Northwest Atlantic Fisheries Organization

Serial No. N4993 **NAFO SCS Doc. 04/14**

SCIENTIFIC COUNCIL MEETING - JUNE 2004

Denmark/Greenland Research Report for 2003

by

H. Siegstad
Greenland Institute of Natural Resources
P.P. Box 570, DK-3900 Nuuk, Greenland

This report presents information on preliminary catch statistics from the commercial Greenland fishery in 2003 and when possible, a forecast for the coming years. Furthermore, the report gives a brief overview over the research carried out in 2003 by the Greenland Institute of Natural Resources.

WEST GREENLAND (NAFO SUBAREA 1)

A. Status of the fisheries

Provisional statistics for the fisheries from 2000 to 2003 are presented in Table 1. Additional information on the status of the fisheries is as follows:

1. **Shrimp**

The shrimp stock off West Greenland is distributed in Div. 0A and Subarea 1. The fishery is conducted by Greenland and Canada. The Greenland fishery exploits the stock in Subarea 1 (Div. 1A to 1F) in offshore and inshore areas (primarily Disko Bay). The Canadian fishery has been restricted to Div. 0A since 1981.

Until 2003 catches of shrimp taken in SA 1 have been reported without accounting for "overpacking" – the amount of surplus weight in packaging – or the difference between the product weight and live weight. Advised and actual TACs have been set in the same units as used within the reporting practice. January 1st 2004 new legislation should be enforced to ensure that total removals by fishing are reported in units of live weight. To allow management advice derived from the stock assessment to be stated in the units of the future catch reporting, a correction of the input catch data series was performed (Hvingel, 2003)

Overall annual catch has increased from about 10 000 tons in the early-1970s to more than 105 000 tons in 1992. Restrictions by the Greenlandic authorities to reduce effort and fishing opportunities elsewhere for the Canadian fleet then made catches decrease to about 80 000 tons in 1998. Since then overall catches have increased. The Greenland catch in 2003 is estimated to around 135 000 tons.

In 2002 a quantitative assessment framework (Hvingel and Kingsley, 2002) based on a biological model of shrimp stock dynamics was adopted by STACFIS and Scientific Council. Short-term (1-year) and medium-term (ten-year) projections of stock development are made for five levels of annual catch: 110, 120, 130, 140 and 150 thousand tons under the assumption that the cod stock remain at its current low level. The associated risk of transgressing the reference parameters maximum sustainable yield level of biomass (B_{MSY}) and mortality (Z_{MSY}) are estimated. The stock is evaluated as being in good condition, and supportive of the current level of exploitation (Anon., 2003).

2. **Greenland halibut**

The total catches of Greenland halibut by Greenland vessels in NAFO Subarea 1 (excluding Div. 1A inshore) amounted to 5 675 in 2003. 3 476 tons were taken in Div. 1AB and, 2 126 tons were taken off shore mainly in Div. 1D and 73 tons was taken inshore in Div. 1B-1F. The catches were taken primarily by trawlers, but gillnettes also participated in the fishery (Fig. 1.).

The inshore fishery in Div. 1A was concentrated in three areas Disko Bay (11 571), Uummannaq (5 039 tons) and Upernavik (3 886). The fishery was conducted by long lines and gill nets.

No analytical assessment has been made for either inshore or offshore stock components.

Commercial fisheries data. CPUE data, based on logbooks reported to the Greenland authorities, are available from the two Greenland trawlers and two gilnetters. The CPUE for the trawlers decreased from 1.09 ton/hr to 0.87 ton/hr in Div. 1A and 0.87 to 0.71 ton/hr in Div. 1CD, respectively. The CPUE for the gilnetters decreased form 0.25 ton/hr to 0.23 ton/hr in Div. 1AB and increased from 0.18 to 0.21 ton/hr in Div. 1CD

Length frequency data were available from the gillnet fishery in Div. 1A and Div. 1C.

3. **Cod**

The inshore cod fishery at West Greenland is since 1992 assumed to be based on self-sustained fjord populations. Since the years 1993-1995 catches decreased dramatically from about 2 000 tons yearly to only 326 tons in 1998. In recent years catches has increased again. Preliminary catch statistics for 2003 are at 4000t where the two northern NAFO divisions (1A and 1B) are accounting for approximately 2/3 of the total inshore landings. Besides 1250 thave been transhipped from local inshore areas to foreign vessels.

