be the only species to which the ETP assessment for MSC would apply. There are no records of any negative interactions between the fleet and large whales, and the nature of the fishery is such that encounters are highly unlikely. No stakeholders (including WWF and GINR) have raised any concerns in this regard. A Greenland Red List (2007) identifying species considered biologically at risk has been prepared according to the regional guidelines issued by IUCN, but does not have official status. Six species/populations of marine mammals are classified as critically endangered. Eight seabirds and Atlantic salmon (*Salmo salar*) are classed as vulnerable. Near threatened species include eight seabirds or birds associated with coastal waters. No species of marine fishes have been included on the Greenland Red List. While some of the seabird species on the Greenland Red List may forage around fishing vessels, there is no evidence of detrimental impact, and none of the other species are considered to interact with the fishery. There is periodic monitoring of the Red List species.SG 60, 80 and 100 are met.		

PI 2.3.1		**The fishery meets national and international requirements for the protection of ETP species The fishery does not pose a risk of serious or irreversible harm to ETP species and does not hinder recovery of ETP species**		
b	**Guidepost**	Known direct effects are unlikely to create unacceptable impacts to ETP species.	Direct effects are highly unlikely to create unacceptable impacts to ETP species.	There is a high degree of confidence that there are no significant detrimental direct effects of the fishery on ETP species.
	Met?	Y	Y	Y
	Justification	There are no interactions with ETP species, thus a score of 100 is justified and meets the preceding SG60 and 80.		
c	**Guidepost**		Indirect effects have been considered and are thought to be unlikely to create unacceptable impacts.	There is a high degree of confidence that there are no significant detrimental indirect effects of the fishery on ETP species.
	Met?		Y	Y
	Justification	Indirect effects on ETP species could arise through disturbance or removal of a forage species. Greenland's marine mammal populations are monitored and researched by GINR; there are no reported incidents of disturbance by the fishery. The relatively low exploitation rate leaves plenty of shrimp resource for other species and therefore there is a high degree of confidence that there are no significant detrimental indirect effects of the fishery on ETP species.SG 80 and 100 are met.		
References		» Boertmann, D. 2007. Greenlands Redlist. Grønlands Hjemmestyre Direktoratet for Miljø og Natur/Aarhus University. http://www2.dmu.dk/Pub/Groenlands_Roedliste_2007_DK.pdf		
OVERALL PERFORMANCE INDICATOR SCORE:				**100**
CONDITION NUMBER (if relevant):				

Evaluation Table for PI 2.3.2

PI 2.3.2		**The fishery has in place precautionary management strategies designed to:** • **Meet national and international requirements;** • **Ensure the fishery does not pose a risk of serious harm to ETP species;** • **Ensure the fishery does not hinder recovery of ETP species; and** • **Minimise mortality of ETP species.**		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guidepost**	There are measures in place that minimise mortality of ETP species, and are expected to be highly likely to achieve national and international requirements for the protection of ETP species.	There is a strategy in place for managing the fishery's impact on ETP species, including measures to minimise mortality, which is designed to be highly likely to achieve national and international requirements for the protection of ETP species.	There is a comprehensive strategy in place for managing the fishery's impact on ETP species, including measures to minimise mortality, which is designed to achieve above national and international requirements for the protection of ETP species.
	Met?	Y	Y	Y
	Justification	No management strategy is required as there are no interactions with ETP species (see 2.3.3). The observer program monitors this situation and if it were to change management action would be taken. SG60, 80 and 100 are met.		
b	**Guidepost**	The measures are considered likely to work, based on plausible argument (e.g., general experience, theory or comparison with similar fisheries/species).	There is an objective basis for confidence that the strategy will work, based on information directly about the fishery and/or the species involved.	The strategy is mainly based on information directly about the fishery and/or species involved, and a quantitative analysis supports high confidence that the strategy will work.
	Met?	Y	Y	Y
	Justification	The observer program monitors this situation and if it were to change management action would be taken. SG60, 80 and 100 are met.		

PI 2.3.2		**The fishery has in place precautionary management strategies designed to:** • **Meet national and international requirements;** • **Ensure the fishery does not pose a risk of serious harm to ETP species;** • **Ensure the fishery does not hinder recovery of ETP species; and** • **Minimise mortality of ETP species.**		
c	**Guidepost**		There is evidence that the strategy is being implemented successfully.	There is clear evidence that the strategy is being implemented successfully.
	Met?		Y	Y
	Justification	No management strategy is required as there are no interactions with ETP species (see 2.3.3). The observer program monitors this situation and if it were to change management action would be taken. SG80 and 100 are met.		
d	**Guidepost**			There is evidence that the strategy is achieving its objective.
	Met?			Y
	Justification	No management strategy is required as there are no interactions with ETP species (see 2.3.3). The observer program monitors this situation and if it were to change management action would be taken. SG 100 is met.		
References		»		
OVERALL PERFORMANCE INDICATOR SCORE:				**100**
CONDITION NUMBER (if relevant):				

Evaluation Table for PI 2.3.3

PI 2.3.3		**Relevant information is collected to support the management of fishery impacts on ETP species, including:** • **Information for the development of the management strategy;** • **Information to assess the effectiveness of the management strategy; and** • **Information to determine the outcome status of ETP species.**		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guidepost**	Information is sufficient to qualitatively estimate the fishery related mortality of ETP species.	Sufficient information is available to allow fishery related mortality and the impact of fishing to be quantitatively estimated for ETP species.	Information is sufficient to quantitatively estimate outcome status of ETP species with a high degree of certainty.
	Met?	Y	Y	Y
	Justification	All species of large whales occurring in Greenland (except the west Greenland population of minke whales) are on Appendix I of CITES (Convention on International Trade in Endangered Species of Fauna and Flora). These would be the only species to which the ETP assessment for MSC would apply. None of the species on CITES appendices interact with the fishery, which operates in such a way that marine mammal interactions do not occur. The following is provided for information purposes. A Greenland Red List (Boertmann 2007) identifying species considered biologically at risk has been prepared according to the regional guidelines issued by IUCN. Six species/populations of marine mammals are classified as critically endangered. Eight seabirds and Atlantic salmon (*Salmo salar)* are classed as vulnerable. Near threatened species include eight seabirds or birds associated with coastal waters. No species of marine fishes have been included on the Greenland Red List. While some of the seabird species on the Greenland Red List may forage around fishing vessels, there is no evidence of detrimental impact, and none of the other species are considered to interact with the fishery. There is periodic monitoring of the Red List species. Therefore SG60, 80 and 100 are all met.		
b	**Guidepost**	Information is adequate to broadly understand the impact of the fishery on ETP species.	Information is sufficient to determine whether the fishery may be a threat to protection and recovery of the ETP species.	Accurate and verifiable information is available on the magnitude of all impacts, mortalities and injuries and the consequences for the status of ETP species.

PI 2.3.3		**Relevant information is collected to support the management of fishery impacts on ETP species, including:** • **Information for the development of the management strategy;** • **Information to assess the effectiveness of the management strategy; and** • **Information to determine the outcome status of ETP species.**		
	Met?	Y	Y	Y
	Justification	Accurate and verifiable information is available from skippers, from observers and from survey fishing on magnitude of all impacts and consequences for status of ETP species (i.e. large whales present in Greenland waters). SG60, 80 and 100 are all met.		
c	**Guidepost**	Information is adequate to support measures to manage the impacts on ETP species.	Information is sufficient to measure trends and support a full strategy to manage impacts on ETP species.	Information is adequate to support a comprehensive strategy to manage impacts, minimize mortality and injury of ETP species, and evaluate with a high degree of certainty whether a strategy is achieving its objectives.
	Met?	Y	Y	Y
	Justification	Information is adequate to determine that no strategy is required beyond on-going fishery observer programme and marine mammal monitoring. SG60, 80 and 100 are all met.		
References		» Boertmann, D. 2007. Greenlands Redlist. Grønlands Hjemmestyre Direktoratet for Miljø og Natur/Aarhus University. http://www2.dmu.dk/Pub/Groenlands_Roedliste_2007_DK.pdf » CITES Appendices: http://www.cites.org/eng/app/index.shtml		
OVERALL PERFORMANCE INDICATOR SCORE:				**100**
CONDITION NUMBER (if relevant):				

Evaluation Table for PI 2.4.1

PI 2.4.1		The fishery does not cause serious or irreversible harm to habitat structure, considered on a regional or bioregional basis, and function		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guidepost**	The fishery is unlikely to reduce habitat structure and function to a point where there would be serious or irreversible harm.	The fishery is highly unlikely to reduce habitat structure and function to a point where there would be serious or irreversible harm.	There is evidence that the fishery is highly unlikely to reduce habitat structure and function to a point where there would be serious or irreversible harm.
	Met?	Y	Y	Partial
	Justification	The following categorises the habitats as commonly encountered habitats and VMEs (a requirement of v2 of the MSC fisheries standard) but is considered a useful framework to consider habitats under v1.3 that is being used to assess this fishery. **Commonly encountered habitats**. The fishing area is characterised by a mosaic of deep channels and basins dominated by muddy sediments, many of which are fed by glacial sedimentation and outlets from fjords, and shallow banks and shelf with a mix of more complex habitats. Muddy sediments are more prevalent in the northerly colder areas; and rocky and sandy sediment in the more southerly areas. Coarse rocky ground comprises a relatively small proportion of the area fished, varying between 1% and 10%, whereas mud covers 1/3rd of the total fishing area (Gougeon et al 2017). Polychaeta, Ophiuroidea and Ascidiacea are the most commonly encountered taxa, especially on muddy bottoms. Hard bottom substrates are more diverse and organisms more abundant. Large organisms attached to rock, such as gorgonians are unusual but *Paragorgia arborea* is found at some southern stations (Yesson net al 2015) 86% of the study area and depth (200-500m) has been subject to some trawling impact since 1986. Trawling intensity ranged from zero to more than 100h/yr. (per 3.5km square). Over most of the survey area, less than 50% of sample squares were affected in any one year, but over a period of four or more years up to 65% of habitat was trawled at some point. Fishermen target the softer less diverse sediments with trawling intensity on soft habitat more than double that on hard sediments (Yesson et al 2016) Trawling intensity is the most important factor determining the overall abundance of benthic organisms, accounting for 12 to 16% of variance. Furthermore, both abundance and diversity are higher in		

the new (i.e. previously unfished) fishing areas. Frequently trawled soft bottoms are characterized by fewer anthazoa, ascidians, bryozoans, *Ophiura* spp. Frequently trawled hard bottoms are characterized by fewer anthazoa, bryozoans, hydrozoa, maxilipoda, polychaeta and porifera. Recovery time based on significant difference between trawled and untrawled sites is around 5 years for soft bottoms and 10 years for hard bottoms. However, median values remain different over longer time periods (at least 25 years on harder substrates), and more comprehensive sampling would be required to harden up the evidence. There is no evidence of loss of function (filtration, recycling, carbon capture) as a result of trawling (Yesson et al 2016).
An overall assessment of the impact of the fishery on main habitat types is provided in the table below

Main habitat element	Organism abundance and diversity	Approximate proportion within fishery footprint (2008-13)	Intensity of trawling (scale of 1 (lowest) to 5 (highest)	Recovery times (Yrs.)	Likelihood of serious or irreversible harm
mud	medium high-	15%	5	5	80
muddy sand	Medium-high	12%**	1	5	100
gravelly mud	Medium	30%	2	5	80
gravelly sand	Medium	10%	2	5-10	100
bedrock with mud	Medium-high	20%	2	5-10	100
bedrock with sand	Medium-high	40%	2	5-10	80
coarse rocky ground	High	25%*	1	10+	80

Least concern				Most concern

Notes

*Was as high as 50% through to 2006, but may be over-estimated

** Peaked at 35% in 2004

A score of 90 is therefore appropriate for commonly encountered habitats

Vulnerable marine ecosystems (VMEs).

Most of the VMEs that occur in these waters (such as maerl; *Lophelia*; Bamboo coral; cup corals (though possibly not strictly VME) occur outside the normal depth range of the fishery (150-400m, occasionally to 600m (Jorgensen pers comm). However, *Paragorgia* (tree coral) favour the base of the shelf break at 500-900m, and there maybe some partial overlap with fleet activities. The seapen *Umbellula*, which has multi-decadal lifespan and can form a VME type aggregation vulnerable to trawling, was not encountered in the recent survey (Yesson et al 2015, 2016), but is seen as regular bycatch in some areas in West Greenland (Jørgensen et al., 2013). Encounters with both these will need to be recorded and monitored and areas avoided .

Large discrete (*Ostur*) sponges are rare on the West Greenland shelf. It is thought that it is probably too cold (40C) although it is possible that the historic fishery has cleared some of these. A few *Geodia* have been found in fishing areas but never in significant quantities.

An overall assessment of the impact of the fishery on VME is provided in the tables below

VME type	Preferred substrate	Depth range	Geographic distribution	Vulnerability, recovery	Likelihood of serious or irreversible harm
Maerl	sand, mud or gravel	<20m	Wide-spread coastal especially in the south	High, medium	100
Lophelia reef	Soft bottoms	800-1000 m	N Atlantic, min 4ºC. Only occurs in S of W Greenland shelf	High, slow	An area has been identified in depths 800m S/SW Greenland and is slated for protection 100
Bamboo coral	Hard substrate	800-900m	Localized (one known coral forest)	High, slow	Widespread along foot of shelf slope with v limited overlap 100
Ostur and *Geodia* sponges	Soft bottoms and semi soft	200-700m	Common in E Greenland but rare/occasional along W Greenland shelf	High; slow	Some uncertainty over reasons for rarity 80
Paragorgia tree coral	Sometimes associated with *Lophelia*	500-900m (200-1300)	Bottom fringe of the shelf break. Prefers strong current	High, slow	Low – may be encountered, but limited overlap One mapped area 80

	Umbellula seapens	Soft bottoms	500-1000 m	More northerly distribution	High; medium-fast	Low – may be encountered but limited overlap 80

Least concern				Most concern

It should also be noted that there are special measures to protect potential vulnerable marine ecosystems (pVMEs) in the Melville Bay North of 73°30' N.

On the basis of the above, the VME habitats also score 90, and the overall score for this PI is 90.

