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Denmark/Greenland Research Report for 2015

Compiled by

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

This report presents information on catch statistics from the commercial Greenland fishery in 2015 at West Greenland. Furthermore, the report gives a brief overview over the research carried out in 2015 by the Greenland Institute of Natural Resources.

WEST GREENLAND (NAFO SUBAREA 1)

A. Status of the fisheries

Provisional statistics for the fisheries from 2012 to 2015 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 late1970s. 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.

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 of shrimp gradually increased throughout the 1980's and 1990's and reached a level around 157000 tons by 2005-2006. Since then catches have gradually decreased and the total catches were at 70899 t in 2015 (68875 tons of *P. borealis* and 2024 tons of *P. montagui*).

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 stocks of Greenland halibut in the area are assessed as several isolated populations. Greenland halibut in East Greenland (ICES XIV) are considered to be a shared population with Icelandic and Faroese stocks. Greenland halibut in NAFO 1 offshore is a population shared with Canada in NAFO (0AB) and assessed with the inshore stocks in division 1B-F. The inshore stocks in NAFO subarea 1A are considered isolated from the offshore stocks and further divided into local populations and assessed by fjord area (Disko bay, Uummannaq and Upernavik districts).
The total catches of Greenland halibut (*Reinhardtius hippoglossoides*) in NAFO Subarea 1 amounted to 39591 tons in 2015. 14873 tons were taken offshore and of these Greenlandic vessels caught 9595 tons (7216 tons in division 1AB + 2379 tons in division 1CD) and 24836 tons were taken inshore (23059 in division 1A inshore, 1527 in division 1BCDEF and 138 t in the Qaanaaq district (1A)). 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 and 2013 to increase to 1.55 ton/hr in 2014. The highest level in the time series apart from small trial fisheries in 2000 and 2001. In 2015 CPUE was back at the 2011-2013 level, 1.9 ton/hr.

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 ton/hr but and it remained at that level in 2012 (0.88 ton/hr) but increased gradually in 2013- 2015 to record high 1.91 to ton/hr in 2015.

Length frequency samples 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. From 2016 the offshore components have been assessed separately with the West Greenland offshore component being comprised in the offshore area corresponding to NAFO subdivisions 1A, 1B, 1C, 1D and 1E. The East Greenland offshore component is comprised in the offshore area corresponding to NAFO subdivision 1F in SouthWest Greenland and East Greenland (ICES subarea XIV). The stocks are assessed by the ICES North-Western Working Group (NWWG), see ICES (2016) and ACFM (2016) 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 the two offshore stocks (as also recognized by ICES). According to the management plan, management area West (NAFO subdivisions 1A-1E) TAC should be 0 t for the period 2014-2016. The TAC in management area East (NAFO subdivision 1F and ICES Subarea 14) is 10,000 t/year between 2014 and 2016, though with possible changes if stock developments changes significantly. The TAC for 2015 and 2016 has however not followed the management plan, as the TAC for management area West has been set at 5,000 tons and TAC for management area East has been set at 18,000 tons in 2015 and 16,000 tons in 2016.

There are no explicit management objectives for the inshore cod in Greenland, and TAC for 2016 has been set at 26,000 tons (27,500 tons in 2015). The total TAC for cod Greenland is therefore set at 50,500 tons in 2015 and 47,000 tons in 2016.

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. 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 (5,000 tons) was allowed in order to collect information on the distribution and composition of the cod stock. In 2014 a management plan was implemented and the TAC was increased.
Total offshore catches amounted to 20,600 tons (including EU: 2,000 tons, Norway:1,230 tons, Faeroese: 355 tons) in 2015. This is highest catches since 1991. Catches rose especially in NAFO subdivision 1D and 1E that comprises Dana Bank where a total of 4,500 tons was fished. Since the 2000s, were fishing was allowed in this area, only 300-500 tons was fished (2007-2008, 2012-2013). A small amount (300 tons) was fished further to the north on Tovsuqas Bank in NAFO subdivision 1C. In management area East (NAFO subdivision 1F and ICES Subarea 14) the catches amounted to 15,800 tons with 4,000 tons (including Norway: 134 tons) being fished in NAFO subdivision 1F.

