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Denmark/Greenland Research Report for 2013

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This report presents information on catch statistics from the commercial Greenland fishery in 2013. Furthermore, the report gives a brief overview over the research carried out in 2013 by the Greenland Institute of Natural Resources.

WEST GREENLAND (NAFO SUBAREA 1)

A. Status of the fisheries

Provisional statistics for the fisheries from 2010 to 2013 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 NAFO SA 1 (Div. 1A-1F), but a small part of the habitat, and of the stock, intrudes into the eastern edge of Div. 0A (east of 60°30' W). Northern shrimp is found mainly in depths between 150 and 600 m. The stock is assessed as a single population. The Greenland fishery exploits the stock in SA 1, Canada in Div. 0A.

Three fleets, one from Canada and two from Greenland (vessels above and below 75 GRT) have participated in the fishery since the late 1970s. The Canadian fleet and the Greenland offshore fleet (> 75 GRT) have been restricted by areas and quotas since 1977. The fishery by the Greenland coastal fleet (< 75 GRT) was unrestricted until 1997, when quota regulation was imposed. Mesh size is at least 44 mm in Greenland, 40 mm in Canada. Sorting grids to reduce by-catch of fish are required in both of the Greenland fleets (but dispensation from this has been granted for all vessels under 75 GRT from 2001 until 2011 for safety reasons) and in the Canadian fleet. Discarding of shrimps is prohibited.

The annual TAC advised for the entire stock for 2004-2007 was 130 000 tons live-caught weight, which was reduced to 110 000 tons for 2008-2010. The advised TAC for 2011 was 120 000 tons. The advised TAC for 2012 was 90 000 tons and the advised TAC for both 2013 and 2014 is 80 000 tons.

The TAC set by the Greenland authorities for SA 1 was 114 570 tons in 2009 and 2010 and 124 000 tons in 2011. The TAC for SA 1 for 2012 was 101 675 tons, which was reduced to 90 000 tons for 2013. The TAC for 2014 for SA1 is 85 000 tons. A TAC of 18 417 tons was set by the Canadian authorities for Div. 0A east of 60°30'W for 2007-2011, which was reduced to 12 750 tons in 2012 and 11 333 tons in 2013.

Greenland requires that logbooks should record catch live weight, but for shrimps sold to on-shore processing plants an allowance was made for crushed and broken shrimps in reckoning quota draw-downs, which were based on weight sold, not on weight caught. From 1st of January 2011 the quotas is required to be drawn down by the amount caught without allowances for shrimps landed in poor condition.

Catches peaked in 1992 at 105 000 tons, but then decreased to around 80 000 tons by 1998 owing to management measures. Since then increases in allowed takes have been accompanied by increased catches.

The logbook recorded catches in 2005 and 2006, around 157 000 tons, were the highest recorded. Total catch for 2008 was 153 900 tons, total catch for 2009 was 135 450 tons and for 2010 was 134 000 tons. Total catch for 2011 was 124 000 tons. Total catch for 2012 was 116 000 tons. Total catch for 2013 is approximately 95 000 tons.

The overall combined index of standardized catch rates (CPUE) for the 3 fleets fluctuated without trend by a factor of 1½ between 1976 and 1987. It then dropped precipitously to the lowest levels in the series in 1989–91, and stayed fairly flat until 1997. Since then, the unified CPUE index increased markedly and sustainedly for 11 years, reaching the highest level in 2008, to turn downward in 2009. Since then the unified CPUE index has been decreasing. In 2012 the decrease was 17 % and in 2013 (based on part years data) the decrease was 28 % compared to the 2008 value.

According to logbook records, the early fishery was concentrated in NAFO Division 1B, but from the late 1980s the fishery spread southwards, - and by 1996–98 Divisions 1C–1F were producing nearly 70% of the catches. Since then the range of the fishery has contracted northwards and since 2007 Divisions 1C-1F have yielded only about 10% of the catch. In recent years up to 40% of the catch has been taken in Division 1A alone. This is especially due to increased fishing in the Disko Bay) area. This is consistent with results from the survey, in which the proportion of survey biomass in Disko Bay has been high since 2005 and the proportion of survey biomass in the northern Areas has been high since 2003.

2. Greenland halibut

The total catches of Greenland halibut (*Reinhardtius hippoglossoides*) by Greenland vessels in NAFO Subarea 1 amounted in to 31502 tons in 2013. Of these, 8095 tons were taken offshore (5865 tons in division 1AB + 2229 tons in division 1CD) and 23419 tons were taken inshore (22119 in division 1A inshore and 1289 in division 1BCDEF). Landings in East-Greenlandic fjords amounted to 66 tons in 2013. The offshore catches were exclusively taken by trawlers (Fig. 1), while the inshore catches were taken by small vessels using gillnets and longlines (Fig. 2). Trawl fishery is banned inshore, with the exception of shrimp trawl fishery in the Disko bay and a small area inshore in division 1B. Sorting grids in the shrimp fishery have been mandatory offshore since 2002 and on the smaller vessels operating inshore since 2011.