References

» Gougeon S, Kemp KM, Blicher ME & Yesson C (2017) Mapping and classifying the seabed of the West Greenland continental shelf. Estuarine and Coastal Shelf Science. doi:10.1016/j.ecss.2017.01.009

» Jorgensen et al 2013

» Yesson C, Simon P, Chemshirova I, Gorham T, Turner CJ, Hammeken Arboe N, Blicher ME & Kemp KM (2015) Community composition of epibenthic megafauna on the West Greenland Shelf. Polar Biology. 38:2085-2096

» Yesson C, Fisher J, Gorham T, Turner CJ, Hammeken Arboe N, Blicher ME & Kemp KM (2016) The impact of trawling on the epibenthic megafauna of the West Greenland shelf. ICES Journal of Marine Science. doi:10.1093/icesjms/fsw206

OVERALL PERFORMANCE INDICATOR SCORE:	**90**
CONDITION NUMBER (if relevant):	

Evaluation Table for PI 2.4.2

PI 2.4.2		There is a strategy in place that is designed to ensure the fishery does not pose a risk of serious or irreversible harm to habitat types		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guidepost**	There are measures in place, if necessary, that are expected to achieve the Habitat Outcome 80 level of performance.	There is a partial strategy in place, if necessary, that is expected to achieve the Habitat Outcome 80 level of performance or above.	There is a strategy in place for managing the impact of the fishery on habitat types.
	Met?	Y	Y	N
	Justification	A range of measures serve to reduce benthic impacts, though not all are specifically designed for this purpose. Executive Order 12 (9 November 2011) on Technical Conservation measures sets out a range of new measures designed to protect bottom habitats (SG60 is met): • A requirement to use rotating rockhopper gear on all shrimp trawls, such that foot gear will roll over bottom obstructions rather than dig into bottom • A requirement to use toggle chains of 72 mm or greater, keeping trawl netting off the bottom • A general shift to the use of lighter “sparrow” trawl doors in recent years; • A closed area of approximately 650 nm^2 in which are found concentrations of sponge and coral beds • Exclusion of trawlers from coastal bays • A requirement to report live coral catches of >60 kg and/or live sponge catches of >800 kg to the Licensing Authority, and to move a minimum of 2 km in a direction away from any place at which such catches are taken • The fishing area has been assessed for the existence and distribution of VME, and their occurrence in existing fishing areas is very rare. Provisions are in process to protect *lophelia* reefs in deeper waters in the south • Ships guidebooks have been produced and distributed for the identification of ETP and VME indicator species • An addendum to the Management Plan includes a protocol for working in new fishery areas, which is intended to map new areas of sensitive bottom habitat and lead to protection if necessary • It is intended that encounter reporting and move on rules be implemented throughout the fishery in line with NAFO/NEAFC recommendations		

		• Special measures have been introduced (beginning of 2018) to protect potential vulnerable marine ecosystems (pVMEs) in the Melville Bay North of 73°30' N. (http://naalakkersuisut.gl/da/Naalakkersuisut/Nyheder/2018/01/2301_melvillebugten) These measures amount to a partial strategy and are approaching a strategy. SG 80 is met. However, there is no strategy in place to manage the fishery's impact on all habitats. There is partial overlap between the fishing footprint and areas suitable for the growth of a potential VME *umbellula* fields. There is also a need to refine the move on rule in line with NAFO/NEAFC recommendations for both existing areas and exploratory fishing (a recommendation is made by the assessment team on this matter), and ensure that encounters are logged and reported and serve to inform a more comprehensive strategy for the protection of VME. SG100 is not met.		
b	**Guidepost**	The measures are considered likely to work, based on plausible argument (e.g. general experience, theory or comparison with similar fisheries/habitats).	There is some objective basis for confidence that the partial strategy will work, based on information directly about the fishery and/or habitats involved.	Testing supports high confidence that the strategy will work, based on information directly about the fishery and/or habitats involved.
	Met?	Y	Y	N
	Justification	The research undertaken since first certification is specific to the fishery and provides some objective basis for confidence that the partial strategy will work (SG60 & 80 are met), but given the remaining uncertainties about recovery rates and impact in test fishing areas this does not support high confidence.SG100 is not met.		
c	**Guidepost**		There is some evidence that the partial strategy is being implemented successfully.	There is clear evidence that the strategy is being implemented successfully.
	Met?		Y	N
	Justification	There is solid evidence that gear design is in line with the partial strategy, and that most VMEs are outside the fishing area. SG80 is met. Reporting of VMEs however remains limited and thresholds higher than current recommendations from NEAFC and NAFO. Reporting may also be inconsistent and possibly of poor quality (observers require special payments to take samples for example) and has not been rolled out comprehensively across the fishery. SG100 is not met.		

d	**Guidepost**			There is some evidence that the strategy is achieving its objective.
	Met?			N
	Justification	The objectives relating to benthic habitat as outlined in the 2014 Fishing Plan are insufficiently explicit to allow for measurement of progress and success in protecting benthic habitat so SG 100 is not met.		
References		» DFO 2007. Development of a closed area in NAFO 0A to protect narwhal over-wintering grounds, including deep-sea corals. Can. Sci. Adv. Sec. Science Response 2007/002: 16 pp. Available at www.dfo-mpo.gc.ca/csas » Executive Order 12, 9 November 2011 » Gougeon S, Kemp KM, Blicher ME & Yesson C (2017) Mapping and classifying the seabed of the West Greenland continental shelf. Estuarine and Coastal Shelf Science. doi:10.1016/j.ecss.2017.01.009DFO 2006benthic; Rice 2006; Lokkeborg 2005 » NAFO 2012. Serial No. N6080 NAFO/FC Doc. 12/6 (Adopted) 34th Annual Meeting - September 2012. Recommendations from the WGFMS-VME to the Fisheries Commission » NEAFC Recommendation 19 2014: Protection of VMEs in NEAFC Regulatory Areas as Amended by Recommendation 09:2015 http://www.neafc.org/system/files/Rec_19-2014_as_amended_by_09_2015_fulltext_0.pdf » Simpson, A. W. and L. Watling 2006. An investigation of the cumulative impacts of shrimp trawling on mud-bottom fishing grounds in the Gulf of Maine: effects on habitat and macrofaunal community structure. ICES J. Mar. Sci. 63: 1616-1630. » Yesson C, Simon P, Chemshirova I, Gorham T, Turner CJ, Hammeken Arboe N, Blicher ME & Kemp KM (2015) Community composition of epibenthic megafauna on the West Greenland Shelf. Polar Biology. 38:2085-2096 » Yesson C, Fisher J, Gorham T, Turner CJ, Hammeken Arboe N, Blicher ME & Kemp KM (2016) The impact of trawling on the epibenthic megafauna of the West Greenland shelf. ICES Journal of Marine Science. doi:10.1093/icesjms/fsw206		
OVERALL PERFORMANCE INDICATOR SCORE:				**80**
CONDITION NUMBER (if relevant):				

Evaluation Table for PI 2.4.3

PI 2.4.3		Information is adequate to determine the risk posed to habitat types by the fishery and the effectiveness of the strategy to manage impacts on habitat types		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guidepost**	There is basic understanding of the types and distribution of main habitats in the area of the fishery.	The nature, distribution and vulnerability of all main habitat types in the fishery are known at a level of detail relevant to the scale and intensity of the fishery.	The distribution of habitat types is known over their range, with particular attention to the occurrence of vulnerable habitat types.
	Met?	Y	Y	N
	Justification	The research conducted specifically in relation to the fishery since first certification means that the nature, distribution and vulnerability of all main habitat types in the fishery are known at a level of detail relevant to the scale and intensity of the fishery so SG 60 and 80 are met. The more limited survey in the test fishing areas of the north, and the fragmented distribution of most VMEs mean that knowledge of distribution of VMEs remains somewhat limited and SG100 is not met.		
b	**Guidepost**	Information is adequate to broadly understand the nature of the main impacts of gear use on the main habitats, including spatial overlap of habitat with fishing gear.	Sufficient data are available to allow the nature of the impacts of the fishery on habitat types to be identified and there is reliable information on the spatial extent of interaction, and the timing and location of use of the fishing gear.	The physical impacts of the gear on the habitat types have been quantified fully.
	Met?	Y	Y	N
	Justification	The research conducted specifically in relation to the fishery since first certification, coupled with VMS and log book data are adequate to meet SG80 as it provides evidence of the nature and extent of impacts. The lower SG 60 is also therefore met. There is not full quantification of gear impacts on all habitats and so SG100 is not met.		

PI 2.4.3		**Information is adequate to determine the risk posed to habitat types by the fishery and the effectiveness of the strategy to manage impacts on habitat types**		
c	**Guidepost**		Sufficient data continue to be collected to detect any increase in risk to habitat (e.g. due to changes in the outcome indicator scores or the operation of the fishery or the effectiveness of the measures).	Changes in habitat distributions over time are measured.
	Met?		Y	N
	Justification	GNIR has developed a benthic habitats mapping and monitoring programme which is on-going and which, taken together with VMS, logbook and encounter reporting protocols meets SG 80. Although GNIR are developing a benthic habitats programme this is not yet in place and the scope of the programme relative to potential changes in habitat distributions remains unclear so SG 100 is not met.		
References		» Gougeon S, Kemp KM, Blicher ME & Yesson C (2017) Mapping and classifying the seabed of the West Greenland continental shelf. Estuarine and Coastal Shelf Science. doi:10.1016/j.ecss.2017.01.009DFO 2006benthic; Rice 2006; Lokkeborg 2005 » NAFO 2012. Serial No. N6080 NAFO/FC Doc. 12/6 (Adopted) 34th Annual Meeting - September 2012. Recommendations from the WGFMS-VME to the Fisheries Commission » Sejr, M.K., Włodarska-Kowalczuk, M., Legeżyńska, J. et al. Macrobenthic species composition and diversity in the Godthaabsfjord system, SW Greenland. Polar Biol (2010) 33: 421. doi:10.1007/s00300-009-0717-z » Simpson, A. W. and L. Watling 2006. An investigation of the cumulative impacts of shrimp trawling on mud-bottom fishing grounds in the Gulf of Maine: effects on habitat and macrofaunal community structure. ICES J. Mar. Sci. 63: 1616-1630 » Yesson C, Simon P, Chemshirova I, Gorham T, Turner CJ, Hammeken Arboe N, Blicher ME & Kemp KM (2015) Community composition of epibenthic megafauna on the West Greenland Shelf. Polar Biology. 38:2085-2096 » Yesson C, Fisher J, Gorham T, Turner CJ, Hammeken Arboe N, Blicher ME & Kemp KM (2016) The impact of trawling on the epibenthic megafauna of the West Greenland shelf. ICES Journal of Marine Science. doi:10.1093/icesjms/fsw206……	

PI 2.4.3	Information is adequate to determine the risk posed to habitat types by the fishery and the effectiveness of the strategy to manage impacts on habitat types
OVERALL PERFORMANCE INDICATOR SCORE:	**80**
CONDITION NUMBER (if relevant):	

Evaluation Table for PI 2.5.1

PI 2.5.1		The fishery does not cause serious or irreversible harm to the key elements of ecosystem structure and function		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guidepost**	The fishery is unlikely to disrupt the key elements underlying ecosystem structure and function to a point where there would be a serious or irreversible harm.	The fishery is highly unlikely to disrupt the key elements underlying ecosystem structure and function to a point where there would be a serious or irreversible harm.	There is evidence that the fishery is highly unlikely to disrupt the key elements underlying ecosystem structure and function to a point where there would be a serious or irreversible harm.
	Met?	Y	Y	Partial
	Justification	The fishery operates in a high-latitude continental shelf ecosystem considered to be of relatively low productivity (Aquarone et al 2009) although fishery productivity is relatively high. Trophic chains are short and predators are relatively unspecialised resulting in substitutability in the food web (Pedersen and Zeller 2001). Species diversity is low relative to ecosystems further south. The ecosystem is naturally exposed to a range of environmental pressures including intense seasonality, major variations in ice cover, iceberg scouring, shifts in intensity of ocean currents and is therefore necessarily robust and regularly recovers from perturbations in the past (Buch et al. 2004). The fishery is relatively “clean”, that is, it is well targeted on the target species. **Trophic relationships** Shrimp are prey for a wide range of species including seals and demersal fishes (Parsons 2005 a, b; Pedersen and Zeller 2001). These predators target a range of prey species and so are able to switch among prey (Pedersen and Zeller 2001). Exploitation rate of the shrimp stock historically has been relatively low, of the order of 10-12% based on landings of 135,000-157,000 t per year in 2006-9 (NIPAG 2010) and total biomass of the order of 1.3-1.4 mt (NIPAG 2011). Modelled biomass steadily declined from 2004 to 2013 but has since stabilized at a level similar to that of the late 1990s which is close to Bmsy (NAFO 2016). Given this low exploitation rate, current and recent levels of removal of the target species leave a substantial proportion of total biomass in the population and thus do not represent an unacceptable impact on trophic relationships. Cod predation is explicitly considered as a mortality term in the assessment model used to advise on TACs, with the objective of providing a high level of certainty that forage will be maintained for predators. Bycatch of discarded species is low (2.2.1) so removal of predators is insignificant as an ecosystem impact. The fishery is highly unlikely to disrupt trophic relationships by reducing shrimp abundance to levels which would impact predators, as the need		

PI 2.5.1	The fishery does not cause serious or irreversible harm to the key elements of ecosystem structure and function
	to maintain shrimp biomass as forage for predators is addressed in the assessment and the management of the fishery. The fishery meets the 60 and 80 SG for this issue. There is inadequate understanding of ecosystem structure and function to be able to offer clear evidence that there is no such disruption. **Ghost fishing** Lost trawl gear is retrieved in most cases, since cost of trawls is very high and there is a high probability of retrieving lost gear. **Benthic biodiversity and ecosystem structure** Impacts on benthic habitats and biodiversity have been scored in PI 2.4. Given its mode of operation (2.5.2) the fishery is highly unlikely to disrupt biodiversity and ecosystem structure to an extent that serious or irreversible harm would ensue, and there is no evidence of loss of function (filtration, recycling, carbon capture) as a result of trawling. This is based on information and research relating specifically to the fishery. The fishery mainly operates on relatively resilient communities (soft-bottom) and uses relatively light gear. There is no evidence that the fishery has substantially changed the pattern and distribution of major habitat types, though it has temporarily changed the nature and biodiversity associated with both soft and hard bottom types. Some initial measures (closed areas, moving protocol) have been taken which will help to protect biodiversity and ecosystem structure. The fishery is highly unlikely to disrupt this key elements structure and function to a point where there would be a serious or irreversible harm to ecosystems mediated through benthic impacts. A partial score of 90 is assigned to this PI.
References	» Aquarone, M. C., S. Adams, D. Mikkelson and T. J. Pedersen. 2009. XIX-58 West Greenland Shelf:LME 18. Large marine ecosystems of the world portal. http://www.lme.noaa.gov/index.php?option=com_content&view=article&id=64:lme18&catid=41:briefs&Itemid=72Buch et al. 2004 » Garde E. 2013. Rapid Assessment of Circum-Arctic Ecosystem Resilience (RACER). The West Greenland Shelf. WWF Report » NAFO 2017 Scientific Council Report. » NAFO/ICES 2010. Report of the NAFO/ICES Pandalus assessment group 20-37 October 2010. NAFO SCS Doc. 010/22. » NAFO/ICES (NIPAG) 2011. Report of the NAFO/ICES Pandalus assessment group meeting, 19-26 October 2011. NAFO SCS Doc. 11/20. » Pedersen, S.A. and D. Zeller. 2001. A mass balance model for the West Greenland marine ecosystem. In: Guenette, S., Christensen, V. and Pauly, D. (eds). Fisheries impacts on North Atlantic Ecosystems: Models and Analyses. Fisheries Centre Research Reports 9(4). P. 111-127.

PI 2.5.1	The fishery does not cause serious or irreversible harm to the key elements of ecosystem structure and function
OVERALL PERFORMANCE INDICATOR SCORE:	**90**
CONDITION NUMBER (if relevant):	

