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Jørgensen, Ole A; Treble, M.A.

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Assessment of the Greenland Halibut Stock Component in NAFO Subarea 0 + Division 1A Offshore + Divisions 1B-1F

O.A. Jørgensen
DTU-Aqua, Technical University of Denmark,
Charlottenlund Slot, DK 2920 Charlottenlund, Denmark
and
M. A. Treble
Fisheries and Oceans Canada, Freshwater Institute,
501 University Cres., Winnipeg, Manitoa, Canada R3T 2N6

Abstract

The paper presents the background and the input parameters from research surveys and the commercial fishery to the assessment of the Greenland halibut stock component in NAFO Subarea 0 + Div. 1A offshore + Div. 1B-1F. During 2006-2009 catches have been around 24,000 tons. Catches increased to 26 900 tons in 2010 and has been at that level since. Survey trawlable biomass in Div. 0B decreased between 2011 and 2013 while biomass and recruitment increases in the Greenland shrimp fish survey and the recruitment of the 2012 year class in the entire survey area was the third largest in the time series. A combined standardized CPUE series from Div. 0A + 1AB has been stable since 2002. A combined CPUE series from Div. 1CD+0B decreased between 2011 and 2012 but increased slightly in 2013 and is above the level in 1990-2004. A combined standardized CPUE series from SA0 and 1 combined has been increasing gradually since 1997 and was in 2013 at the third highest level seen since 1990. CPUE series from the gill net in Div. 0A and Div. 0B were close to or at the highest level in the time series.

1. TAC, description of the fishery and nominal catches.

TAC

Between 1979 and 1994 a TAC was set at 25,000 tons for SA 0+1, including Div. 1A inshore. In 1994 it was decided to make separate assessments for the inshore area in Div. 1A and for SA 0 + Div. 1A offshore + Div.1B-1F. From 1995-2000 the advised TAC for the latter area was 11,000 tons but the TAC was fished almost exclusively in Div. 0B and Div. 1CD. In 2000 there was set an additional TAC of 4,000 tons for Div. 0A+1AB for 2001 and the TAC on 11,000 tons was allocated to Div. 0B and Div. 1CF. The TAC in Div. 0A+ Div. 1AB was in 2002 increased to 8,000 tons for 2003. Total advised TAC for 2004 and 2005 remained at 19,000 tons. In 2006 the advised TAC in Div. 0A+1AB was increased by 5,000 tons to 13,000 tons. The total advised TAC remained at 24,000 tons in 2008 and 2009. In 2010 the TAC for Div. 0B+ Div. 1CF was increased by 3,000 tons to 14,000 tons and the total TAC for Subarea 0+1 was 27,000 tons. The TAC remained at 27,000 tons in 2011-2013. In 2014 the TAC was increased by 3,000 tons to 16,000 tons in in Div. 0A+ Div. 1AB and the total TAC for the area (excluding inshore areas in Div. 1A) is 30,000 tons (Fig.1)

Catches in SA 0 + Div. 1A offshore + Div.1B-1F

During the period 1982-1989 nominal catches of Greenland halibut in SA 0 + Div. 1A offshore + Div.1B-1F fluctuated between 300 and 4,500 tons. Catches increased from 2,927 tons in 1989 to 11,633 tons in 1990. Catches remained at that level in 1991 but increased again in 1992 to 18,457 tons. During 1993-2000 catches have fluctuated between 8,250 and 11,750 tons. Catches increased to 13,760 tons in 2001 and further to 19,716 tons in 2005. In 2006 catches increased to 24,164, remained at that level in 2007 but decreased slightly to 22,071 tons in 2008. Catches increased again to 24,805 tons in 2009 and further to 26,934 tons in 2010 and catches remained at that level in 2011 - 2012 – 27,260 tons in 2012 but increased to 28,062 tons in 2013 (Fig. 1).

The increase in catches from 1989 to 1990 was due to a new trawl fishery by Canada and Norway and increased effort by Russia and Faeroe Islands in Div. 0B, while the increase from 1991 to 1992 was caused by a further increase in effort by Russia in Div. 0B and an increase in fishing activity in SA 1. The increase in catches between 2000 and 2006 was primarily due to an in increase in effort in Div. 0A and Div. 1A. The increase in catches between 2009 and 2010 was due to increased effort in Div. 0B and 1CD. The increase in catches between 2012 and 2013 was primarily due to increased effort in inshore areas in Div. 1D.

Catches in SA 0

In 1983 annual catches in SA 0 were about 4,500 tons. Catches then dropped to a level of 1,000 tons or lower, where they remained until they increased from 1,087 tons in 1989 to 9,753 tons in 1990. Catches decreased in 1991 to 8,745 tons, to increase again in 1992 to 12,788 tons. Catches then decreased gradually to 3,233 tons in 1995 and fluctuated between 3,924 and 5,438 tons between 1996 and 2000. Until 2000 almost all catches in SA 0 were taken in Div. 0B. In 2001 a commercial fishery started in Div. 0A. Catches in SA 0 increased to 8,107 tons in 2001 and further to 9,201 tons in 2003 and remained at that level in 2004 and 2005. Catches increased to 12,319 in 2006 but decreased slightly to 11,489 tons in 2007 and further to 10,432 tons in 2008. Catches increased again to 12,400 tons in 2009 and further to 13,225 tons in 2010. Catches decreased slightly in 2011 to increase again in 2012 to 13,331 tons. Catches remained at that level in 2013 (13,351 tons, excluding 315 tons taken in Cumberland Sound) (Table 1).

The increase in catches seen since 2000 was mainly due to an increased effort in Div. 0A where catches increased from a level of about 300 ton, where they have been since 1996 (trial fishery not officially reported), to 3,073 tons in 2001 and further to 4,142 tons in 2003. Catches remained at that level in 2004 and 2005. In 2006 catches increased to 6,634 tons due to increased effort, but decreased to 6,173 tons in 2007 and further to 5,257 tons in 2008. Catches increased again in 2009 to 6,627 tons and remained at that level in 2010 – 2013, - 6,314 tons in 2013 (Table 1).

About half of the catches in Div. 0A in 2013 were taken by trawlers, mainly twin trawlers, while the other half was taken by gill net. The long lines fishery in the area only amounted to 9 tons. The fishery was prosecuted by Canadian vessels.

Catches in Div. 0B 2013 amounted to 7,037 tons which is at the same level as in 2011 and 2012. About 1/3 was taken by gill net, single trawl and twin trawl, respectively. All catches were taken by Canadian vessels. 315 tons reported from Cumberland Sound Cumberland Sound are not included.

Catches in SA1

The catches in Subarea 1 (Div. offshore 1A + Div. 1B-1F) were below 2,500 tons during 1982-1991. In 1992 catches increased to 5,669 tons, decreased to 3,870 tons in 1993 and increased again in 1994. During 1995-1999 catches were around 4,500-5,000 tons. Catches increased to 5,728 tons in 2000, remained at that level in 2001 and increased gradually to 9,495 tons in 2003 and remained at this level in 2004 and 2005. Catches increased to 11,945 tons in 2006 due to increased effort by Greenland in Div. 1AB and remained at that level in 2007 and 2008. In 2009 catches amounted to 12,405 tons and increased further to 13,709 tons in 2010 and remained at that level in 2011 and 2012. Catches increased to 14,711 tons in 2013 (Table 2). Almost all catches have been taken offshore. However, the inshore catches increased from 440 tons in 2012 to 1289 tons in 2013 primarily due to an increased effort inshore in Div. 1D (Fig. 1).

Catches in Div. 1AB (mainly in Div. 1A) increased gradually from 575 tons in 2001 to 4,007 tons in 2003 and remained at that level in 2004-2005. Catches increased again in 2006 to 6,223 and remained at that level during 2007-2013 (6,500 tons in 2013). All catches were taken off shore by trawlers from Faeroe Islands, Russia (SCS 14/13) and Greenland (SCS 14/12).

Catches in Div. 1CD have been stable around 5,600 tons during 2000 to 2009, but catches increased to 7,247 in 2010 due to increased effort. Catches remained at that level in 2011 and 2012 but increased to 8,227 tons in 2013. Catches were taken by vessels from Greenland (SCS 14/12), Norway, EU-Germany and Russia (SCS 14/13). All most all catches offshore were taken by trawl except 75 tons that was taken by longline. Inshore catches in Div. 1B-1F, increased from 400 tons in 2012 to 1289 tons mainly due to increased effort in Div. 1D (1024 tons in 2013).

Reported discards in the trawl fishery is small, normally < 1% of the total catch.

2. Input data

2.1 Research trawl survey

Div. 1C-1D GHL-survey

Since 1997 Greenland has conducted stratified random bottom trawl surveys for Greenland halibut in September-October in NAFO Div. 1C-D at depth between 400 and 1500 m. In 2013 only Div. 1D was covered by just 27 valid hauls (SCR 14/02) and the survey is considered incomplete and not used for assessment because the biomass in Div. 1C not could be determined with a reasonable degree of precision. The proportion of the biomass found in Div. 1D has been varying during the years between 65 and 85%. And although the biomass in Div. 1D is at the same level as in 2012 the standardized trawl CPUE for Div. 1CD increased between 2012 and 2013 (Fig. 12c) indicating that a substantial part of the biomass could be found in Div. 1C.

The biomass of Greenland halibut in Div. 1D 43 457.5 tons which is at the same low level as in 2012 (42 370.6 tons) where the total biomass was estimated as 64 948.8 tons, which was a decrease compared to 86 591 tons in 2011 and the lowest in the time series since 2000 (Fig. 2a, 2c). The abundance in 2013 was estimated at $32.372*10^6$. The overall length distribution was dominated by a single mode at 50 cm, where the length distribution use to be monomodal with a mode around 47-49 cm (Fig. 2d).

Greenland deep sea survey in Baffin Bay (Div. 1A)

There was no survey in 2013. Greenland has conducted surveys primarily aimed at Greenland halibut in the Baffin Bay in 2001, 2004 and 2010. The biomass and abundance of Greenland halibut was in 2010 estimated as 79.332 tons and $1.04*10^8$ specimens, respectively (SCR 11/10). The surveys did not cover the same areas but a comparison of the abundance and biomass in areas covered both in 2001 and 2010 showed a small increase in biomass from 46.521 tons in 2001 to 52.428 tons in 2010 while there was a decrease in abundance from 101.8 mill. in 2001 to 63.5 mill. in 2010. The biomass has hence been relatively constant while there were significantly more and smaller fish in 2001. The biomass in the area covered both in 2004 and 2010 was estimated to 47.244 tons and 38.632 tons, respectively while the abundance was estimated at 58.8 mill. and 54.4 mill., respectively. The length in 2010 ranged from 20 cm to 105 cm. The overall length distribution (weighted by stratum area) was totally dominated by a mode at 45 cm, while the mode was at 46 cm at depths > 800 m. Generally the length distributions in the deeper depth strata were dominated by a single mode and fish size increased with depth as seen in previous surveys.

Canadian deep sea surveys in Baffin Bay (Div. 0A) and Davis Strait (Div. 0B)

There was no survey in Div. 0A in 2013. Canada has conducted 7 surveys in the southern part of Div. 0A, beginning in 1999. The biomass has varied from 68,760 tons to 86,176 tons (Fig. 2ef). The 2012 estimate of biomass is 102,486 t. However, one very large set in a depth stratum that comprises 30% of the area covered contributed to this increase. With this set removed the biomass estimate drops 15% to 86,874 t. Also, the 2006 survey suffered from poor coverage and two of the four strata that were missed fell within the depths 1001-1500 m, these strata had accounted for 11,000 – 13,000 tons of biomass in previous surveys. The abundance in 2012 was estimated at 1.31×10^8 (1.02×10^8 with outlier removed). This compares to previous highs of 1.19×10^8 in 1999 and 2001 (Fig. 2g). Mean biomass per tow is not influenced by the large set to the same extent as total biomass. In 2012 it was 2.07 t/ km^2 (1.76 t/ km^2 with outlier removed) (2 hi). This is similar to previous highs of 2.00 t/ km^2 and 1.94 km^2 in 2001 and 2004, respectively. The overall length distribution ranged from 6 cm to 90 cm with a small mode at 21 cm and a larger one at 42 cm, slightly higher than seen in previous surveys (64% <45 cm (57% with outlier removed) (Fig. 2j) (SCR 13/033).

In 2012 the survey also covered the northern part of Division 0A from 73°N to 75°35'N, which had been surveyed previously in 2010 and 2004. The 2012 estimates of biomass and abundance were 82,669 t (S.E. 6695 t) and 9.4 x 10^7, respectively. This is a significant increase from previous estimates that ranged from 45,877 t to 46,689 t. This increase is due to the increase in survey area due to good weather and little ice in the northern strata. Mean biomass per tow was also higher in 2012, 1.26 t/km^2 compared to 0.85 and 1.18 t/km^2 in 2004 and 2010, respectively. Mean biomass per tow has varied without any clear trend within depth strata across survey years (SCR 13/033). Length ranged from 18 to 78 cm with a mode at 45 cm and a smaller mode at 21 cm, similar to that observed for 0A-South; 46% were <45 cm (Fig. 2k) (SCR 13/033).

Division 0B was surveyed in 2013 for the fourth time by R/V Pâmiut. Previous surveys were conducted in 2000, 2001 and 2011, respectively. Prior to this there had been a survey conducted in 1986 using the RV Gadus Atlantica. Total estimated biomass and abundance were in 2013 57,765 tons and 5.60x10^7, respectively. Biomass had decreased compared to previous two surveys and was back at the level seen in 2000 (Fig. 2l) and the abundance was lower than in 2000. Biomass and abundance were reduced in all strata compared to 2011. Lengths ranged from 6 cm to 92 cm with 30% <45 cm. The length distribution had a single mode at 48 cm (Fig 2m. (SCR 14/020).

Greenland shrimp-fish-survey

Since 1988 annual trawl surveys with a shrimp trawl have been conducted off West Greenland in July-September. The survey covers the area between 59°N and 72°30'N (Div. 1A-1F), from the 3-mile limit to the 600-m depth contour line. The survey area was restratified in 2004 based on better information about depths. All biomass and abundance indices have been recalculated. The recalculation did not change the trends in the development of the different stocks. The trawl was changed in 2005 but the data have not been adjusted for that and the two time series are not directly comparable.

Estimated total trawlable biomass of Greenland halibut in the offshore areas has during 2005-2012 fluctuated between 49,779 and 25,644 tons estimated in 2012. The 2012 estimate is a decline form 40, 003 tons in 2011. The biomass was back at the 2011 level in 2013 – 39,383 tons (Fig. 2n).

The abundance was estimated at 534 mill. in 2011 which was the highest in the time series. The abundance decreased to 187 mill. in 2012 which is the lowest in the 2005-2012 time series and not seen lower since 1997 although the figures are not directly comparable. The abundance increased again in 2013 to 521 mill. The increase was seen in all division except Div. 1D-1F and the increase was most pronounced in Div. 1AS

Recruitment

A recruitment index was estimated for the Greenland shrimp – fish survey. By means of the Petersen-method ages 1, 2 and 3+ were separated in the survey catches. The number of one-year-old fish in the total survey area including Disko Bay increased gradually from 1996 to a peak of 500 million in 2001. The number of one-year old fish was in 2011 estimated as 530 mill. which is an increase from 310 mill.in 2010 and the highest in the time series. The increase between 2010 and 2011 was caused by an increase in abundance both offshore in Div. 1A and inshore in Disko Bay. In 2012 the 2011 year class was estimated to 175 mill. - the lowest estimate since 1996 and at the level of the early 90'es. The recruitment increased again in 2013 where the 2012 year-class was estimated at 444 mill. which is the third largest estimate in the time series (Fig. 3).

To allow comparison of abundance throughout the time series, the 2005 to 2013 catches were divided by a conversion factors to adjust the new Cosmos trawl catches to the old Skjervoy trawl catches. For Greenland halibut the conversion were length dependent and x in the equations is the individual fish length. Greenland halibut conversion factor: $0.0404x+0.6527$.

The offshore recruitment has been rather stable between 2003 and 2010. The recruitment increased to the highest level in the time series in 2011 but decrease to lowest level seen since 1997 (1996 year-class) in 2012. The offshore recruitment (2012 year-class) increased again in 2013 and the estimate is the second largest in the time series. In 2013 79% of the one year old fish was found in the off shore areas. The increase in recruitment between 2012 and 2013 was seen in all divisions except Div. 1C-1F (Fig. 4).

In Disko Bay the recruitment has been decreasing between 2003 and 2008 and increased since then to the highest level seen since 2001 in 2011. In 2012 the recruitment decreased again to the lowest level seen since 2008 to increase again in 2013, but not as significantly as in the of shore areas (Fig. 4).

Generally there is a steep decline between abundance at age 1 and age 2 and 3+ which also was observed in the 2013 survey. Further, it has been noted, that the year-classes estimated to be a very strong year-class at age 1 have not shown up as a particularly strong year-classes at age 5-8 in the fishery catches or in the 1CD survey for Greenland halibut.

Biological information
Information about maturity and feeding of Greenland halibut sampled during 2001-2013 in Div. 1AB and Div. 1CD on board Russian Federation trawlers was presented (SCR 14/XX). Generally the proportion of maturing fish was low in Div. 1AB, while it was somewhat higher in Div. 1CD especially among males. Spawning individuals were observed in October-November in Div. 1CD. In Div. 1AB the food was dominated by fish and shrimps while fish and squids dominated in Div. 1CD.

2.2 Commercial fishery data.

Length distribution

SA 0

No length distributions were available from the fishery in SA 0 in 2013

SA1

Length frequencies were available from the Greenlandic and the Russian trawl fishery in Div. 1A and from the Russian (SCS 14/13), Greenlandic and Norwegian trawl fishery and from the inshore fishery in Div. 1D.

In Div. 1A the mode was at 48 cm in the Russian trawl fishery (Fig. 6) and at 51 and 53 cm in the Greenlandic fishery (Fig. 7). In recent years the trawl catches have been dominated by fish on 44-52 cm.

In Div. 1D the catches by Norway had modes at 52 and 55 cm , the mode in the Russia fishery was at 48-50 cm while it was at 51 cm in the Greenland fishery, respectively (Fig. 8, 9, 10a). The catches seems to be composed of slightly larger fish than in previous years where the mode was around 47-50 cm. The inshore catches in Div.1D were composed of fish between 35 and 83 cm with a mode at 53 cm (Fig. 10b).

Age distribution.

There is considerable uncertainty about accuracy in the current age reading methods (see section in STACREC 2011 report) and the age reading procedure is currently under revision hence no age based analysis are presented.

Catch rate

The fleets used for standardization of catch rates are grouped according to NAFO's protocol:

Code for country.

2	CAN-MQ	Canada Maritimes & Quebec
3	CAN-N	Canada Newfoundland
5	FRO	Faroe Islands
6	GRL	Denmark Greenland
7	E/DNK	Denmark Mainland
8	E/FRA-M	France Mainland
9	FRA-SP	France St. Pierre et Miquelon
10	E/DEU	Federal Republic of Germany
14	JPN	Japan
15	NOR	Norway
16	E/POL	Poland
18	ROM	Romania
19	E/ESP	Spain
20	SUN	Union Soviet Socialist Republics
27	CAN-M	Canada Maritimes
28	CAN-Q	Canada Quebec
31	E/LVA	Latvia
32	E/EST	Estonia
33	E/LTU	Lithuania
34	RUS	Russia
38	EU	European Union
39	CAN	Canada
40	CAN-CA	Canada Central & Arctic

All vessels fishing in SA1 have been given the code 6 (Greenland).