In the inshore fishery (vessels below 40 GRT) pound nets are used to take about 50% of the inshore catch, handline, longline and set gillnets are accounting for 30%. Peak fishing time is June and July where more than 50% of the catches are taken. A commercial pound net CPUE series is available since 1992 (total catch from pound nets pr day / total number of poundnet landings pr day). The CPUE decreases from 1994 until 1998 and levels off in 1999. No data on commercial CPUE is available from 2000 to 2003.

Greenland cod stocks are assessed by ICES, see the North-western Working Group report, April 2004 (ICES CM2004 ACFM:.250) and ACFM report 2004: "The offshore component is severely depleted since 1990 with some recovery potential as derived from recent survey indices. The dramatic decrease in stock abundance was associated with changes in environmental conditions, emigration and high fishing mortalities. Inshore catches are increasing although the level is still low compared to landing in the late-1980s. Recruitment to the inshore component has been poor since the moderate 1993-year class but in 2002- 2003 some recovery potential was evident in the northern division.

Only the offshore catches in Greenland are subject to a TAC regulation. The inshore fishery is unregulated. This may give cause for concern about the exploitation rate of the inshore component. Given suitable climatic conditions (water temperature) and prudent management, sustained production of offshore cod is possible. However, interaction between the East Greenland and Irminger currents during the early-1970s and 1980s has apparently rendered climatic conditions unsuitable for offshore cod in some years. Combined with high fishing mortality, this caused the offshore cod stock to be severely depleted. In order to take advantage of suitable climatic conditions, when they occur, it is necessary to protect the remaining biomass of offshore cod."

4. **Salmon**

The salmon caught in the West Greenland fishery are mostly (>90%) non-maturing 1SW salmon, most of which are destined to return to homewaters in Europe or North America as MSW fish if they survive. The abundance of non-maturing 1SW salmon has declined steadily during the recent 30 years both in the Southern European and the North American continental areas.

The North American stock complex of non-maturing salmon has declined to record levels and is in tenuous condition. Smolt production in 2002 and 2003 in monitored rivers of eastern Canada was less than or similar to the average of

the last five years. Unless sea survival improves, the abundance of non-maturing 1SW salmon in the Northwest Atlantic is not expected to improve above the levels of the last five years.

In West Greenland total nominal catches in 2003 amounted to 9 tons. The distribution of the catches along the coast was close to average as was the overall mean size of the salmon. Some unreported catches (mainly private fishery for own consumption) have probably been taken, but due to the very scattered nature of this fishery estimating of the magnitude of this fishery is difficult. As in the past, the magnitude of the unreported catches is estimated at 10 tons for 2003. The non-maturing 1SW salmon from Southern European areas, that are contributing to the fishery at Greenland, have been declining steadily since the 1970s, and the preliminary quantitative prediction of pre-fishery abundance for this stock complex will remain low for 2004.

The advice generated by ICES is in response to terms of reference posed by the North Atlantic Salmon Conservation Organization (NASCO), pursuant to its role in international management of salmon. The stock complex at West Greenland is considered to be outside safe biological limits, and even in the absence of fishery at West Greenland in 2004 there is only a minor chance for achieving stock conservation limits in the home waters, both in the North American and the European continents.

5. **Capelin**

The capelin fishery in West Greenland is carried out inshore and in the spawning season only (May-July). The main part of the catches amounted a total of 41 tons in 2003 is produced as whole frozen fish for bait and local consumption, while a smaller part is dried and stored as food for sledge dogs in the winter season. The majority of the catches were taken in Div. 1A.

6. **Redfish**

Redfish catches are reported as Beaked redfish (pelagic redfish), redfish (unspecified - mainly by-catch) and Golden redfish. Redfish is mainly taken as by-catch by the offshore shrimp trawlers. Reported redfish taken, as by-catches in 2002 and 2003 were 422 tons and 312 tons respectively, however this is considered an underestimate. Reported catches of beaked redfish from the Greenland pelagic fishery in NAFO Div 1F in 2002 were 124 tons and catches in 2003 was reported to 1.561 tons.