Commercial fisheries data. CPUE data, based on logbooks reported to the Greenland authorities, were available from four Greenland trawlers. The CPUE for all vessels combined increased in Div. 1AB from 0.82 ton/hr in 2009 to 0.93 ton/hr in 2010 and further to 1.30 ton/hr in 2011 and remained at that level in 2012 (1.32). The highest level in the time series apart from small trial fisheries in 2000 and 2001.

In Div. 1CD the CPUE for three Greenland vessels fishing there has been fluctuating between 0.55 tons/hr and 0.87 ton/hr since 2000. The CPUE has been rather stable since 2005. In 2011 CPUE was 0.87 tons/hr but and it remained at that level in 2012 (0.88 ton/hr) but increased to 1.16 ton/hr in 2013.

Length frequency samples sampled by Greenland were available from Norwegian longliner fishing in Div. 1D and from trawlers fishing in Div. 1AB and Div. 1CD.

3. Cod

Cod (*Gadus morhua*) found in Greenland is a mixture of four separate “stocks” that are defined by their spawning areas: I) offshore West Greenland waters; II) West Greenland fiords cod III) offshore East Greenland and offshore Icelandic waters and IV) inshore Icelandic waters (Therkildsen et al. 2013). Therkildsen et al. (2013) showed a relatively stable spatial and temporal distribution of these spawning stocks during actual spawning events, but the proportional contribution of the different components to commercial and survey catches in different areas, seasons and years and the associated variation is unclear. However Icelandic inputs are believed to have been responsible for the previous large year classes in Greenland (i.e. 1984 and 2003). A proportion of these cod return to Iceland when reaching maturity.

Previously the stocks have been assessed together. From 2012 the inshore component (West Greenland, NAFO Subarea 1) was assessed separately from all offshore components. The stocks are assessed by the ICES North-

Western Working Group (NWWG), see ICES (2014) and ACFM (2014) report.

In 2013 a management plan was implemented for the offshore cod fishery in Greenland (2014-2016). The management plan is build on the distinction between the inshore and offshore stocks (as also recognized by ICES). However, the management plan further divides the offshore stock into a West and an East component. Management area West covers NAFO Subarea 1A-E and management area East covers ICES Subarea XIVb (survey area Q1-6) +NAFO 1F. According to the management plan, management area West TAC should be 0 t for the period 2014-2016. The TAC in management area East is 10,000 t/year between 2014 and 2016, though with possible changes if stock developments changes significantly.

There are no explicit management objectives for the inshore cod in Greenland.

The cod fishery in Greenland consists of two components, an offshore fishery and an inshore fishery. The offshore fishery completely collapsed in 1993. From 1994 to 2001 no directed offshore cod fishery has taken place. In the 2000s catches have gradually increased with maximum catches in 2008. Between 2008-2010 offshore areal closures were implemented in order to protect the spawning stock in offshore areas. In 2011, 2012 and 2013 an experimental fishery was allowed in order to collect information on the distribution and composition of the cod stock. The catch for the experimental fishery amounted to 6,000 tons in 2013, where the majority has been taken outside the NAFO areas along the Greenland East coast in the ICES Subareas (2,000 tones in NAFO Subarea 1 and 4,000 tones in ICES Subdivision XIV, for 2013).

The Greenland inshore commercial cod fishery in West Greenland started in the 1920s. The fishery gradually developed culminating with catch levels above 30,000 tons annually in the 1960s. Catches then fluctuated between 5,000 and 35,000 tons in the 70s and 80s. The stock size then declined and the catches went below 500 tons in the 1990's. In the 2000s catches gradually increased until the maximum in 2007 and 2008 of 13,000 tons and then declined to around 8,000-11,000 the following years before reaching 13,500 tons again in 2013. The inshore fisheries did not require a license until 2009 and has historically not been constrained by catch ceilings (for 2009 a TAC of 10,000 tons was introduced). In 2014 a TAC of 15,000 tons was allocated to the inshore fisheries. The coastal fleet catches peaks during summer where the dominant pound net fishery takes place.

The offshore Greenland spawning component has not been fished during the last 15 years. Surveys and exploratory fishery now suggest dense concentrations of large spawning cod in East Greenland north of 63°N. The area is limited in distribution compared to the spawning grounds observed historically. Recruitments in the offshore area have improved since the end of the 1990s although it is still low compared to the recruitments before the stock was depleted.