Code for Trawl Gear:
Bottom otter trawl (charters),8,OTB
Bottom otter trawl (side or stern not specified),10,OTB
Bottom otter trawl,12,OTB-2
Otter twin trawl,192,OTT

Code for Tonnage:

0	Not known
2	0-49.9
3	50-149.9
4	150-499.9
5	500-999.9
6	1000-1999.9
7	2000 and over

Ex. Code 401927 is 40: Canada Central & Arctic, 192: Otter twin trawl, 7: Over 2000 Gross Tonnage

SA0

There have been frequent vessel changes in this fishery over the years and the catch from single and double trawl gear was often aggregated as "otter trawl" catch when this gear was first introduced to the fishery in the early 2000s. Very few of the vessels operating in the fishery in 2013 have been in the fishery for more than 3 years. A standardized catch rate is produced using a General Linear Model. The model was updated in 2014 with the 2013 data. Catches (t) and hours fished with values less than 10 were removed.

Div. 0A

In Div. 0A the standardized CPUE index have been increasing between 2010 and 2013, but generally the standardized catch rates have been relatively stable since 2002 (Fig. 12a) (Appendix 1). The increase could also be seen in the un-standardized catch rates for both single and twin trawl gears (Fig. 11a).

Standardized CPUE for Gill nets has been increasing gradually between 2006 and 2011 and has been stable since then (Fig. 12b) (Appendix 4).

Un-standardized CPUE for gillnets has increased gradually from 5.36 t/100 nets in 2004 to 12.79 t/100 nets in 2011 but decrease to 11.8 t/100 nets in 2012 and stayed at that level in 2013 (Fig. 11c).

Div. 0B

In Div. 0B the overall CPUE index increased to the highest observed level in 2009 but declined in 2010 to increase slightly in 2011 but decreased again in 2012 to the low level seen in 2003 and 2004 (Fig. 12d) (Appendix 5). The index increased slightly in 2013. The un-standardized catch rates for both twin and single trawls also increased slightly between 2012 and 13 (Fig. 11b).

The standardized CPUE for gill net in Div. 0B has been increasing since 2007 and was in 2013 at the highest level in the time series (Fig. 12b) (Appendix 8).

Un-standardized CPUE for gillnets remained relatively stable at 3-4 t/100 nets from 2003 to 2008, then increased to 6.54 t/100 nets in 2010. In 2011 the CPUE dropped slightly to 5.98 t/100 nets to increase again in 2012 to 6.7 t/100 net, the highest level in the time series but decreased slightly in 2013 to 6.2 t/100 net (Fig. 11c).

SA1

Un-standardized catch rates were available for the Greenland trawl fishery in Div. 1A and 1D (SCS 14/12). Further, catch rates were available from logbooks submitted by all countries to the Greenland authorities. Standardized catch rates were available from the trawl fishery in Div. 1AB and 1CD. Until 2008 the fleets in the catch rate analysis have been grouped by nation, but information about gross tonnage is now available in the Greenland logbook database and the fleets are grouped based on size and gear according to NAFO's protocol. This has not changed the trends in the CPUE series but the SE and CV of the estimates have been reduced significantly. In the GLM model catches (t) and hours fished with values less than 10 are removed.

Div. 1AB

Un-standardized catch rates from large (>2000 GT) trawlers that take most of the catch in Div. 1A have been relatively stable since 2005 around 0.93 ton/hr but showed a slight increase between 2009 to 2010 and increased substantially between 2010 and 2011 to 1.4 ton hr^{-1} and 1.3 ton hr^{-1} for single trawlers and twin trawlers, respectively. Since the CPUE has declined gradually to 1.2 ton/ for both gear types (Fig. 11e)

Standardized catch rate series, based on logbook data from the Greenland authorities, were available for the offshore trawl fishery in Div. 1AB for the period 2002-2013. Standardized catch rates in Div. 1AB has been declining between 2006 and 2008 but has been increasing since then and was in 2011 on the highest level in the time series. The CPUE decreased slightly in 2012 and 2013 but is still at a high level. (Fig. 12a, Appendix 2).

Div. 1CD

The un-standardized catch rates for all trawlers fishing in Div. 1CD increased between 2011 and 2012, except for trawlers > 2000 tons trawlers. The catch rates increased significantly for > 2000 tons single trawlers in 2013 and the smaler single trawlers also showed an increase, while the twin trawlers showed minor decreases between 2012 and 2013. The high catch rates for > 2000 GT single trawlers in 1988 and 1989 is from a single large vessel (4000 GT) and the decrease in catch rates in 2007 for large > 2000 GT twin trawlers was caused by a significant decrease in catch rates from one out of two vessels (Fig.11f).

Standardized catch rate series, based on logbook data from the Greenland authorities, were available for the offshore trawl fishery in Div. 1CD for the period 1988-2013 (Fig.12c). Standardized catch rates in Div. 1CD decreased gradually from 1989-1997 but have shown an increasing trend since then. CPUE decreased between 2009 and 2010 but increased again in 2011-2013 and the CPUE is at the high level seen in 1989 (Appendix 6).

Combined standardized catch rate in Div. 0A-1AB
The combined Div. 0A+1AB standardized CPUE series decreased slightly between 2009 and 2010 to increase again in 2011, but were back at the 2010 level in 2012 and 2013. The catch rate has, however, been relatively stable since 2001 (Fig. 12a) (Appendix 3).

Combined standardized catch rate in Div. 0B-1CD
The combined Div. 0B+1CD standardized CPUE series has been stable in the period 1990-2004. The CPUE gradually increased to peak in 2009. CPUE decreased slightly between 2009 and 2010 to increase again in 2011 but decreased in 2012 to increase again in 2013. The estimate is, higher than the estimates from 1990-2004. The high catch rates seen in 1988 and 1989 are from a single very large trawler fishing in Div. 1CD (Fig. 12e) (Appendix 7).

Combined standardized trawl catch rate for SA 0+1
The combined catch rate has been gradually increasing since 1997 and was in 2013 at the third largest level seen since 1989 (Fig 12g).

It is not known how the technical development of fishing gear, etc. has influenced the catch rates. There are indications that the coding of gear type in the log books is not always reliable, which also can influence the estimation of the catch rates. Further, due to the frequency of fleet changes in the fishery in both SA0 and SA1 and change in fishing grounds in Div. 0A and 1A, both the un-standardized_ and the standardized indices of CPUE should, however, be interpreted with caution.

3. **Assessment**

A Greenland halibut age determination workshop in 2011 concluded that there is considerable uncertainty about accuracy in the current age reading methods (see section in STACREC 2011 report) and the age reading procedure is currently under revision hence no age based analysis are up dated.

3.1 Yield per Recruit Analysis.

The level of total mortality has in 1994-1996 been estimated by means of catch-curves using data from the offshore longline fishery in Div. 1D. Z was estimated from regression on ages 15-21. A relative F-at-age was derived from the catch curve analysis, where the trawl, longline and gillnet catches were weighed and scaled to the estimated stock composition. In all three years STACFIS considered that the estimation of Z was based on too limited samples and represented too small a part of the fishery and that the outcome of the catch curve analysis was too uncertain to be used in the yield per recruit analysis. No Yield per Recruit Analysis were made due to lack of age data.

3.2 XSA.

Extended Survivors Analysis
An XSA has been run unsuccessfully several times during the 1990'ies, using a survey series covering 1987-1995 as tuning. STAFIS considered the XSA's unsuitable for an analytic assessment due to high log-catchability residuals and S.E.'s and systematic shift in the residuals by year. Further, a retrospective plot of F_{bar} showed poor convergence. In 1999 the XSA analyses was rerun including the latest two years surveys (1997-1998, new vessel and gear) but the outcome of the analysis did not improve.

An XSA analysis was run using the stock data for SA 0+1, calibrated with trawl survey data (age 5-15) from the Greenland deep sea surveys (1997-2001) in Div. 1CD. The assessment results were considered to be provisional due to problems with the catch-at-age data and the short time series, the assessment is, however, considered to reflect the dynamics in the stock. The rate of exploitation had been relatively stable in recent years between 0.2-0.3 (F_{bar} 7-13). The input parameters to the analysis and the outcome of the analysis is given in SCR 02/68.

The XSA was run again in 2003 with the 2002 survey and catch data and updated catch data from 2001 (very small changes). The assessment results were considered to be provisional due to problems with the catch-at-age data and the short time series. The assessment was, however, considered to some extent to reflect the dynamics in the stock. The rate of exploitation had been relatively stable in recent years between 0.2-0.3 (F_{bar} 7-13). The summary of the XSA is given in SCR (03/54).

The XSA was not run this year as no catch-at-age data were available for 2003-2012.

3.3 Spawning stock/recruitment relations.

A spawning stock/recruitment plot based on the available observations from the joint Japan/Greenland survey and the Greenland survey is shown in Fig.5. No further analysis of spawning stock recruitment relationships have been made due to few observations distributed on two different surveys, poor estimate of spawning stock biomass (survey trawls only take a very small proportion of the mature fish), poor estimates of ages of old fish, the survey covers only a restricted part of the area covered by the assessment, and knife edge maturity ogive was applied. Further, the age of the recruits is poorly estimated (the Petersen method). The plot was not updated because there was no aging of Greenland halibut in the recent surveys.

3.4 Relative F

A relative F was estimated from the catches and the swept area biomass estimates from Div. 1CD (Catch/Biomass) (Fig. 13). F has fluctuated between 0.02 and 0.17 but has been relatively stable around 0.08 since during 1997 2011, but F increased to 0.11 in 2012 due to a decline in the estimated biomass. There biomass was poorly estimated in 2013 but F is probably at the same level as in 2012.

A relative F cannot be estimated in SA0 because a large fraction of the catches are taken by gill nets that generally catch larger fish than the commercial trawl and the trawl surveys. The trawl fishery seems, however, not to affect the catch rates in the gill net fishery that has been stable in recent years.

3.5 ASPIC

ASPIC was run in 1999 with standardized CPUE data and a biomass index as inputs. Three CPUE series were available, one series covering Div. 0B during the period 1990-1998, one covering Div. 1CD during the period 1987-1998 and a series combining the two data sets. The biomass index was from 1CD and covered the period 1987-1995 and 1997-1998. Several runs showed that the combined CPUE series from Div. 0B+1CD fitted the total catch data best in terms of r^2 and "total objective function". Runs with biomass alone gave relatively bad fits in terms of "total objective function" and r^2 and the modeled population trajectory declining drastically over the period. Runs with the CPUE series from 0B gave unrealisticly high B_{msy} and negative r^2. The run with the combined CPUE series showed, however, that sensitivity analysis should be run, because "the B1-ratio constraint term contributed to loss". Several runs with different realistic values for the constraint did not solve the problem. Further, the coverage index and nearness index was equal in all runs. Several runs with different constraints on r and MSY were tried but it did not change the outcome of the analysis. Removing the three first years from the input data gave negative r^2. To get measures of variance the run with the combined CPUE series was bootstrapped (500 re-samplings).

The results showed that estimated fishing mortalities 1987-1998 have been less than the (bias-reduced) estimate of F_{msy} (0.22) except for one year (1992). A number of essential parameters are quite imprecisely estimated (r, q, F_{msy}), and it is considered that the estimates of MSY and F_{msy} were not precise enough to be used.

An ASPIC was run in 2009, but the outcome of the analysis did not change significantly from the analysis in 1999, mainly because there is very little contrast in the input data and the data series were relatively short.

The ASPIC Fox model was tested again during this assessment. Three different formulations were run: 1) one was with the 0B + 1CD CPUE series and the 0B +1CD catch for 1988-2011; 2) with two 1CD survey series (1988-1995 and 1997-2011) and 1CD catch (1988-2011); and 3) one 1CD survey series (1997-2011) and 1CD catch (1988-2011). The first formulation using CPUE resulted in a poor fit of observed and estimated values, with low r-square (.319) and low nearness index (.369). The logistic fit failed in the second formulation. The third formulation resulted in an unbelievably high MSY with F of 0. The estimate of catchability (q) was also extremely low. The model fit was not robust to changes in model parameters. Given that there is little variation in this time series and it is still relatively short (1997-2012) for a long lived species like Greenland halibut this model was not accepted.

3.6 Estimates of MSY from Catches and resilience

A simple Schaefer model was tested on the Greenland halibut stock offshore in NAFO SA 0 and 1. The minimum data required for this model is a catch time series and a measure of the resilience of the species. Other input parameters that had to be guessed were the carrying capacity, the biomass as a fraction of the carrying capacity at both the beginning and end of the time series, and the growth rate. MSY was estimated to be between 19 000 and 23 000 t. Sensitivity tests showed that the estimation of MSY was heavily dependent on the guess of especially the biomass at the end of the time series and the growth rate.

3.7 Environmental Forcing of the Greenland halibut stock dynamics at West Greenland

In the presentation it was shown that year class strength and abundance in West Greenland halibut (WGHL) may be driven by environmental pulses (of different frequencies):

(i) The variability in the Sea Surface Temperature (SST_{SD}) in the area of Age 1 drift in the mixing layer is regarded as a system wide variable (a co-factor) for WGHL recruitment and abundance. Different trends in SST means and dispersion are reported and the variability is considered as a key co-factor.

(ii) Evidence for the following relationships ($p<0.05$) is further presented:

(a) Abundance is the inverse of the SST variation considering a lag of 6 years (assumed main of recruitment to the adult popultion) and can be estimated for short term management planning (5-6 years in advance). Floors in abundance are expected in years 2014 and 2018 and a ceiling in 2017. Two cycles at different levels of abundance were identified.

(b) Age class 1 (considering a lag of 5 years) is both related to overall abundance and showed higher sensitivity for SST_{minima}.

(c) CPUE effort (both means and variability) showed two clear cycles.

(iii) The population system showed several years of memory and it is highly differentiated from a random process (Hurst exponent >0.75) and residuals were –as in several dynamical systems of such nature- auto-correlated (not random).

These relationships were not reported earlier as variability and lags were not considered - due to the use of the Logistic model –or some derivtive- which assumes that (a) residuals are random and (b) there is no memory effect in the series (no dependency on preceding values).

The work is still in progress and has not been peer reviewed and is not included in the assessment.

4. Conclusion

Since catches peaked with 18,000 tons in 1992 they have been stable at around 10,000 tons until 2000. Since then catches have gradually increased to 18,696 tons in 2003 and they remained at that level during 2004-2005. The TAC was increased by 5,000 tons in 2006 and catches increased to 24,164 and the TAC has hence been taken. The increase in catches has been due to increased effort in Div. 0A and Div. 1A. Catches remained at that level in 2007, - 23,416 tons but decreased slightly to 22,380 tons in 2008. Catches increased to 24,805 tons in 2009 and further to 26,934 tons in 2010 due to increased effort in Div. 0B and Div. 1CD. Catches remained at that level in 2012 but increased to 28,062 tons in 2013 mainly due to increased effort inshore in Div. 1D.

Div. 0A+1AB

No R/V survey in 2013

The standardized CPUE index for Div. 0A has been increasing since 2010 and is at the highest level seen since 2004 Standardized catch rates in Div. 1AB has been increasing between 2008 and 2011 but declined in 2012 and 2013 but it is still above the level seen in 2002-2009. The combined Div. 0A+1AB standardized CPUE series has been stable since 2002.

Standardized CPUE for Gill nets has been stable since 2009.

Length frequencies in the fisheries in Div 0A and Div. 1AB have been stable in recent years.

Div 0B+1C-F.

The biomass in Div. 1CD increased between 2003 and 2005, decreased slightly during 2006-2007 and then increased to a record high level in 2008. The biomass decreased in 2009 but increased again in 2010 to a level a little above the average for the time series and the biomass increased further in 2011 to the third highest level in the time series. The biomass decreased in 2012 to the lowest level seen since 2000. No data from 2013.

Estimated total trawlable biomass of Greenland halibut in the offshore areas estimated in the Greenland shrimp survey has during 2005-2013 fluctuated between 49,779 and 25,644 tons estimated in 2012. The 2013 estimate was 39.383 tons.

Division 0B was surveyed in 2013. Previous surveys were conducted in 2000, 2001 and 2011, respectively. Total estimated biomass and abundance were 57,765 tons and 5.60×10^7, respectively. Biomass had decreased compared to previous two surveys and was back at the level seen in 2000 and the abundance was lower than in 2000. Biomass and abundance were reduced in all strata compared to 2011.

The offshore recruitment (age one) has been rather stable between 2003 and 2010. The recruitment increased to the highest level in the time series in 2011 but decrease to lowest level seen since 1997 (1996 year-class) in 2012 to increase again to the 3. largest estimate in the times series in 2013.

Standardized CPUE rates in Div. 1CD decreased between 2009 and 2010 but increased again in 2011and further in 2012 and 2013 to the highest level seen since 1990, while the CPUE decreased in 2012 in Div. 0B to the level seen in 2003-2004 but increased slightly in 2013. The combined Div. 0B+1CD standardized CPUE series has been stable in the period 1990-2004. The CPUE gradually increased to peak in 2009. CPUE decreased slightly between 2009 and 2010 to increase again in 2011,t decreased in 2012 to increase again in 2013 and the estimate is higher than the estimates from 1990-2004.

The standardized CPUE for gill net in Div. 0B has been increasing since 2007 and was in 2013 at the highest level in the time series.

Length compositions in the commercial catches in Div. 0B + 1CD have been stable in recent years.

A standardized CPUE index for all trawlers fishing in SA 0+1 has been increasing between 2002 and 2006 and has been fluctuating at a high level since then. The 2013 estimate was the third largest seen since 1990.

5. Biological reference points

Yield per recruit analysis or other age-based methods are not available, for estimating biological reference points.

There is no accepted analytical model so quantitative estimation of reference points is not possible. SC has recormeded that a proxy of B_{lim} should be estimated based on the survey indexes that are used as the primary basis for advice for this stock.

A preliminary proxy for B_{lim} was set as 30% of the mean of survey biomass for 1997-2012 in Div. 1CD, the mean of 7 surveys in the southern part of Div. 0A conducted during 1999-2012 and a combined proxy for Div. 0A+1CD, respectively (Fig. 14, Fig. 15 and Fig 16).

B_{msy} is not known for this stock. If it is assumed that the stock is at or close to B_{msy} the B_{lim} should according to Report of the NAFO Study Group on Limit Reference Points Lorient, France, 15-20 April, 2004 (SCS 04/12) be set at 30% of B_{msy}. If the stock increases B_{lim} should be increased accordingly.

6. References

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Table 1. Greenland halibut catches (metric tons) by year and country for Subarea 0 (Split on Div. 0A and 0B) from 1987 to 2013. Minor (300 ton or less) catches from Div. 0A are included in some of the 0B catches prior to 2001.

Count.	87	88	89	90	91	92	93	94	95	96	97	98	99	00[e]	01[c]	02[d]	03[f]	4	5	6	7	8	9	10	11	12[h]	13[h]
0A																											
CAN							681		82	576	3		517		2628	3561	4142	3751	4209	6634	6173	5257	6627	6390	6260	6365	6314
POL															445												
TOT 0A							681		82	576	3		517		3073	3561	4142	3751	4209	6634	6173	5257	6627	6390	6260	6365	6314
0B																											
CAN		2	180	844	395	2624	592	402	1859	2354	3868	3924	4267	5438	5034	3910	5059	5771	5789	5585	5318	5175	5622	6835	6865	6966	7037
EST							631																				
FRO	388	963	596	2252	2401	463	1038			578	452																
JAP				113	232	337	252	600	1031	500																	
LAV							84																				
NOR			282	5016[b]	3959		373																				
RUS		59	29	1528	1758	9364	4229[a]	3674	261	600																	
TOT 0B	388	1024	1087	9753	8745	12788	7199	4676	3151	4032	4320	3924	4267	5438	5034	3910	5059	5771	5789	5585	5318	5175	5622	6835	6865	6966	7037
TOT 0AB	388	1024	1087	9753	8745	12788	7880	4676	3233	4608	4323	3924	4784	5438	8107	7471	9201	9522	9998	12219	11491	10432	12249	13225	13125	13331	13351

[a] The Russian catch is reported as area unknown, but has previously been reported from Div. 0B
[b] Double reported as 10031 tons
[d] Excluding 782 tons reported by error
[e] STACFIS estimate
[f] excluding 2 tons reported by error
[h] excluding catches from Cumberland Sound

Table 2. Greenland halibut catches (metric tons) by year and country for Subarea 1 (Split on Div. 1AB and Div. 1CF) from 1987 to 2013. The Greenland catches are excl. inshore catches in Div. 1A. Offshore catches in Div. 1A prior to 2000 are negligible.