Pelagic redfish

Since 1999 a pelagic fishery has developed in Div. 1F in West Greenland for the pelagic *S. mentella* (beaked redfish). The parameters analyzed so far do suggest, however, that the newly discovered aggregations in the NAFO Convention Area do not form a separate stock component. NAFO Scientific Council do agree with this conclusion. The pelagic redfish in the Irminger Sea is assessed by ICES (NWWG report 2004). This assessment also covers the pelagic redfish caught in the NAFO Div. 1F, 2H and 2J since 1999. The structure of the pelagic and demersal stocks of deep-sea redfish (*S. mentella*) in the North Atlantic remains poorly known, but further research is currently being carried out. The stock stucture of *S.mentella* will be discussed within ICES SGSIMUR WG in late Augutst-September 2004. Directly thereafter, the NWWG will meet again to complete the assessment of the *S. mentella* stock(s) based on the outcome of SGSIMUR. Therefore, the group did not conclude on the status of this stock(s) during the ICES NWWG meeting in April 2004.

7. **Grenadiers**

There are two species of grenadiers of commercial interest in Greenland: roundnose grenadier and roughead grenadier. All catches are, however, reported as roundnose grenadier. The catch reported is taken as by-catch in the Greenland halibut fishery. The total catch in 2003 I SA1 was 37 tons.

8. **Snow Crab**

The snow crab fishery after snow crab is distributed in NAFO Div. 1A, 1B, 1C, 1D and 1E and total catch by Greenland vessel in entire Subarea 1, decreased from about 14.000 tons in 2001 to 6.642 tons in 2003. Offshore catches estimated from logbooks amounted 2.560 tons in 2003 was 20% reduction of the 2002 catch level. In 2003 inshore catches, estimated by landings statistics, was reduced with 33% to 4.082 tons in the same period. Effort in offshore areas is four double from 1999 to 2002, while efforts figure is unknown from inshore areas, due to the lack of logbooks information from 1999 to 2002. Preliminary catch figures for 2000 to 2003 are given in Table 1.

9. **Scallops**

Total catches of Icelandic scallops in NAFO Subarea 1 amounted to 2.528 tons in 2003, which is a small increase from 2002. A total quota for scallops was set at 2.320 tons in 2003. All catches are taken in inshore areas in Div. 1A, 1B, 1C and 1D. Catches from fishing grounds around Disko (1A) have decreased from app. 1000 tons in the late 1990'ies to 36 tons in 2003. Due to the discovery of new fishing grounds, particularly near Sisimiut (1B), total catches have not been affected this decrease.

10. **Lumpfish**

Total catches of Lumpfish in NAFO Subarea 1 increased from 1.200 tons in 2000 to almost 8.800 tons in 2003. Catches are taken in inshore areas in Div. 1A, 1B, 1C, 1D, 1E and 1F. The fishery is conducted over a short time period of one to two months and over a vast coastline from 59° N to 72° N.

B. **Special Research Studies**

1. **Environmental Studies**

a. **Hydrographic Studies**

A survey of oceanographic stations along the West Greenland standard sections was carried out in 2003. Also two different kinds of fjords system were measured around Sisimiut (Buch and Ribergaard, 2003).

The time series of mid-June temperatures on top of Fylla Bank was about one degree above average conditions, while the salinity was slightly higher than normal. The temperature of the Polar Water was high compared to normal years and the front between Polar Water and Irminger Water week indicating a reduced inflow of Polar Water to the West Greenland area in 2003. Pure Irminger Water was observed from Cape Farewell to the Fylla Bank section, and Modified Irminger Water could be traced as far north as the Maniitsoq (Sukkertoppen) section. The inflow of Irminger Water seems to be much higher than the last couple of years, which most likely can be a consequence of reduced inflow of Polar Water.

2. **Biological Studies**

a) **Shrimp**

The series of annual stratified-random trawl surveys initiated in 1988 was continued in 2003. In July-August 172 research trawl hauls were made in the major parts of the distribution area of the West Greenland shrimp stock, including areas in Subarea 0 and the inshore areas in Disko Bay and Vaigat.