Evaluation Table for PI 2.5.2

PI 2.5.2		There are measures in place to ensure the fishery does not pose a risk of serious or irreversible harm to ecosystem structure and function		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guidepost**	There are measures in place, if necessary.	There is a partial strategy in place, if necessary.	There is a strategy that consists of a plan, in place.
	Met?	Y	Y	N
	Justification	The ecosystem issues to be considered here are (a) Trophic relationships - the effect of the removal of the target species, which are forage for a wide range of predator species (b) Biodiversity and ecosystem structure – the non-catch impacts on biological diversity and community structure, particularly for benthic species. **Trophic relationships** Predator-prey relationships are explicitly considered in the assessment model used to support setting TACs: a cod predation term based on current cod biomass and overlap with shrimp is included in mortality. As such, a partial strategy is in place for ensuring that adequate shrimp biomass is maintained for predators. This is considered a partial strategy rather than a strategy, since only one predator (cod) is considered, of the wide range of species which use shrimp as forage Removal of predators by the fishery is not significant, since bycatch of species other than the target species are low. It may be concluded that there is a partial strategy in place designed to address the main potential trophic impact – i.e. to ensure that shrimp is maintained as forage for predators. This does not however consist of a specific plan to address this or related issues. Nor does it come close to an analysis of, for example, definition of an ecosystem-level exploitation rate that can be considered sustainable, or ecosystem level limit reference points (see for example Rosenberg et al, 2014. 80 **Impacts of the fishery on benthic biodiversity and community structure** As noted in 2.4.2, Executive Order 12 (9 November 2011) on Technical Conservation measures sets out a range of new measures designed to protect bottom habitats and communities: • a requirement to use rotating rockhopper gear on all shrimp trawls, such that foot gear will roll over bottom obstructions rather than dig into bottom • a requirement to use toggle chains of 72 mm or greater, keeping trawl netting off the bottom • definition of a closed area of almost 650 nm2 in which are found sponge and coral beds • a requirement to report live coral catches of >60 kg and live sponge catches of >800 kg to the Licensing Authority, and to		

		move a minimum of 2 km in a direction away from coral or sponge areas • a protocol (Addendum to the Management Plan) for working in new fishery areas, which is intended to map new areas of sensitive bottom habitat and lead to protection if necessary. Taken together, and given that these measures have been put in place with the intention of protecting bottom habitats and communities, they are considered to represent a partial strategy. There are furthermore plans to continue research on benthic habitat and embed such research in a longer term programme at GNIR. It may be concluded that for impacts on benthic biodiversity and community structure, a partial strategy has been put in place (SG 60 & 80 are met). However, this lacks any clear objectives, performance measures or response mechanisms and as such cannot be regarded as a plan (SG100 is not met).		
b	**Guidepost**	The measures take into account potential impacts of the fishery on key elements of the ecosystem.	The partial strategy takes into account available information and is expected to restrain impacts of the fishery on the ecosystem so as to achieve the Ecosystem Outcome 80 level of performance.	The strategy, which consists of a plan, contains measures to address all main impacts of the fishery on the ecosystem, and at least some of these measures are in place. The plan and measures are based on well-understood functional relationships between the fishery and the Components and elements of the ecosystem. This plan provides for development of a full strategy that restrains impacts on the ecosystem to ensure the fishery does not cause serious or irreversible harm.
	Met?	Y	Y	N
	Justification	Reviews and general descriptions of the west Greenland continental shelf ecosystem are available, including a general description of physical and chemical characteristics, productivity, and biological characteristics in the context of large marine ecosystem descriptions (Aquarone et al 2009); a summary of trophic relationships (Pedersen and Zeller 2001); and rapid assessment of ecosystem resilience (Garde 2013). A description of changes in the ecosystem over several decades (Buch et al. 2004) indicates that the ecosystem has fluctuated considerably under the influence of oceanographic changes and removal of demersal fishes by fishing, and has shown the capacity to maintain structure and function under these fluctuations. This and the		

		analysis of Garde (2013) suggests that the ecosystem is resilient to such stresses. The available information provides a broad understanding of the key elements of the ecosystem and of the functions of the Components. The more recent work by yesson et al (2015, 2016) and Gougeaon et al 2016) has expanded the scope of our understanding of spatial distribution of major habitats and also VME (Jorgensen pers com.) **Impact of removals on trophic structure** Information compiled for a mass balance study of the west Greenland ecosystem indicates that northern shrimp are important prey for cod, redfish, Greenland halibut, and to a lesser extent flatfishes, rays and marine mammals (Pedersen and Zeller 2001). This is consistent with information on predators of northern shrimp throughout its range (Parsons 2005a, b). These predators have other options for prey species (Pedersen and Zeller 2001). Information on prey of northern shrimp from an ecosystem study in another northern shrimp ecosystem (northern Gulf of St. Lawrence; Savenkoff et al 2006) is probably generally applicable here. Information from a recent food web study on the west Greenland shelf (Moller 2006) generally confirms information from other areas on the place of northern shrimp in the trophic structure. No information is available specifically on predator-prey relationships of larval northern shrimp but good information is available on their size, morphology, general behaviour and seasonality (e.g. Bergström 2000) which would allow inferring predator-prey relationships from existing knowledge of various size fractions of zooplankton. Information on shrimp catches is excellent and information on the very low fish bycatch is available; although detailed species-level information is available over a relatively short time period. **Impacts on benthic biodiversity and community structure and function** Studies suggest that mortality of fish escaping via the Nordmore grate would be low (Soldal and Engas 1997; Broadhurst 2000; Suuronen 2005). A study of biodiversity on all bottom types within the 200 m contour has been initiated by the Greenland Climate Centre, and several publications are available on biodiversity in fjords and near-shore areas of west Greenland. Substantial information on the nature and distribution of major habitat types, VMEs, and trawling impacts and recovery has been collected in recent years and published (Yesson et al 2015,16; Gougeon et al 2015). A review of shrimp trawling gear similar to that used in this area (Grant and Hiscock 2010) also concluded that non-catch impacts of this gear on benthic and demersal fauna are likely to be relatively low Bycatch of bottom invertebrates is not recorded in the one available study (Sunksen 2007) but is probably very low, based on a comprehensive study of bycatch in a nearby shrimp fishery using similar gear (Siferd 2010). Tables and charts of bottom types have been prepared by skippers (Management Plan Appendix 2) and provide some potentially useful

		information on distribution of benthic ecosystems. Information from the fleet on bottom communities was used to identify two areas near the west coast closed to trawling to protect sensitive coral habitats. The partial strategy takes into account available information as outlined above and is expected to restrain impacts of the fishery on the ecosystem so as to achieve the Ecosystem Outcome 80 level of performance. The partial strategy lacks clear and coherent objectives, reference points and response procedures and therefore cannot be described as a plan. SG 100 is not met		
c	**Guidepost**	The measures are considered likely to work, based on plausible argument (e.g., general experience, theory or comparison with similar fisheries/ecosystems).	The partial strategy is considered likely to work, based on plausible argument (e.g., general experience, theory or comparison with similar fisheries/ecosystems).	The measures are considered likely to work based on prior experience, plausible argument or information directly from the fishery/ecosystems involved.
	Met?	Y	Y	Y
	Justification	The partial strategy is known to work in some respects (e.g. by reducing bycatch and bottom pressure, and excluding vessels from certain protected areas) and, based on first principles and taking account of observer coverage in new exploratory fishing areas, is likely to work in terms of avoiding negative encounters with VME. The exploitation rate of the fishery remains within bounds unlikely to have a detrimental impact on competing predators (i.e. those other than fishers). The measures are considered likely to work based on prior experience, plausible argument or information directly from the fishery/ecosystems involved. SG 100 is met		
d	**Guidepost**		There is some evidence that the measures comprising the partial strategy are being implemented successfully.	There is evidence that the measures are being implemented successfully.
	Met?		Y	N
	Justification	There is clear evidence that measures involving gear design are being implemented; TAC are being adhered to; protected areas are being avoided (VMS data); handling and encounter rules are being implemented (observer coverage). SG80 is met. However, there remains some uncertainty about the rigor of reporting and identification of VMEs and invertebrate bycatch more generally so SG 100 is not met.		
References		» Bergström, B. 2000. Biology of Pandalus. Advances in Marine Biology, 38:55-256.		

	» Broadhurst, M. K. 2000. Modifications to reduce bycatch in prawn trawls: a review and framework for development. Rev. Fish Biol. Fisheries 10: 27-60.Garde E. 2013. Rapid Assessment of Circum-Arctic Ecosystem Resilience (RACER). The West Greenland Shelf. WWF Report » Grant, S. M. and W. Hiscock 2010. Unobserved fishing mortality in the Canadian northern shrimp fishery: shrimp fishing areas 5, 6 and 7 (Newfoundland-Labrador Shelf) and shrimp fishing areas 13, 14 and 15 (Scotian Shelf). Report to the Association of Seafood Producers, August 2010. 31 pp. Moller 2006 » Parsons, D. G. 2005a. Predators of northern shrimp, Pandalus borealis (Pandalidae), throughout the North Atlantic. Mar. Biol. Res. 1: 48-58 » Parsons, D. G. 2005b. Interactions between northern shrimp, Pandalus borealis (Pandalidae) and its key predators within the eastern Newfoundland and Labrador marine ecosystem. Mar. Biol. Res. 1: 59-67 » Rosenberg, A.A., Fogarty, M.J., Cooper, A.B., Dickey-Collas, M., Fulton, E.A., Gutiérrez, N.L., Hyde, K.J.W., Kleisner, K.M., Kristiansen, T., Longo, C., Minte-Vera, C., Minto, C., Mosqueira, I., Chato Osio, G., Ovando, D., Selig, E.R., Thorson, J.T. and Ye, Y. 2014. Developing new approaches to global stock status assessment and fishery production potential of the seas. FAO Fisheries and Aquaculture Circular No. 1086. Rome, FAO……. » Savenkoff, C., L. Savard, B. Morin and D. Chabot. 2006. Main prey and predators of northern shrimp (Pandalus borealis) in the northern Gulf of St. Lawrence during the mid-1980s, mid-1990s, and early 2000s. Can. Tech. Rep. Fish. Aquat. Sci. 2639: 28 pp. » Soldal, A. V. and A. Engas 1997. Survival of young gadoids excluded from a shrimp trawl by a rigid deflecting grid. ICES J. Mar. Sci. 54: 117-124. » Suuronen, P. 2005. Mortality of fish escaping trawl gears. FAO Fish. Tech. Pap. 478: 72 pp.

OVERALL PERFORMANCE INDICATOR SCORE:	**85**
CONDITION NUMBER (if relevant):	

Evaluation Table for PI 2.5.3

PI 2.5.3		There is adequate knowledge of the impacts of the fishery on the ecosystem		
Scoring Issue		SG 60	SG 80	SG 100
a	Guidepost	Information is adequate to identify the key elements of the ecosystem (e.g., trophic structure and function, community composition, productivity pattern and biodiversity).	Information is adequate to broadly understand the key elements of the ecosystem.	
	Met?	Y	Y	
	Justification	Reviews and general descriptions of the west Greenland continental shelf ecosystem are available, including a general description of physical and chemical characteristics, productivity, and biological characteristics in the context of large marine ecosystem descriptions (Aquarone et al 2009); a summary of trophic relationships (Pedersen and Zeller 2001); and rapid assessment of ecosystem resilience (Garde 2013). A description of changes in the ecosystem over several decades (Buch et al. 2004) indicates that the ecosystem has fluctuated considerably under the influence of oceanographic changes and removal of demersal fishes by fishing, and has shown the capacity to maintain structure and function under these fluctuations. This and the analysis of Garde (2013) suggests that the ecosystem is resilient to such stresses. The available information provides a broad understanding of the key elements of the ecosystem and of the functions of the Components. The more recent work by Yesson et al (2015, 2016) and Gougeon et al (2016) has expanded added greatly to our understanding of spatial distribution of major habitats, and research by Jorgensen (unpubl.) has provided substantial information on actual and likely distribution of VME. SG60 and SG80 are met.		
b	Guidepost	Main impacts of the fishery on these key ecosystem elements can be inferred from existing information, and have not been investigated in detail.	Main impacts of the fishery on these key ecosystem elements can be inferred from existing information and some have been investigated in detail.	Main interactions between the fishery and these ecosystem elements can be inferred from existing information, and have been investigated in detail.
	Met?	Y	Y	N

PI 2.5.3		There is adequate knowledge of the impacts of the fishery on the ecosystem
	Justification	**Impacts on trophic structure** Information compiled for a mass balance study of the west Greenland ecosystem indicates that northern shrimp are important prey for cod, redfish, Greenland halibut, and to a lesser extent flatfishes, rays and marine mammals (Pedersen and Zeller 2001). This is consistent with information on predators of northern shrimp throughout its range (Parsons 2005a, b). These predators have other options for prey species (Pedersen and Zeller 2001). Information on prey of northern shrimp from an ecosystem study in another northern shrimp ecosystem (northern Gulf of St. Lawrence; Savenkoff et al 2006) is probably generally applicable here. Information from a recent food web study on the west Greenland shelf (Moller 2006) generally confirms information from other areas on the place of northern shrimp in the trophic structure. No information is available specifically on predator-prey relationships of larval northern shrimp, but good information is available on their size, morphology, general behaviour and seasonality (e.g. Bergström 2000) from which predator-prey relationships can be inferred. Information on shrimp catches is excellent and information on fish bycatch is available; although detailed species-level information has only been available for a relatively short time and is not readily accessible. The main impacts of the fishery on trophic structure can be inferred from this information and some have been investigated in detail. A score of 80 is therefore appropriate for this element. **Impacts on benthic biodiversity and community structure and function** Studies suggest that mortality of fish escaping via the Nordmore grate would be low (Soldal and Engas 1997; Broadhurst 2000; Suuronen 2005). A study of biodiversity on all bottom types within the 200 m contour has been initiated by the Greenland Climate Centre, and several publications are available on biodiversity in fjords and near-shore areas of west Greenland. Substantial information on the nature and distribution of major habitat types, VMEs, and trawling impacts and recovery has been collected in recent years and published (Yesson et al 2015,16; Gougeon et al 2015). A review of shrimp trawling gear similar to that used in this area (Grant and Hiscock 2010) also concluded that non-catch impacts of this gear on benthic and demersal fauna are likely to be relatively low. Bycatch of bottom invertebrates is not recorded in the one available study (Sunksen 2007) but is probably very low, based on a comprehensive study of bycatch in a nearby shrimp fishery using similar gear (Siferd 2010).

PI 2.5.3		**There is adequate knowledge of the impacts of the fishery on the ecosystem**		
		Tables and charts of bottom types have been prepared by skippers (Management Plan Appendix 2) and provide some potentially useful information on distribution of benthic ecosystems, complimenting the recent scientific survey described above. Information from the fleet on bottom communities was used to identify two areas near the west coast closed to trawling to protect sensitive coral habitats. The main impacts of the fishery on benthic community structure and function can be inferred from this information and some have been investigated in detail. Main interactions are broadly understood and some have been investigated in detail. However information remains limited especially in new fishing areas in the north. SG60 and SG80 are met but SG100 is not.		
c	**Guidepost**		The main functions of the Components (i.e., target, Bycatch, Retained and ETP species and Habitats) in the ecosystem are known.	The impacts of the fishery on target, Bycatch, Retained and ETP species are identified and the main functions of these Components in the ecosystem are understood.
	Met?		Y	N
	Justification	The impacts of the fishery on target (shrimp), Bycatch (primarily redfish and cod), ETP species (none) and habitats are identified and the main functions of these Components in the ecosystem are reasonably well understood. SG 80 is met, however SG100 is not met as there is less knowledge associated with the test fishery operating further north.		
d	**Guidepost**		Sufficient information is available on the impacts of the fishery on these Components to allow some of the main consequences for the ecosystem to be inferred.	Sufficient information is available on the impacts of the fishery on the Components and elements to allow the main consequences for the ecosystem to be inferred.
	Met?		Y	Y
	Justification	Direct and indirect impacts on target species, other demersal fish and benthic habitats are known and their role in the ecosystem reasonably understood – meaning that main consequences can be inferred – either quantitatively through stock assessment models or qualitatively with regard to effects on benthic habitat and other invertebrates. SG80 and SG100 are met.		

PI 2.5.3		**There is adequate knowledge of the impacts of the fishery on the ecosystem**		
e	**Guidepost**		Sufficient data continue to be collected to detect any increase in risk level (e.g., due to changes in the outcome indicator scores or the operation of the fishery or the effectiveness of the measures).	Information is sufficient to support the development of strategies to manage ecosystem impacts.
	Met?		Y	Y
	Justification	Ongoing data collection on catch of target and bycatch species, and on the various measures to manage these should allow for the detection of any increase in risk related to these elements and is sufficient to support development of strategies to manage ecosystem impacts for these elements. Information on encounters with VME in new fishing areas should allow for development of appropriate strategies for their protection. Monitoring of the state of VME and commonly encountered habitats is more challenging but should nonetheless allow for development of appropriate strategies. SG 80 and 100 are met.		
References		» Buch, E., S. A. Pedersen and M. H. Ribergaard 2004. Ecosystem variability in west Greenland waters. J. Northw. Atl. Fish. Sci. 34: 13-28. Yesson et al (2015, » Other references as previously cited.		
OVERALL PERFORMANCE INDICATOR SCORE:				**90**
CONDITION NUMBER (if relevant):				

Evaluation Table for PI 3.1.1

PI 3.1.1		**The management system exists within an appropriate legal and/or customary framework which ensures that it:** • **Is capable of delivering sustainable fisheries in accordance with MSC Principles 1 and 2; and** • **Observes the legal rights created explicitly or established by custom of people dependent on fishing for food or livelihood; and** • **Incorporates an appropriate dispute resolution framework.**		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guidepost**	There is an effective national legal system and a framework for cooperation with other parties, where necessary, to deliver management outcomes consistent with MSC Principles 1 and 2	There is an effective national legal system and organised and effective cooperation with other parties, where necessary, to deliver management outcomes consistent with MSC Principles 1 and 2.	There is an effective national legal system and binding procedures governing cooperation with other parties which delivers management outcomes consistent with MSC Principles 1 and 2.
	Met?	Y	N	
	Justification	It is noted that P1 relates to the whole stock (Canada and Greenland) while P2 relates to the UoA (vessels operating in W Greenland). As such the necessary co-operation for P1 extends to co-operation between Canada and Greenland, while P2 relates to co-operation between parties within Greenland.		
	Justification	Greenland and Canada are fishing different portions of a shared stock of northern prawn. Their decisions for the management of their fisheries are based on the same scientific advice, from NAFO. The NAFO Convention contains binding procedures governing cooperation with other contracting parties. That cooperation delivers sustainable management under the obligations of UNCLOS Articles 63(2), 118, 119, and UNFSA Article 8. It further delivers the intent of UNFSA Article 10 paragraphs relating to the collection and sharing of scientific data, the scientific assessment of stock status, and development of scientific advice. This addresses requirements for at SG60 as the cooperation delivers the intent of UNFSA Article 10 with the collection and sharing of scientific data, the assessment of stock status and the development of scientific advice.		