Inshore spawning occurs in many fiords and recruitment has increased in recent years in the areas surveyed. Recruitment is now well above the lows observed in the late 1990's.

4. **Salmon**

Atlantic salmon (*Salmo salar*) migrates to Greenland from most salmon producing countries around the North Atlantic and in Greenland only one spawning population Atlantic salmon is known. The modern fishery for Atlantic salmon fishery in Greenland waters started around 1960 and peaked in the early seventies at a catch level of more than 2000 tons a year. The fishery was quota regulated from 1972, but due to declining stocks NASCO in June 1998, agreed that no commercial fishery for salmon should be allowed, but that the catch at West Greenland should be restricted to '*that amount used for internal consumption in Greenland, which in the past has been estimated at 20 tonnes*'. Since then export of salmon from Greenland has been banned. The salmon caught along the shores of West Greenland are mostly (>90%) non-maturing 1SW salmon, most of which are destined to return to home waters in Europe or North America as MSW fish. In 2013 total reported catches amounted to 47 tons including an insignificant amount from East Greenland.

5. **Capelin**

The capelin (*Mallotus villosus*) fishery in West Greenland is carried out inshore and in the spawning season only (May-July). Only part of the catches are reported, as capelin are used directly by fishermen for bait and

dog food during the capelin season. Reported catches of capelin amounted to 262 tons in 2013 and comprise a mixture of factory landed capelin (237 tons in 2013) for bait, human and animal consumption and logbook bycatch in other fisheries (25 tons in 2013). Reported catches are low and have been for the last decade with highest catches being 267 tons in 2004. The majority of the catches are taken in the northern part of West Greenland (NAFO 1A and 1B).

6. Redfish

Two species of redfish of commercial interest occur off West Greenland inshore and offshore, golden redfish (*Sebastes marinus*) and deep-sea redfish (*Sebastes mentella* Travin). Relationships to other North Atlantic redfish stocks are unclear. Redfish catches in West Greenland are reported as redfish (unspecified, mainly by-catch), golden redfish and beaked redfish (deep-sea redfish).

Demersal redfish

In 2013 logbook reported by-catch by Greenlandic shrimp vessels of un-specified redfish amounted to 10 tons. Catches reported as golden redfish is a mixture of *sebastes marinus* and *sebastes mentella* taken mainly inshore partly as a bycatch in other fisheries. In 2013 reported landings of Golden redfish amounted to 157 tons reported exclusively by open boats and small inshore operating vessels.

Pelagic redfish

The aggregations of pelagic redfish *S. mentella* found in the NAFO Convention Area likely belong to the same stock of pelagic redfish from the Irminger Sea. The stock is assessed by ICES (NWWG report 2014) and the assessment covers the pelagic redfish in ICES Divisions Va, Vb, and XIV and in the NAFO Div. 1F, 2H and 2J. The pelagic fishery on *S. mentella* in NAFO Div. 1F started in 1999 and from 2000 - 2009, significant catches with up to 20% of total catches as in 2003 were taken in NAFO Divisions 1F outside Greenlands EEZ and 2J. In 2013, 3113 t were taken in the NAFO 1F. No catches were reported by the Greenlandic fleet.

7. Grenadiers

There are two species of grenadiers of commercial interest in Greenland, roundnose grenadier (*Coryphaenoides rupestris*) and roughead grenadier (*Macrourus berglax*). Inshore catches in division 1A (mostly Uummannaq) are roughead grenadier taken as by-catch in the fishery targeting Greenland halibut amounted to 33 tons. Offshore catches is a mixture of both species taken bycatch in the trawl fishery targeting Greenland halibut. No forecast – the biological advice is “no direct fishery”.

8. Snow Crab

Snow crab (*Chionoecetes opilio*) is distributed along the west coast of Greenland from division 1A to 1F. The fishery is conducted mainly by Greenland vessels. Since 2004, the crab resource has been managed in 6 areas (from North to South: Upernavik, Uummannaq-Disko Bay, Sisimiut, Maniitsoq-Kangaamiut, Nuuk-Paamiut and Narsaq-Qaqortoq). The fishing fleet is dominated by small vessels (less than 75 GRT), which have exclusive rights for fishing inshore within the basis-line as well as offshore. Large vessels (greater than 75 GRT) may only fish in all offshore areas (outside the basis-line). Total allowable catch (TAC) restrictions have been imposed since 1995, but have only limited the catch in some years and management areas since 2004.

The number of vessels with licenses to participate in the snow crab fishery increased from 1999 to 2002 from approximately 120 vessels to 392 vessels. Since then the number of both large and small vessels have decreased substantially as the abundance of the resource has also declined. In 2013 number of permits were 66, where by 26 were active in the snow crab fishery.