During the period of stratified random surveys in the offshore areas of shrimp distribution, biomass estimates have been relatively stable until 1998 fluctuating around 250 thousand tons, apart from somewhat lower values in 1991, 1995 and 1997. Since 1998 a significant increase is observed, with record high biomass in 2003 of 653 thousand tons. Total number of shrimp in 2003 is at the highest level found in the survey series and recruitment to the female group appears to be secured for the coming years.

b) **Greenland halibut**

A Greenland offshore trawl survey for Greenland halibut was initiated in 1997. The survey is a continuing of the joint Japanese / Greenland survey carried out in the period 1987-95. In 1997-2000 the survey covered NAFO Div. 1C and 1D between the 3 nm line and the 200 nm line or the midline against Canada at depths between 400 and 1500 m. In 2001 the survey area was expanded to include NAFO Div. 1B-1A (to 74°N). In 2003 the survey covered Div. 1CD and a total of 35 hauls were made. The survey was carried out as a stratified random bottom trawl survey Fig. 2

A longline survey for Greenland halibut in the inshore areas of Disko Bay, Uummannaq, and Upernavik was initiated in 1993. No longline survey was conducted 2002 due to technical problems and in 2003 the longline survey was only conducted in Uummannaq.

Since 2001 a gillnet survey was conducted in the Disko Bay area. In 2003 a total of 58 gillnet settings were made along 4 transect. Each gillnet was compiled of 4 different nets, each with a different mesh size (46, 55, 60 and 70

mm stretch meshes). The distribution patterned showed a markedly higher density of Greenland halibut in the mouth of the ice fjords. In 2003 more abundant young fish < 35 seem coming into the survey.

c) **Cod survey**

The series of annual gill-net surveys initiated in 1985 with a main target group of 2-3 years old fish. Survey results from 2002 and 2003 show an increased recruitment index for Div. 1B, which is the first sign of recovery since the 1993 year class. No juvenile cod survey was conducted in 2001 due to technical problems.

Since 1988, Greenland Institute of Natural Resources has annually conducted a bottom trawl survey off West Greenland. The main purpose of the survey is to evaluate the biomass and abundance of Northern shrimp (*Pandalus borealis*), but data on most fish spices have been recorded. The biomass-indices for cod were estimated to 4 000-7 000 tons in 1988-1990. In 1992 the biomass decreased with over 95% to only 250 tons and 528 000 individuals and remained at this low until recent years. There are indications of a slight improvement in the abundance of small cod. Abundance indices in 2003 were estimated to 3.7 million individuals and biomass to 1500 tons, which is the 2.highest estimate in time series. Compared to the German survey, which has been conducted since 1982, abundance in 2002 is still less than 5% of the abundance in 1987.

d) **Snow crab**

Annual monitoring program (trap survey) was initiated in 1997 in Disko Bay (Div. 1A) and Sisimiut (Div. 1B). In 2003 survey were conducted in May/June with the research vessel "Adolf Jensen". On the survey baited traps with large and small mesh are used. All snow crab were enumerated by sex, carapace width, chela height, abdomen width, carapace condition and development stages were determined. Females were sampled in relation fecundity studies.

An annual offshore trap survey was initiated in 2001 in Div. 1D and 1E conducted by the research vessel "Paamiut". The scientific catch was treated similar to the inshore survey.

The objective of both monitoring programs is to assess the abundance of snow crab in inshore and offshore waters of Greenland. Results from this survey are presented in the Technical Report Series of the Greenland Institute of Natural Research.

e) **Marine mammals**

Studies of white whale and narwhal continued in 2003. Details are being reported to JCCM and NAMMCO. Studies of minke whale, fin whale and humpback whale continued in 2003. Monitoring study on large cetaceans is being reported to IWC. Studies of harp and hooded seals are being reported to the Joint ICES/NAFO Working Group on Harp and Hooded Seals.

f) **Special studies**

A Ph.D. project, initiated in 2002, are studying the reproductive potential of snow crab in the coastal waters of West Greenland. The present study will use existing data and data collected in fieldwork surveys in Div. 1A, 1B and 1D. Fisheries exploited and non-exploited stocks will be examined and compared. Effects of latitude, i.e., water temperature, and fisheries exploitation on, 1) carapace width at maturity, and 2) reproduction will be examined. Various life history traits will be related to aspects of snow crab fecundity at three study sites along a latitudinal gradient: Disko Bay (north), Sisimiut (middle) and Nuuk (south). The study will contribute to a better understanding of the reproductive potential in the snow crab fisheries resource, and provide essential base line information for adaptive management and conservation strategies.

GREENLAND FISHERY IN OTHER NAFO SUBAREAS

A. **Status of the fisheries**

In 2003 two Greenland vessels was engaged in shrimp fishery at Flemish Cap (NAFO Div. 3M) and Grand Bank (NAFO Div. 3L) and reported catch from 3M was 379 tons and reported catch in 3L amounted to 1.181 tons.