	Year																										
Coun.	87	88	89	90	91	92	93	94	95	96	97	98	99[a]	0	1	2	3[g]	4	5	6	7	8	9	10	11	12	13
1AB																											
GRL															340[c]	1619[c]	3558[c]	3500[c]	3363[c]	5530[c]	5596[c]	5524[c]	6094[c]	568[c]	5722[c]	5810[c]	5865[c]
RUS															85	279	259	241	549	565	575	570	517	654	648	546	546
FRO														96	150	150	117	153	125	128	125	149	124	126	102	103	89[b]
EU																	73[e]	141[e]									
TOT 1AB														96	575	2048	4007	3908	4037	6223	6296	6243	6735	6462	6472	6459	6500
1CF																											
GRL	1646	605	540	841	933	191	186	872	1399	1876	2312	2295	2529	2659	2012	2284	2059	2102[b]	2380[b]	2430[b]	1805[b]	1888	1457	2491	2493	2712	3514
FRO				54	123	151	128	780			127	125	116	147	150	150	135	150	149	147	150	184	149	152			
JPN	855	1576	1300	985	673	2895	1161	820	323																		
NOR					611	2432	2344	3119	2472	1785	1893	1338	1360	1590	1550	1734	1423	1364	1456[b]	1379	1441	1452[b]	1501	1572	1720	1743	1457
RUS							5		296	254		543	552	792	829	654	1328	1214	1147	1222	689	763	1056	1214	865	1231	1223
EU							46	266	527	455	446	350	330	444[b]	537[b]	536	543[d]	665[f]	549	544	1516	1517	1511	1818	1824	1784	2017
TOT 1CD	2501	2181	1840	1880	2340	5669	3870	5857	5017	4370	4778	4651	4887	5632	5078	5358	5488	5495	5681	5722	5601	5804	5670	7247	6902	7470	8211
Total	2501	2181	1840	1880	2340	5669	3870	5857	5017	4370	4778	4651	4887	5728	5653	7406	9495	9403	9718	11945	11897	12047	12404	13709	13374	13929	14711

[a] Excluding 7603 tons reported by error

[b] Reported to the Greenland Fisheries License Control Authority. Statlant 21A data from Div. ICD from Greenland during 2004-2007 include double reported catches.

[c] Offshore catches

[d] Including 2 tons taken in an experimental fishery

[e] Spanish research fishery

[f] Includes 131 tons taken in Spanish research fishery

[g] Excludes 1366 tons reported from Div. 1A by error

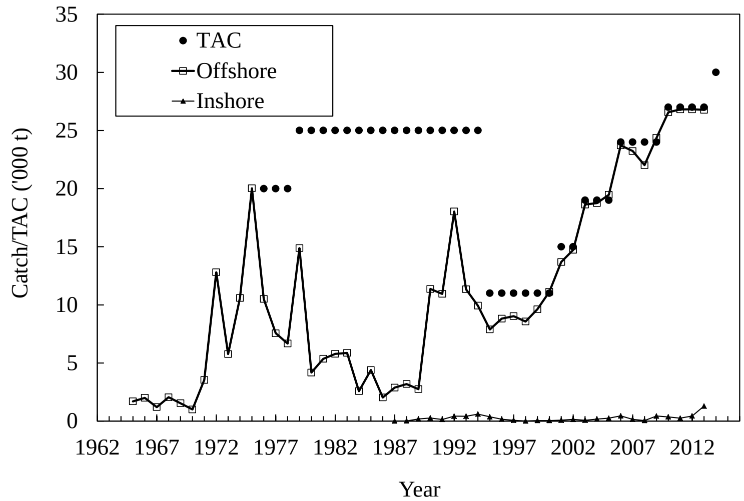


Fig. 1. Catches in SA0 and Div. 1A offshore + Div. 1B-1F and recommended TAC. For TAC before 1995 see text.

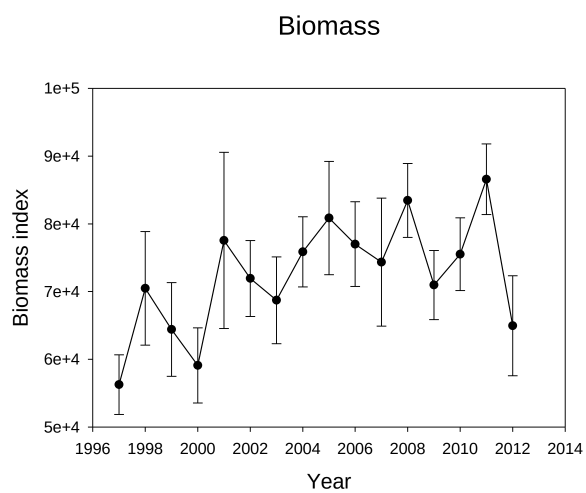


Fig. 2a. Biomass index with S.E. from the Greenland deep sea survey in Div. 1CD. No data from 2013.

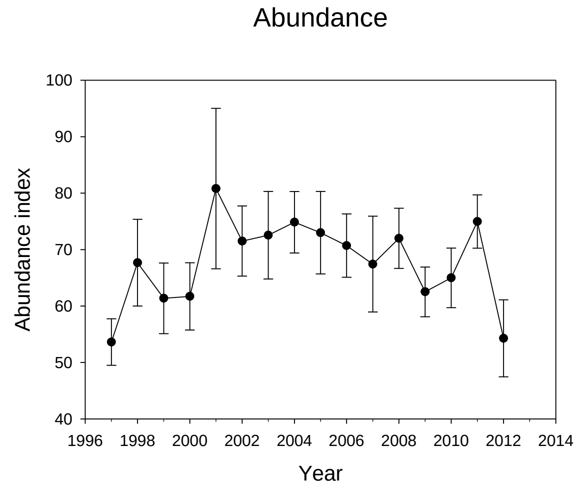


Fig. 2b. Abundance with S.E. from the Greenland deep sea survey in 1CD. No data from 2013.

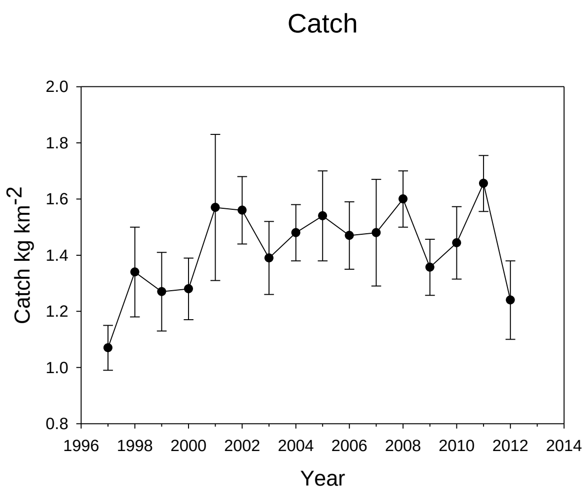


Fig. 2c. Mean catch per km^2 swept with S.E. in the Greenland deep sea survey in Div. 1CD. No data from 2013.

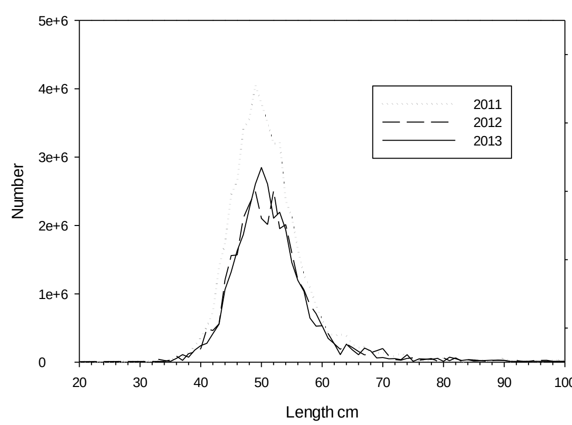


Fig. 2d. Length distribution in Div. 1D in 2011-2013..

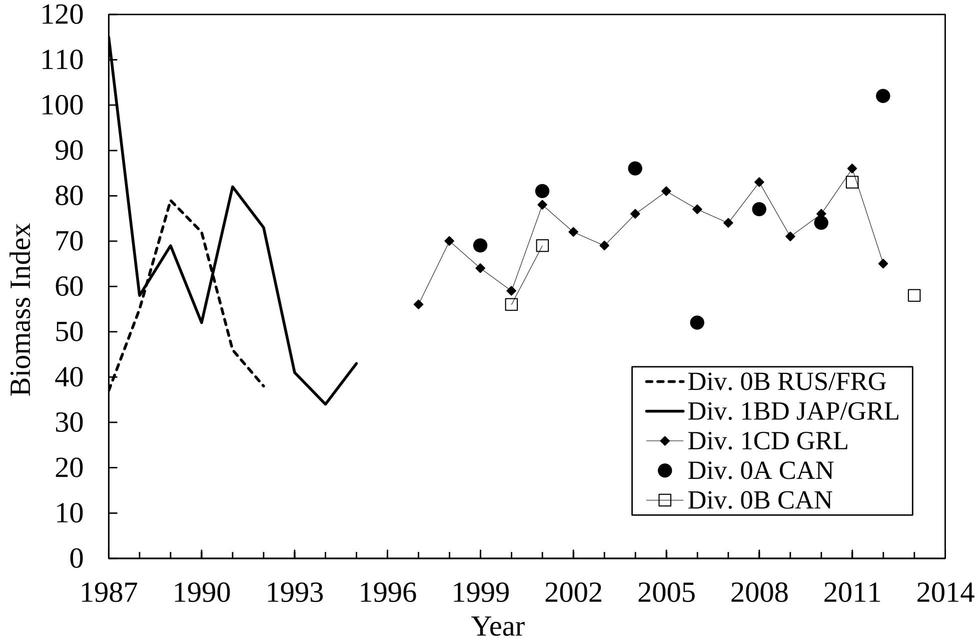


Fig. 2e. Biomass estimates from various surveys in SA 0 and 1. Survey estimates from Div. 0A does not include surveys in the northern part in 2004, 2010 and 2012. No survey in 2013. Note that the survey in Div. 0A in 2006 had incomplete coverage (see text).

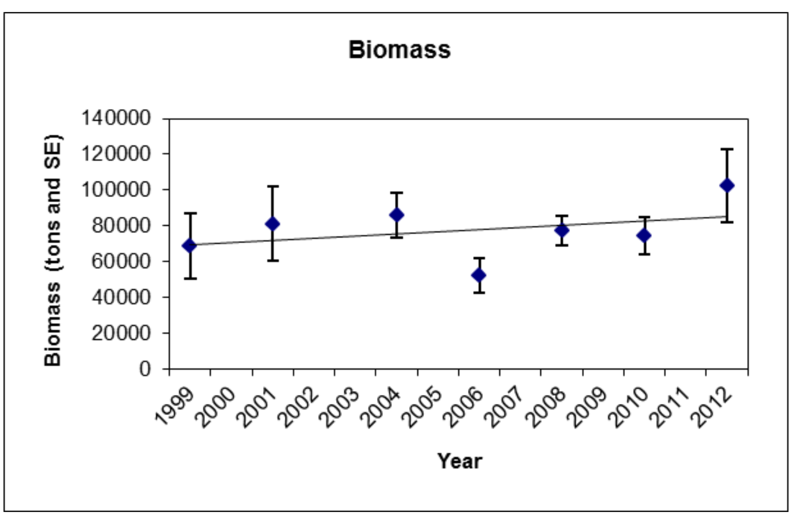


Fig. 2f. Biomass estimates for Greenland halibut in Div. 0A (South) with SE and trendline. No survey in 2013.

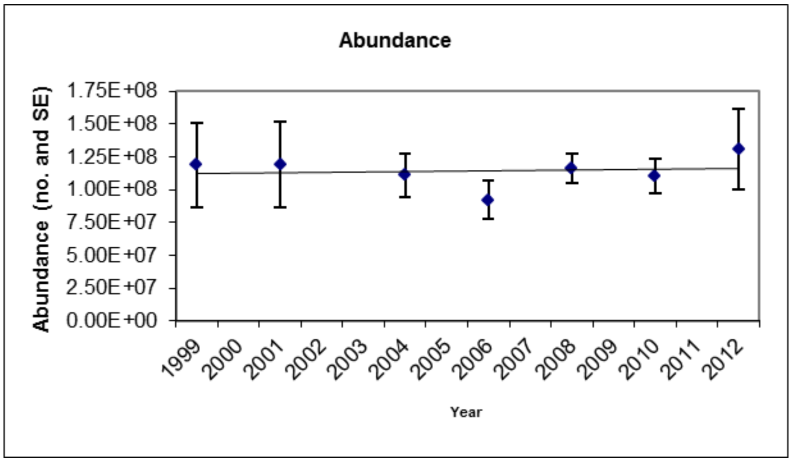


Fig. 2g. Abundance (right) estimates for Greenland halibut in Div. 0A (South) with SE and trendline. No survey in 2013.

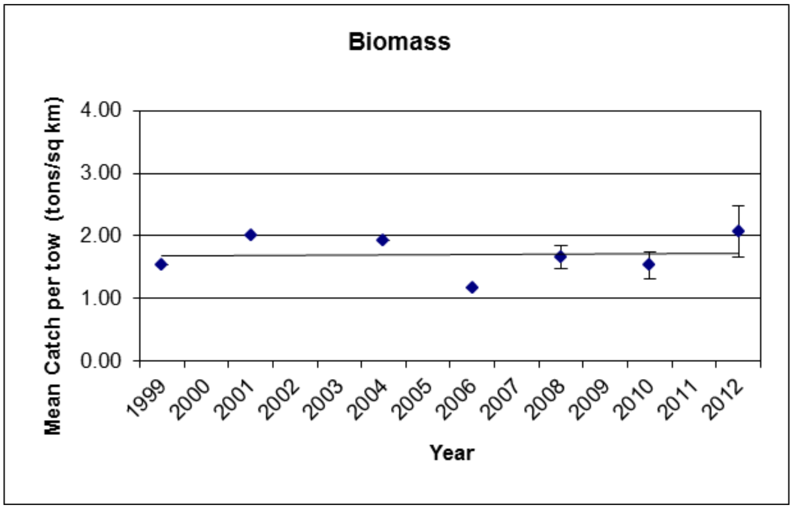


Fig. 2h. Mean catch per tow (with SE for most recent years and linear trend line) for Greenland halibut in Division 0A-South. No survey in 2013.

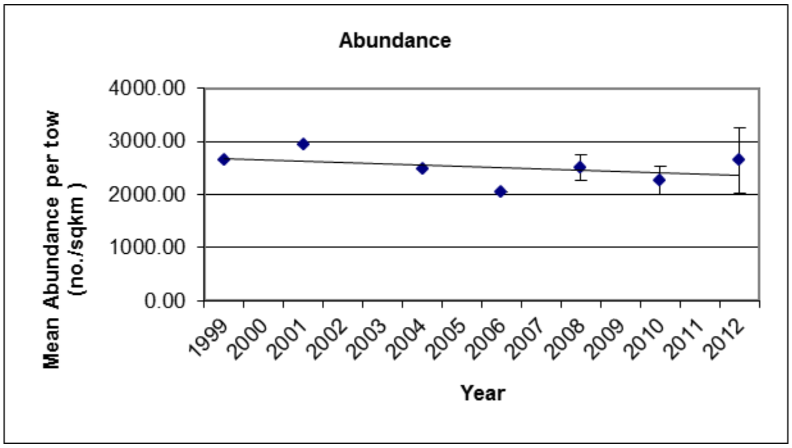


Fig. 2i. Mean abundance per tow (with SE for most recent years and linear trend line) for Greenland halibut in Division 0A-South. No survey in 2013.

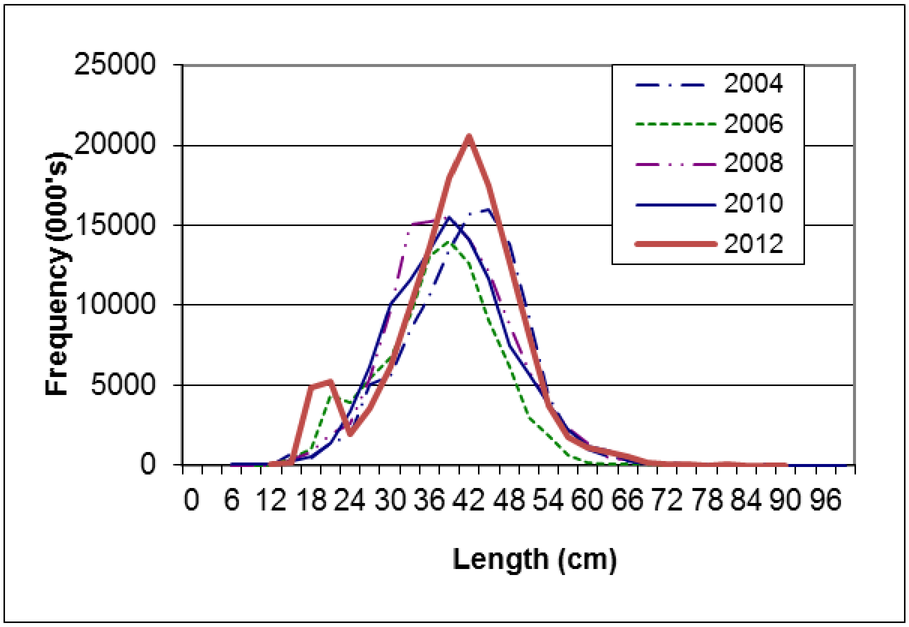


Fig. 2j. Abundance at length for the Greenland halibut in NAFO Division 0A-South, 2004 to 2012 (weighted by stratum area). Includes data from large set. No survey in 2013.

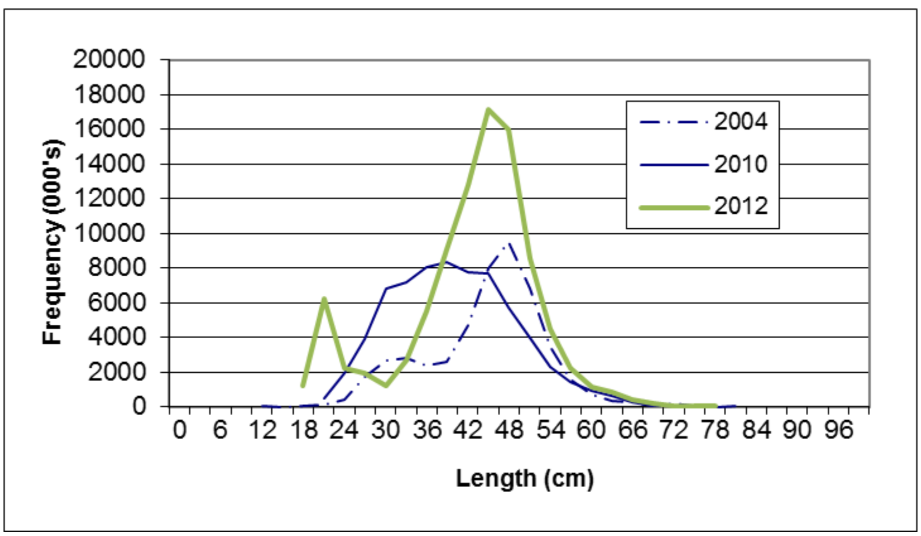


Fig. 2k. Abundance at length for the Greenland halibut in NAFO Division 0A-North, 2004, 2010 and 2012 (weighted by stratum area). No survey in 2013.