The total catch in NAFO Subarea 1 peaked in 2001 with approximately 15.100 tons. From 2001 to 2013 total landings decreased approximately 86% to 2.162 tons, however landings have remain stable at approx 2.100 tons since 2010 . (table 1). Most of the landings are based on fishery in the management areas Nuuk-Paamiut, Disko Bay-Uummannaq and Sisimiut and total fishing effort (trap hauls) has declined by 92% since 2001 (from 3,416 to 288 thousand trap hauls during 2001-2012).

9. Wolffish

There are three species of wolffish in subarea 1, Atlantic wolffish (*Anarhichas lupus*), spotted wolffish (*Anarhichas minor*) and Northern wolffish (*Anarhichas denticulatus*). Only the two first are of commercial interest. In the past, these stocks have mainly been taken as a by-catch in the offshore fisheries targeting Cod, Greenland halibut and shrimp, but occasionally are directly targeted. A directed small-boat fishery still exists in the West Greenlandic fjords mostly targeting spotted wolffish. In 2013, 852 tons of wolffish, mainly spotted wolffish, were landed to factories by small boats and smaller vessels mainly from the fjords. There are no forecasts for any of the species. The biological advice is for Atlantic wolffish is “no direct fishery” and no advice is currently given for Spotted wolffish due to data deficiencies.

10. Scallops

Total catches of Icelandic scallops (*Chlamys islandica*) in NAFO Subarea 1 amounted to 406 tons in 2012. A total quota for scallops in 2012 was set at 1.520 tons. All catches are taken in inshore areas in Div. 1A, 1B, 1C and 1D. New fishing grounds near Sisimiut (1B) was found in 2003 and quotas for two new areas was introduced in 2004.

11. Lumpfish

Total landings of lumpfish (*Cycloperus lumpus*) in NAFO Subarea 1 increased from 1.200 tons in 2000 to almost 9.000 tons in 2003. Catches have remained at this level until 2011 where catches increased to 11.443 tons and . Catches are taken in inshore areas in Div. 1A, 1B, 1C, 1D, 1E and 1F with the majority being caught in 1D. 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. Total landings of lumpfish roe in 2013 amounted to 2124 tons, which is converted to 14229 tons whole weight. The historically used conversion factor is however currently under evaluation. Since 2008, lumpfish carcasses have also increasingly been landed.

12. Greenland cod

Greenland cod (*Gadus ogac*) is mostly by-catch in other fisheries. Greenland cod is mostly used for human consumption as dried or frozen fish for the local Greenlandic market. Total reported landings in 2013 amounted to 60 tons.

13. Arctic char

Arctic char (*Salvinus alpinus*) is taken in gillnets when returning to natal rivers during their annual feeding migrations and in coastal areas. Production is mainly for the Greenlandic market, and decreased to 15 tons in 2013.

14. Atlantic halibut

Catches of Atlantic halibut (*Hippoglossus hippoglossus*) peaked in the beginning of the 1960's and the mid 1980's at a level of 600 to 1000 tons per year. In 2013 less than 12 tons were landed to factories and only from small vessels operating inshore and near the coast.

15. Polar cod

Reported catches of polar cod (*Boreagadus saida*) is a mixture of bycatch in the shrimp fishery (10 tons) and a large vessel landing 34 tons of polar cod, presumably for bait in other fisheries.

16. Fish not specified

Fish not specified (FAO: MZZ) are logbook reported bycatch of mixed fish. The bycatch was mainly reported from shrimp trawlers indicating that is mainly small fish of noncommercial interest that are not sorted by the shrimp trawl sorting grids. In total 759 tons of nonspecified fish were reported in 2013.

B. Special Research Studies

1. Environmental Studies

a. Hydrography Studies

A survey of oceanographic stations along the West Greenland standard sections was carried out in summer 2014. Results are presented in NAFO scr.doc. 14/001.

In winter 2012/13, the North Atlantic Oscillation (NAO) index was negative describing weakening westerlies over the North Atlantic Ocean. Often this results in warmer conditions over the West Greenland region which was also the case this winter with air temperature above normal.

The general settings in the region have traditionally been presented with offset in the hydrography observed over the Fylla Bank. Here, time series of mid-June temperatures on top of Fylla Bank show temperatures 0.5°C above average conditions in 2013 and average salinities. The normalized near-surface salinity index and the presence of Polar Water were normal in 2013.

The presence of Irminger Water in the West Greenland waters was high in 2013. Pure Irminger Water (waters of Atlantic origin) could be traced north to the Paamiut section and modified Irminger Water further north to the Sisimiut section. However, at the three southernmost sections, the pure Irminger Water does not occupy as large a volume as in recent years. It has to a large extent been replaced by modified Irminger Water. In contrast, mean (400–600 m) temperature and salinity were still very high over the Southwest Greenland shelf break north of Fylla Bank and into the Disko Bay region.