Table 1. Estimated catches (tons) by Greenland vessels at West Greenland (NAFO Subarea 1) in 2000-2003.

	Div. 1A, B, C, D, E, F				Div 3M	Div 3L
Species	Estimated catch 2000*	Estimated catch 2001*	Estimated catch 2002*	Estimated catch 2003*	Catch 2003	Catch 2003
American Plaice	1	4	0	0		
Arctic char	29	20	20	0		
Atlantic halibut	9	1	1	0		
Atlantic salmon	21	43	9			
Atlantic cod	764	1.680	3.698	5.215		
Capelin	43	13	43	41		
Crabs	10.236	14.247	10.271	6.642		
Greenland cod	931	1.152	939	1.288		
Greenland halibut	23.219	19.111	23.814	26.636		
Grenadiers	17	22	21	37		
Lumpfish	1.211	3.216	5.872	8.832		
Polar cod	118	11	38	4		
Redfish (unspecified - bycatch maily)	606	305	422	312		
Redfish beaked (pelagic redfish)	671	124	124	1.561		
Redfish golden	129	27	65	166		
Scallops	1.630	1.593	2.459	2.528		
Shark	*nd*	*nd*	*nd*	0		
Shrimp (P.boreallis)	95.424	99.156	125.894	135.465	379	1.181
Shrimp (P.montagui)	697	609	206	924		
Skate	nd	nd	nd	12		
Wolffishes	59	75	118	393		
Fish not specified	769	589	584	475		
Sum total	136.584	141.998	174.598	190.531	379	1.181

* Catch figures from recent years are provisional.

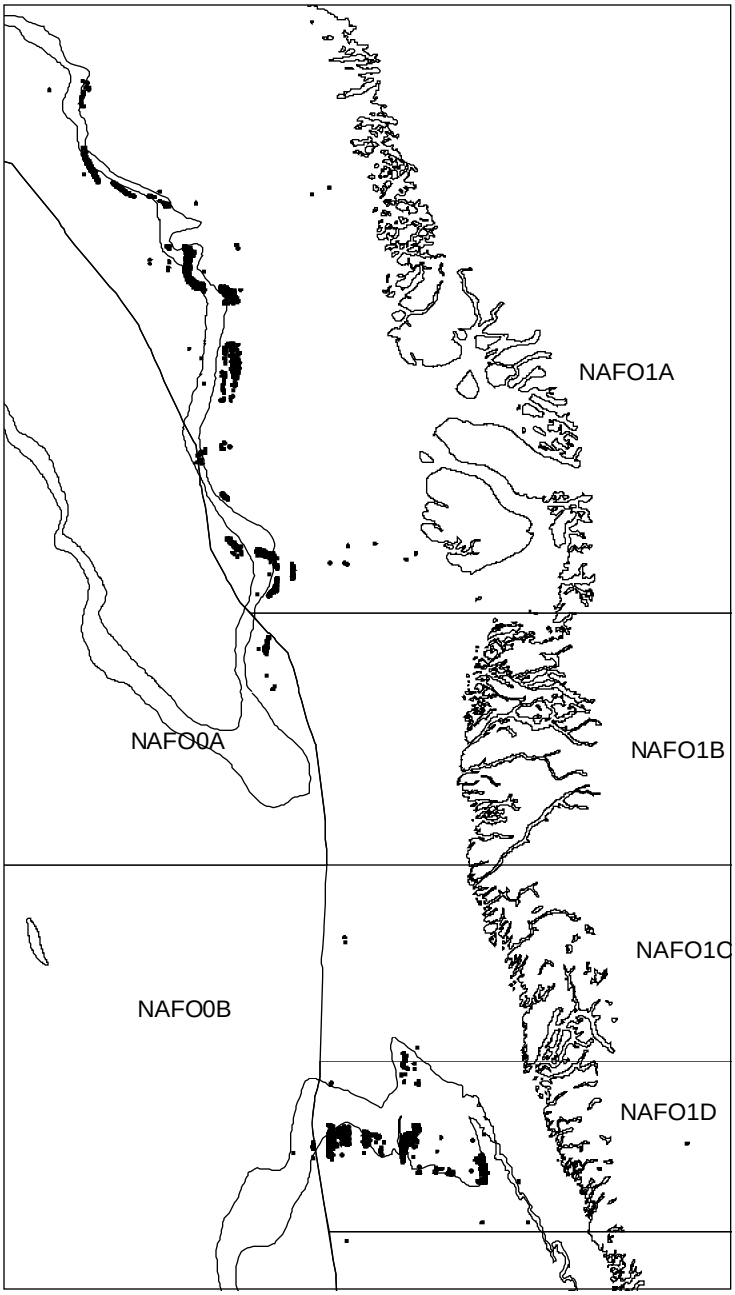

Fig. 1. Distribution of the offshore fishery for Greenland halibut in SA 1 in 2003.