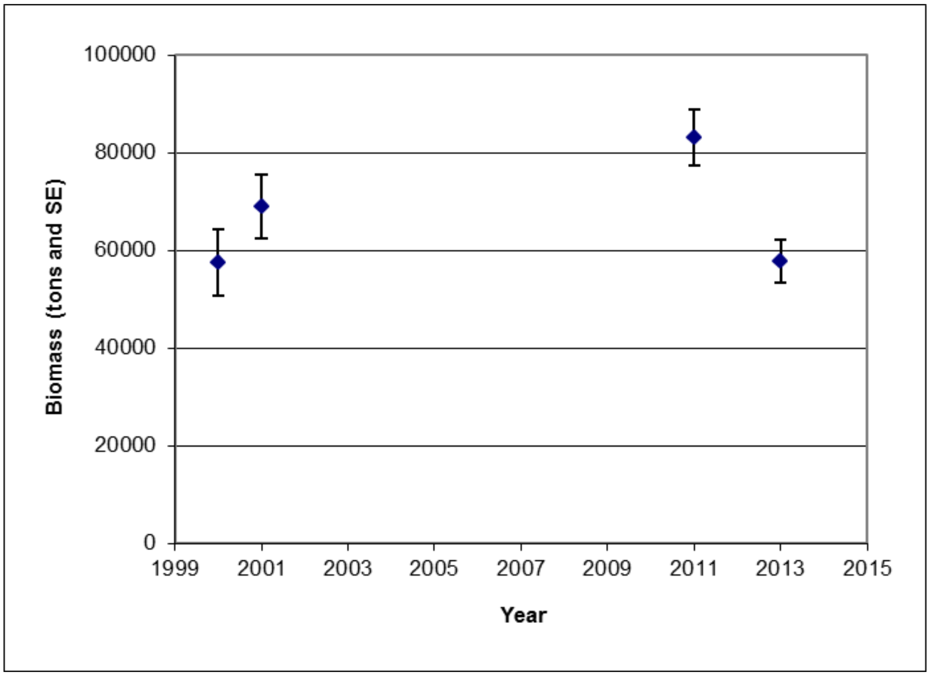


Fig. 2 l. Biomass estimates from Div. 0B with S.E. by year.

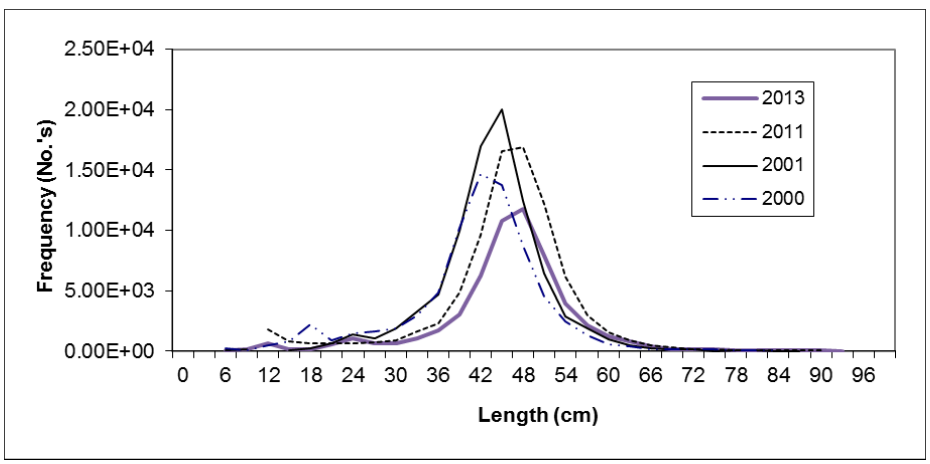


Fig. 2 m. Over all length distribution weighted by area by year.

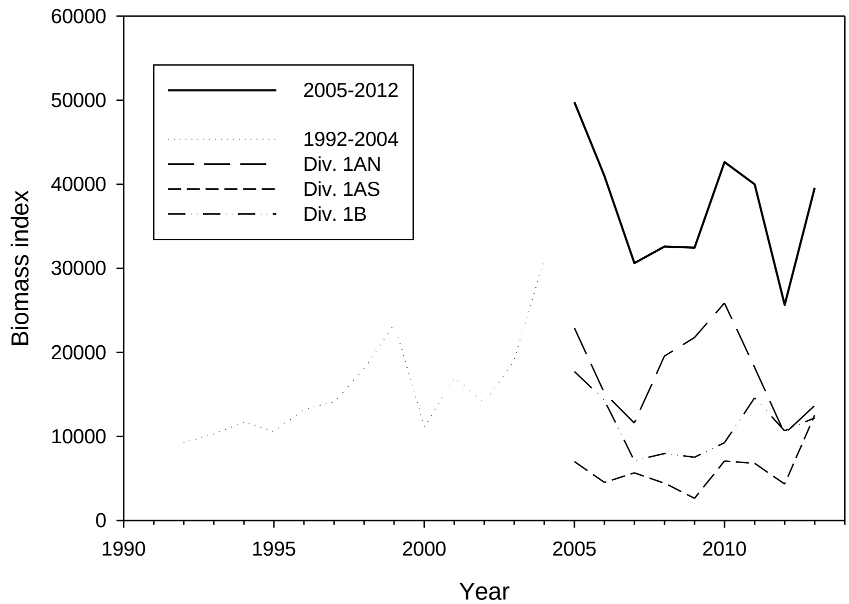


Fig. 2n. Biomass index from the Greenland shrimp survey by most important Divisions and in total offshore (including 1C-1F, which have little biomass).

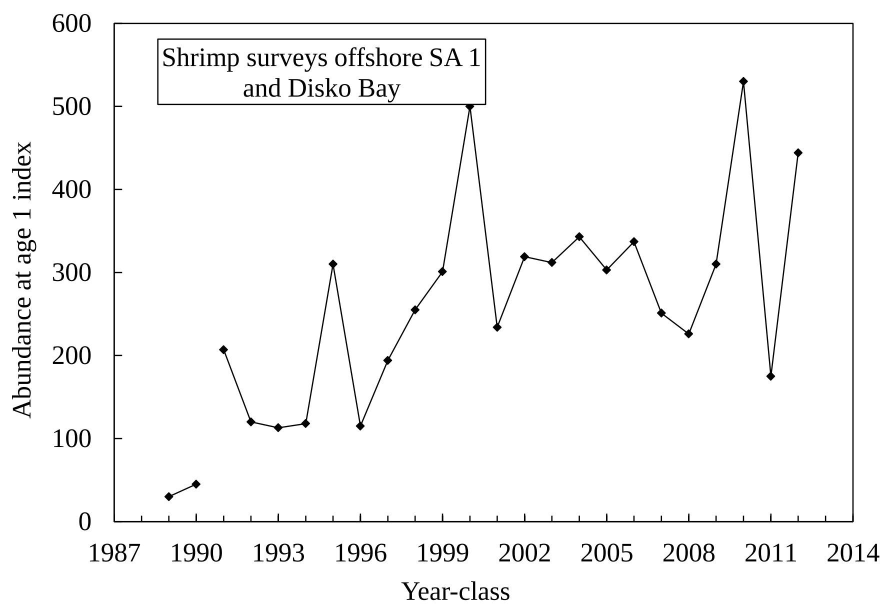


Fig.3. Abundance of age-one Greenland halibut in the entire area covered by the Greenland shrimp survey including inshore Disko Bay and Div. 1AN (North of 70°37.5'N) adjusted for change in survey gear in 2005.

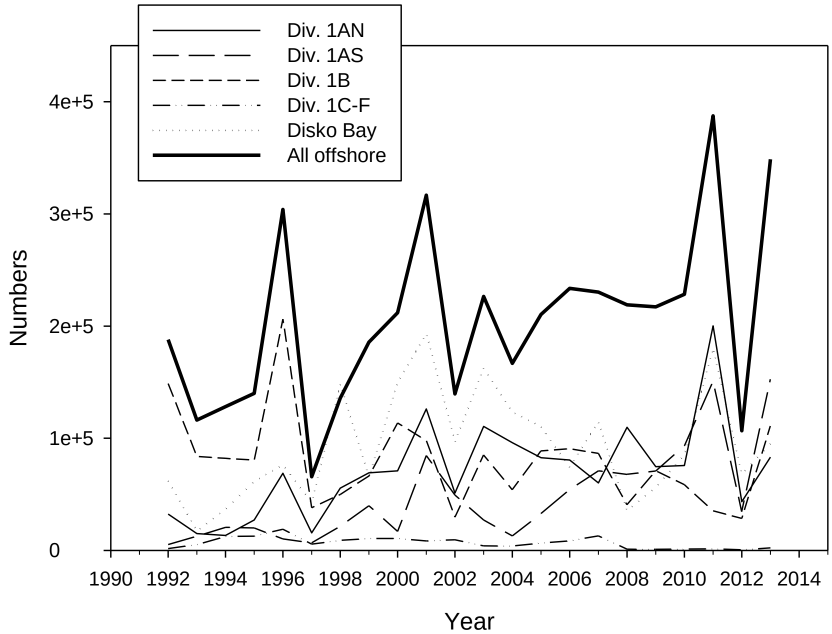


Fig 4. Number of one-year of Greenland halibut by division and year.

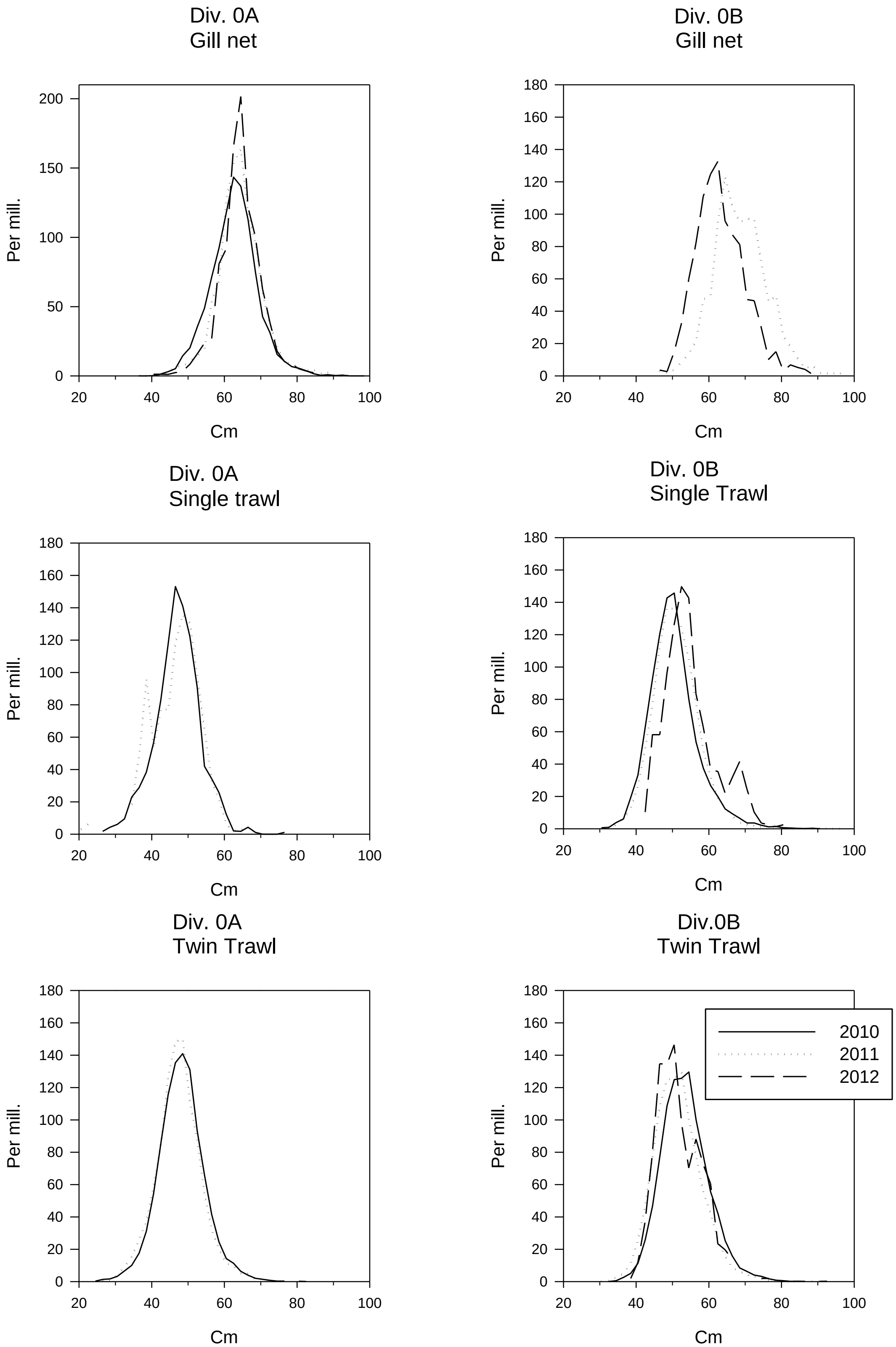


Fig.5. Length distribution from the fishery in Subarea 0 in 2010-2012 in per mill., 2 cm groups. No data from the trawl fishery in Div. 0A in 2012. No data from 2013.

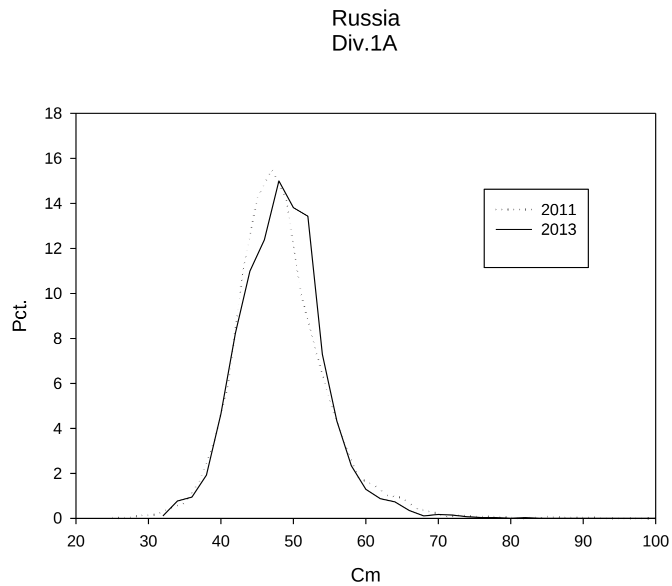


Fig. 6. Length distribution in the Russian trawl fishery in Div. 1A in 2011 and 2013 in percent, 2-cm groups. No Data from 2012.

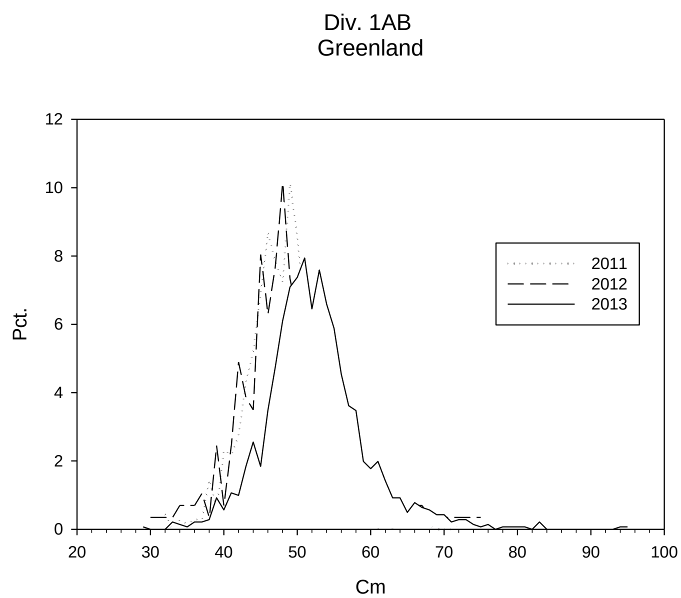


Fig. 7. Length distribution in the Greenland trawl fishery in Div. 1A in 2011-2013 in percent, 1-cm groups.

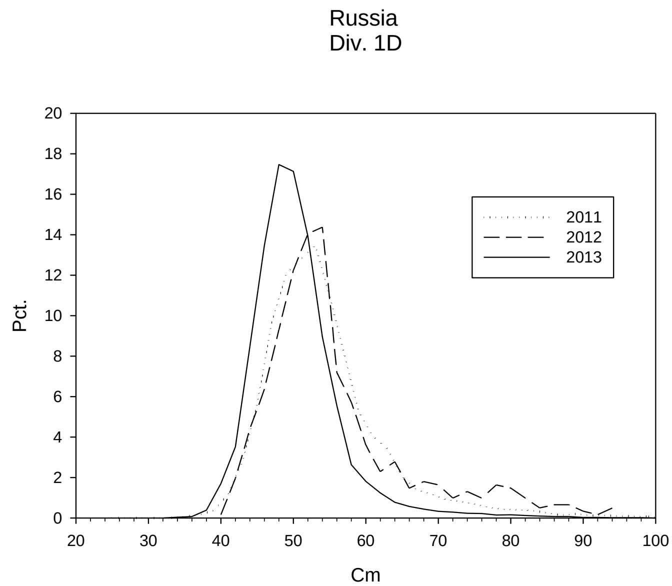


Fig. 8. Length distribution in the Russian trawl fishery in Div. 1D in 2010-2012 in percent, 2-cm groups.

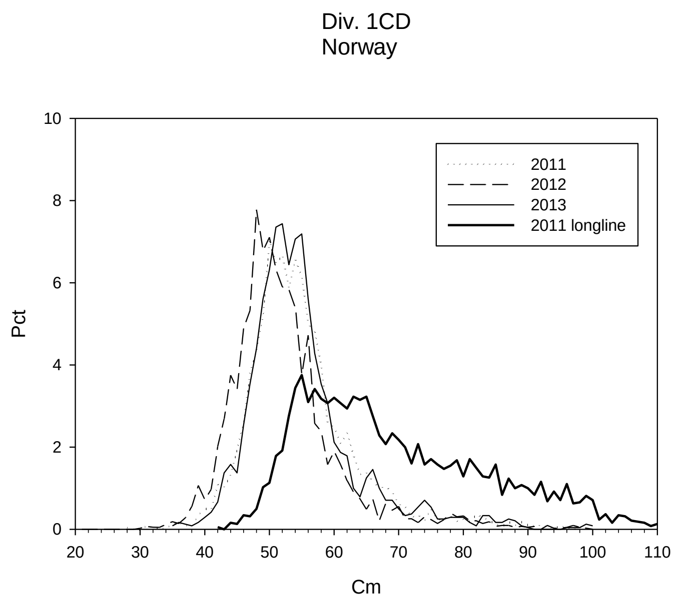


Fig. 9. Length distribution from the Norwegian Trawl fishery in Div. 1D in 2011-2013, and a small Norwegian longline fishery in 2011 in percent, 1-cm groups.