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 7,500 tons in 2009. Since 2009 catches have gradually increased again reaching 25,200 tons in 2015 which is the highest recorded since 1990. 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). Even though TAC has been introduced these tend to be raised during the season when the quota is fished (2010-2011 and 2014-2015) and therefore the fishery is in principle not constrained by catch ceilings.

In 2015 a TAC of 25,000 tons was allocated to the inshore fisheries, but was raised in December to 27,500 tons as the quota had been fished. 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 and peaked to a record high in 2011 and 2012 caused by the 2009 YC. Recruitment has, however, since declined and is now below the timeseries average. Increasing catches in combination with declining recruitment suggest an increasing fishing pressure,

A strong 2009 YC is recognized in all areas in Greenland. The origin of this YC is not known, but the YC at age 6 in 2015 was still distributed in the inshore and offshore areas in West Greenland and has not shown the same eastward migration pattern as the previous strong 2003 YC that originated from Iceland.

4. Salmon

The fishery for Atlantic salmon in Greenland waters started around 1960 and peaked in the early seventies at a catch of more than 2,000t a year. The fishery was quota regulated from 1972, but due to declining stocks, in June 1998 NASCO agreed that no commercial fishery for salmon should be allowed, but that the catch at West Greenland should be restricted to internal consumption. Since then export of salmon from Greenland has been banned by law by the government of Greenland, and the fishery has been reduced to an internal subsistence fishery within Greenland. After 1997, it has been mandatory to report private catches of salmon. From 2002 licensed fishermen were allowed to sell salmon to institutions, local markets and restaurants only, but in 2012 pressure by fishermen, led to the opening of factory landings for the Greenlandic home market, at a selected few factories. In total 56,8 tons were reported from the 2015 season. Very little salmon was reported from division 1A and it seems clear that very little fishery took place north of Sisimiut. Besides the reported landings, a phone survey conducted among the 197 licensed fishermen whom had failed to report catches, indicated 5 tons of nonreported catches in 2015.

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 338 tons in 2015 and comprise a mixture of factory landed capelin (303 tons) for bait, human and animal consumption and logbook bycatch in other fisheries (35 tons).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 norvegicus*) and deep-sea redfish (*Sebastes mentella* Travin). Relationships to other North Atlantic redfish stocks are unclear, but the nearest stocks are the demersal and pelagic stocks in East Greenland and the Irminger Sea. Redfish catches in West Greenland are reported as redfish (unspecified, mainly by-catch), golden redfish and beaked redfish (deep-sea redfish).

Demersal redfish
In 2015 logbook reported by-catch by Greenlandic shrimp vessels of un-specified redfish amounted to 18 tons. Catches reported as golden redfish is a mixture of *Sebastes norvegicus* and *sebastes mentella* taken mainly inshore partly as a bycatch in other fisheries. In 2015 reported landings of Golden redfish amounted to 244 tons (16 tons from offshore operating vessels and 228 reported by open boats and small vessels operating inshore.

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 2015) 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, but since then No catches were reported by the Greenlandic fleet in 1F.

7. Grenadiers

There are two species of grenadiers of commercial interest in Greenland, roundnose grenadier (*Coryphaenoides rupestris*) and roughead grenadier (*Macrourus berglax)*. In 2015 4 tons of roughhead grenadier were caught inshore in Uummannaq and landed to factories and Norwegian vessels reported 3 tons as bycatch in division 1C. Roundnouse grenadier were exclusively reported from offshore vessels targeting Greenland halibut and amounted to 29 tons in 2015. 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 2014 number of permits were 63, where by 42 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 2006 total landings decreased markedly to 2,200 tons, and since annual landings have remained stable at approx 2.100 tons. (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 more than 90% since 2001 (from 3,416 to about 319 thousand trap hauls during 2001-2014).

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 2015, 400 tons of wolffish were caught. 332 t (mainly spotted wolffish), were landed to factories by small boats and smaller vessels

mainly from the fjords and small amounts were taken as bycatch offshore mainly in the test fishery targeting cod (67 t). There are no forecasts for any of the species. The biological advice is for Atlantic wolffish is "no direct fishery" and the advice Spotted wolffish is 1025 t.

10. **Scallops**

Total catches of Icelandic scallops (*Chlamys islandica*) in NAFO Subarea 1 amounted to 799 tons in 2015 which is an increase compared to the most recent 5 years. 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 2015 amounted to 1058 tons, which is converted to 7089 tons whole weight. The historically used conversion factor is however currently under evaluation.