		As the fisheries are then prosecuted by vessels fishing in their own waters, technical measures and TACs are enacted separately under their own jurisdictions. The Greenland government has established a fishery management regime based on its *Fisheries Act, 1996* and regulations made thereunder. which provides for a wide array of management and conservation measures including harvest controls, vessel surveillance, catch reporting, on-board observers, TAC setting, identification of fishing vessels, satellite surveillance, access to fishing areas, catch reporting and licence control measures. Within Canada's EEZ, there is a well-established legislative framework. The single-jurisdiction federal system has enacted several pieces of legislation that govern fisheries, notably the *Fisheries Act* and the *Oceans Act*, which grant authority and regulatory powers for the management of fisheries and oceans. The *Atlantic Fishery Regulations*, 1985 and the *Fishery (General) Regulations* are the main regulatory instruments governing the fishery. Management measures are developed under the authority of the *Act* and regulatory powers have been delegated to DFO officials. Both Canada and Greenland have set harvest limits and strategies which work independently to achieve management objectives reflected in the target and limit reference points. However, this approach has led to the combined TAC being above NAFO SC advice, due to a lack of agreement on catch shares. For several years talks between Canada and Greenland have been ongoing but as yet there is no agreement on catch shares. The assessment team agrees with (and this scoring harmonises with) the assessment of the Canadian fishery: Agreement between the parties on joint action to reduce exploitation to acceptable levels in the event of such a situation is needed. So while a framework for co-operation exists and SG60 is met, there is not currently organized and effective cooperation with other parties exists to deliver management outcomes consistent with MSC Principles 1 and 2.SG80 is not met and a Condition is set.		
b	**Guidepost**	The management system incorporates or is subject by law to a mechanism for the resolution of legal disputes arising within the system.	The management system incorporates or is subject by law to a transparent mechanism for the resolution of legal disputes which is considered to be effective in dealing with most issues and that is appropriate to the context of the fishery.	The management system incorporates or subject by law to a transparent mechanism for the resolution of legal disputes that is appropriate to the context of the fishery and has been tested and proven to be effective.

	Met?	Y	Y	N
	Justification	Stakeholders (including GFLK) identified that legal disputes are proactively avoided through discussion of emerging issues at the Fisheries Council. GFLK and the police initially warn and then fine or confiscate gear and catch using powers afforded by the Fisheries Act. Article 13 para 38 of the Fisheries Act 1996 establishes the right of stakeholders to appeal decisions and that these can be resolved by the General Court for larger vessels and companies. Greenlandic Law requires compliance with judicial decisions. Unless otherwise agreed, a two-month period is stated under the Fisheries Act for an adequate response to judicial decisions. This is a transparent mechanism that is proven to be effective with various legal challenges regarding violations of fisheries regulations. SG 60 and 80 are met. At an international level for this shared stock, disputes between or among Contracting Parties about proposals before the NAFO FC are first subject to the usual discussion and negotiating process. NAFO has a solid history of resolving most disputes through this mechanism. For disputes that cannot be resolved through this process, a formal objection procedure is provided for in Article XV of the NAFO Convention: 1. If any Commission member presents to the Executive Secretary an objection to a proposal within sixty days of the date of transmittal specified in the notification of the proposal by the Executive Secretary, the proposal shall not become a binding measure until the expiration of forty days following the date of transmittal specified in the notification of that objection to the Contracting Parties. There upon any other Commission member may similarly object prior to the expiration of the additional forty-day period, or within thirty days after the date of transmittal specified in the notification to the Contracting Parties of any objection presented within that additional forty-day period, whichever shall be the later. The proposal shall then become a measure binding on all Contracting Parties, except those which have presented objections, at the end of the extended period or periods for objecting. If, however, at the end of such extended period or periods, objections have been presented and maintained by a majority of Commission members, the proposal shall not become a binding measure, unless any or all of the Commission members nevertheless agree as among themselves to be bound by it on an agreed date. This process means that a NAFO Contracting Party that submits a formal objection to a proposed measure may elect to not be bound by that measure. Unless a majority of Contracting Parties object to a measure, the measure becomes binding on all who do not register an objection. The mechanism has been considered effective in dealing with most issues, as evidenced by the various resolutions adopted by the contracting parties. However, the ability to abstain from measures indicates that a mechanism to resolve disputes has not been fully tested and SG100 is not therefore met.		

d	**Guidepost**	The management system has a mechanism to generally respect the legal rights created explicitly or established by custom of people dependent on fishing for food or livelihood in a manner consistent with the objectives of MSC Principles 1 and 2.	The management system has a mechanism to observe the legal rights created explicitly or established by custom of people dependent on fishing for food or livelihood in a manner consistent with the objectives of MSC Principles 1 and 2.	The management system has a mechanism to formally commit to the legal rights created explicitly or established by custom of people dependent on fishing for food and livelihood in a manner consistent with the objectives of MSC Principles 1 and 2.
	Met?	Y	Y	N
	Justification	The West Greenland prawn fishery operates entirely within Greenland's EEZ, which is under the Greenland Self-Government's regulation and legal system. As described in section 4.3 of the main report, the legal framework for the management of Greenland's fisheries resources is provided by the 'Fisheries Act'). The Act is implemented through numerous executive orders, issued in pursuance of the Act, which provide more detailed regulation in specific aspects of fisheries management and for specific fisheries. Section 2, subsection 2 states: In the administration of this Act, emphasis shall be given to the conservation and reproduction of the resources, and to the need to keep the impact of the fishing on the ecosystem at an acceptable level. Moreover, emphasis shall also be placed on the rational and seasonally best exploitation, in accordance with the usual scientific advice and the recreational needs of the population. This is an explicit recognition of the need to observe the rights of the Greenlandic people and SG 60 and SG80 are met), but does not represent a formal commitment therefore SG100 is not met. As this is a shared stock, Canada's management of the stock, including its observance of fishing-dependent people is relevant to the scoring of this PI. The *Constitution Act, 1982* recognizes and confirms aboriginal and treaty rights of the indigenous peoples of Canada including the guarantee of legal rights to fish for food and livelihood. This section has been litigated and confirmed by the SCC on several occasions and constitutes a formal commitment to the rights of aboriginal peoples. Disputes regarding aboriginal fishing rights have been fairly litigated (*R.v Sparrow, R.v Marshall*) and have led to current policy initiatives that ensures the protection of aboriginal rights, the "*Aboriginal Fisheries Strategy"* (DFO 2008b) which is aimed at ensuring that entitlements are respected in the development of fisheries management regimes for aboriginal peoples. This is a formal commitment and SG100 is met by Canada. However SG100 is not met by Greenland.		
References		Canadian DFO 2008		

	Greenland Fisheries Act, 1996 (amended Landstings Act no 29 of 18 December 2003 on the Protection of Nature NAFO 2007
OVERALL PERFORMANCE INDICATOR SCORE:	**75**
CONDITION NUMBER (if relevant):	**1**

Evaluation Table for PI 3.1.2

PI 3.1.2		The management system has effective consultation processes that are open to interested and affected parties. The roles and responsibilities of organisations and individuals who are involved in the management process are clear and understood by all relevant parties		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guidepost**	Organisations and individuals involved in the management process have been identified. Functions, roles and responsibilities are generally understood.	Organisations and individuals involved in the management process have been identified. Functions, roles and responsibilities are explicitly defined and well understood for key areas of responsibility and interaction.	Organisations and individuals involved in the management process have been identified. Functions, roles and responsibilities are explicitly defined and well understood for all areas of responsibility and interaction.
	Met?	Y	Y	Y
	Justification	Section 4.3 of the main report describes the organisations involved in fisheries management system in Greenland. These roles and the individuals representing are well understood by stakeholders: SG60 and SG80 are met. The organisation of the MFHA is well understood by stakeholders, as is the membership and role of the Fisheries Council. Article 12 of the Fisheries Act explicitly states the aspects of Fisheries regulation where the Fisheries Council can advise. Article 9 of the Act defines the role and responsibilities of the GINR. Article 11 of the Act specifies the role of the GFLK. The roles and responsibilities within Greenland are explicitly defined by the fisheries act and well understood by all parties for all areas of responsibility and interaction. The same is true at an international level, with the NAFO convention clearly setting out the roles and functions of the General Council, Scientific Council and contracting members. SG100 is met.		

PI 3.1.2		**The management system has effective consultation processes that are open to interested and affected parties.** **The roles and responsibilities of organisations and individuals who are involved in the management process are clear and understood by all relevant parties**		
b	**Guidepost**	The management system includes consultation processes that obtain relevant information from the main affected parties, including local knowledge, to inform the management system.	The management system includes consultation processes that regularly seek and accept relevant information, including local knowledge. The management system demonstrates consideration of the information obtained.	The management system includes consultation processes that regularly seek and accept relevant information, including local knowledge. The management system demonstrates consideration of the information and explains how it is used or not used.
	Met?	Y	Y	Y
	Justification	The Fisheries Council (which meets monthly or more regularly at the request from a member organisation for an extraordinary meeting) is the main mechanism by which relevant information, including local knowledge is sought and accepted by the MFHA. Any changes in legislation such as proposed Executive Orders are circulated for comment to a full range of stakeholders. SG80 is met. There is regular consultation between the fishermen's representatives in KNAPK and the MFHA. There is also regular consultation between the MFHA and the fishing companies involved in the prawn fishery. The annual NAFO process contains provisions and rules of procedure that regularly seeks and accepts relevant information. Annual assessment reports of the SC and proceedings of the FC include consideration of relevant information and indicate how it is used or not used. Stock assessment documents and meeting proceedings are approved and published on the NAFO website. The working group on the development of the management plan for northern prawn illustrates the extensive consultation processes in place. The management system feedbacks to the Fisheries Council how information was used and not used in decision-making and SG100 is met.		
c	**Guidepost**		The consultation process provides opportunity for all interested and affected parties to be involved.	The consultation process provides opportunity and encouragement for all interested and affected parties to be involved, and facilitates their effective engagement.
	Met?		Y	N

PI 3.1.2		**The management system has effective consultation processes that are open to interested and affected parties.** **The roles and responsibilities of organisations and individuals who are involved in the management process are clear and understood by all relevant parties**
	Justification	Participation of the fishers and hunters association (KNAPK) and the Greenland Employers Association in the Fisheries Council enables all interested and affected parties to be involved in consultation processes (SG 80 is met). Any changes in legislation such as proposed Executive Orders are circulated for comment to a full range of stakeholders, including these groups whose membership extends to all participants in the fishery. The Fisheries Council structure facilitates the effective engagement of all stakeholders as member organisations disseminate information to individual members and SG100 is met at a national level. The consultation process facilitated by NAFO for this stock shared between Greenland and Canada is less inclusive than the those employed at a national level in each country. While observer status can be given for attendance at NAFO meetings, it does not actively facilitate the effective engagement of all interested parties and so SG100 is not met.
References		Greenland Fisheries Act, 1996 (amended) NAFO 2007
OVERALL PERFORMANCE INDICATOR SCORE:		**95**
CONDITION NUMBER (if relevant):		

Evaluation Table for PI 3.1.3

PI 3.1.3		The management policy has clear long-term objectives to guide decision-making that are consistent with MSC Principles and Criteria, and incorporates the precautionary approach		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guidepost**	Long-term objectives to guide decision-making, consistent with the MSC Principles and Criteria and the precautionary approach, are implicit within management policy	Clear long-term objectives that guide decision-making, consistent with MSC Principles and Criteria and the precautionary approach are explicit within management policy.	Clear long-term objectives that guide decision-making, consistent with MSC Principles and Criteria and the precautionary approach, are explicit within and required by management policy.
	Met?	Y	Y	N
	Justification	The NAFO FC has adopted the Precautionary Framework that was developed by the NAFO SC and has agreed to manage NAFO stocks following that framework. The principal long-term objective of NAFO is explicitly defined in the Convention as "...the optimum utilization, rational management and conservation of the fishery resources of the Convention Area. NAFO promotes contemporary ideas for international collaboration in the high seas based on the scientific research fundamentals." (NAFO 1979). The Convention outlines a detailed framework for the development and implementation of fishery management plans to meet this overall objective. The Greenland Fishery Act states "In the administration of this Act, emphasis must be placed on the conservation and reproduction of resources and on keeping the fishery's impact on the ecosystem at an acceptable level. Moreover, emphasis is placed on the most rational and seasonally best exploitation in accordance with common biological advice and the recreational needs of the inhabitants". Section 4.3 of this report lists relevant objectives, which illustrate that clear long-term objectives are in place and that these are consistent with the MSC criteria for both Principles 1 and 2 (SG60 is met). The northern prawn management plan operates under the Fisheries Act. The Act's long-term objectives are therefore explicit within this fishery's management plan (SG80 is met). However, there is no indication that this is a stated requirement of management policy and therefore SG100 is not met.		
References		Greenland Fisheries Act, 1996 (amended) NAFO 2007		
OVERALL PERFORMANCE INDICATOR SCORE:				**80**
CONDITION NUMBER (if relevant):				

Evaluation Table for PI 3.1.4

PI 3.1.4		The management system provides economic and social incentives for sustainable fishing and does not operate with subsidies that contribute to unsustainable fishing		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guidepost**	The management system provides for incentives that are consistent with achieving the outcomes expressed by MSC Principles 1 and 2.	The management system provides for incentives that are consistent with achieving the outcomes expressed by MSC Principles 1 and 2, and seeks to ensure that perverse incentives do not arise.	The management system provides for incentives that are consistent with achieving the outcomes expressed by MSC Principles 1 and 2, and explicitly considers incentives in a regular review of management policy or procedures to ensure they do not contribute to unsustainable fishing practices.
	Met?	Y	Y	N
	Justification	The following aspects of the Greenland management system provide mechanisms and benefits that can be regarded as incentives for achieving sustainability of the fishery and its environment: • The critical importance of shrimp fishery income for the Greenland economy as a whole • The implementation of regulations that provide rights through licensing • Introduction of the ITQ system, and on-board processing of shrimp on offshore vessels • Provision of boat quotas for the inshore fishery, and capacity limitation in the inshore fishery by virtue of transferable capacity points • Rights to participation in decision making through membership of fisheries associations, and their representation on the Fisheries Council • Rules on quota flexibility (carrying unused quota over, or borrowing from next year's quota) that incentivise against cheating on quotas. • Scrutiny of the outcome of the management system, nationally by the Fisheries Council, and internationally by the NAFO Scientific Council • Economic advantages of reducing the risk of gear damage by adopting rock hopper gear, toggle chains, and by avoiding hard bottom areas. • Fish excluding device reduces by-catch and hence eliminates sorting and discarding issues No direct subsidies or perverse incentives were identified by stakeholders. Grants for modernisation have been given in the past but have been conditional on reducing overall capacity of the fleet.		