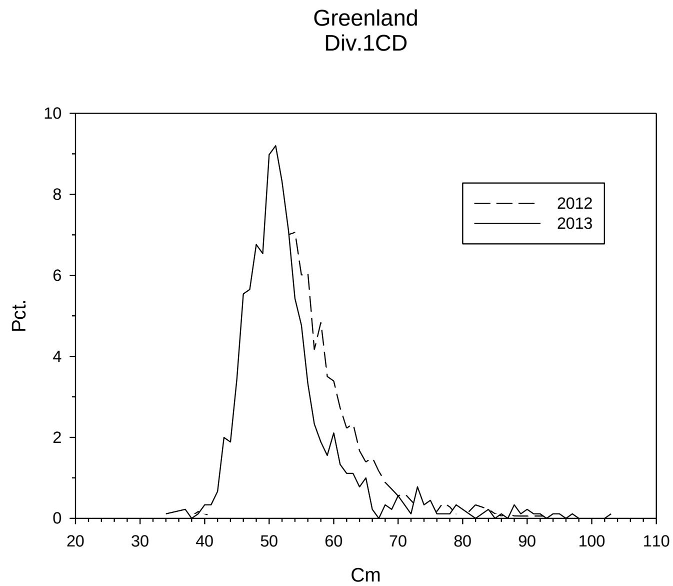


Fig. 10a . Length distribution from the Greenland trawl fishery in Div. 1D in 2013, No data from 2011.

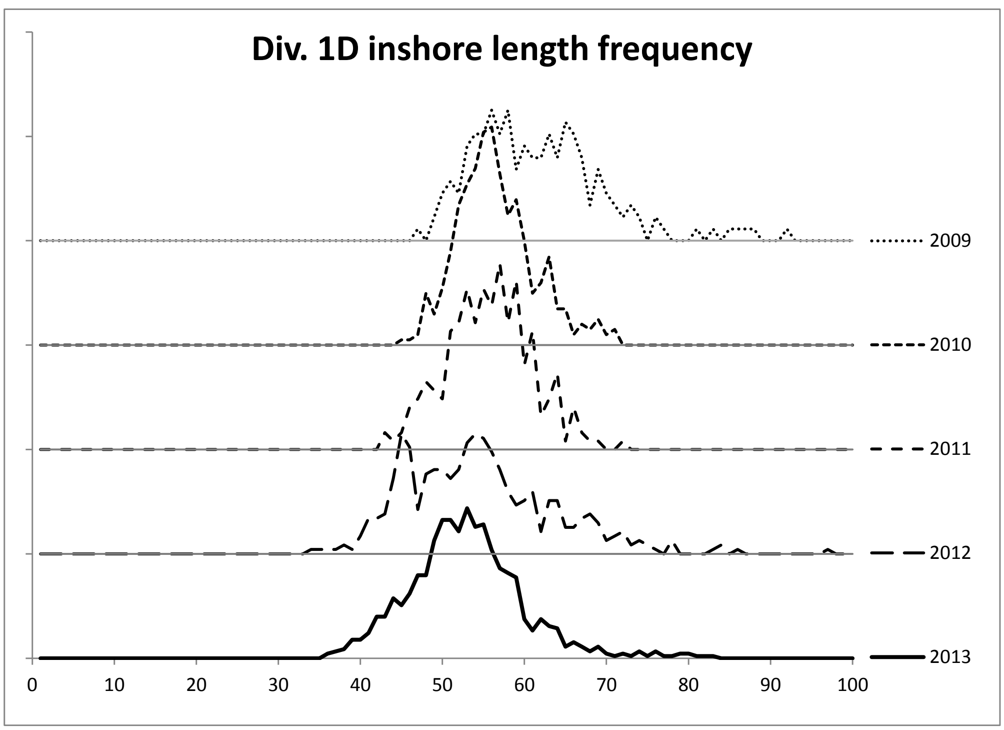
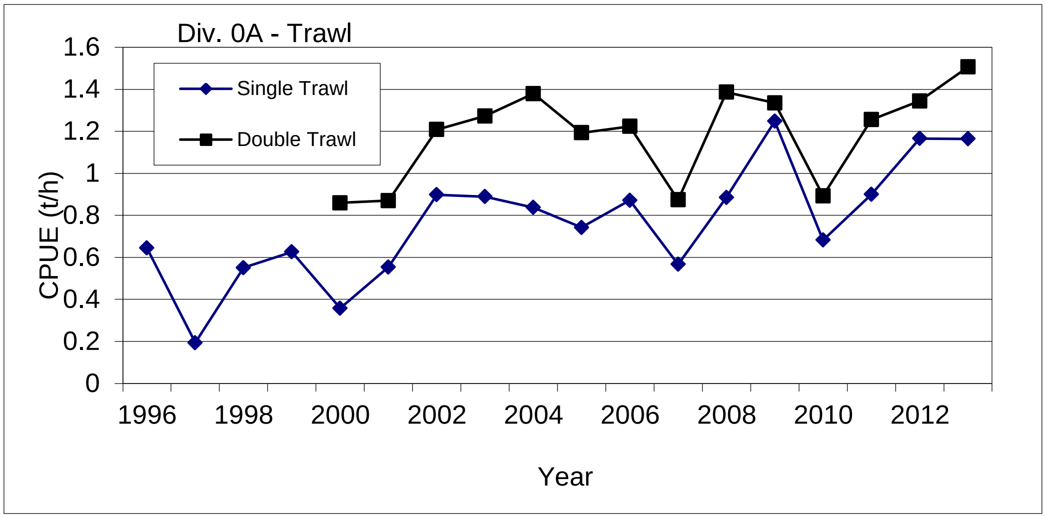


Fig. 10b . Length distribution from the Greenland inshore longline fishery in Div.



1D.

Fig. 11a. Un-standardized CPUE from the trawl fishery in Div. 0A.

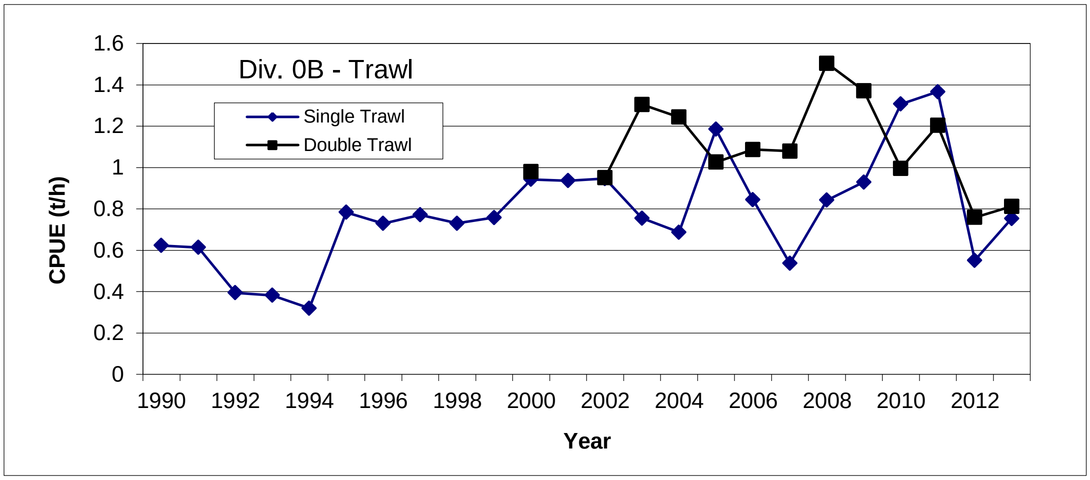


Fig. 11b. Un-standardized CPUE from the trawl fishery in Div. 0B.

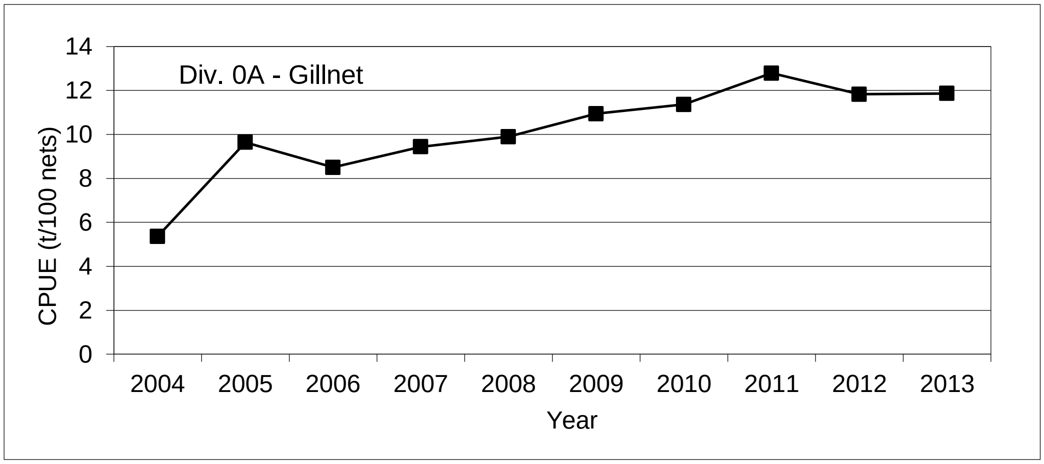


Figure 11c. Un-standardized CPUE from the gillnet fishery in Div. 0A.

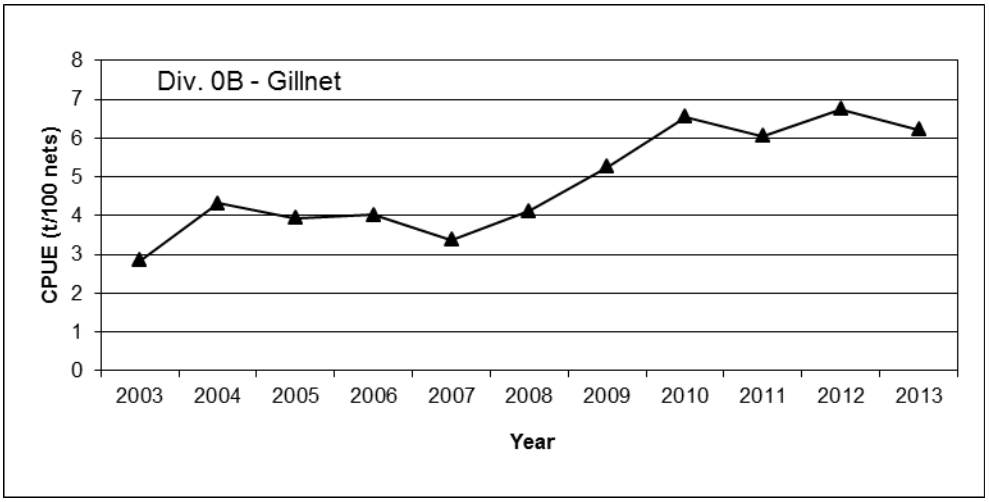


Figure 11d. Un-standardized CPUE from the gillnet fishery in Div. 0B.

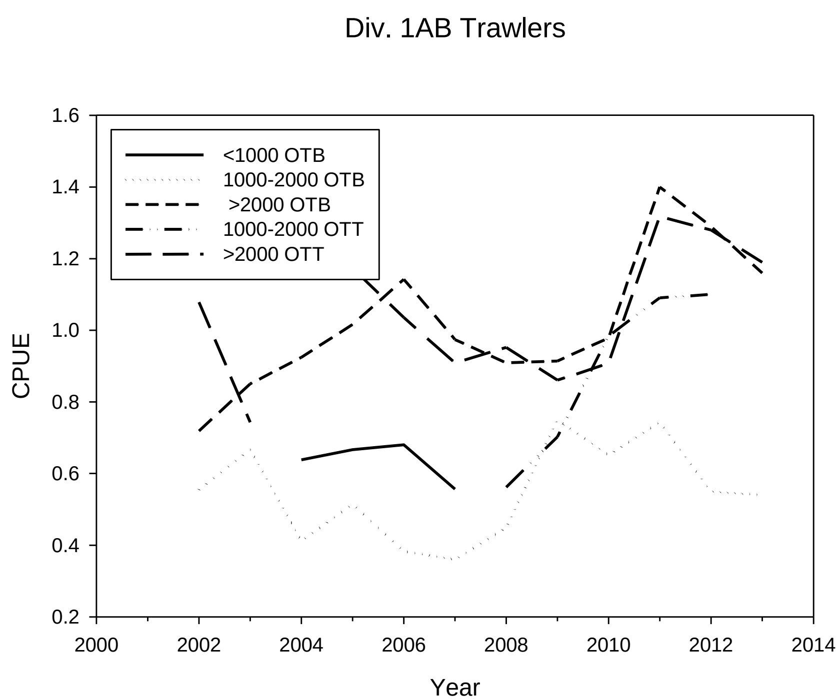


Fig. 11e. Unstandardized trawl CPUE series from Div. 1AB.

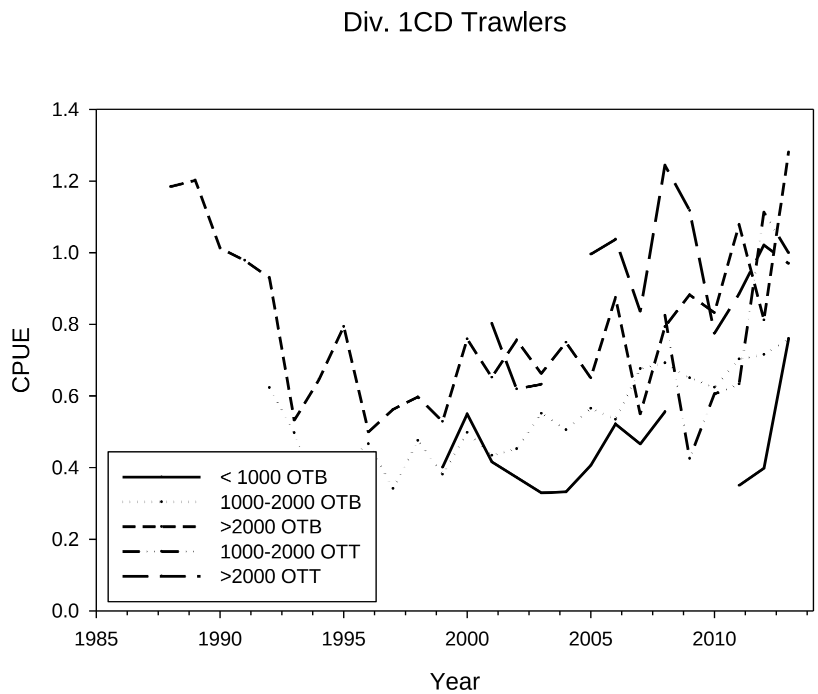


Fig. 11f. Unstandardized catch rates from different fleets fishing in Div. 1CD.

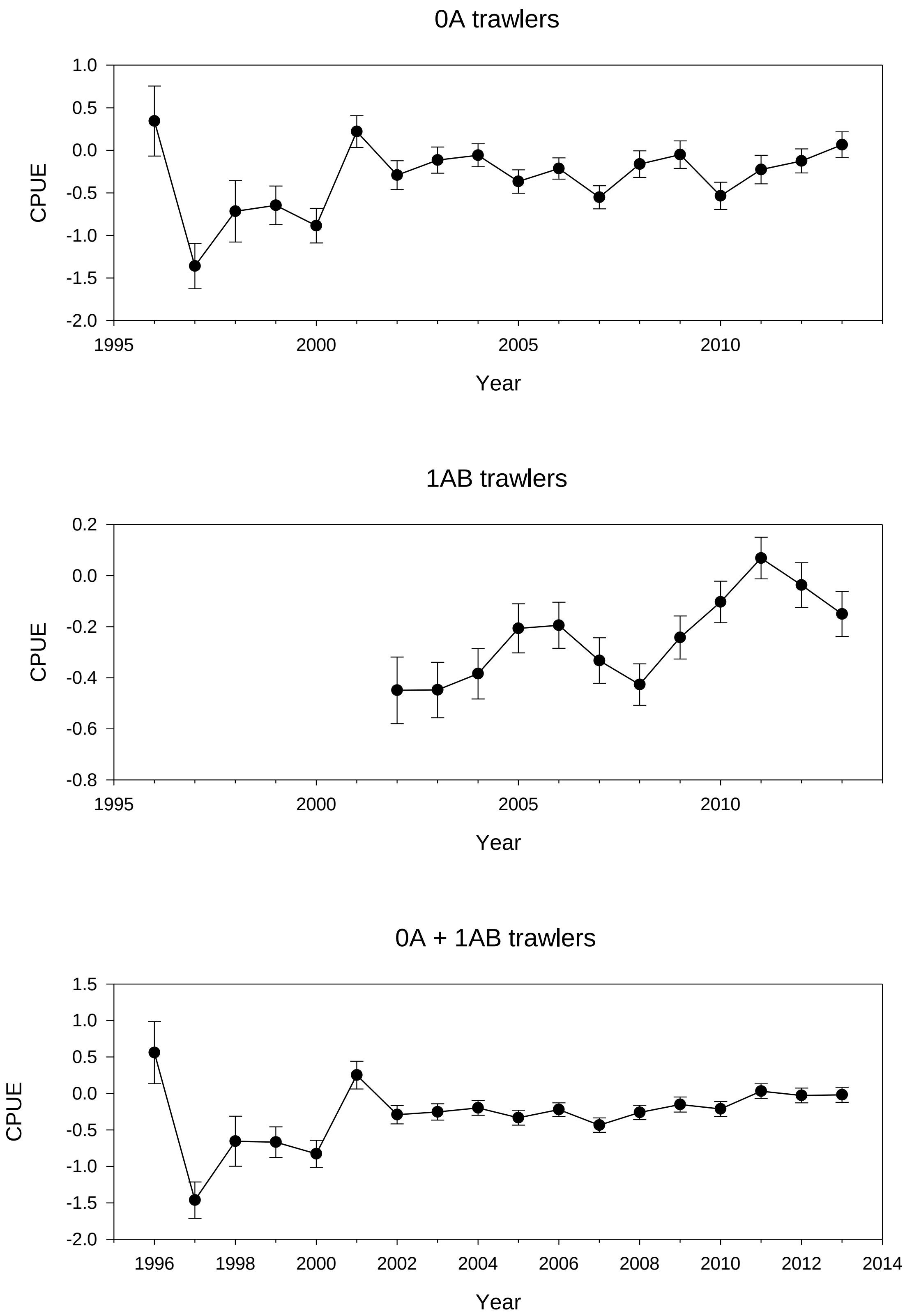


Fig. 12a. Standardized CPUE series from trawlers in 0A, Div. 1AB and 0B+1AB combined with +/- S.E.