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 2015 amounted to 22 tons which is a significant decrease compared to previous years.

13. **Arctic char**

Arctic char (*Salvinus alpinus*) is taken in gillnets when returning to natal rivers during their annual feeding migrations in coastal areas. Production is mainly for the Greenlandic market, and decreased increased slightly to 17 tons in 2015.

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 2015, 9 tons were landed to factories and 4 tons were reported in logbooks from vessels operating offshore.

15. **Polar cod / Arctic cod**

Reported catches of polar cod (*Boreagadus saida*) is mainly taken as bycatch in the shrimp fishery . In recent years part of the bycatch has been landed and used internally in Greenland, for bait in other fisheries. In 2015, 114 tons were reported as by-catch in the shrimp fishery and of these 10 tons were landed to factories. In 2015, 3 tons of Arctic cod *Arctogadus glacialis* was also reported in logbooks, but these are likely polar cod.

16. **Fish not specified**

Fish not specified (FAO: MZZ) are logbook reported by-catch of mixed fish. The by-catch 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 610 tons of non-specified fish were reported in 2015.

17. **Large sharks**

Large sharks (FAO: SHX/GSK) are without doubt exclusively Greenland sharks *somniosus microcephalus*. In 2015, 63 tons of large sharks were reported (20 t in ICES 14) exclusively from trawl fishery indicating that they were taken in fisheries targeting Greenland halibut, cod and redfish. Shrimp-trawls are equipped with sorting grids and no sharks were reported via shrimp logbooks.

B. **Special Research Studies**

1. **Environmental Studies**

a. **Hydrography Studies**

Hydrographic conditions were monitored at 8 of 10 hydrographic standard sections in June 2015 across the continental shelf off West Greenland. The two southernmost standard sections were not occupied due to string of low-pressure passage in the Cape Farewell area. Two of three offshore stations have been chosen to document changes in hydrographic conditions off Southwest Greenland. The coastal water showed temperatures below the long-term mean in the area south of the Sisimiut section. The lack of the Cape Desolation stations takes it difficult to state if the same tendency was observed in the subpolar mode water mass, though neighboring sections showed temperature below those observed in 2014.

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 2015. In June and July In 2015, 235 stations were fished in 42 fishing days; 186 provided data to the shrimp survey in all strata. No stations were fished in sub stratum C0 on the West Greenland 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 2014 the lowest levels since 1997, but the total survey biomass increased by 58% over 2014. While offshore survey biomass were 137 higher in 2015 than in 2014, and is about 85% of its previous maximum in 2010, in Disko Bugt and Vaigat the survey biomass was 16% less than in 2014, 56% of its, of its (2005) maximum, but in its range to 2007 – 2014 values. Offshore regions comprise 73% of the total survey biomass and 27% is inshore in Disko Bay and Vaigat.

Both inshore and offshore the index of age-2 shrimps is well below its 20-year upper quantile when considered relative to survey biomass. Absolute numbers of age-2 shrimps increased by more than four times offshore in 2015, but remain at a comparable 2014 level in Disko Bay and Vaigat.

The spawning stock compose a low proportion of the total survey biomass and the stock is assumed to be sensitive to fishing pressure and long-term recruitment to spawning stock is likely to be low.

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 2015 there were made 68 successful hauls in Div. in Div. 1CD. (Jørgensen 2015)

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 the area since then.

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 59º15'N and 72º30'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 has also covered the East Greenland area to Dohrn Bank at 67ºN.

A longline survey for Greenland halibut in the inshore areas of Disko Bay, Uummannaq, and Upernavik was initiated in 1993. Since 2001 the Disko Bay survey was changed to a gillnet survey . 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). Likewise the surveys in Uummannaq and Upernavik has gradually changed to gillnet surveys since 2013.

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 of NAFO subdivisions 1B and 1D (historically NAFO subdivision 1F has also been surveyed). The numbers of juveniles in NAFO subdivision 1B, that historically has driven the index, are among the lowest seen in the timeseries in this area, whereas in NAFO subdivision 1D the numbers of juveniles are among the highest seen in the timeseries in this area. Because NAFO subdivision historically has driven the index, the combined index of the 2 and 3 yr olds are lower than the time series mean, following a record high in 2011 and 2012 where the 2009 YC was caught as 2 and 3 yr old. The index of the +4 yr olds is stable over the past 3 years at the highest level seen in the timeseries, this means that more large cod than juveniles are being caught in a survey that is designed for juveniles and suggest very low recruitment and high abundance of adults. These results, in combination with increasing catches, suggest an increasing fishing pressure.