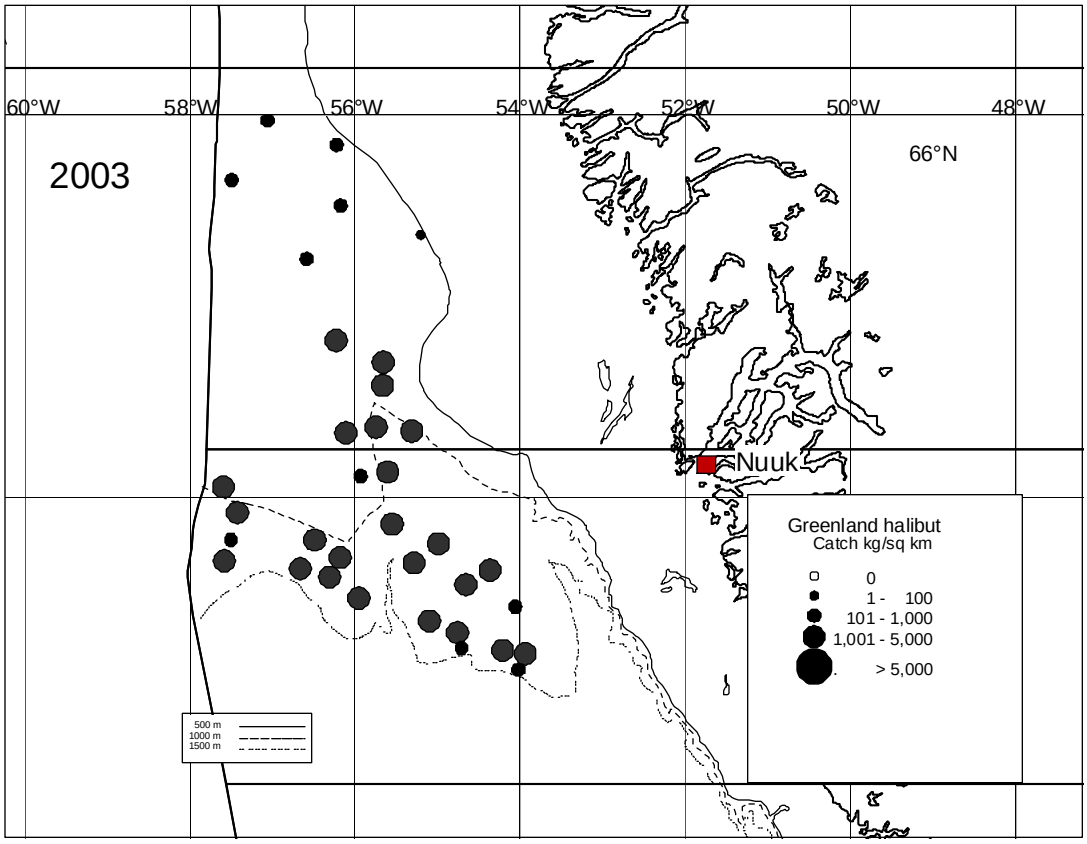

Fig. 2. Distribution of stations and catch of Greenland halibut in the Greenland deep-sea survey in Div. 1CD in 2003.

References

Anon. 2003. Scientific Council Reports. Northwest Atlantic Fisheries organization. Dartmouth Canada 2003.

Ribergaard, M.H. and Buch, E. 2004. Oceanographic Investigations off West Greenland 2003. *NAFO Scientific Council Documents* **04/1**

HVINGEL, C., 2003. Correction of Reported Past Catches of Northern Shrimp Within the Greenland EEZ to Conformto a Revision of Reporting Practices. *NAFO SCR Doc.*, No. 03/74, Serial No. N4913.

HVINGEL, C. and M.C.S. KINGSLEY, 2002. A framework for the development of management advice on a shrimp stock using a Bayesian approach. *NAFO SCR Doc.*, No. 158, Serial No. N4787.