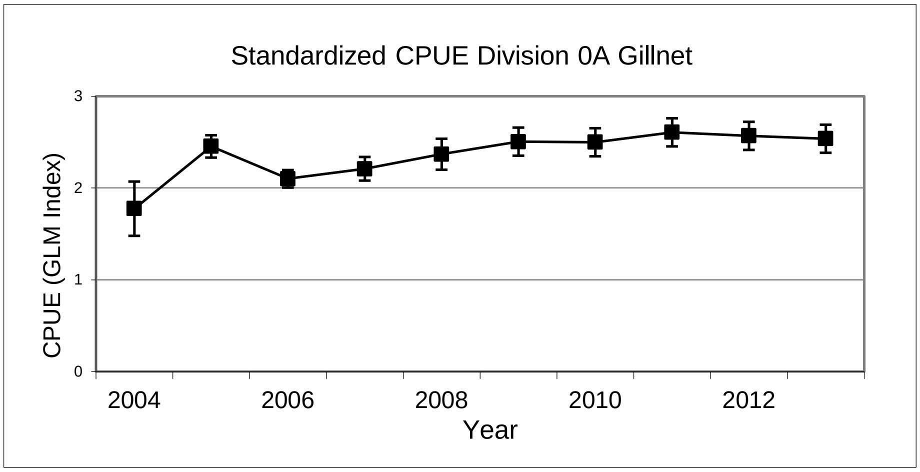


Fig 12b. Standardized CPUE series from gill net in Div. 0A with +/- S.E

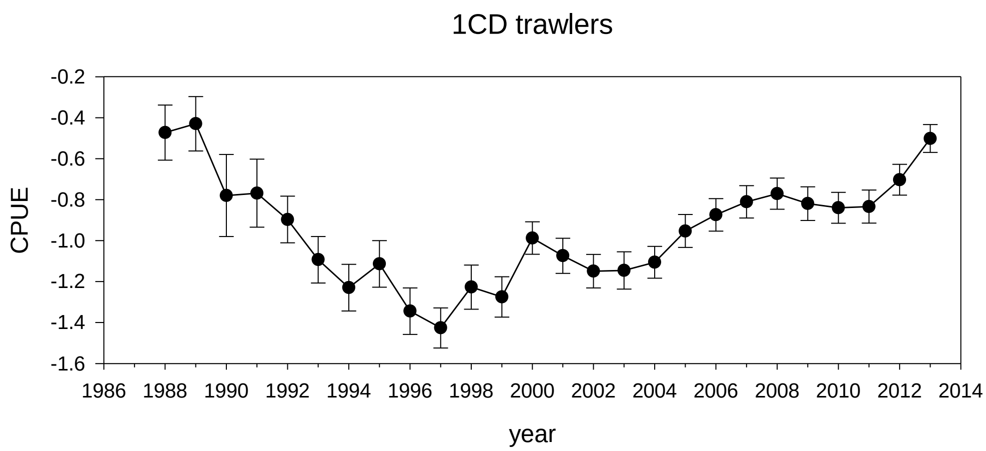


Fig. 12c. Standardized trawl CPUE index from trawlers in Div. 1CD with +/- S.E..

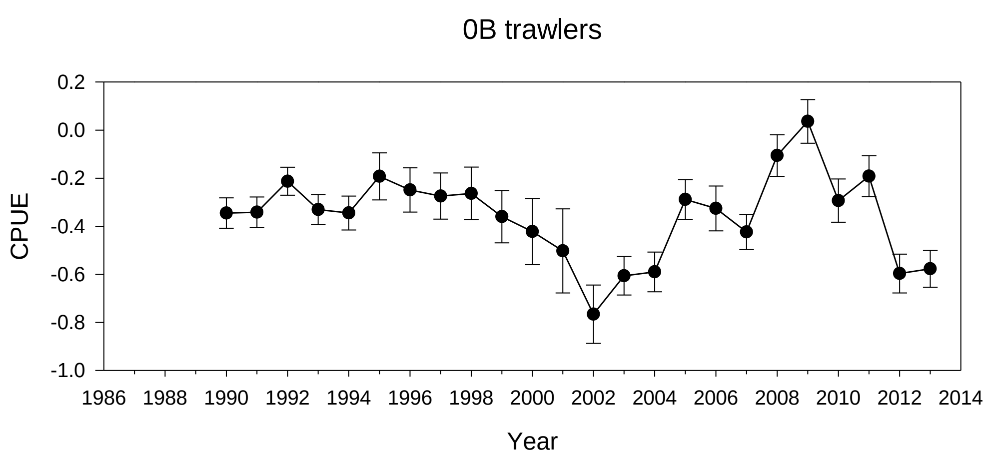


Fig 12d. Standardized CPUE series from trawlers in Div. 0B with +/- S.E.

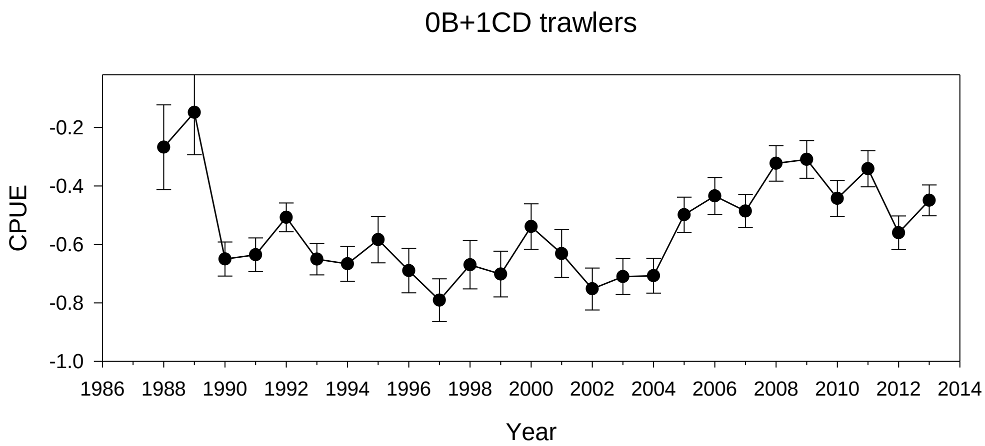


Fig. 12e. Combined standardized trawl CPUE index from trawlers in Div. 0B +1CD with +/- S.E.

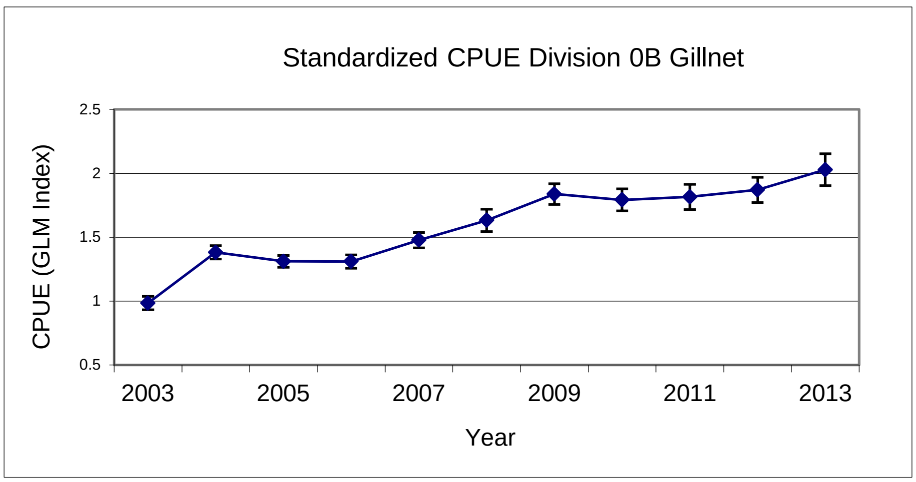


Fig 12 f. Standardized CPUE series from gill net in Div. 0B with +/- S.E

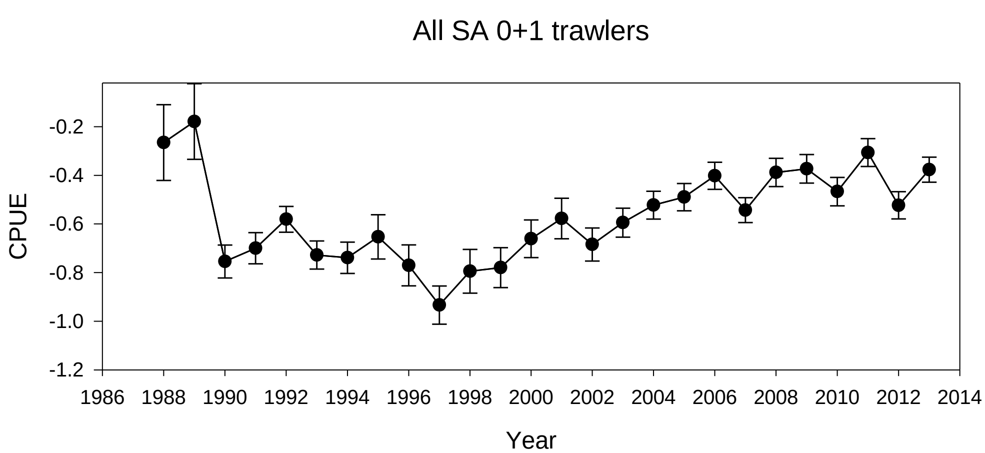


Fig. 12g. Combined standardized trawl CPUE index from trawlers in SA 0+1with +/- S.E

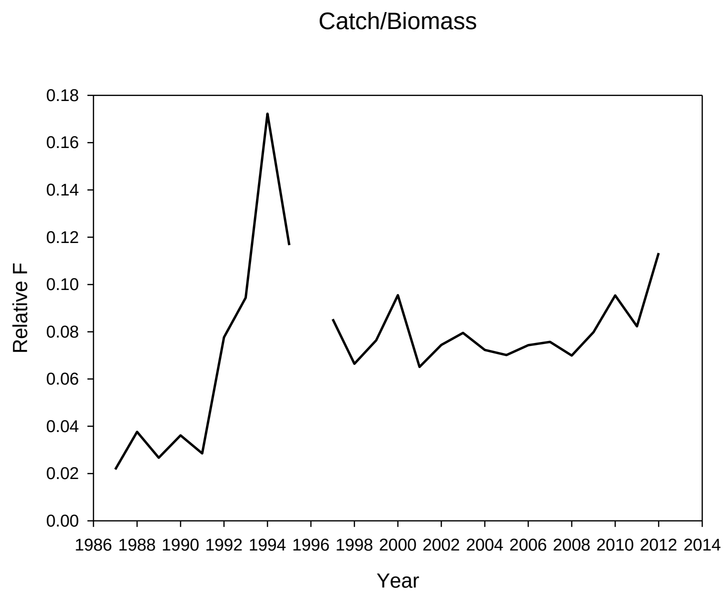


Fig 13. Relative F (catch/swept area biomass) in Div.1CD.

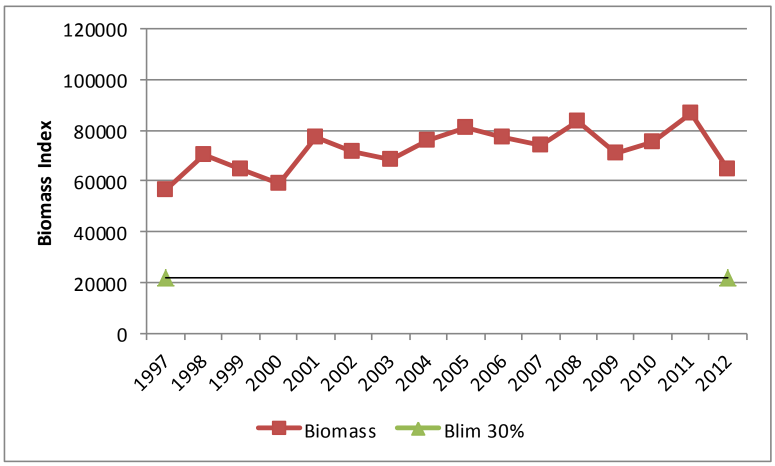


Fig. 14. Biomass trends in Div. 1CD and preliminary $B_{lim.}$

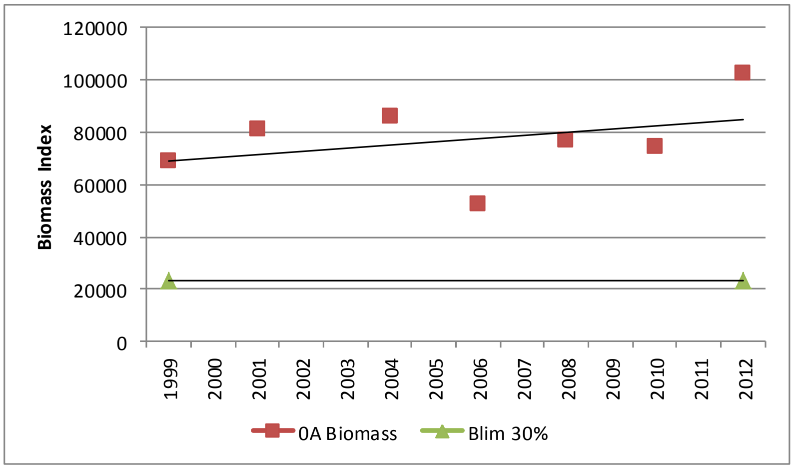


Fig. 15. Biomass trends in Div. 0A and preliminary $B_{lim.}$

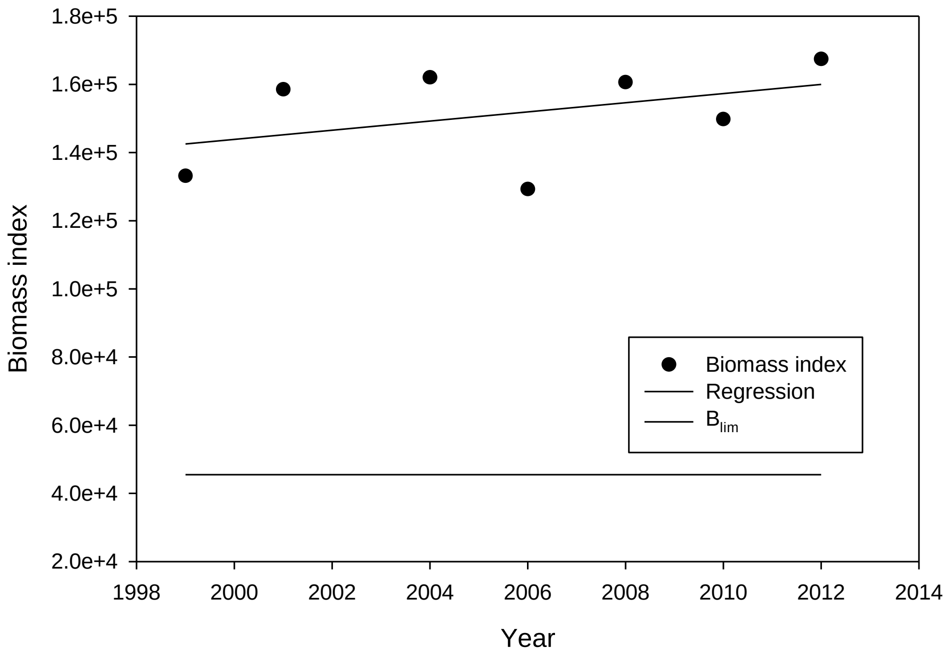


Fig. 16. Biomass trends in Div. 0A + Div. 1CD and preliminary B_{lim}.

Appendix 1. Standardized CPUE index from trawlers in Div. 0A.

```
                       Greenland halibut, 0A trawlers
                                          The GLM Procedure

                           Class Level Information

 Class       Levels  Values

 Year            18  1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006
                     2007 2008 2009 2010 2011 2012 2013

 md               6  6 7 8 9 10 11

 kode             5  2126 2127 5127 21926 21927


                   Number of Observations Read         154
                   Number of Observations Used         154

                       Greenland halibut, 0A trawlers                     5
                                     15:23 Wednesday, June 1, 2011

                             The GLM Procedure

 Dependent Variable: lcph

                                         Sum of
  Source                      DF        Squares    Mean Square   F Value   Pr > F

  Model                       26    19.83996034     0.76307540      6.59   <.0001

  Error                      127    14.69509910     0.11570944

  Corrected Total            153    34.53505943


            R-Square     Coeff Var      Root MSE     lcph Mean

            0.574488     -796.4975      0.340161     -0.042707


  Source                      DF      Type I SS    Mean Square   F Value   Pr > F

  Year                        17    11.91755922     0.70103290      6.06   <.0001
  md                           5     3.02138044     0.60427609      5.22   0.0002
  kode                         4     4.90102068     1.22525517     10.59   <.0001


  Source                      DF    Type III SS    Mean Square   F Value   Pr > F

  Year                        17     9.80709095     0.57688770      4.99   <.0001
  md                           5     2.27594843     0.45518969      3.93   0.0024
  kode                         4     4.90102068     1.22525517     10.59   <.0001


                                                  Standard
  Parameter                 Estimate                 Error    t Value    Pr > |t|

  Intercept              0.215516784 B      0.12698238       1.70      0.0921
  Year      1996         0.278939426 B      0.48415361       0.58      0.5655
  Year      1997        -1.425596447 B      0.27283618      -5.23      <.0001
  Year      1998        -0.781745376 B      0.36214565      -2.16      0.0328
  Year      1999        -0.712527760 B      0.22806134      -3.12      0.0022
  Year      2000        -0.950898029 B      0.20467418      -4.65      <.0001
  Year      2001         0.154920177 B      0.22736105       0.68      0.4969
  Year      2002        -0.357502167 B      0.17111950      -2.09      0.0387
  Year      2003        -0.180108513 B      0.16194489      -1.11      0.2682
  Year      2004        -0.123276167 B      0.15459662      -0.80      0.4267
  Year      2005        -0.432517339 B      0.15237515      -2.84      0.0053
  Year      2006        -0.279418725 B      0.13656808      -2.05      0.0428
  Year      2007        -0.617684821 B      0.13751680      -4.49      <.0001
  Year      2008        -0.228249763 B      0.15657916      -1.46      0.1474
  Year      2009        -0.115873453 B      0.16253869      -0.71      0.4772
  Year      2010        -0.601229601 B      0.16205748      -3.71      0.0003
  Year      2011        -0.292164760 B      0.16870007      -1.73      0.0857
  Year      2012        -0.190563438 B      0.15648569      -1.22      0.2256
  Year      2013         0.000000000 B       .                .          .
```

md	6	0.216208711 B	0.36572290	0.59	0.5554
md	7	0.352368279 B	0.11542517	3.05	0.0028
md	8	0.206962828 B	0.09699853	2.13	0.0348
md	9	0.253570630 B	0.08755084	2.90	0.0044
md	10	0.350637501 B	0.08377939	4.19	<.0001
md	11	0.000000000 B	.	.	.
kode	2126	-0.391889478 B	0.11052992	-3.55	0.0005
kode	2127	-0.293477841 B	0.06535374	-4.49	<.0001
kode	5127	-1.257740156 B	0.40060190	-3.14	0.0021
kode	21926	0.045152769 B	0.11742038	0.38	0.7012
kode	21927	0.000000000 B	.	.	.

NOTE: The X'X matrix has been found to be singular, and a generalized inverse was used to solve the normal equations. Terms whose estimates are followed by the letter 'B' are not uniquely estimable.