Greenland Shrimp and fish survey

An annual stratified random trawl survey has been conducted since 1988 in West Greenland between 59º15'N and 72º30'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 67ºN.

In the period before 2005 biomass was very low in West Greenland. With the emergence of the 2003 YC biomass increased from 2005, and the overall biomass value for all of Greenland in 2015 was the highest observed in the survey timeseries (since 2008). This increase is especially caused by a large 2009 yearclass, but also due to yearclasses between the 2003 YC and the 2009 YC at intermediate sizes. A 2010 and 2011 YC is also recognized at intermediate size in West Greenland.

The main distribution pattern is that juveniles (ages 1-3 yrs) are predominantly observed in West Greenland (NAFO subdivision 1A-1E), ages 4-6 yrs are predominantly distributed in South Greenland, and older spawning cod are predominantly distributed in East Greenland north of 62ºN. West Greenland is therefore presently considered to act as a nursing area for the East Greenland stock component. The origin of the strong 2009 YC is not known, but the YC, at age 6 in 2015, was still mainly found and dominated the offshore area in Southwest Greenland (NAFO subdivisions 1E and 1F) and the inshore area corresponding to NAFO subdivision 1A-1D (Disko By to Nuuk area). The Yearclass has therefore not shown the same eastward migration pattern as the previous strong 2003 YC that originated from Iceland.

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.

The overall findings of the German survey with respect to distribution pattern and state of the stock correspond to the findings in the Greenland survey. The 2009 YC was, however, not found as abundant in the German survey as in the Greenland survey in 2015 and therefore the survey indices in the German survey decreased in 2015 compared to increasing survey indices in the Greenland survey in 2015.

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**

For yearly summaries of studies of marine mammals in Greenland, see the annual reports of the North Atlantic Marine Mammal Commission (NAMMCO).

GREENLAND FISHERY IN OTHER NAFO SUBAREAS

A. **Status of the fisheries**

In 2015 no Greenlandic vessels has been involved in shrimp fishery at Grand Bank or other NAFO subareas than subarea 1.

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Table 1. Estimated catches (tons) at West Greenland (NAFO Subarea 1).

NAFO Subarea 1						total	**Other nations**	**Greenland**
Species		2011	2012	2013	2014	2015*	2015	2015
American Plaice	PLA	0	nd	nd	nd	1	0	1
Arctic char	ACH	62	70	15	21	17	0	17
Atlantic halibut	HAL	5	9	12	14	13	1	12
Atlantic salmon	SAL	28	34	47	58	61	0	61
Atlantic cod	COD	11.201	11.801	14542	20280	33981	142	33839
Capelin	CAP	124	59	262	346	338	0	338
Snow crab	CRQ	2.015	1.983	2.162	2.157	2088	0	2.088
Greenland cod	GRC	155	130	60	35	22	0	22
Greenland halibut	GHL	29.088	29.365	31.513	31.513	39.709	5.278	34.431
Roughhead Grenadier	RHG	8	2	33	9	7	3	4
Roundnose Grenadier	RNG	8	4	2	6	29	18	11
Haddoc	HAD	nd	nd	0	1	11	2	9
Lumpfish	LUM	11.443	11.776	14.229	8.127	7.089	0	7.089
Polar cod	POC	172	73	46	158	114	0	114
Arctic cod	ATG	nd	nd	nd	146	3	0	3
Redfish (unspecified - bycatch mainly)	RED	46	26	10	16	26	4	22
Pelagic redfish	REB	0	0	0	0	2	2	0
Redfish golden	REG	136	128	157	156	244	0	244
Saithe	POK	nd	0	0	0	0	0	0
Scallops	ISC	412	406	587	633	799	0	799
Greenland Shark	GSK	nd	nd	nd	nd	63	2	61
Shrimp (P.boreallis)	PRA	123.985	111.450	92058	83224	68875	1859	67.016
Shrimp (P.montagui)	AES	nd	3.124	4894	1380	2024	0	2.024
Skate	SKA	1	1	0	1	6	4	2
Wolffishes	CAT	779	1.002	852	897	400	3	397
Tusk	USK	-	-	-	-	6	4	2
Fish not specified	MZZ	678	842	759	758	610	2	608
Sum total		180.346	172.285	162.240	149.936	156.538	7.324	148.951

NOTE: 2015 figures represent catches from both Greenlandic and forging vessels.
2 - Catch figures are provisional.