		In Canadian waters the Enterprise Allocation system of fishing provides a quasi-property right to each offshore licence holder. Such stability and security of access provides strong economic incentives to harvest for the long-term to maximize value and not volume and to minimize negative impacts on the stock and its ecosystem (Acoura, 2016) The above economic and social incentives are consistent with achieving the outcomes expressed by MSC Principles 1 and 2 (SG60 & 80 are met), but there is no indication that incentives are explicitly considered in management policy review and SG100 is not met.
References		Acoura 2016 Canadian shrimp MSC re-assessment report September, 2016
OVERALL PERFORMANCE INDICATOR SCORE:		**80**
CONDITION NUMBER (if relevant):		

Evaluation Table for PI 3.2.1

PI 3.2.1		The fishery has clear, specific objectives designed to achieve the outcomes expressed by MSC's Principles 1 and 2		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guidepost**	Objectives, which are broadly consistent with achieving the outcomes expressed by MSC's Principles 1 and 2, are implicit within the fishery's management system	Short and long-term objectives, which are consistent with achieving the outcomes expressed by MSC's Principles 1 and 2, are explicit within the fishery's management system.	Well defined and measurable short and long-term objectives, which are demonstrably consistent with achieving the outcomes expressed by MSC's Principles 1 and 2, are explicit within the fishery's management system.
	Met?	Y	Y	Partial
	Justification	The Greenland fishery operates under a management plan that was developed in 2010 and revised in 2015. This revision is still to be formally approved due to administrative delays in approving a new Executive Order, but there is consensus that the fishery is to be managed in accordance with this updated version (MFHA, 2015). The previous and current Management Plan set out a clear harvest strategy and harvest control rules to support this: • The principal objective is to maintain the stock in a condition in which it can be most profitably fished (i.e. largest net revenue from the fishery) • harvest control rules should maintain the stock with high probability ABOVE the MSY level It notes that: "with a principal objective that seeks to *maintain* the stock, sustainability is implicit and need not be separately specified" However in relation to Principle 2 aspects, the plan also defines a series of measures that can be considered to support P2 outcomes: Short-term measures: - Increased knowledge of vulnerable habitats through data collected from the knowledge bank of the fishing fleets; - Resources have been obtained for a business Ph.D. (Helle Jørgensbye) in which a student is collecting existing data on bottom types and conditions and on the effect of the trawl fishery; - A research project has been started (Dr Kirsty Kemp) where the objective is to use bottom photography to evaluate the bottom condition and relate it to the historical intensity of trawling; - Vulnerable marine areas identified from skippers' knowledge have been closed to trawl fishing; Long-term measures: - Fishery managers and fishermen will work together with Grønlands Naturinstitut to develop a strategic research plan that		

PI 3.2.1		The fishery has clear, specific objectives designed to achieve the outcomes expressed by MSC's Principles 1 and 2
		will include benthic investigations and monitoring of the effect of the trawl fishery; - The Department for Fishery, Hunting and Agriculture will take the fishery's effect on ecosystems into consideration and where it is necessary will introduce regulations to the end that the integrity of the benthic environment is assured to a sufficient degree that the structure and function of the ecosystem is maintained. The currently applied Management Plan explicitly states short and long-term objectives consistent with P1 and P2 outcomes (SG60 & 80 is met). These are well-defined and some of these are measurable (SG100 is partially met and a score of 90 given).For the Canadian part of the fishery short and long-term fishery-specific objectives are set out in the IFMP (DFO 2010). Three principles or long-term objectives to manage the CNSSF are outlined in the following sections: i) Conservation and sustainable harvest, ii) Benefits to stakeholders and, iii) Co-management of the shrimp resource. Strategies and management measures enumerated under each principle are considered to be medium- and short-term objectives for management of the fishery consistent with the MSC requirements. It is noted that the P2-related objectives are not as well defined and therefore a score of 90 is given (Acoura, 2016)
References		DFO, 2010 Integrated Fishery Management Plan for Greenland Halibut NAFO Sub-Area 0 (Canadian DFO) http://www.dfo-mpo.gc.ca/fm-gp/peches-fisheries/ifmp-gmp/groundfish-poisson-fond/halibut-fletan-eng.htm MFHA 2015 Management Plan for the Shrimp Trawl fishery in West Greenland
OVERALL PERFORMANCE INDICATOR SCORE:		**90**
CONDITION NUMBER (if relevant):		

Evaluation Table for PI 3.2.2

PI 3.2.2		The fishery-specific management system includes effective decision-making processes that result in measures and strategies to achieve the objectives, and has an appropriate approach to actual disputes in the fishery under assessment.		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guidepost**	There are some decision-making processes in place that result in measures and strategies to achieve the fishery-specific objectives.	There are established decision-making processes that result in measures and strategies to achieve the fishery-specific objectives.	
	Met?	Y	Y	
	Justification	Decision-making processes in Greenland are well-established. In accordance with the fisheries legislation in force, the Minister for Fisheries is required to hear advice from the Fishery Council on a number of defined issues. This requirement is given in §32 of the Fisheries Act, where the composition of the Fishery Council is also laid down. The Minister prepares decision briefs within the limits of the fisheries legislation in force. These suggestions are submitted to cabinet and approved or rejected. (MFHA, 2015) In Canada the Northern Shrimp Advisory Committee (NSAC) serves as a forum for the discussion of issues on the management and development of the northern shrimp fishery providing advice and recommendations to the Minister of Fisheries and Oceans. The NSAC provides input for the content of the IFMP, including but not limited to advice on quota allocations and regulatory measures such as seasons, size limits, gear restrictions, conservation, compliance issues and licensing policy. Advice to the Minister is analyzed by the DFO after which decisions are made and incorporated into the IFMP. At international level, decision-making in the NAFO Scientific Council is based on the Rules of Procedure for the SC that is part of the NAFO Rules of Procedure and Financial Regulations. The document outlines guidelines for representation, voting, order of business, committees and records and reports. Similar rules exist in the Convention for decisions of the NAFO. For all jurisdictions within the fishery, the processes result in measures and strategies to achieve the fishery-specific objectives (SG60 & 80 is met).		

PI 3.2.2		**The fishery-specific management system includes effective decision-making processes that result in measures and strategies to achieve the objectives, and has an appropriate approach to actual disputes in the fishery under assessment.**		
b	**Guidepost**	Decision-making processes respond to serious issues identified in relevant research, monitoring, evaluation and consultation, in a transparent, timely and adaptive manner and take some account of the wider implications of decisions.	Decision-making processes respond to serious and other important issues identified in relevant research, monitoring, evaluation and consultation, in a transparent, timely and adaptive manner and take account of the wider implications of decisions.	Decision-making processes respond to all issues identified in relevant research, monitoring, evaluation and consultation, in a transparent, timely and adaptive manner and take account of the wider implications of decisions.
	Met?	Y	Y	N
	Justification	In Greenland the Fishery Council's responses to government proposals are published on a web-page set up by the government and on the self-government web-site www.nanoq.gl. In accordance with its constitution, the Fishery Council is also entitled to submit its own suggestions and proposals to the Minister. With the development of the management plan and early adoption of key measures it is clear that serious and important issues are addressed in a timely and adaptive manner (SG60 & 80 is met). However, the lengthy parliamentary process for formal approval shows that all issues are not addressed in such a timely way (SG100 is not met) In Canada the NSAC reviews issues identified through research, monitoring, evaluation and consultation at its meetings. Stock assessments or updates are conducted each year and ensuing reports are tabled at NSAC meetings. DFO management staff present a resource overview of TAC, landings, number of active fish harvesters and combined enterprises. This, as with the NAFO SC process at international level, shows that the processes are responsive to serious issues such as stock status (SG60 & 80 is met), but are not responsive to all issues taking into account wider implications (SG100 is not met).		
c	**Guidepost**		Decision-making processes use the precautionary approach and are based on best available information.	
	Met?		Y	

PI 3.2.2		**The fishery-specific management system includes effective decision-making processes that result in measures and strategies to achieve the objectives, and has an appropriate approach to actual disputes in the fishery under assessment.**		
	Justification	In Greenland, new environmental legislation explicitly focuses on the principle of sustainability and requires that an ecosystem and precautionary approach be applied in combination with the best accessible technology. Within the Canadian system, the use of the precautionary approach in the exploitation of marine resources is legislatively enshrined in the *Oceans Act* (1996). There is a clearly articulated legislative and policy framework consistent with MSC Principles and Criteria in both NAFO and Canada that guides decision-making including guidelines for the precautionary approach. Reference points are included in the current management plan. Decision-making processes, in Greenland, NAFO and Canada use the precautionary approach and are based on best available information (SG80 is met).		
d	**Guidepost**	Some information on fishery performance and management action is generally available on request to stakeholders.	Information on fishery performance and management action is available on request, and explanations are provided for any actions or lack of action associated with findings and relevant recommendations emerging from research, monitoring, evaluation and review activity.	Formal reporting to all interested stakeholders provides comprehensive information on fishery performance and management actions and describes how the management system responded to findings and relevant recommendations emerging from research, monitoring, evaluation and review activity.
	Met?	Y	Y	N
	Justification	Decisions are explained within the Fisheries Council (SG80 is met). The detailed of discussions within this forum are not published (SG100 is not met) although Council responses to government proposals are (see above). In Canada and NAFO information is presented at the annual NSAC and NAFO SC meetings respectively (SG80 is met). Minutes are published, however, the detail of discussions is lacking and there is no formal reporting to all interested parties (SG100 is not met)		

PI 3.2.2		**The fishery-specific management system includes effective decision-making processes that result in measures and strategies to achieve the objectives, and has an appropriate approach to actual disputes in the fishery under assessment.**		
e	**Guidepost**	Although the management authority or fishery may be subject to continuing court challenges, it is not indicating a disrespect or defiance of the law by repeatedly violating the same law or regulation necessary for the sustainability for the fishery.	The management system or fishery is attempting to comply in a timely fashion with judicial decisions arising from any legal challenges.	The management system or fishery acts proactively to avoid legal disputes or rapidly implements judicial decisions arising from legal challenges.
	Met?	Y	Y	Y
	Justification	In Greenland, disputes are proactively avoided through discussion at Fisheries Council. Disputes between members are dealt with in the civilian or criminal courts. There are no legal challenges or any related binding judgements to which the Greenland Government has to respond or adhere. The NAFO process and the domestic Canadian advisory system along with very active hands-on management of the fishery in consultation with the major stakeholders acts proactively to avoid legal disputes during the fishing season. In Canada judicial decisions arising from prosecutions or legal challenges are implemented immediately or as soon as is practically possible. It should be noted that the lack of agreement between Canada and Greenland and TAC share has not escalated to a legal dispute and discussions are ongoing. SG60, 80 and 100 are met in all jurisdictions of the fishery.		
References		Greenland Fisheries Act, No. 18, 1996, as amended Canada Oceans Act. R.S., 1996 (Canada)		
OVERALL PERFORMANCE INDICATOR SCORE:				**85**
CONDITION NUMBER (if relevant):				

Evaluation Table for PI 3.2.3

PI 3.2.3		Monitoring, control and surveillance mechanisms ensure the fishery's management measures are enforced and complied with		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guidepost**	Monitoring, control and surveillance mechanisms exist, are implemented in the fishery under assessment and there is a reasonable expectation that they are effective.	A monitoring, control and surveillance system has been implemented in the fishery under assessment and has demonstrated an ability to enforce relevant management measures, strategies and/or rules.	A comprehensive monitoring, control and surveillance system has been implemented in the fishery under assessment and has demonstrated a consistent ability to enforce relevant management measures, strategies and/or rules.
	Met?	Y	Y	N
	Justification	Section 4.3 describes the MCS system implemented by GFLK. The fishing is subject to inspection, as set out in Government of Greenland Executive Order no. 18 of 9 December 2010 on the inspection of offshore fishing, including the obligation to provide statistical information and to keep a logbook. Under Government of Greenland Executive Order no. 7 of 4 April 2016 on the reporting of first sales of fish and fish products, all landings by both Greenlandic and foreign vessels must be reported, regardless of whether the landing is abroad or in Greenland as first-hand purchases with a view to export. There is a comprehensive Canadian monitoring and surveillance system in place within the Canadian EEZ (SG60 and 80 are met). All vessels are issued a licence containing an extensive list of conditions. Measures such as 100% VMS coverage, hail-in/out requirement, daily hails of position, catch and other information, 100% on-board industry funded observer coverage for the offshore fleet and around 5% for the inshore fleet, aircraft surveillance, at-sea boardings and 100% dockside monitoring for the inshore fleet/spot-checks of landings for the offshore fleet ensure good coverage of the fishery. The Greenlandic MCS system can also be considered comprehensive in most respects with the constraints of the paper logbook system now addressed through the roll-out of the e-logbook system (SG60 and 80 are met). However, observer coverage at around 5% of trips is not as high as planned and, as described under P2, the reporting of by-catch is less comprehensive, consequently SG100 is not met.		

PI 3.2.3		Monitoring, control and surveillance mechanisms ensure the fishery's management measures are enforced and complied with		
b	**Guidepost**	Sanctions to deal with non-compliance exist and there is some evidence that they are applied.	Sanctions to deal with non-compliance exist, are consistently applied and thought to provide effective deterrence.	Sanctions to deal with non-compliance exist, are consistently applied and demonstrably provide effective deterrence.
	Met?	Y	Y	N
	Justification	In Canada a ticket and court-based sanction framework is outlined in the *Fisheries Act* and regulations with court-based prosecution for serious offences through the Criminal Code of Canada. Upon conviction maximum penalties of $500,000 and up to two years in jail may be imposed along with forfeiture of catch and equipment at the discretion of the court (Acoura, 2016). Article 13 of the Greenland Fisheries Act outlines sanctions in terms of fines etc. and how they are to be applied. Warnings, fines and the potential for prosecution have been shown to provide effective deterrence in fisheries elsewhere. They are therefore thought to provide effective deterrence in the Greenland halibut fishery and SG60 is met. GFLK, industry and other stakeholders report that sanctions are applied consistently, which is thought to provide effective deterrence and SG80 is met. However, there is no evidence received by the assessment team showing that the proposed sanctions are demonstrably effective and therefore SG100 is not met.		
c	**Guidepost**	Fishers are generally thought to comply with the management system for the fishery under assessment, including, when required, providing information of importance to the effective management of the fishery.	Some evidence exists to demonstrate fishers comply with the management system under assessment, including, when required, providing information of importance to the effective management of the fishery.	There is a high degree of confidence that fishers comply with the management system under assessment, including, providing information of importance to the effective management of the fishery.
	Met?	Y	Y	Y

PI 3.2.3		**Monitoring, control and surveillance mechanisms ensure the fishery's management measures are enforced and complied with**		
	Justification	In Canada fishers provide information of importance to the effective management of the fishery including, commercial landings provided through an industry funded DMP, logbook returns and fishery data through a harvester-funded observer program (Acoura, 2016). In Greenland observer reporting, inspections at sea by GFLK and the Danish Coastguard all provide evidence that leads GFLK to state, and other stakeholders to confirm, that compliance in the fishery is high (SG60 and 80 are met). Fishers provide all required information through elogbooks, which is corroborated through GFLK controls. The observer coverage, while not 100% except in the northern test fishery contributes to a high degree of confidence and SG100 is met.		
d	**Guidepost**		There is no evidence of systematic non-compliance.	
	Met?		Y	
	Justification	Discussions with stakeholders have provided no evidence of systematic non-compliance in either the Greenlandic or the Canadian fishery. SG80 is met.		
References		Acoura 2016 Canadian shrimp MSC re-assessment report September, 2016		
OVERALL PERFORMANCE INDICATOR SCORE:				**85**
CONDITION NUMBER (if relevant):				

Evaluation Table for PI 3.2.4

PI 3.2.4		The fishery has a research plan that addresses the information needs of management		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guidepost**	Research is undertaken, as required, to achieve the objectives consistent with MSC's Principles 1 and 2.	A research plan provides the management system with a strategic approach to research and reliable and timely information sufficient to achieve the objectives consistent with MSC's Principles 1 and 2.	A comprehensive research plan provides the management system with a coherent and strategic approach to research across P1, P2 and P3, and reliable and timely information sufficient to achieve the objectives consistent with MSC's Principles 1 and 2.
	Met?	Y	Y	N
	Justification	Greenland developed a research plan following a condition in the original assessment. There is coordination among several research providers (GINR, Zoological Society of London and multinational cooperation through NIPAG). In Canada an NSAC MSC Working Group composed of industry and DFO Science participants conducted a research gap analysis and developed a list of required, on-going research in 2013-14 (DFO 2014). From the information provided it is evident that Canadian and Greenlandic research planning associated with the fishery has certainly improved over the course of the original certification and SG80 is met, but these elements do not represent a comprehensive research plan as per SG100 requirements.		
b	**Guidepost**	Research results are available to interested parties.	Research results are disseminated to all interested parties in a timely fashion.	Research plan and results are disseminated to all interested parties in a timely fashion and are widely and publicly available.
	Met?	Y	Y	N
	Justification	Results of research are timely and available to industry and the public through published NAFO assessments, and other scientific publications, and reports. The research is reviewed through NAFO and journal peer review processes, and through presentations at scientific conferences. All research is not, however publicly available and SG100 is not met.		
References		DFO 2014 Northern shrimp research related activities, unpublished DFO document, November 9, 2014.		
OVERALL PERFORMANCE INDICATOR SCORE:				**80**