The GLM Procedure
Least Squares Means

Year	lcph LSMEAN	Standard Error	Pr > |t|
1996	0.34482326	0.41136393	0.4035
1997	-1.35971261	0.26618982	<.0001
1998	-0.71586154	0.36089481	0.0495
1999	-0.64664393	0.22681614	0.0051
2000	-0.88501420	0.20364222	<.0001
2001	0.22080401	0.18687678	0.2396
2002	-0.29161833	0.16944093	0.0877
2003	-0.11422468	0.15381097	0.4591
2004	-0.05739233	0.13550144	0.6726
2005	-0.36663350	0.13802332	0.0089
2006	-0.21353489	0.12494665	0.0899
2007	-0.55180099	0.13620398	<.0001
2008	-0.16236593	0.15557785	0.2986
2009	-0.04998962	0.16134236	0.7572
2010	-0.53534577	0.16034776	0.0011
2011	-0.22628093	0.16752697	0.1792
2012	-0.12467960	0.14077247	0.3775
2013	0.06588383	0.15126292	0.6639

Appendix 2. Standardized CPUE index from trawlers in Div. 1AB

The GLM Procedure

Class Level Information

Class	Levels	Values
year	12	2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013
MD	8	1 6 7 8 9 10 11 12
kode	5	6125 6126 6127 61926 61927

Number of Observations Read	155
Number of Observations Used	155

Greenland halibut, Div. 1A trawlers 11
08:19 Saturday, May 14, 2011

The GLM Procedure

Dependent Variable: lcph

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	22	15.77399220	0.71699965	10.83	<.0001
Error	132	8.74227054	0.06622932		
Corrected Total	154	24.51626275			

R-Square	Coeff Var	Root MSE	lcph Mean
0.643409	-115.7866	0.257351	-0.222263

Source	DF	Type I SS	Mean Square	F Value	Pr > F
year	11	2.49002963	0.22636633	3.42	0.0003
MD	7	2.67217722	0.38173960	5.76	<.0001
kode	4	10.61178536	2.65294634	40.06	<.0001

Source	DF	Type III SS	Mean Square	F Value	Pr > F
year	11	3.40611673	0.30964698	4.68	<.0001
MD	7	3.56519420	0.50931346	7.69	<.0001
kode	4	10.61178536	2.65294634	40.06	<.0001

Parameter		Estimate		Standard Error	t Value	Pr > |t|
Intercept		0.3235436009	B	0.28193327	1.15	0.2532
year	2002	-.2993488740	B	0.13453752	-2.23	0.0278
year	2003	-.2979967002	B	0.11410013	-2.61	0.0101
year	2004	-.2342694022	B	0.10738239	-2.18	0.0309
year	2005	-.0565354951	B	0.10586675	-0.53	0.5942
year	2006	-.0442041202	B	0.10342357	-0.43	0.6698
year	2007	-.1826296909	B	0.09847459	-1.85	0.0659
year	2008	-.2768236549	B	0.09786164	-2.83	0.0054
year	2009	-.0921510942	B	0.09367268	-0.98	0.3270
year	2010	0.0469931915	B	0.09339142	0.50	0.6157
year	2011	0.2188293610	B	0.09866287	2.22	0.0283
year	2012	0.1128302303	B	0.09714510	1.16	0.2476
year	2013	0.0000000000	B	.	.	.
MD	1	0.0857182603	B	0.38160383	0.22	0.8226
MD	6	-.3808988344	B	0.33050892	-1.15	0.2512
MD	7	-.5858127473	B	0.27710974	-2.11	0.0364
MD	8	-.3074355150	B	0.27266371	-1.13	0.2616
MD	9	-.2628231131	B	0.27154954	-0.97	0.3349
MD	10	-.1034081462	B	0.27161315	-0.38	0.7040
MD	11	-.0595549311	B	0.27313524	-0.22	0.8277
MD	12	0.0000000000	B	.	.	.

kode	6125	-.4251087158 B	0.08506620	-5.00	<.0001
kode	6126	-.6428469562 B	0.06082398	-10.57	<.0001
kode	6127	-.0153707141 B	0.05910344	-0.26	0.7952
kode	61926	-.2752542407 B	0.08242470	-3.34	0.0011
kode	61927	0.0000000000 B	.	.	.

NOTE: The X'X matrix has been found to be singular, and a generalized inverse was used to solve the normal equations. Terms whose estimates are followed by the letter 'B' are not uniquely estimable.

The GLM Procedure
Least Squares Means

year	lcph LSMEAN	Standard Error	Pr > |t|
2002	-0.44929828	0.13029330	0.0008
2003	-0.44794610	0.10890192	<.0001
2004	-0.38421881	0.09903431	0.0002
2005	-0.20648490	0.09629241	0.0338
2006	-0.19415352	0.08996827	0.0327
2007	-0.33257909	0.08954898	0.0003
2008	-0.42677306	0.08164965	<.0001
2009	-0.24210050	0.08452355	0.0049
2010	-0.10295621	0.08132947	0.2078
2011	0.06887996	0.08142505	0.3991
2012	-0.03711917	0.08783153	0.6733
2013	-0.14994940	0.08820555	0.0915

Appendix 3. Standardized CPUE index from trawlers in Div. 0A+1AB.

Greenland halibut, 0A+1AB trawlers

The GLM Procedure

Class Level Information

Class	Levels	Values
year	18	1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013
MD	8	1 6 7 8 9 10 11 12
kode	10	2126 2127 5127 6125 6126 6127 21926 21927 61926 61927

Number of Observations Read	309
Number of Observations Used	309

The GLM Procedure

Dependent Variable: lcph

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	33	31.59185401	0.95732891	8.79	<.0001
Error	275	29.95000167	0.10890910		
Corrected Total	308	61.54185568			

R-Square	Coeff Var	Root MSE	lcph Mean
0.513339	-248.5502	0.330014	-0.132775

Source	DF	Type I SS	Mean Square	F Value	Pr > F
year	17	9.78912413	0.57583083	5.29	<.0001
MD	7	2.26717905	0.32388272	2.97	0.0051
kode	9	19.53555083	2.17061676	19.93	<.0001

Source	DF	Type III SS	Mean Square	F Value	Pr > F
year	17	10.28281528	0.60487149	5.55	<.0001
MD	7	2.37758475	0.33965496	3.12	0.0035
kode	9	19.53555083	2.17061676	19.93	<.0001

Parameter		Estimate		Standard Error	t Value	Pr > |t|
Intercept		0.319459606	B	0.35212991	0.91	0.3651
year	1996	0.577555344	B	0.45849261	1.26	0.2089
year	1997	-1.444349707	B	0.24900031	-5.80	<.0001
year	1998	-0.636929496	B	0.34121978	-1.87	0.0630
year	1999	-0.649202235	B	0.20688754	-3.14	0.0019
year	2000	-0.809543788	B	0.18162761	-4.46	<.0001
year	2001	0.269494375	B	0.20525140	1.31	0.1903
year	2002	-0.273328776	B	0.11795114	-2.32	0.0212
year	2003	-0.234975386	B	0.10618786	-2.21	0.0277
year	2004	-0.179290458	B	0.10000866	-1.79	0.0741
year	2005	-0.314357221	B	0.09826063	-3.20	0.0015
year	2006	-0.203828026	B	0.09109139	-2.24	0.0260
year	2007	-0.415947808	B	0.09078399	-4.58	<.0001
year	2008	-0.241855419	B	0.09657182	-2.50	0.0128
year	2009	-0.133497530	B	0.09524355	-1.40	0.1621
year	2010	-0.194318273	B	0.09480983	-2.05	0.0414
year	2011	0.049641879	B	0.09968674	0.50	0.6189
year	2012	-0.009418913	B	0.09556968	-0.10	0.9216

year	2013	0.000000000 B	.	.	.
MD	1	0.240203645 B	0.48319878	0.50	0.6195
MD	6	-0.219842960 B	0.39378802	-0.56	0.5771
MD	7	-0.278736559 B	0.34559078	-0.81	0.4206
MD	8	-0.189116100 B	0.34284155	-0.55	0.5817
MD	9	-0.144355283 B	0.34217234	-0.42	0.6734
MD	10	-0.007002181 B	0.34226705	-0.02	0.9837
MD	11	-0.193741078 B	0.34316869	-0.56	0.5728
MD	12	0.000000000 B	.	.	.
kode	2126	-0.160055055 B	0.10503101	-1.52	0.1287
kode	2127	-0.144310631 B	0.07228044	-2.00	0.0469
kode	5127	-1.282516098 B	0.39071231	-3.28	0.0012
kode	6125	-0.360182377 B	0.10238912	-3.52	0.0005
kode	6126	-0.624060864 B	0.07717880	-8.09	<.0001
kode	6127	-0.046254955 B	0.07464624	-0.62	0.5360
kode	21926	0.294612613 B	0.10921829	2.70	0.0074
kode	21927	0.154243502 B	0.07002775	2.20	0.0285
kode	61926	-0.219689322 B	0.10279755	-2.14	0.0335
kode	61927	0.000000000 B	.	.	.

NOTE: The X'X matrix has been found to be singular, and a generalized inverse was used to solve the normal equations. Terms whose estimates are followed by the letter 'B' are not uniquely estimable.

The GLM Procedure
Least Squares Means

year	lcph LSMEAN	Standard Error	Pr > |t|
1996	0.55911982	0.42590774	0.1904
1997	-1.46278523	0.25007600	<.0001
1998	-0.65536502	0.34285276	0.0570
1999	-0.66763776	0.21019089	0.0017
2000	-0.82797931	0.18490823	<.0001
2001	0.25105885	0.18956684	0.1865
2002	-0.29176430	0.12446836	0.0198
2003	-0.25341091	0.11231975	0.0248
2004	-0.19772599	0.10227442	0.0542
2005	-0.33279275	0.10156905	0.0012
2006	-0.22226355	0.09395570	0.0187
2007	-0.43438333	0.09843778	<.0001
2008	-0.26029095	0.09826548	0.0085
2009	-0.15193306	0.10314054	0.1419
2010	-0.21275380	0.10087638	0.0358
2011	0.03120635	0.10012657	0.7555
2012	-0.02785444	0.10109399	0.7831
2013	-0.01843553	0.10307409	0.8582

Appendix 4. Standardized CPUE index from Gill nets in Div. 0A

Class Level Information		
Class	**Levels**	**Values**
Year	10	2004 2005 2006 2007 2008 2009 2010 2011 2012 2013
Month	5	7 8 9 10 11
CGT	3	40413 40414 40415

Number of Observations Read	55
Number of Observations Used	55

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	15	1.98985677	0.13265712	1.78	0.0754
Error	39	2.91348158	0.07470466		
Corrected Total	54	4.90333835			

R-Square	Coeff Var	Root MSE	lcpue Mean
0.405817	12.05850	0.273322	2.266630

Source	DF	Type I SS	Mean Square	F Value	Pr > F
Year	9	1.14688563	0.12743174	1.71	0.1206
Month	4	0.57640021	0.14410005	1.93	0.1249
CGT	2	0.26657093	0.13328546	1.78	0.1814

Source	DF	Type III SS	Mean Square	F Value	Pr > F
Year	9	1.59879045	0.17764338	2.38	0.0298
Month	4	0.50609760	0.12652440	1.69	0.1710
CGT	2	0.26657093	0.13328546	1.78	0.1814

Parameter	Estimate		Standard Error	t Value	Pr > |t|
Intercept	2.379396298	B	0.17947020	13.26	<.0001
Year 2004	-0.762798936	B	0.30821189	-2.47	0.0178
Year 2005	-0.084249412	B	0.16657791	-0.51	0.6159
Year 2006	-0.437814114	B	0.16718377	-2.62	0.0125
Year 2007	-0.328417636	B	0.16871816	-1.95	0.0588
Year 2008	-0.169720649	B	0.18502954	-0.92	0.3646
Year 2009	-0.032897600	B	0.17286371	-0.19	0.8501
Year 2010	-0.038940719	B	0.17286371	-0.23	0.8229
Year 2011	0.068293737	B	0.17286371	0.40	0.6949
Year 2012	0.030763267	B	0.17286371	0.18	0.8597
Year 2013	0.000000000	B	.	.	.
Month 7	-0.083263473	B	0.14479540	-0.58	0.5686
Month 8	0.173060044	B	0.11656571	1.48	0.1457
Month 9	0.193492230	B	0.11347245	1.71	0.0961
Month 10	0.168831492	B	0.11450183	1.47	0.1484
Month 11	0.000000000	B	.	.	.
CGT 40413	0.307391242	B	0.22802794	1.35	0.1854
CGT 40414	-0.105896039	B	0.11539550	-0.92	0.3644
CGT 40415	0.000000000	B	.	.	.

Least Squares Means

Year	lcpue LSMEAN	Standard Error	Pr > |t|
2004	1.77418649	0.29645802	<.0001
2005	2.45273601	0.12252511	<.0001
2006	2.09917131	0.09535068	<.0001
2007	2.20856779	0.12921496	<.0001
2008	2.36726478	0.16778024	<.0001
2009	2.50408782	0.15339537	<.0001
2010	2.49804471	0.15339537	<.0001
2011	2.60527916	0.15339537	<.0001
2012	2.56774869	0.15339537	<.0001
2013	2.53698542	0.15339537	<.0001

Greenland halibut, 0A gillnets

The GLM Procedure

Class Level Information		
Class	Levels	Values
Year	9	2004 2005 2006 2007 2008 2009 2010 2011 2012
Month	5	7 8 9 10 11
CGT	3	40413 40414 40415

Number of Observations Read	50
Number of Observations Used	50

Greenland halibut, 0A gillnets

The GLM Procedure

Dependent Variable: lcpue

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	14	1.81867998	0.12990571	1.65	0.1144
Error	35	2.75995330	0.07885581		
Corrected Total	49	4.57863328			

R-Square	Coeff Var	Root MSE	lcpue Mean
0.397210	12.44241	0.280813	2.256900

Source	DF	Type I SS	Mean Square	F Value	Pr > F
Year	8	1.09482153	0.13685269	1.74	0.1246
Month	4	0.45190500	0.11297625	1.43	0.2437
CGT	2	0.27195346	0.13597673	1.72	0.1931

Source	DF	Type III SS	Mean Square	F Value	Pr > F
Year	8	1.45399524	0.18174941	2.30	0.0423
Month	4	0.38698491	0.09674623	1.23	0.3172
CGT	2	0.27195346	0.13597673	1.72	0.1931

Parameter	Estimate		Standard Error	t Value	Pr > |t|
Intercept	2.389853291	B	0.18566115	12.87	<.0001
Year 2004	-0.785993389	B	0.31758714	-2.47	0.0183
Year 2005	-0.115013703	B	0.17120907	-0.67	0.5061
Year 2006	-0.457845085	B	0.17200112	-2.66	0.0117
Year 2007	-0.347866375	B	0.17360221	-2.00	0.0529
Year 2008	-0.185979769	B	0.19044185	-0.98	0.3355
Year 2009	-0.063660867	B	0.17760159	-0.36	0.7222
Year 2010	-0.069703986	B	0.17760159	-0.39	0.6971
Year 2011	0.037530470	B	0.17760159	0.21	0.8339
Year 2012	0.000000000	B	.	.	.
Month 7	0.002603087	B	0.16139416	0.02	0.9872
Month 8	0.186709647	B	0.12562261	1.49	0.1462
Month 9	0.212944782	B	0.12199125	1.75	0.0897
Month 10	0.189112654	B	0.12318150	1.54	0.1337
Month 11	0.000000000	B	.	.	.
CGT 40413	0.300414143	B	0.23473748	1.28	0.2090
CGT 40414	-0.113439740	B	0.11872319	-0.96	0.3459
CGT 40415	0.000000000	B	.	.	.

Greenland halibut, 0A gillnets

The GLM Procedure

Least Squares Means

Year	lcpue LSMEAN	Standard Error	Pr > |t|
2004	1.78445874	0.30550254	<.0001
2005	2.45543842	0.12611535	<.0001
2006	2.11260704	0.09870106	<.0001
2007	2.22258575	0.13331110	<.0001
2008	2.38447236	0.17296081	<.0001
2009	2.50679126	0.15765064	<.0001
2010	2.50074814	0.15765064	<.0001
2011	2.60798260	0.15765064	<.0001
2012	2.57045213	0.15765064	<.0001

Appendix 5. Standardized CPUE index from trawlers in Div. 0B

Greenland halibut, 0B trawlers

The GLM Procedure

Class Level Information

Class	Levels	Values
Year	24	1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013
md	12	1 2 3 4 5 6 7 8 9 10 11 12
kode	12	2126 2127 3125 5126 5127 14124 15126 15127 20126 20127 21926 21927

Number of Observations Read	610
Number of Observations Used	610

The GLM Procedure

Dependent Variable: lcph

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	45	174.3979593	3.8755102	48.09	<.0001
Error	564	45.4543311	0.0805928		
Corrected Total	609	219.8522904			

R-Square	Coeff Var	Root MSE	lcph Mean
0.793251	-50.33386	0.283889	-0.564011

Source	DF	Type I SS	Mean Square	F Value	Pr > F
Year	23	108.4539043	4.7153871	58.51	<.0001
md	11	19.5859539	1.7805413	22.09	<.0001
kode	11	46.3581011	4.2143728	52.29	<.0001

Source	DF	Type III SS	Mean Square	F Value	Pr > F
Year	23	10.85854051	0.47211046	5.86	<.0001
md	11	17.78555332	1.61686848	20.06	<.0001
kode	11	46.35810111	4.21437283	52.29	<.0001

Parameter		Estimate		Standard Error	t Value	Pr > |t|
Intercept		-0.056061143	B	0.07536240	-0.74	0.4573
Year	1990	0.231690666	B	0.09521447	2.43	0.0153
Year	1991	0.235475142	B	0.09692107	2.43	0.0154
Year	1992	0.364051794	B	0.09058203	4.02	<.0001
Year	1993	0.246192915	B	0.09565788	2.57	0.0103
Year	1994	0.231991832	B	0.10144644	2.29	0.0226
Year	1995	0.384364008	B	0.12157807	3.16	0.0017
Year	1996	0.327871778	B	0.11173936	2.93	0.0035
Year	1997	0.302418953	B	0.11209834	2.70	0.0072
Year	1998	0.313510250	B	0.11841401	2.65	0.0083
Year	1999	0.216660691	B	0.11402351	1.90	0.0579
Year	2000	0.154904566	B	0.14324009	1.08	0.2800
Year	2001	0.074309362	B	0.17777611	0.42	0.6761
Year	2002	-0.189006164	B	0.12413129	-1.52	0.1284
Year	2003	-0.029280608	B	0.08565799	-0.34	0.7326
Year	2004	-0.012885607	B	0.08835853	-0.15	0.8841

Year	2005	0.288504623 B	0.08874935	3.25	0.0012
Year	2006	0.251010597 B	0.10632303	2.36	0.0186
Year	2007	0.152805107 B	0.09663800	1.58	0.1144
Year	2008	0.471031054 B	0.08974007	5.25	<.0001
Year	2009	0.613038351 B	0.09371259	6.54	<.0001
Year	2010	0.283637845 B	0.09295625	3.05	0.0024
Year	2011	0.384957109 B	0.09046567	4.26	<.0001
Year	2012	-0.019688731 B	0.08414579	-0.23	0.8151
Year	2013	0.000000000 B	.	.	.
md	1	0.064735962 B	0.10277971	0.63	0.5290
md	2	0.293717454 B	0.18015369	1.63	0.1036
md	3	0.113598911 B	0.30229901	0.38	0.7072
md	4	0.218594440 B	0.08850824	2.47	0.0138
md	5	0.474849864 B	0.06454171	7.36	<.0001
md	6	-0.039266236 B	0.06499062	-0.60	0.5460
md	7	-0.312905593 B	0.05790973	-5.40	<.0001
md	8	-0.235711464 B	0.05612764	-4.20	<.0001
md	9	-0.300541208 B	0.05428687	-5.54	<.0001
md	10	-0.350155802 B	0.05149087	-6.80	<.0001
md	11	-0.234621376 B	0.05188673	-4.52	<.0001
md	12	0.000000000 B	.	.	.
kode	2126	-0.569287968 B	0.08757787	-6.50	<.0001
kode	2127	-0.334298861 B	0.04231124	-7.90	<.0001
kode	3125	-1.142901966 B	0.10514557	-10.87	<.0001
kode	5126	-0.476431618 B	0.13797960	-3.45	0.0006
kode	5127	-0.238469659 B	0.08469139	-2.82	0.0050
kode	14124	-0.773079023 B	0.09257093	-8.35	<.0001
kode	15126	-0.018729538 B	0.09501673	-0.20	0.8438
kode	15127	-0.038360954 B	0.11813800	-0.32	0.7455
kode	20126	-1.091992660 B	0.07683143	-14.21	<.0001
kode	20127	-1.106889021 B	0.08745403	-12.66	<.0001
kode	21926	-0.149497820 B	0.12685623	-1.18	0.2391
kode	21927	0.000000000 B	.	.	.