2. Biological Studies

a) Shrimp

The series of annual stratified trawl surveys, initiated in 1988 and converted to a semi-systematic design in 1999, was continued in 2013. In June and July In 2013, 221 stations were fished in 42 fishing days; 181 provided data to the shrimp survey in all strata, including 4 hauls on the Westgreenland shelf part of NAFO Subarea 0. .

The survey index of total biomass remained fairly stable from 1988 to 1997 (c.v. 18%, downward trend 4%/yr). It then increased by, on average, 19%/yr until 2003, when it reached 316% of the 1997 value.

The 2003 peak in total survey and fishable biomasses has been followed by continuous decline, reaching in 2012 the lowest levels since 1997. Total survey biomass increased by 19% over 2012 to 233,775 t in 2013. While offshore survey biomass increased by 45% over 2012 and is about 60% of its previous maximum, in Disko Bay and Vaigat the survey biomass declined by 12%, and is 58% of its (2005) maximum and equal to its 2004 value. Offshore regions comprise 65% of the total survey biomass, and 35% is inshore in Disko Bay and Vaigat.

Both inshore and offshore the index of age-2 shrimps is well below its 20-year mean when consider relative to survey biomass. However absolute numbers of age-2 shrimps increased by more than 50% offshore, mainly owing to a significant increase in numbers of 2-age in strata W4, but declined by 16% over 2012 in Disko Bay.

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 1997-2012 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 2012 there were made 50 successful hauls in Div. in Div. 1CD. (Jørgensen 2013)

In 2001 the survey area was expanded to include NAFO Div. 1B-1A (to 74°N) and in 2004 a survey was conducted in the northern part of the Baffin Bay (73°N-77°N) (Div. 1A) at depths down to 1500 m. In 2010 was conducted a survey in Div. 1A to 75°30' where 93 successful hauls were made. There was no deep sea

survey in Div. 1AB in 2012.

Since 1988, an annual stratified random trawl survey SFW (Shrimp Fish West) has been conducted by the Greenland institute of natural resources on the West Greenlandic shelf between 59°15'N and 72°30'N from the 3 mile limit down to the 600 m and the inshore area of Disko Bay. The main purpose of the survey is to evaluate the biomass and abundance of the Northern shrimp (*Pandalus borealis*), but since 1992 data on fish species have been included. Since 2008 the survey also covers the East Greenland area to Dohrn Bank at 67°N.

A longline survey for Greenland halibut in the inshore areas of Disko Bay, Uummannaq, and Upernavik was initiated in 1993. Since 2001 a gillnet survey was initiated in the Disko Bay area. The survey normally covers 4 transects and each gillnet setting is compiled of 4 different nets with differing mesh size (46, 55, 60 and 70 mm halfmesh). The distribution pattern showed a markedly higher density of Greenland halibut in the mouth of the ice fjords. In 2013 a gillnet survey was conducted in Disko Bay and a longline survey was conducted in the Uummannaq and Upernavik areas.

c) **Cod survey**

Inshore

A survey using gangs of gill nets with different mesh-sizes has been developed and used since 1985 with the objective of assessing the abundance of age 2 and age 3 cod in the inshore areas. The indices in all areas (NAFO 1B and 1D) are generally above the levels observed during the 1990's. The West Greenland inshore gillnet survey was in 2013 conducted in the areas NAFO 1B and NAFO 1D. The overall index is higher than the time series mean, but it has declined compared to high recruitment in 2011 and 2012, which was caused by a large 2009 YC that is no longer caught in the survey as 4 yr old. In NAFO 1D, the 2011 YC is the largest seen since the 2004 YC. In NAFO 1B, catch rates have decreased following two years of time series high recruitment, and current catch rates are similar to the time series mean.

Greenland Shrimp and fish survey

An annual stratified random trawl survey has been conducted since 1988 in West Greenland between 59°15'N and 72°30'N and the inshore area of Disko Bay from the 3 mile limit down to the 600 m. The main purpose of the survey is to evaluate the biomass and abundance of the Northern shrimp (*Pandalus borealis*), but since 1992 data on fish species have been included. Since 2008 the survey also covers the East Greenland area to Dohrn Bank at 67°N.