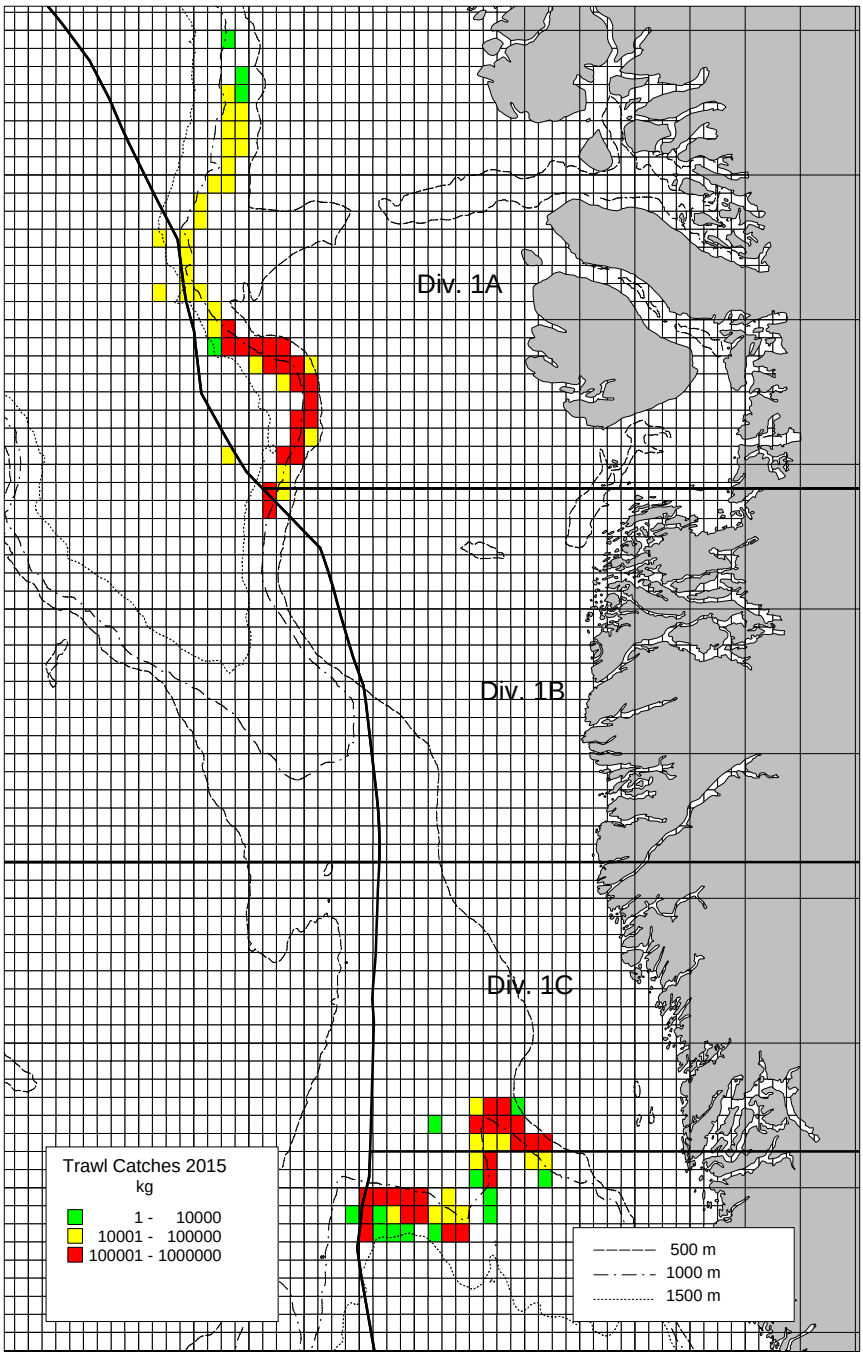

Fig. 1. Distribution of the offshore catches of Greenland halibut in SA 1 in 2015 by statistical square. All nations.