PI 3.2.4	The fishery has a research plan that addresses the information needs of management
CONDITION NUMBER (if relevant):	

Evaluation Table for PI 3.2.5

PI 3.2.5		There is a system of monitoring and evaluating the performance of the fishery-specific management system against its objectives There is effective and timely review of the fishery-specific management system		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guidepost**	The fishery has in place mechanisms to evaluate some parts of the management system.	The fishery has in place mechanisms to evaluate key parts of the management system	The fishery has in place mechanisms to evaluate all parts of the management system.
	Met?	Y	Y	N
	Justification	In Canada DFO fisheries management staff present a resource management overview of landings and activity and C&P personnel present a performance review of enforcement efforts and results. The committee solicits the opinions of members on past performance and focuses on management measures and recommendations for the future. In Greenland, annual reviews are conducted on the effectiveness of decisions on the TAC by GNIR, NIPAG and NAFO scientists, on monitoring and surveillance by GFLK. The Greenland Fisheries Council routinely reviews the management system and processes, fleet capacity, the TAC and its allocation, and surveillance systems, and the need for additional regulations. There are therefore mechanisms to evaluate the key parts of the management system (SG60 and 80 are met) but there is no evidence that all parts of the management system are assessed against the stated objectives for the fishery (SG100 is not met).		
b	**Guidepost**	The fishery-specific management system is subject to occasional internal review.	The fishery-specific management system is subject to regular internal and occasional external review.	The fishery-specific management system is subject to regular internal and external review.
	Met?	Y	Y	N

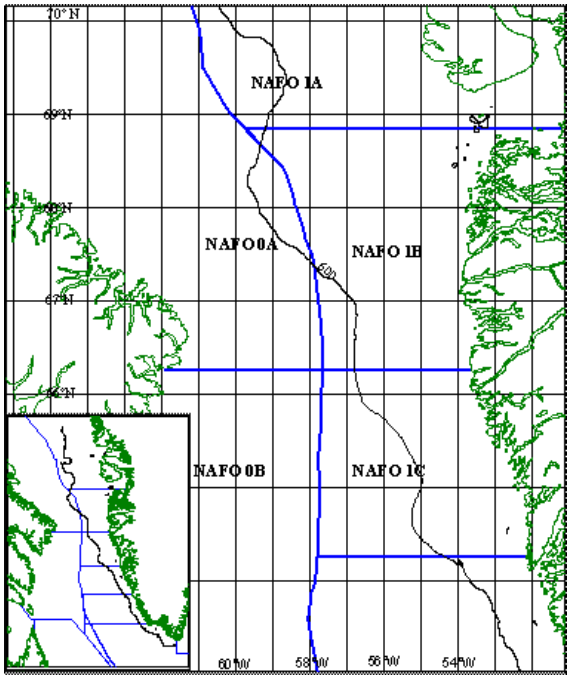
PI 3.2.5		**There is a system of monitoring and evaluating the performance of the fishery-specific management system against its objectives There is effective and timely review of the fishery-specific management system**
	Justification	NAFO established a Performance Assessment Working Group in 2009 to develop a review tasked with addressing NAFO's strengths, weaknesses, challenges and successes, using criteria to identify areas for improvement. A review was conducted in August of 2011 and resulted in 7 recommendations at improving the conservation and management of straddling stocks within the Convention Area, including encouraging all Contracting Parties to become parties to United Nations and FAO fishing protocols, bolstering its commitment to CEMs and catch monitoring/reporting, deterring IUU fisheries and conducting more open, public NAFO FC sessions. SG60 is met. The NIPAG reports also present ongoing evaluation of the effectiveness of management of the fishery. These reports are reviewed by plenary bodies in NAFO and ICES. In addition, the Standing Committee on International Control (STACTIC) of NAFO conducts continuing evaluations of management and surveillance issues. The Greenland shrimp management plan was developed in 2010, then reviewed and revised to an agreed version 2 in 2015. This is in the process of formal approval through parliament, illustrating occasional external review. These represent occasional external review (SG80 is met), but there is not regular external review (SG100 is not met).
References		MFHA 2015 Management Plan for the Shrimp Trawl fishery in West Greenland NAFO, 2011 Performance Assessment Review. August 5, 2011 https://www.nafo.int/Portals/0/PDFs/Performance/PAR-2011.pdf?ver=2016-09-28-051208-390
OVERALL PERFORMANCE INDICATOR SCORE:		**80**
CONDITION NUMBER (if relevant):		

Appendix 1.3 Conditions

Table A1.3: Condition 1

Performance Indicator	3.1.1 (a) There is an effective national legal system and organised and effective cooperation with other parties, where necessary, to deliver management outcomes consistent with MSC Principles 1 and 2.
Score	75
Rationale	Both Canada and Greenland have set harvest limits and strategies which work independently to achieve management objectives reflected in the target and limit reference points. However, this approach has led to the combined TAC being above NAFO SC advice, due to a lack of agreement on catch shares. For several years talks between Canada and Greenland have been ongoing but as yet there is no agreement on catch shares. The assessment team agrees with (and this scoring harmonises with) the assessment of the Canadian fishery: Agreement between the parties on joint action to reduce exploitation to acceptable levels in the event of such a situation is needed. This does not equate to 'effective co-operation with other parties where necessary to deliver management outcomes consistent with Principle 1.'
Condition	Ensure effective co-operation with Canada to deliver management outcomes consistent with MSC Principle 1.
Milestones	Yr. 1 – provide evidence of engagement with Canada to resolve shrimp stock management issues and minutes of those discussions. – Interim score: 75 Yrs2 & 3 – repeat Yr. 1 milestone until co-operation is agreed. - Interim score: 75 Yr. 4 – provide evidence that effective co-operation with Canada to deliver management outcomes consistent with MSC Principle 1 is in place. - Interim score: 80
Client action plan	**Action plan:** **Re: West Greenland coldwater prawn fishery, condition # 1, PI 3.1.1** **Date: Vodskov, 10 April 2018** **From: Sustainable Fisheries Greenland, Peder Munk Pedersen** Greenland and Canada share the stock of prawns normally termed "the west Greenland prawn stock". There is no agreement between the two countries concerning how to determine the TAC, what rules should apply to the fishery, or how to allocate the catch possibilities. In 2004, in response to a special request from Greenland, NAFO's Scientific Council provided the following statement: *a) **Response to Special Request from the Coastal States*** *Denmark (in respect to Faroe Islands and Greenland) had asked the Scientific Council: to update on the distribution of Northern shrimp and provide advice on allocation of TACs to Subarea 0 and Subarea 1.* *The Scientific Council with respect to allocation of TACs to Subareas 0 and 1 responded (SCR Doc. 04/76):*

The distribution area of the Northern shrimp stock off West Greenland includes Subarea 1, from Cape Farewell to 72º30 N and an adjacent small part of Div. 0A between 67ºand 69ºN, east of 60ºW and shallower than 600 m (see map).



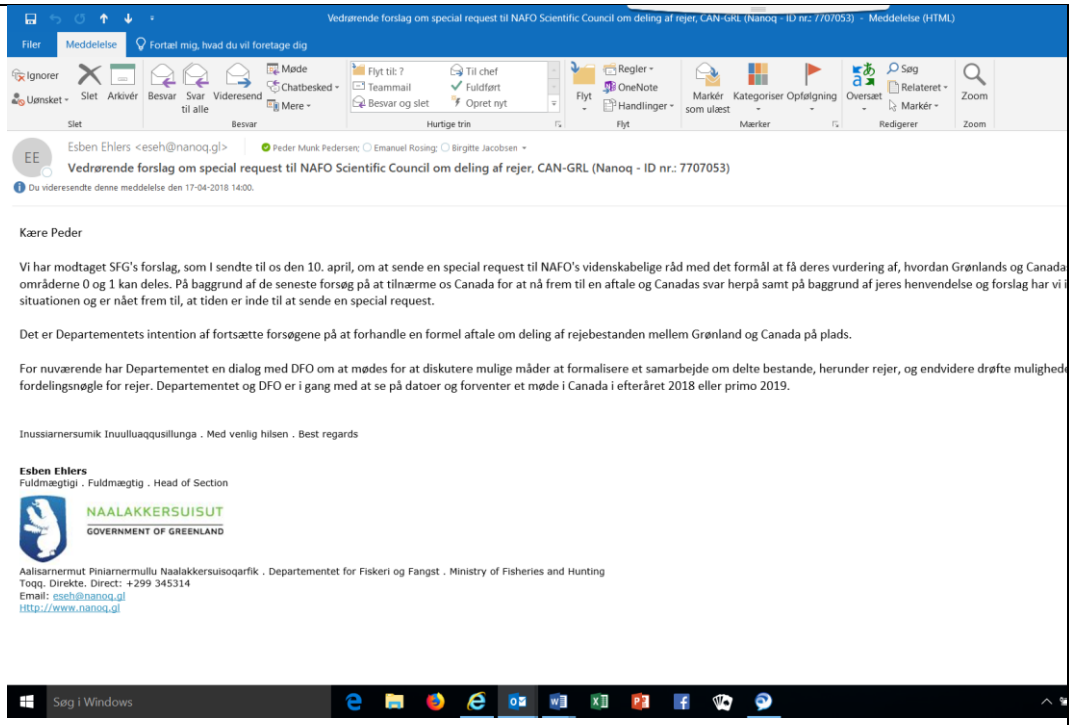
Surveys conducted by Greenland covered the distribution of Northern shrimp in Subarea 1 and Div. 0A, east of 60ºW. The surveys carried out between 1994 and 2004 (with the exception of 2003) have consistent coverage, allowing estimations and comparisons of biomass distribution in the two areas. Annual estimates of biomass have inherent uncertainties and high variance. To minimize effects of these uncertainties the average and range for this period are calculated and used in the analysis. The average percentage of the biomass in Div. 0A was 1.6%, ranging from 0.1% to 4.1%. If TAC for shrimp in Subarea 1 and Div. 0A is split according to the average biomass distribution, the split would be 98.4% in Subarea 1 and 1.6% in Div. 0A. There is no information on the abundance of shrimp in Div. 0A outside of the survey area. Advice on allocation of TAC can be revised, if information on the distribution of shrimp changes.

On the basis of the above, and in view of the catch figures of recent years, SFG's basic position is that Canada's fishing in the SFA 1 area is simply at such a modest level – considering the distribution area of the stock as a whole – that it cannot cause serious or irreversible damage to the overall stock.

Nonetheless, it is SFG's intention to recommend the following to the Government of Greenland:

1. Each year, the Government of Greenland allocates a quantity of prawns to Canada according to the following method of calculation:
    a. Biomass presence is weighted at 60%.
    b. Historic fishing is weighted at 40%.
    c. The calculation includes the average of the last five years' estimated biomass. (Those years in which the Greenland Institute of Natural Resources has been unable to conduct a survey in the area are excluded from the calculation.)

	d. The calculation includes the average of the last five years' fishing (i.e. the last five calendar years, regardless of whether fishing has taken place or not). 2. To continue to place pressure on Canada, so that actual negotiations on the common prawn stock can be resumed and brought as soon as possible to an acceptable conclusion for both parties. Actual joint management of the common prawn stock should consist of the following elements: a. Joint determination of the TAC. b. Determination of a common harvest strategy and harvest control rules. c. Joint determination of a distribution key for the resulting quota. 3. To continue to place pressure on Canada so that agreement can be reached on submitting a joint special request to NAFO's Scientific Council, requesting the identification of objective criteria for the allocation of the fishing possibilities. 4. In the event that inquiries to Canada remain fruitless, to ask the Government of Greenland to unilaterally request the NAFO Scientific Council to set objective criteria for the common fishing possibilities. 5. Based on the recommendation from SFG, the Greenland Department for Fisheries has decided that a unilateral special request should be forwarded to NAFO's Scientific Council as soon as possible. This is stated in the attached appendix 1 (original Danish text and translation to English by O'Shea Translations Silkeborggade 9 3tv, DK-2100 Copenhagen, Denmark, tel: +45 3526 0768, e-mail: billy@oshea.dk, web: www.oshea.dk). 6. The attempts to solve the apparent sharing problems will be two-fold, since it is the Ministry's intention to continue the attempts to negotiate a formal agreement on the sharing of the prawn stock between Greenland and Canada. 7. This allows us to determine the following steps with the aim of closing condition 1 (PI 3.1.1): a. Year 1: Report to the assessment team any progress reaching an agreement on a distribution key for the West Greenland prawn stock. b. Year 2: Report to the assessment team the response of NAFO's Scientific Council to the special request from Greenland, and any progress reaching an agreement on a distribution key for the West Greenland prawn stock. c. Year 3: Report to the assessment team any progress reaching an agreement on a distribution key for the West Greenland prawn stock. d. Year 4: Provide evidence that effective co-operation with Canada consistent with MSC principle 1 is in place and operative.
Consultation on condition	Regarding the attempts to negotiate a formal agreement on the sharing of the prawn stock between Greenland and Canada, SFG has received the following e-mail from the Greenland Government:



Translation:
Dear Peder

We have received SFG's proposal, which you sent to us on 10 April, to send a special request to NAFO's scientific council for the purpose of receiving their assessment on how Greenland and Canada's joint prawn stock in NAFO areas 0 and 1 can be shared. On the basis of the latest attempts to approach Canada in order to reach an agreement, and Canada's response to this, as well as your inquiry and proposal, we have assessed the situation in the Ministry and have concluded that the time has come to send a special request.

It is the Ministry's intention to continue the attempts to negotiate a formal agreement on the sharing of the prawn stock between Greenland and Canada.

Currently, the Ministry is taking part in dialogue with DFO on meeting to discuss possible ways to formalise cooperation on common stocks, including prawns, as well as to discuss the possibilities of reaching agreement on a distribution key for prawn. The Ministry and DFO are looking at dates, and expect to hold a meeting in Canada in the autumn of 2018 or early 2019.

Inussiarnersumik Inuulluaqqusillunga.
Med venlig hilsen . Best regards
Esben Ehlers
Fuldmægtigi . Fuldmægtig . Head of Section

Appendix 2 Peer Review Reports

Summary of Peer Reviewer Opinion

Has the assessment team arrived at an appropriate conclusion based on the evidence presented in the assessment report?	**Yes**	**CAB Response**
Justification: The report is well-written and my conclusion is that the team's determination is correct – the fishery should be recertified. I have identified a number of places in the scoring text (discussed below) where clarifications with respect to, for example, observer coverage levels, the spatial distribution of fishing effort, habitat impacts and *P. montagui* status (as the only main retained species) should add confidence to this assessment. Rescoring down in a small number of instances may be appropriate if the team is unable to provide assurance.		*Thank you for your review.* *Text revised where indicated.*

Do you think the condition(s) raised are appropriately written to achieve the SG80 outcome within the specified timeframe? [Reference: FCR 7.11.1 and sub-clauses]	**Yes**	**CAB Response**
Yes – the condition on PI 3.1.1 is consistent with that given to the overlapping Canadian northern and striped prawn fishery. I agree is appropriate.		

If included:

Do you think the client action plan is sufficient to close the conditions raised? [Reference FCR 7.11.2-7.11.3 and sub-clauses]	**Yes**	**CAB Response**
Justification: In general, yes, although it is noted that, having read the CAP, demonstrating that there is "*organised and effective cooperation with other parties, where necessary*", still feels some way away.		*We agree and note the two-pronged approach proposed in the CAP: continued dialogue and a special request to NAFO.*

Performance Indicator Review

Please complete the appropriate table(s) in relation to the CAB's Peer Review Draft Report:

- For reports using one of the default assessment trees (general, salmon or enhanced bivalves), please enter the details on the assessment outcome using Table 16.
- For reports using the Risk-Based Framework please enter the details on the assessment outcome at Table 17.
- For reports assessing enhanced fisheries please enter the further details required.