Until 2001 the survey biomass indices of cod was below 1,000 tons but increased to about 2,300 tons in 2004 and continued to increase thereafter with highest biomass indices in 2007 and 2008 with estimated biomass and abundance indices at 28,481 tons and 53.4 mill individuals. The stock in West Greenland then declined in 2009 compared to 2008 with 85% in biomass and 70% in abundance. This was mainly caused by a decrease in the abundance of the 2003 and 2005 YC in West Greenland, which were the dominating YC in previous years. Since 2008 biomass and abundance has increased, and the 2013 survey showed that the offshore cod stock in West Greenland increased with 131% in biomass (86,000 tons) and 76% in abundance (125 million individuals) compared to 2012. The main cause for the increase in biomass was the growth of the 2009 YC which first appeared in the survey as 2 year olds in 2011. This 2009 YC was mainly distributed in the northern part of the survey area (NAFO area 1B) in 2011, but had a more southerly distribution in 2012 and 2013 in NAFO area 1F. Cod older than 6 years are almost absent in West Greenland.

The survey started in East Greenland in 2008 and biomass and abundance has gradually increased. Large and old cod were especially observed north of 63°N. The dominating yearclass in 2013 was the 2007 YC which have moved further north in East Greenland compared to 2012, probably to join the spawning stock. The second largest yearclass was the 2009 YC which was mainly observed in South Greenland.

German survey

An annual stratified random trawl survey has been conducted by Germany since 1982 in West and East

Greenland from 67°N in West Greenland to 67°N in East Greenland covering the depthzone between 0-400 m. The main purpose of the survey is to evaluate the biomass and abundance of the Atlantic cod.

The survey time series shows two abundance peaks in 1987-1989 caused by the 1984 and 1985 YC and from 2005 and onwards caused by the 2003 and younger Yearclasses.

In 2013 the German survey did not find the same increase in abundance and biomass as the Greenland survey in both West and East Greenland. However overall findings were the same: a 2009 YC predominantly distributed in South Greenland. The main difference between the surveys were fewer large cod caught especially in the Dohrn Bank area in the northern part of the survey area in East Greenland and fewer individuals caught of the 2009 YC by the German survey.

Overall the Greenland and the German surveys show that older cod (>8 yrs) are predominantly found in the northern areas off East Greenland (Dohrn Bank) being scarcer off Cape Farewell and absent from West Greenland. Younger cod (4-6 yrs) are predominantly found in South Greenland, and recruits (<4 yrs) are predominantly found in North and Mid West Greenland.

d) **Snow crab**

Annual monitoring program (trap survey) was initiated in 1997 in Disko Bay (Div. 1A) and Sisimiut (Div. 1B). Since 2001 annual offshore trap survey has been conducted in more southern areas in West Greenland (Div. 1C and 1D) but has been canceled since 2010. Large and small meshed conical traps are used. All snow crab were enumerated by sex, carapace width and carapace condition. The chelae height was measured in males and the abdomen width in females, respectively for maturity determination. Ovary contents, clutch weight, sperm load and egg development stage in females was also determined and females were sampled in relation fecundity studies.

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. In general the stock and recruitment prospects are at a low level in all areas.

A Ph.D. project, initiated in 2004, is 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. Exploited and non-exploited stocks will be examined as well as temperature effects. Life history traits will be related to aspects of snow crab reproductive potential at three study sites: 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.

e) **Marine mammals**

Yearly summaries of studies of marine mammals in Greenland can be found at the annual reports of the North Atlantic Marine Mammal Commission (NAMMCO).

GREENLAND FISHERY IN OTHER NAFO SUBAREAS

A. Status of the fisheries

In 2013 no Greenlandic vessels has been involved in shrimp fishery at Grand Bank.

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Table 1. Estimated catches (tons) by Greenland vessels at West Greenland (NAFO Subarea 1) in 2009-2012.

| SPECIES | FAO | NAFO SUBAREA 1 DIVISION 1ABCDEF | | | | NAFO 0 Div AB | NAFO 2,3 |
|--|-----|------------------------------------|---------|---------|--------------------|------------------|-------------|
| | | 2010 | 2011 | 2012 | 2013 | 2013 | 2013 |
| American Plaice | PLA | 0 | 0 | nd | nd | | |
| Arctic char | ACH | nd | 62 | 70 | 15 | | |
| Atlantic halibut | HAL | 6 | 5 | 9 | 12 | | |
| Atlantic salmon | SAL | 38 | 28 | 34 | 47 | | |
| Atlantic cod | COD | 12.000 | 16.100 | 11.869 | 15120 ¹ | | |
| Capelin | CAP | 90 | 124 | 59 | 262 | | |
| Crabs | CRQ | 2.363 | 2.015 | 1.983 | 2.162 | | |
| Greenland cod | GRC | nd | 155 | 130 | 60 | | |
| Greenland halibut | GHL | 29.222 | 29.088 | 29.365 | 31.513 | | |
| Roughhead Grenadier | RHG | nd | 8 | 2 | 33 | | |
| Roundnose Grenadier | RNG | nd | 8 | 4 | 2 | | |
| Haddock | HAD | nd | nd | nd | 0 | | |
| Lumpfish | LUM | 8.482 | 11.443 | 11.776 | 14.229 | | |
| Polar cod | POC | nd | 172 | 73 | 46 | | |
| Redfish (unspecified - bycatch mainly) | RED | 75 | 46 | 26 | 10 | | |
| Pelagic redfish | REB | 0 | 0 | 0 | 0 | | |
| Redfish golden | REG | 166 | 136 | 128 | 157 | | |
| Saithe | POK | nd | nd | 0 | 0 | | |
| Scallops | ISC | 398 | 412 | 406 | 587 | | |
| Shark | | nd | nd | nd | nd | | |
| Shrimp (P.boreallis) | PRA | 133.990 | 123.985 | 111.450 | 92058 ² | | |
| Shrimp (P.montagui) | AES | 2.594 | nd | 3.124 | 4894 ² | | |
| Skate | SKA | 0 | 1 | 1 | 0 | | |
| Wolffishes | CAT | 1.315 | 779 | 1.002 | 852 | | |
| Fish not specified | MZZ | nd | 678 | 842 | 759 | | |
| Sum total | | 190.739 | 185.245 | 172.353 | 147.698 | | |