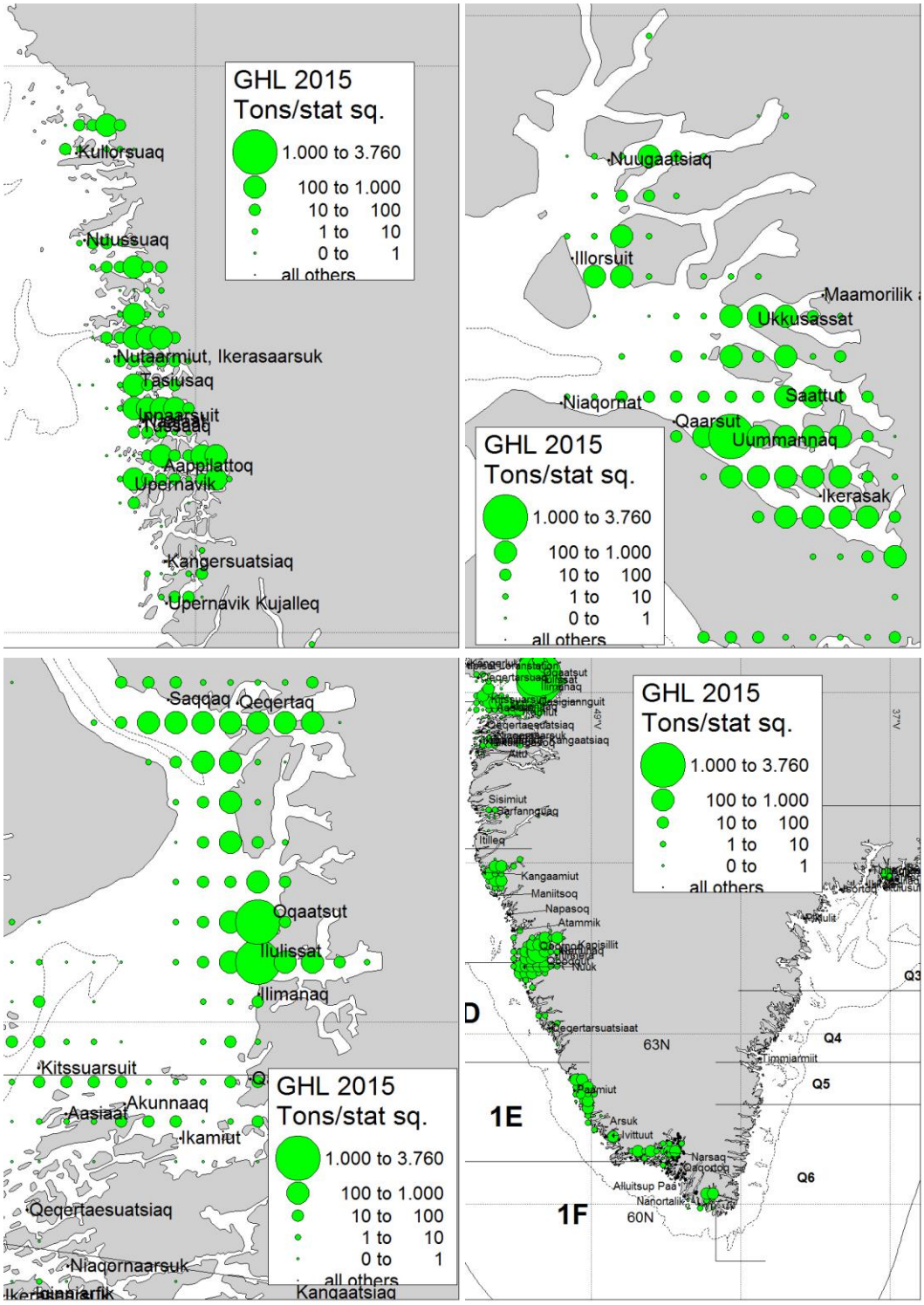

Fig. 2. Distribution of the Inshore catches of Greenland halibut in SA 1 in 2015 by statistical square. Top left – Upernavik area, Top right - Uummannaq fjord. Bottom left – Disko bay, Bottom right – NAFO 1BCDEF + ICES 14.