Table 16 For reports using one of the default assessment trees:

Performance Indicator	Has all available relevant information been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary. Note: Justification to support your answers is only required where answers given are 'No'.	CAB Response
1.1.1	Y	Y	N/A	Nothing to add	
1.1.2	Y	Y	N/A	Nothing to add	
1.2.1	Y	Y	N/A	Nothing to add	
1.2.2	Y	Y	N/A	Nothing to add	
1.2.3	Y	Yes, but…	N/A	The information is all presented, but I think the 'fishery' in the case of SIa and SIb is the Greenland fishery under assessment, so that SIc would include Canadian (and any other) catches from the stock. This is partiularly the case given that the Canadian fishery doesn't (necessarily) fish to the same harvest strategy. Otherwise, what is the point in having SIc? In this case, a minor revision to the text should easily clarify the situation.	Text revised to clarify with inclusion of: The Greenland and Canadian fisheries represent all removals from this stock.
1.2.4	Y	Y	N/A	Nothing to add	

Performance Indicator	Has all available relevant information been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	**Justification** Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary. Note: Justification to support your answers is only required where answers given are 'No'.	CAB Response
2.1.1	Y	Mostly	N/A	Note, there appears to be a footnote (#16) attached to the justification of the SG80 score for P. montagui. Something appears to have happened to the formatting within Word, though, and only part of the text can be read a page or so below. Nevertheless, given that biomass ranges from "near zero to 16,000 t", I am not convinced by the argument that it is highly likely that P. montagui is within biologically based limits in part because 'catches are low relative to biomass' (i.e., catches being low relative to a near zero biomass is no comfort). A question here would be whether the striped shrimp is being actively targeted by another fishery. If not, then the fact that there is a depth separation and widespread distribution gives much greater confidence that the stock is within biologically-based limits. I don't see the relevance of the 3NO capelin assessment results to the West Greenland shrimp fishery, and suggest that this reference should be removed. Nevertheless, the score is given as 80 with capelin as a minor species, so removing this text won't	*P montagui* is at the northern end of its natural range with the main concentration of population round the UK and the Grand Banks, as far south as Rhode Island. It is commercially abundant in the Hudson Strait. It occasionally occurs in significant quantities in the West Greenland Fishery but this is not a main centre of population. Its preferred depth is less than that for *borealis*, and studies in Greenland have shown it is generally found in water shallower than that targeted by the fleet. This shrimp is not targeted by any other fisheries. It is caught as bycatch (averaging 2.8% in recent years) in the Canadian *P borealis* fishery in adjacent fishery area SFA1. Reference to 3NO deleted

Performance Indicator	Has all available relevant information been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	**Justification** Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary. Note: Justification to support your answers is only required where answers given are 'No'.	CAB Response
				affect the outcome.	
2.1.2	Y	Y	N/A	Nothing to add	
2.1.3	Y	Mostly	N/A	Related to my comment on PI 2.1.1 – I don't really disagree with the score given the available information, but I find the statement: "*No survey of P. montagui abundance is available in areas where it is common, but it is an abundant and widely distributed species and thus the observed catches would represent a very low proportion of total population size*" hard to reason. Essentially, if no survey data are available, how is it known that is abundant or that observed catches represent a very low proportion of total population, and in any case, in some years, survey biomass is near zero!? However, even 16,000 t (identified as the maximum survey biomass in PI 2.1.1) is a pretty small figure. I suggest the rationale be revised.	The sentence referred to has been removed and is not necessary for the rationale.
2.2.1	Y	Y	N/A	On the basis of the evidence presented, I agree that there are no main bycatch species. However, this section mentions P.	Reference removed

Performance Indicator	Has all available relevant information been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary. Note: Justification to support your answers is only required where answers given are 'No'.	CAB Response
				montagui, which is not necessary as it is already assessed as a bycatch species.	
2.2.2	Y	Mostly	N/A	SId notes that there is "no direct evidence on invertebrate bycatch". Although I agree it is likely that invertebrate bycatch is very low, in the absence of information from the fishery under assessment it seems overly generous to award a score of 100 here.	Bycatch is recorded, if not consistently, and while there is no detailed analysis of invertebrate bycatch we know that total bycatch is less than 1.5% and invertebrate bycatch is a fraction of this. This is sufficient evidence from the fishery that the strategy does not pose a risk of serious or irreversible harm to invertebrate bycatch populations.
2.2.3	No	No	N/A	In the report's introduction, it is written that "All trawlers in the shrimp fishery are required to use a Nordmore sorting grid with a minimum 22mm space between bars, which substantially reduces the by-catch of fish." PI 2.2.2SIa also states: "A fish excluding device with a 22 mm grate spacing ("Nordmore" grate) is mandatory for all vessels in the fleet." On that basis, I am very willing to accept that	The Nordmore grid is compulsory for offshore vessels and is now used by all vessels in the UoC. The reference to "except two small vessels" reflects the situation at the time of the previous assessment and is no longer correct, and has been deleted from the scoring text. Gear regulations are relatively easy to enforce, and there are no reports of observers finding infringements. Data on bycatch as a whole has been

Performance Indicator	Has all available relevant information been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	**Justification** Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary. Note: Justification to support your answers is only required where answers given are 'No'.	CAB Response
				bycatch is likely to be very limited, and at the low levels reported. However, in scoring SIa, here, it is noted that "Information on species composition is not available for the inshore fleet, however all vessels **(except two small vessels)** [my emphasis] now use the Nordmore grate, and fish similar habitats to that targeted by the offshore fleet, so amounts and species composition **is likely to be similar** [my emphasis] to those on offshore vessels". This throws the issue of catch/bycatch in to confusion, as it appears that the use of a Nordmore grid is not compulsory. If it isn't compulsory, is their use being checked by compliance officers, and how does the team know that fishermen always use them? If not, how much of the time do the fishermen actually use them (always, or not in very poor weather, or only in certain areas, for example?), and are the low bycatch figures truly representative, or are they only representative of trips when the grids are used? Also, where do the bycatch figures come	collected for some time with regular analyses by GINR. Bycatch has reduced over the years through better targetting and official figures suggest it now comprises around 1% of shrimp catch. (NAFO 2017). Formal published analysis of bycatch species is limited to a paper by Sunksen (2007) which provides a detailed breakdown by fish species. Invertebrate catch has not been studied because it is considered insignificant. The rationale for this is strengthened by a study of invertebrates in the adjacent Canadian shrimp fishery on the same stock, in adjacent waters (NAFO SA 0A), using similar gear, in which invertebrate bycatch was extremely low (much less than 500 kg per year for all species combined over a 10+ year period) (Siferd 2010).

Performance Indicator	Has all available relevant information been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	**Justification** Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary. Note: Justification to support your answers is only required where answers given are 'No'.	CAB Response
				from – are they only sampled from the large offshore vessels or are they sampled from offshore and inshore vessels? I note that the coastal fishery (including with on-board processing) appears to comprise about half the fishery (if the numbers in the 'Quota holding (%)' column in Table 1 are shares or in some other way reflect the proportions of the catch allocation, because they total 182 and so are not percentages), so the coastal fishery is not an insignificant component of the fishery. A clarificaiton is needed, and possibly a resocring of any SIs that rely on the very low bycatch figures for 100 scores.	
2.3.1	Yes	No	N/A	Note that I don't think PI 2.3.1 is scored correctly. See 3.11.4 – I think SIa shouldn't be scored in this case. Also note that the scoring here states: "….while some species of small whales in Greenland are on CITES Appendix II. These would be the only species to which the ETP assessment for MSC would apply." This is not correct as only CITES Appendix 1 is	The guidance states: "Where there are no requirements for protection and rebuilding, provided through national legislation or binding international agreements defined in CB3.11.1, the team shall not score the first element in SG 2.3.1, which refers to such requirements". Greenland is effectively party to the binding international agreement that is CITES, and therefore

Performance Indicator	Has all available relevant information been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	**Justification** Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary. Note: Justification to support your answers is only required where answers given are 'No'.	CAB Response
				considered ETP (CB 3.11.1). Nevertheless, for SIa it is stated that "*None of the species on CITES appendices interact with the fishery, which operates in such a way that marine mammal interactions do not occur. Monitoring by observers will indicate whether this changes and management would act accordingly*", while SIb states "*There are no interactions with ETP species, thus a score of 100 is justified*." Although I agree it is unlikely that the fishery will interact with any of the cetacean species that qualify as ETP, I do question on what basis these statements are made. Essentially, the introduction states: "*Observers are carried on >80% of offshore trips and on <10% of coastal trips (Mads Nedergaard, pers. comm)*." In this case, then, I do not believe it is possible to confirm with <10% observer coverage on the inshore fishery (noting that <10% could be 0%??) that "*There is a high degree of confidence that there are no significant detrimental direct effects of the fishery on ETP species*" (scoring	there *are* requirements to protect appendix 1 species. This should therefore be scored. This is consistent with the previous assessment. The implication that small whales are ETP is indeed incorrect, and the text has been revised accordingly. With regard to the larger whale species the text has also been revised: "There are no records of any negative interactions between the fleet and large whales, and the nature of the fishery is such that encounters are highly unlikely. No stakeholders (including WWF, GINR and GFLK) have raised any concerns in this regard". The high degree of confidence relates to the behaviour of the fishery and the behaviour of ETP, and the logical (un)likelihood of negative interactions. It is strengthened by the lack of negative reports from observers, and lack of concern from any stakeholders - which

Performance Indicator	Has all available relevant information been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	**Justification** Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary. Note: Justification to support your answers is only required where answers given are 'No'.	CAB Response
				SIb). Even though the offshore fishery is observed at a higher rate, that fleet comprises only six vessels (or is it five – Table 1 shows Qaqqatsiaq has no quota?) in comparison to 23 in the inshore fishery. A score of 80 feels more appropriate for SIb. For SIc, might there be other possible indirect effects other than just those arising through 'removal of a forage species'? What about disturbance of feeding or breeding behaviours, or of critical habitat? Have these been 'considered'?	there would undoubtedly be for ETP species. A huge range of indirect effects - through possible disturbance of feeding or breeding behaviour or critical habitat - are possible, but GINR research and monitoring have shown no grounds/rationale for concern nor are there concerns expressed by environmental agencies or NGOs. No research identifying possible indirect effects have been found, and no concerns have been expressed by GINR or WWF
2.3.2				Note that I think the Alternate 2.3.2A should be scored, here. Scoring at SG100 here is predicated on the basis that there are "no interactions with ETP species". However, while observer coverage is >80% in the offshore fleet (5 or 6 vessels), it is <10% (I don't think the actual level is provided), I think) in the inshore fleet (23 vessels), and ETP species (cetaceans) occur in the areas fished. As such, I do not think it	See the responses for 2.3.1

Performance Indicator	Has all available relevant information been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	**Justification** Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary. Note: Justification to support your answers is only required where answers given are 'No'.	CAB Response
				is possible to say categorically that there are 'no interactions'. I highlight that while the fishery is assessed against the v1.3 tree, the team has adopted a v2.0 approach to describing habitat interactions, and so it seems worth highlighting the guidance in v2.0 at GSA3.6.3. This states (amongst other things) that "*At SG100 the scoring issue requires that estimates of catch and UoA-related mortality of all species are quantitative and available with a 'high degree of certainty'.*" And:"*Generally, for species that are highly variable, clumped in distribution and/or relatively rare, higher levels of observer coverage are needed (Wolfaardt, 2011). For more normal species, observer coverage rates above 20% provide only diminishing returns and small incremental improvements in the CV of catch estimates (Lawson, 2006).*"	
2.3.3	Yes	No	N/A	Continuing from the 2.3.1 and 2.3.2 comments, recognising that interactions with ETP species are likely to be rare, I don't think the survey data are likely to be very useful in terms of identifying impacts, while there is no incentive for fishermen to self-report	The wording relating to marine mammals has been changed (see response 2.3.1) in response to this first concern

Performance Indicator	Has all available relevant information been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	**Justification** Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary. Note: Justification to support your answers is only required where answers given are 'No'.	CAB Response
				interactions on logbooks. <10% observer coverage is unlikely to be sufficient to identify impacts with a high degree of certainty. Together, then, these do not appear to be sufficient to demonstrate that "*None of the species on CITES appendices interact with the fishery, which operates in such a way that marine mammal interactions do not occur*" (i.e., SIa SG100), nor that (for the inshore fleet at least) "*Accurate and verifiable information is available from skippers, from observers and from survey fishing on magnitude of all impacts and consequences for status of ETP species*" (i.e., SIb SG100).	More generally, while all these points are sound, it is unreasonable to expect a fishery to provide detailed quantitative data on all species with which it may rarely interact. No fishery can provide this data beyond periodic scientific surveys of all catch (which this has), and therefore no fishery would score 100. Note furthermore that this score is consistent with the original assessment and those for similar fisheries, and there is no new evidence to suggest the score should be reduced.
2.4.1	No	No	N/A	I don't altogether disagree with the aproach taken to addressing VMEs specifically, but it is a little odd in a v1.3 assessment. In any case, I note that Yesson 2016 is relied upon for scoring, with the comment that "Recovery time based on significant difference between trawled and untrawled sites is around 5 years for soft bottoms and 10 years for hard bottoms. However, median values remain different over longer time	Several objections in the past have focused on scoring elements, and VME would appear to be rational scoring elements to focus on even under 1.3.

Performance Indicator	Has all available relevant information been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	**Justification** Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary. Note: Justification to support your answers is only required where answers given are 'No'.	CAB Response
				periods (at least 25 years on harder substrates), and more comprehensive sampling would be required to harden up the evidence." However, in their paper, this author also noted: "However, even this extensive dataset does not cover half the duration of the fisheries' operation and decades of trawling activity (pre-1986) are unaccounted for in this study. If the first impact has a significant and potentially long-lasting negative effect on the most vulnerable benthic fauna (i.e. Cook et al., 2013) and longer-term impacts have no significant additional influence (Moritz et al., 2016) then we may expect a limited signal from our analysis of trawling effort." Scoes of 90 overall may therefore be too high. I also note that the benthic habitat map of West Greenland (Figure 4-16) looks very detailed and useful. However, given the amount of information apparently available on habitat impacts, I am very surprised that there is no map of fishing activity/intensity	Scoring has been undertaken systematically by separate scoring element. Mud, gravelly mud, bedrock with sand and coarse rocky ground only receive an 80 score because the evidence is more limited and possibility of longer term impact greater The evidence presented here relating to status, while still of course retaining some caveats, is nonetheless of a different order of quality and thoroughness than that for most similar fisheries. No map is provided is because of the quality of the spatial distribution/interaction analysis undertaken by the researchers goes well beyond a large scale interaction map.

Performance Indicator	Has all available relevant information been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	**Justification** Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary. Note: Justification to support your answers is only required where answers given are 'No'.	CAB Response
				provided. Can one be provided, please, to help readers understand the distribution of activity?	However, if necessary this can be provided
2.4.2	Yes	Mostly	N/A	I wonder if the team checked whether the move-on rule (i.e., report to the Licensing Authority and move 2 km away from an area where live coral catches of >60 kg and/or live sponge catches of >800 kg are taken) had ever been applied by any vessel operating in the fishery, as a check of its application as part of the partial habitat strategy? I ask because I note scoring for PI 2.5.2 states: "*However, their remains some uncertainty about the rigour of reporting and identification of VMEs*". Finally, the PI score is given as 85, apparently because SIa is scored partially at 90 ("*A score of 90 is appropriate*"). Of course, partial scoring is not permitted for PIs where there is more than one SI (see CR1.3, 27.10.6), so a score of 80 for SIa and overall for the PI is actually approprtiate.	There has been no instance of the move-on rule being envoked. However, given the threshold levels, a recommendation is added to ensure alignment with NAFO/NEAFC recommended threshold levels. Score revised to 80 with no partial scoring of SIa. .
2.4.3	Yes	Mostly	N/A	The scoring text is generally OK, but partial scoring is given for SIb, which is not	Text and score revised to 80 with no partial scoring of SIb.

Performance Indicator	Has all available relevant information been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	**Justification** Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary. Note: Justification to support your answers is only required where answers given are 'No'.	CAB Response
				permitted (see CR1.3, 27.10.6).	
2.5.1	Yes	Yes	N/A	Nothing to add.	
2.5.2	Yes	Yes	N/A	Nothing to add.	
2.5.3	Yes	Yes	N/A	Nothing to add.	
3.1.1	Yes	Yes	N/A	Nothing to add.	
3.1.2	Yes	Mostly	N/A	The scoring text is generally OK, but partial scoring is given for SIc, which is not permitted (see CR1.3, 27.10.6).	Typo removed – a partial score was not given.
3.1.3	Yes	Yes	N/A	I admit that the following sentence does not make sense to me: "The northern prawn management plan re-iterates the Fisheries Act and Long-term objectives are therefore explicit within this and other management policy documents, but this is not a stated requirement of management policy and therefore SG100 is only partially met and a score of 90 is given." Therefore, I am not entirely sure that 90 is, in fact, appropriate. I believe a review is required.	Revised text. As there is no evidence that this is a stated requirement of management policy (which is the distinguishing text in SG100), the score is reduced to 80.