1 – Catches include insignificant amounts of cod landed by foreign vessels.

2 - Catch figures are provisional.

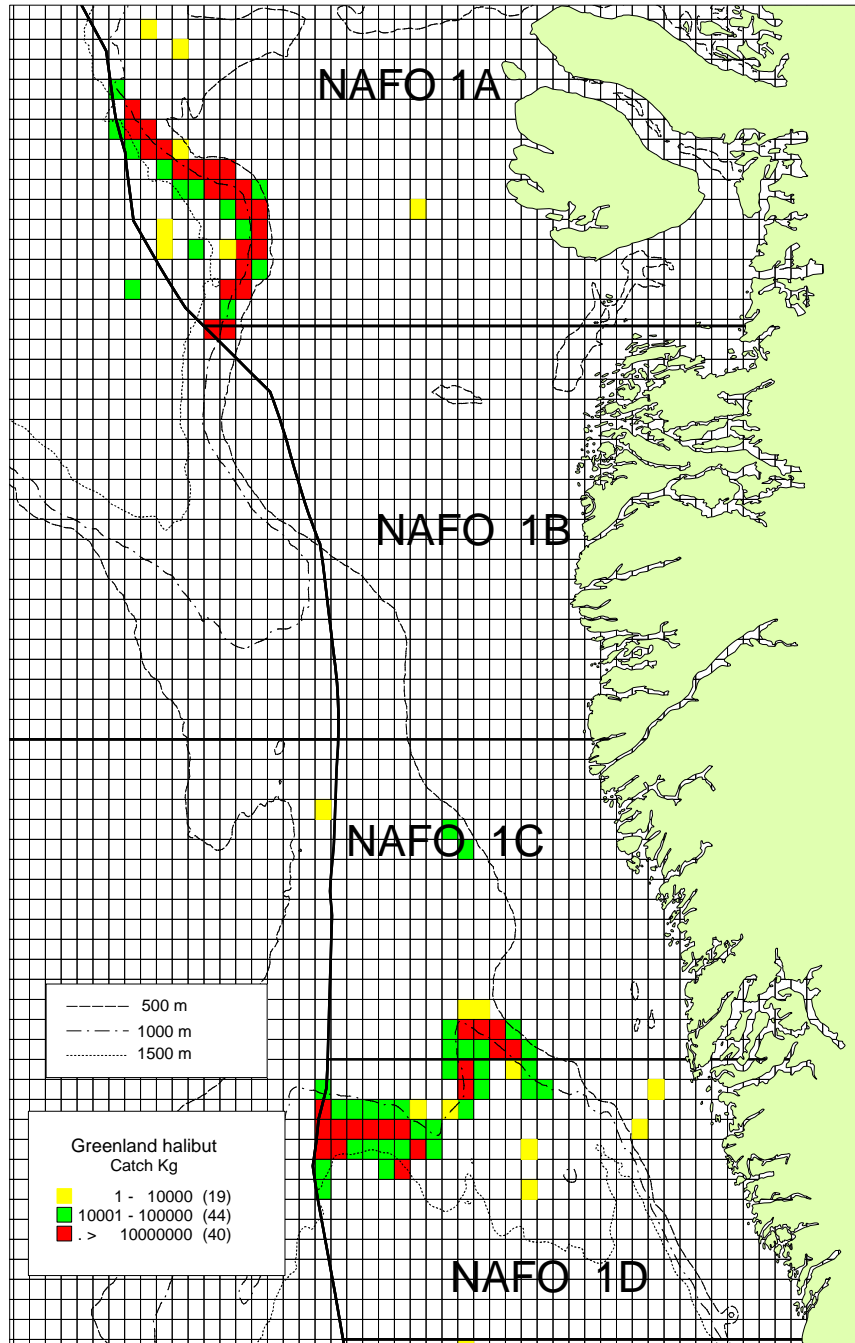


Fig. 1. Distribution of the offshore catches of Greenland halibut in SA 1 in 2012 by statistical square. All nations.