Performance Indicator	Has all available relevant information been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary. Note: Justification to support your answers is only required where answers given are 'No'.	CAB Response
3.1.4	Yes	Yes	N/A	Nothing to add.	
3.2.1	Yes	No		A partial score of 90 is given, but the text starts off by stating: "The Greenland fishery operates under a management plan that was developed in 2010 and revised in 2015. This revision is still to be formally approved due to administrative delays in approving a new Executive Order, but there is consensus that the fishery is to be managed in accordance with this updated version". It appears, therefore, that the fishery has been scored on the basis of a management plan that is not in place formally. Even if most (all?) fishers are following the proposed approach, awarding a score of 100 for this part of the fishery seems overly generous.	100 was not awarded, a partial score of 90 is given. There is evidence that the current management plan is fully applied by all involved despite not being adopted on the statute books at the time – a formality.
3.2.2	Yes	Yes	N/A	Nothing to add.	
3.2.3				SIc states: "Fishers provide all required information." However, I note scoring for PI 2.5.2 states: "However, their remains some uncertainty about the rigour of reporting and identification of VMEs", while I am also	Text revised (mainly SIa) and score reduced to 85

Performance Indicator	Has all available relevant information been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	**Justification** Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary. Note: Justification to support your answers is only required where answers given are 'No'.	CAB Response
				unsure as to whether or not fishers are supposed to report invertebrate bycatch (they do not report, according to PI 2.2.2). In this case, a score of 100 does not appear appropriate. I note the observer coverage levels for the Canadian fleet are provided in the text, here, but not the coverage levels for the Greenland fishery under assessment. Th etext states: "*The Greenlandic MCS system can also be considered comprehensive*", so what coverage levels are achieved??	
3.2.4	Yes	Yes	N/A	Nothing to add.	
3.2.5	Yes	Yes	N/A	Nothing to add.	

Table 17 For reports using the Risk-Based Framework:

Performance Indicator	Does the report clearly explain how the process(es) applied to determine risk using the RBF has led to the stated outcome? Yes/No	Are the RBF risk scores well-referenced? Yes/No	Justification: Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary. Note: Justification to support your answers is only required where answers given are 'No'.	CAB Response:
1.1.1	N/A	N/A	RBF not used	
2.1.1	N/A	N/A	RBF not used	
2.2.1	N/A	N/A	RBF not used (although Table 10 – scoring elements) indicated it might have been needed – wolfish and thorny skate are listed as 'dd' (data deficient)? However, as minor species, they don't need to be scored for the fishery to meet SG80.	
2.3.1	N/A	N/A	RBF not used (although Table 10 indicates commonly encountered and VME habitats are 'dd'.) However, I don't think these habitats are dd.	
2.4.1	N/A	N/A	RBF not used	
2.5.1	N/A	N/A	RBF not used	

Optional: General Comments on the Peer Review Draft Report (including comments on the adequacy of the background information if necessary) can be added below and on additional pages

1) Table 1 (Vessel list for the West Greenland Coldwater Prawn Fishery as of January 2017) requires review and explanation:
    a. Some vessels are included which appear to have no quota
    b. What do the blacked-out cells mean?
    c. The commas and points used in the numbering are used counter to convention (i.e., commas for points and points for commas), which makes it confusing.
    d. The 'Quota holding (%)' column adds up to 182.
    e. What does the * after the figures in the final column mean?
    f. At least one vessel appears in more than one place.

2) I have identified various minor typo / editing / formatting errors in the report and have provided that back to the assessment team.

CAB response:
Table 1 revised format to be consistent throughout report. Quota shares relate to % of coastal and offshore quota separately.

Summary of Peer Reviewer Opinion

Has the assessment team arrived at an appropriate conclusion based on the evidence presented in the assessment report?	**Yes**	**CAB Response**
Justification: Evidence is provided that the fishery is within the biological limits set by the stock assessment and is well-managed with limited impact on non-target species and the ecosystem. There has been a considerable amount of research conducted in the last 5 years in relation to P2 considerations raised in the first MSC assessment. The client group, supporting agencies and individual researchers are to be commended on the quantity and quality of this research. Just about all relevant information is presented. More justification and rationale are needed for some performance indicators, but scores are expected to change in only a minor way, if at all.		*Thank you for your review. We agree the level of research undertaken to address the conditions in the first assessment should be commended.*

o you think the condition(s) raised are ppropriately written to achieve the SG80 utcome within the specified timeframe? [Reference: FCR 7.11.1 and sub-clauses]	**Yes**	**CAB Response**
Justification: Cooperation between Greenland and Canada is needed to ensure management outcomes consistent with P1 for this unit stock. The rationale highlights the need for the two countries to agree on an approach to reduce exploitation if (when) needed. The condition as written allows 2-3 years for the two countries to engage on a solution and is written to reflect the language in PI 3.1.1a. It does not put constraints on how the client addresses the condition. Having said that, the milestones for years 2 and 3 ("repeat Year 1") could be more specific given that FCR 7.11.1.4 states that milestones should spell out "*The measurable improvements and outcomes (using quantitative metrics) expected each year*." Satisfying this condition requires an international discussion and so the speed at which it proceeds is a question for someone more knowledgeable about the working relationship between Greenland / Denmark and Canada. Given that a very similar condition exists in the MSC assessment of the Canadian fishery in SFA 1, the SFA 1 client group should be motivated to push for a solution. SG80 will be achieved if this condition is met.		

Do you think the client action plan is sufficient to close the conditions raised? [Reference FCR 7.11.2-7.11.3 and sub-clauses]	**Yes**	**CAB Response**
Justification: The client action plan contains an approach recommended to the Government of Greenland and includes a proposed sharing calculation, elements that should be included in a sharing agreement, an approach for setting up a discussion in the NAFO Scientific Council, and annual milestones. The clients have a plan in place to address the condition. The fact that the clients provide evidence of strong support from their Ministry, and that the Ministry expects to meet with Canada's DFO by early 2019, is positive and suggests there will be progress before the 1st audit. As mentioned above, success is somewhat uncertain because of the need for international discussion and agreement. If the client action plan as summarized in the annual milestones is achieved, it will close the condition.		

Performance Indicator Review

Table 18 For reports using one of the default assessment trees:

Performance Indicator	Has all available relevant information been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary. Note: Justification to support your answers is only required where answers given are 'No'.	CAB Response
1.1.1	No	Yes	NA	1.1.1b – text should reference modeled shrimp biomass in Fig. 3.4 and the fact that quartile intervals include values less than BMSY in each of last 5 years. Thus there is some risk (yes low) that biomass is below the target. Agree that it is highly likely that stock is fluctuating around the target.	Text revised accordingly
1.1.2	No	No	NA	1.1.2a - Justify why a Blim of 30% of Bmsy is appropriate (e.g. history of biomass trends with declines and recovery of this or other stocks? Model consideration? Reference to MSC guidance?) 1.1.2b – Justify how the level of Blim guarantees that it represents a level above which there is no appreciable risk of impairing reproductive capacity	Further context has been provied in the text and a reference provided Again some additional justification and a reference have been provided.

Performance Indicator	Has all available relevant information been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary. Note: Justification to support your answers is only required where answers given are 'No'.	CAB Response
1.2.1	No	No	NA	1.2.1.a – provide more justification, harvest strategy is more than just the stock assessment 1.2.1b – conduct of a stock assessment in itself is not evidence that the harvest strategy is achieving objectives	Text has been amended Text has been amended

1.2.2	No	No	NA	The reference points are provided elsewhere but there appears to be no place in the document where the harvest control rule is explicilty stated. Please state the HCR here. Reference is made to the management plan (Anon 2015), but this doc is not readily available on line. 1.2.2c – refer to relative fishing mortality rates (Fig 3.5) which demonstrate that harvest control rules are maintaining fishing mortality below the ZMSY reference point in recent years. 1.2.2c –Although fishing mortality is below the ZMSY reference point (Fig. 3.5), reference to Table 3 indicates that harvest control rules are not working well given that the enacted TAC has been set above that advised by the council in each of the last 11 years (Table 3). This is obviously a concern which the assessors have recognized via a Condition for PI 3.1.1. It should be made clear that the management of the Greenland portion of the stock, which is by far the largest, is not setting a TAC higher than that recommended by NAFO. There is a footnote beside the Enacted TAC indicating Canada and Greenland set independent autonomous TACs but no indication as to the enacted TAC of each country, or that the enacted TAC shown is in fact the sum of the two countries TACs. Can the enacted TACs of Greenland and Canada be shown? At the very least document the most recent year enacted TACs for each country. For example the Table could have a footnote refererencing the following from NAFO	Greater detail on the HCR has been included in the text Text modfied accordingly Amendments made to the text and the table to show the enacted TAC. (Note – Table 4 refers to TACs)

Performance Indicator	Has all available relevant information been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary. Note: Justification to support your answers is only required where answers given are 'No'.	CAB Response
				2016a : "The enacted TAC for Greenland Waters in 2016 was set at 82 801 and for Canadian Waters, 10 625 t. "	
1.2.3	No	Yes	NA	1.2.3a – provide evidence that environmental information (e.g. temperature) is collected and utilized. Clearly important for this stock given its changes in geographic distribution over the last few decades.	Text amended accordingly with respect to the temperature data which is collected via the annual survey.
1.2.4	Yes	Yes	NA		
2.1.1	Yes	Yes	NA		
2.1.2	Yes	Yes	NA		
2.1.3	Yes	Yes	NA		

Performance Indicator	Has all available relevant information been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	**Justification** Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary. Note: Justification to support your answers is only required where answers given are 'No'.	CAB Response
2.2.1	No	Yes	NA	2.2.1a – address how the study showing bycatch is likely higher than conventionally reported Sunksen (2007) affects interpretation of whether any species are above 2% or 5% levels. Looks like all species would still be below benchmarks. 2.2.1a – provide data on weight of wolffish bycatch [I see provided later but needed here]	Even allowing for a possible 20% under-reporting, based on latest figures provided by GINR, total bycatch has been less than 1.2% over the last 5 years. Background text amended accordingly. Percentage catch of different bycatch species has been added to rationale for 2.2.1
2.2.2	No	No	NA	2.2.2 a – are closed areas relevant here? May be designed for VMEs but have benefit of protecting associated fish species 2.2.2.b & c– more evidence needed to support 100 e.g. a decreasing trend in bycatch in relation to measures implemented. 2.2.2 d – must be more recent data on cod bycatch than a document written in 2009	Yes – text edited accordingly Yes – text edited accordingly Cod is such a minor component of shrimp bycatch that this issue has not been revisted.

Performance Indicator	Has all available relevant information been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary. Note: Justification to support your answers is only required where answers given are 'No'.	CAB Response
2.2.3	Yes	Yes	NA		
2.3.1	Yes	Yes	NA		
2.3.2	Yes	Yes	NA		
2.3.3	Yes	Yes	NA		
2.4.1	Yes	No	NA	2.4.1 a – relevant text and tables are provided, but no explicit link made with the score (90). If partial score for commonly encountered habitats is based on first Table provided, how is 90 deduced from 4 80's and 3 100's? For the next table for VMEs the partial score of 90 makes sense (3 80's and 3 100's).	Scoring of elements and derivation of overall scores follows guidance in section 27.10.7 and Table C2 of the 1.3 CR guidance
2.4.2	Yes	Yes	NA	2.4.2 a – Recommendation? "the fishing footprint and areas suitable for the growth of a potential VME *umbellula* fields, and a recommendation is therefore raised…" No such recommendation is listed under 6.4.	Text amended to confirm recommendation made and stated under 6.4.
2.4.3	Yes	Yes	NA		

Performance Indicator	Has all available relevant information been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary. Note: Justification to support your answers is only required where answers given are 'No'.	CAB Response
2.5.1	Yes	Yes	NA		
2.5.2	Yes	Yes	NA		
2.5.3	Yes	Yes	NA		
3.1.1	Yes	Yes	Yes		
3.1.2	Yes	Yes	NA		
3.1.3	Yes	Yes	NA		
3.1.4	Yes	Yes	NA		
3.2.1	Yes	Yes	NA		
3.2.2	Yes	No	NA	3.2.2c – consistent setting of TAC's higher than recommended does not seem precautionary, please provide rationale.	This is reflected under 1.2.2 Harvest Strategy. The issue of Greenland & Canada not being in agreement on allocations is addressed under 3.1.1, which seems to be the most appropriate place to address it and results in a resulting condition.

Performance Indicator	Has all available relevant information been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary. Note: Justification to support your answers is only required where answers given are 'No'.	CAB Response
3.2.3	Yes	Yes	NA		
3.2.4	Yes	Yes	NA		
3.2.5	Yes	Yes	NA		

Optional: General Comments on the Peer Review Draft Report (including comments on the adequacy of the background information if necessary) can be added below and on additional pages

A clear description of the harvest control rule would be very useful for the careful reader of this document. A figure might suffice. There are many references to the management plan (Anon 2015) but I could not find this on line. The reference points are of course provided, and the stock assessment process is described, but details of the HCR are not clear. For example, how does the TAC change if the biomass falls below the target, and what provisions are in place to reduce large changes in the TAC? From section 3.1.3: *"The management plan also sets out specific management measures in relation to P1 (TAC setting and HCRs) and P2 aspects ...*" How is the TAC setting process captured in the HCR?

The background information appears comprehensive and all the pieces are present. Assume it is recognized that the document needs to be reviewed for formatting and spelling. There are occurrences where figure numbers in text do not match with figures. Note that there is a repeated block of text in the scoring justification for 2.2.1.

Appendix 3 Stakeholder submissions

MSC Technical Oversight on PCDR

SubID	PageReference	Grade	RequirementVersion	OversightDescription	Pi	CABComment
28815	53-54	Minor	FCR-7.12.1.1 v2.0	The Full Assessment Reporting Template (section 5.2.2) requires a "A description of the tracking, tracing and segregation systems within the fishery and how these systems will allow any products sold as MSC certified to be traced back to the UoC." The risk table captures some of this information but not all. The traceability section would be improved substantially by including the required description. In particular, the description should help to address the lack of clarity on the following points: 1. In Table 12, the description of risk of UoC vessels fishing in non-certified regions does provide sufficient detail on how the risk of mixing is mitigated, i.e. the control systems in place that help to ensure UoC vessels do not fish in Canadian waters. 2. In Table 12, the description of risk of non-UoC vessels fishing the stock does not provide detail on how the risk of substitution or mislabelling is mitigated, i.e. that prawn caught in Canadian waters is not mixed with UoC catch. 3. The use of IPI in the fishery is reported in Section 4.4 and referred to in Table 12. However, without a description of the traceability systems in place, it is unclear how traceability is maintained and bycatch levels will be monitored, especially for those vessels with on-board processing.		Table 12 has been revised to address the points raised.

Appendix 4 Surveillance Frequency

Table 4.1 : Surveillance level rationale

Year	Surveillance activity	Number of auditors	Rationale
2	2 off-site surveillance audits 1 review of information 1 on-site surveillance audits	*2 remote auditors 1 auditor on-site with remote support from 1 auditor*	*Single condition relates to evidence of meetings and agreements that must be documented and therefore can be easily reviewed remotely. Recommendations can also be considered with data supplied by client and reviewed.*

Table 4.2: Timing of surveillance audit

Year	Anniversary date of certificate	Proposed date of surveillance audit	Rationale
1	*1st August 2018*	*1st August 2019*	*Surveillance should be timed to allow review of the previous year's full fishery so is aligned with the anniversary date.*

Table 4.3: Fishery Surveillance Program

Surveillance Level	Year 1	Year 2	Year 3	Year 4
Level 2	*off site surveillance*	*review of information*	*off-site surveillance*	*On-site surveillance audit & re-certification site visit*

Appendix 5 Objections Process

(REQUIRED FOR THE PCR IN ASSESSMENTS WHERE AN OBJECTION WAS RAISED AND ACCEPTED BY AN INDEPENDENT ADJUDICATOR)

The report shall include all written decisions arising from an objection.

(Reference: FCR 7.19.1)