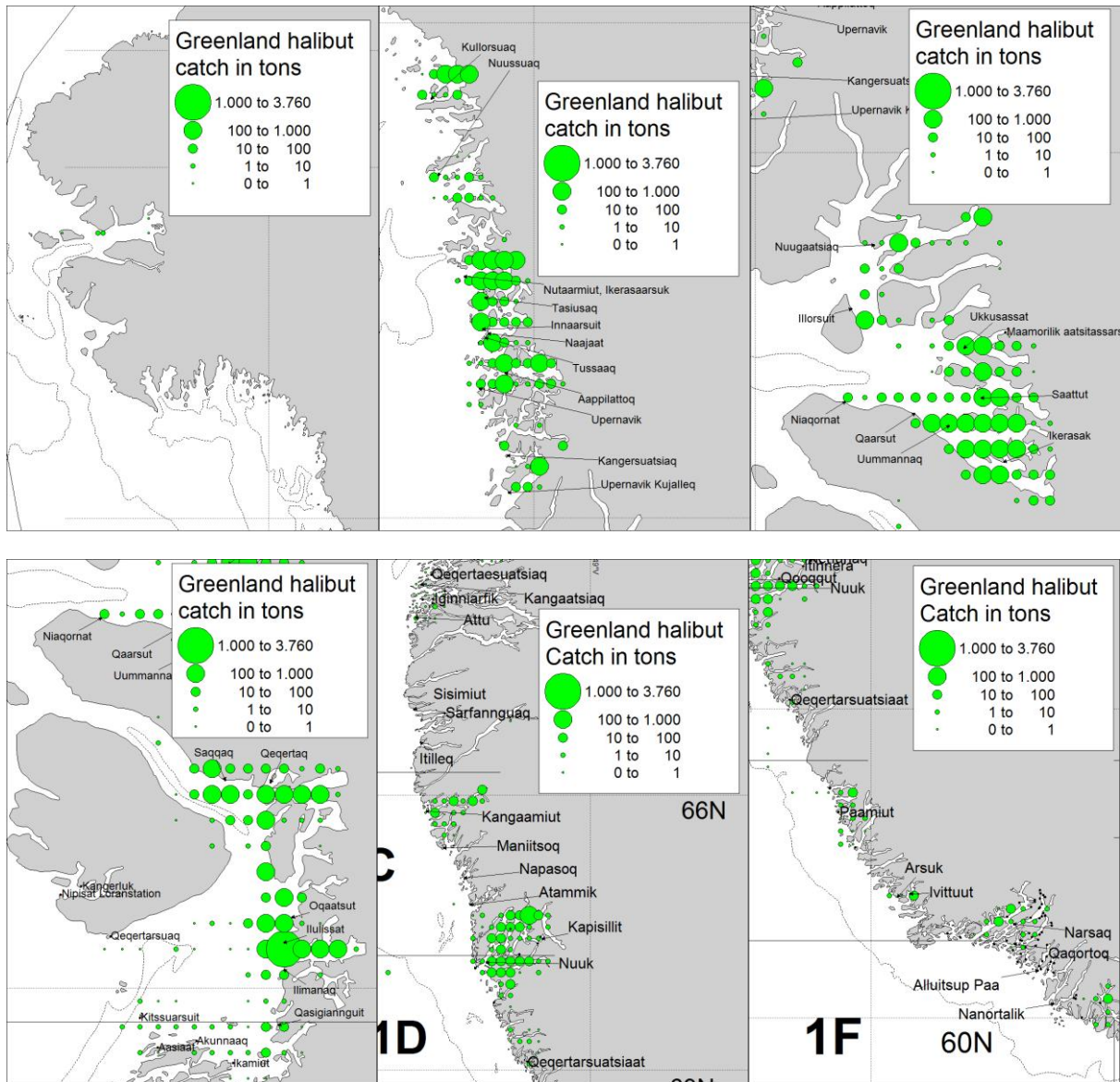


Fig. 2. Distribution of the Inshore catches of Greenland halibut in SA 1 in 2013 by statistical square.
 Top left – Qaanaq area, Top center - Upernavik area, Top right - Uummannaq fjord.
 Bottom left – Disko bay, Bottom center - NAFO 1BCD, Bottom right – NAFO 1DEF.