NOTE: The X'X matrix has been found to be singular, and a generalized inverse was used to solve the normal equations. Terms whose estimates are followed by the letter 'B' are not uniquely estimable.

The GLM Procedure
Least Squares Means

Year	lcph LSMEAN	Standard Error	Pr > |t|
1990	-0.34500749	0.06293846	<.0001
1991	-0.34122301	0.06323308	<.0001
1992	-0.21264636	0.05812806	0.0003
1993	-0.33050524	0.06263465	<.0001
1994	-0.34470632	0.07037144	<.0001
1995	-0.19233415	0.09796307	0.0501
1996	-0.24882638	0.09177764	0.0069
1997	-0.27427920	0.09595552	0.0044
1998	-0.26318790	0.10946832	0.0165
1999	-0.36003746	0.10893354	0.0010
2000	-0.42179359	0.13767803	0.0023
2001	-0.50238879	0.17462391	0.0042
2002	-0.76570432	0.12146471	<.0001
2003	-0.60597876	0.08013197	<.0001
2004	-0.58958376	0.08261965	<.0001
2005	-0.28819353	0.08281946	0.0005
2006	-0.32568756	0.09301001	0.0005
2007	-0.42389305	0.07316668	<.0001
2008	-0.10566710	0.08677529	0.2238
2009	0.03634020	0.09055328	0.6883
2010	-0.29306031	0.09016172	0.0012
2011	-0.19174105	0.08545037	0.0252
2012	-0.59638689	0.08062657	<.0001
2013	-0.57669815	0.07684668	<.0001

Appendix 6. Standardized CPUE index for trawlers in Div.1CD.

Greenland halibut, 1CD trawlers
The GLM Procedure

Class Level Information

Class	Levels	Values
year	26	1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013
MD	12	1 2 3 4 5 6 7 8 9 10 11 12
kode	6	6124 6125 6126 6127 61926 61927

Number of Observations Read	313
Number of Observations Used	313

Dependent Variable: lcph

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	41	52.51615442	1.28088182	17.31	<.0001
Error	271	20.05460882	0.07400225		
Corrected Total	312	72.57076323			

R-Square	Coeff Var	Root MSE	lcph Mean
0.723654	-54.66145	0.272034	-0.497670

Source	DF	Type I SS	Mean Square	F Value	Pr > F
year	25	22.54292728	0.90171709	12.18	<.0001
MD	11	7.13652472	0.64877497	8.77	<.0001
kode	5	22.83670241	4.56734048	61.72	<.0001

Source	DF	Type III SS	Mean Square	F Value	Pr > F
year	25	15.45961809	0.61838472	8.36	<.0001
MD	11	4.91719708	0.44701792	6.04	<.0001
kode	5	22.83670241	4.56734048	61.72	<.0001

Parameter		Estimate		Standard Error	t Value	Pr > |t|
Intercept		0.388802039	B	0.08399044	4.63	<.0001
year	1988	0.029081482	B	0.14701857	0.20	0.8433
year	1989	0.071950068	B	0.14026535	0.51	0.6084
year	1990	-0.278107278	B	0.20482812	-1.36	0.1757
year	1991	-0.266692972	B	0.17127912	-1.56	0.1206
year	1992	-0.395357534	B	0.12071744	-3.28	0.0012
year	1993	-0.592107464	B	0.12041504	-4.92	<.0001
year	1994	-0.728241631	B	0.12068531	-6.03	<.0001
year	1995	-0.612394355	B	0.12038741	-5.09	<.0001
year	1996	-0.843088914	B	0.12004114	-7.02	<.0001
year	1997	-0.925004035	B	0.10529803	-8.78	<.0001
year	1998	-0.725630549	B	0.11403995	-6.36	<.0001
year	1999	-0.773725018	B	0.10658425	-7.26	<.0001
year	2000	-0.485755822	B	0.10017585	-4.85	<.0001
year	2001	-0.572770972	B	0.09494302	-6.03	<.0001
year	2002	-0.647964958	B	0.09178716	-7.06	<.0001
year	2003	-0.644472396	B	0.09931203	-6.49	<.0001
year	2004	-0.604914929	B	0.09038282	-6.69	<.0001

year	2005	-0.451571352 B	0.09138513	-4.94	<.0001
year	2006	-0.372333080 B	0.08971054	-4.15	<.0001
year	2007	-0.309028594 B	0.09043643	-3.42	0.0007
year	2008	-0.269076951 B	0.08707820	-3.09	0.0022
year	2009	-0.317656586 B	0.09191844	-3.46	0.0006
year	2010	-0.337895253 B	0.08618526	-3.92	0.0001
year	2011	-0.332132154 B	0.09036802	-3.68	0.0003
year	2012	-0.201481079 B	0.08546772	-2.36	0.0191
year	2013	0.000000000 B	.	.	.
MD	1	-0.325663962 B	0.09425562	-3.46	0.0006
MD	2	-0.714673332 B	0.11290235	-6.33	<.0001
MD	3	-0.605648755 B	0.20366126	-2.97	0.0032
MD	4	-0.333257160 B	0.21251017	-1.57	0.1180
MD	5	-0.169677898 B	0.11826480	-1.43	0.1525
MD	6	-0.346742181 B	0.09155548	-3.79	0.0002
MD	7	-0.331067085 B	0.07586841	-4.36	<.0001
MD	8	-0.294765518 B	0.06779311	-4.35	<.0001
MD	9	-0.151996945 B	0.06241220	-2.44	0.0155
MD	10	-0.185465559 B	0.05817608	-3.19	0.0016
MD	11	-0.118685227 B	0.05776678	-2.05	0.0409
MD	12	0.000000000 B	.	.	.
kode	6124	-2.489252640 B	0.18374820	-13.55	<.0001
kode	6125	-0.577863943 B	0.06517052	-8.87	<.0001
kode	6126	-0.352462618 B	0.05706767	-6.18	<.0001
kode	6127	-0.048366849 B	0.05940215	-0.81	0.4162
kode	61926	-0.085014617 B	0.10448977	-0.81	0.4166
kode	61927	0.000000000 B	.	.	.

NOTE: The X'X matrix has been found to be singular, and a generalized inverse was used to solve the normal equations. Terms whose estimates are followed by the letter 'B' are not uniquely estimable.

The GLM Procedure
Least Squares Means

year	lcph LSMEAN	Standard Error	Pr > |t|
1988	-0.47241356	0.13444311	0.0005
1989	-0.42954497	0.13273598	0.0014
1990	-0.77960232	0.20028036	0.0001
1991	-0.76818801	0.16605376	<.0001
1992	-0.89685258	0.11414569	<.0001
1993	-1.09360251	0.11382102	<.0001
1994	-1.22973667	0.11379164	<.0001
1995	-1.11388940	0.11388497	<.0001
1996	-1.34458395	0.11357759	<.0001
1997	-1.42649908	0.09781839	<.0001
1998	-1.22712559	0.10775007	<.0001
1999	-1.27522006	0.09858157	<.0001
2000	-0.98725086	0.07961808	<.0001
2001	-1.07426601	0.08604308	<.0001
2002	-1.14946000	0.08176168	<.0001
2003	-1.14596744	0.09101150	<.0001
2004	-1.10640997	0.07761105	<.0001
2005	-0.95306639	0.08089231	<.0001
2006	-0.87382812	0.07926001	<.0001
2007	-0.81052364	0.07876771	<.0001
2008	-0.77057199	0.07630926	<.0001
2009	-0.81915163	0.08201803	<.0001
2010	-0.83939029	0.07545170	<.0001
2011	-0.83362720	0.08084439	<.0001
2012	-0.70297612	0.07500786	<.0001
2013	-0.50149504	0.06798162	<.0001

Appendix 7. Standardized CPUE index for trawlers in Div. 1CD and Div. 0B.

Greenland halibut, 0B+1CD trawlers
The GLM Procedure

Class Level Information

Class	Levels	Values
year	26	1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013
MD	12	1 2 3 4 5 6 7 8 9 10 11 12
kode	18	2126 2127 3125 5126 5127 6124 6125 6126 6127 14124 15126 15127 20126 20127 21926 21927 61926 61927

Number of Observations Read 923
Number of Observations Used 923

The GLM Procedure

Dependent Variable: lcph

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	53	210.6292563	3.9741369	41.76	<.0001
Error	869	82.7042205	0.0951717		
Corrected Total	922	293.3334768			

R-Square	Coeff Var	Root MSE	lcph Mean
0.718054	-56.96973	0.308499	-0.541514

Source	DF	Type I SS	Mean Square	F Value	Pr > F
year	25	98.75368098	3.95014724	41.51	<.0001
MD	11	25.20415885	2.29128717	24.08	<.0001
kode	17	86.67141648	5.09831862	53.57	<.0001

Source	DF	Type III SS	Mean Square	F Value	Pr > F
year	25	12.64438120	0.50577525	5.31	<.0001
MD	11	15.45119297	1.40465391	14.76	<.0001
kode	17	86.67141648	5.09831862	53.57	<.0001

Parameter		Estimate		Standard Error	t Value	Pr > |t|
Intercept		0.082258052	B	0.07622752	1.08	0.2808
year	1988	0.181746366	B	0.15026499	1.21	0.2268
year	1989	0.300795971	B	0.14956484	2.01	0.0446
year	1990	-0.200574561	B	0.07723619	-2.60	0.0096
year	1991	-0.186078363	B	0.07776528	-2.39	0.0169
year	1992	-0.058158752	B	0.06983307	-0.83	0.4052
year	1993	-0.201138641	B	0.07320435	-2.75	0.0061
year	1994	-0.216800588	B	0.07782412	-2.79	0.0055
year	1995	-0.134266105	B	0.09129862	-1.47	0.1418
year	1996	-0.240115800	B	0.08762164	-2.74	0.0063
year	1997	-0.341563542	B	0.08429851	-4.05	<.0001
year	1998	-0.220282100	B	0.09064460	-2.43	0.0153
year	1999	-0.252003128	B	0.08598589	-2.93	0.0035
year	2000	-0.089260803	B	0.08917670	-1.00	0.3171
year	2001	-0.181792858	B	0.08902862	-2.04	0.0415
year	2002	-0.303007226	B	0.07991882	-3.79	0.0002
year	2003	-0.260530549	B	0.07078720	-3.68	0.0002
year	2004	-0.257809669	B	0.06940949	-3.71	0.0002

year	2005	-0.049229367 B	0.07023330	-0.70	0.4835
year	2006	0.015007454 B	0.07414232	0.20	0.8396
year	2007	-0.036508342 B	0.07149777	-0.51	0.6097
year	2008	0.126577165 B	0.06913605	1.83	0.0675
year	2009	0.140232538 B	0.07243583	1.94	0.0532
year	2010	0.006729492 B	0.06983923	0.10	0.9233
year	2011	0.108052025 B	0.07008967	1.54	0.1235
year	2012	-0.110793439 B	0.06630949	-1.67	0.0951
year	2013	0.000000000 B	.	.	.
MD	1	-0.156973116 B	0.07483395	-2.10	0.0362
MD	2	-0.399275980 B	0.10318903	-3.87	0.0001
MD	3	-0.267553878 B	0.18694401	-1.43	0.1527
MD	4	0.072543137 B	0.08589183	0.84	0.3986
MD	5	0.329032607 B	0.05953721	5.53	<.0001
MD	6	-0.157999744 B	0.05700420	-2.77	0.0057
MD	7	-0.306171883 B	0.04916487	-6.23	<.0001
MD	8	-0.223439798 B	0.04643007	-4.81	<.0001
MD	9	-0.224639612 B	0.04418268	-5.08	<.0001
MD	10	-0.266360543 B	0.04188835	-6.36	<.0001
MD	11	-0.169979308 B	0.04221703	-4.03	<.0001
MD	12	0.000000000 B	.	.	.
kode	2126	-0.324455305 B	0.09436250	-3.44	0.0006
kode	2127	-0.147130341 B	0.06247344	-2.36	0.0187
kode	3125	-1.072046939 B	0.11244800	-9.53	<.0001
kode	5126	-0.053896462 B	0.14179768	-0.38	0.7040
kode	5127	0.063853019 B	0.08426083	0.76	0.4488
kode	6124	-2.510926428 B	0.20186235	-12.44	<.0001
kode	6125	-0.672835495 B	0.07130487	-9.44	<.0001
kode	6126	-0.405798716 B	0.06301608	-6.44	<.0001
kode	6127	-0.086700581 B	0.06503193	-1.33	0.1828
kode	14124	-0.529056366 B	0.09373311	-5.64	<.0001
kode	15126	0.207378528 B	0.09849567	2.11	0.0355
kode	15127	0.184768420 B	0.12374998	1.49	0.1358
kode	20126	-0.842382876 B	0.07626078	-11.05	<.0001
kode	20127	-0.853633938 B	0.08652645	-9.87	<.0001
kode	21926	0.110212033 B	0.13367327	0.82	0.4099
kode	21927	0.140459414 B	0.06608230	2.13	0.0338
kode	61926	-0.121627136 B	0.11600936	-1.05	0.2947
kode	61927	0.000000000 B	.	.	.

NOTE: The X'X matrix has been found to be singular, and a generalized inverse was used to solve the normal equations. Terms whose estimates are followed by the letter 'B' are not uniquely estimable.

The GLM Procedure
Least Squares Means

year	lcph LSMEAN	Standard Error	Pr > |t|
1988	-0.26766482	0.14494892	0.0651
1989	-0.14861522	0.14463506	0.3045
1990	-0.64998575	0.05834562	<.0001
1991	-0.63548955	0.05765605	<.0001
1992	-0.50756994	0.04945124	<.0001
1993	-0.65054983	0.05332944	<.0001
1994	-0.66621178	0.05973510	<.0001
1995	-0.58367730	0.07904008	<.0001
1996	-0.68952699	0.07647928	<.0001
1997	-0.79097473	0.07327821	<.0001
1998	-0.66969329	0.08268851	<.0001
1999	-0.70141432	0.07852827	<.0001
2000	-0.53867199	0.07767548	<.0001
2001	-0.63120405	0.08207786	<.0001
2002	-0.75241842	0.07192121	<.0001
2003	-0.70994174	0.06180301	<.0001
2004	-0.70722086	0.05983799	<.0001
2005	-0.49864056	0.06045466	<.0001
2006	-0.43440374	0.06321145	<.0001
2007	-0.48591953	0.05685411	<.0001
2008	-0.32283402	0.06076427	<.0001
2009	-0.30917865	0.06422898	<.0001
2010	-0.44268170	0.06136944	<.0001
2011	-0.34135916	0.06178203	<.0001
2012	-0.56020463	0.05771551	<.0001
2013	-0.44941119	0.05274897	<.0001

Appendix 8. Standardized CPUE index for Gill net in Div. 0B.

Greenland halibut, 0B gillnets

The GLM Procedure

Class Level Information		
Class	**Levels**	**Values**
Year	11	2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013
Month	7	5 6 7 8 9 10 11
CGT	2	40413 40414

Number of Observations Read	94
Number of Observations Used	94

Dependent Variable: lcpue

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	17	11.92271417	0.70133613	7.20	<.0001
Error	76	7.39903189	0.09735568		
Corrected Total	93	19.32174606			

R-Square	Coeff Var	Root MSE	lcpue Mean
0.617062	18.24094	0.312019	1.710541

Source	DF	Type I SS	Mean Square	F Value	Pr > F
Year	10	8.46037686	0.84603769	8.69	<.0001
Month	6	3.44980566	0.57496761	5.91	<.0001
CGT	1	0.01253165	0.01253165	0.13	0.7208

Source	DF	Type III SS	Mean Square	F Value	Pr > F
Year	10	7.76243866	0.77624387	7.97	<.0001
Month	6	3.42043158	0.57007193	5.86	<.0001
CGT	1	0.01253165	0.01253165	0.13	0.7208

Parameter	Estimate		Standard Error	t Value	Pr > |t|
Intercept	1.913502529	B	0.17826666	10.73	<.0001
Year 2003	-1.043904396	B	0.15217988	-6.86	<.0001
Year 2004	-0.646970312	B	0.16897023	-3.83	0.0003
Year 2005	-0.717123027	B	0.16016957	-4.48	<.0001
Year 2006	-0.718173139	B	0.15217988	-4.72	<.0001
Year 2007	-0.550338252	B	0.13193871	-4.17	<.0001
Year 2008	-0.396242630	B	0.14191694	-2.79	0.0066
Year 2009	-0.190276838	B	0.14128503	-1.35	0.1821
Year 2010	-0.235975213	B	0.15208705	-1.55	0.1249
Year 2011	-0.212327372	B	0.14129693	-1.50	0.1371
Year 2012	-0.157894433	B	0.13565303	-1.16	0.2481
Year 2013	0.000000000	B	.	.	.
Month 5	0.485233901	B	0.17926525	2.71	0.0084
Month 6	0.103012142	B	0.17926525	0.57	0.5672
Month 7	-0.094111535	B	0.17978737	-0.52	0.6022
Month 8	0.284465222	B	0.18303222	1.55	0.1243
Month 9	0.272619820	B	0.18213080	1.50	0.1386
Month 10	0.170345429	B	0.19645123	0.87	0.3886
Month 11	0.000000000	B	.	.	.
CGT 40413	-0.119504502	B	0.33308940	-0.36	0.7208
CGT 40414	0.000000000	B	.	.	.

Least Squares Means

Year	lcpue LSMEAN	Standard Error	Pr > |t|

2003	0.98435516	0.20407129	<.0001
2004	1.38128925	0.22035343	<.0001
2005	1.31113653	0.21096441	<.0001
2006	1.31008642	0.20407129	<.0001
2007	1.47792131	0.18989596	<.0001
2008	1.63201693	0.19899906	<.0001
2009	1.83798272	0.20028235	<.0001
2010	1.79228435	0.20879083	<.0001
2011	1.81593219	0.20011706	<.0001
2012	1.87036513	0.16840832	<.0001
2013	2.02825956	0.19330918	<.0001

Appendix 9. Standardized CPUE index for trawlers in SA 0+1

Greenland halibut, All trawlers

The GLM Procedure

Class Level Information

Class	Levels	Values
year	26	1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013
MD	12	1 2 3 4 5 6 7 8 9 10 11 12
kode	17	2126 2127 3125 5126 5127 6124 6125 6126 6127 14124 15126 20126 20127 21926 21927 61926 61927

Number of Observations Read	1070
Number of Observations Used	1070

The GLM Procedure

Dependent Variable: lcph

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	52	247.0861450	4.7516566	42.95	<.0001
Error	1017	112.5211419	0.1106403		
Corrected Total	1069	359.6072869			

R-Square	Coeff Var	Root MSE	lcph Mean
0.687100	-72.30428	0.332626	-0.460037

Source	DF	Type I SS	Mean Square	F Value	Pr > F
year	25	135.5777360	5.4231094	49.02	<.0001
MD	11	13.9175558	1.2652323	11.44	<.0001
kode	16	97.5908532	6.0994283	55.13	<.0001

Source	DF	Type III SS	Mean Square	F Value	Pr > F
year	25	15.73282847	0.62931314	5.69	<.0001
MD	11	9.82625918	0.89329629	8.07	<.0001
kode	16	97.59085317	6.09942832	55.13	<.0001

Parameter		Estimate	Standard Error	t Value	Pr > |t|
Intercept		0.163995061 B	0.08066253	2.03	0.0423
year	1988	0.111539873 B	0.16015389	0.70	0.4863
year	1989	0.198042358 B	0.15932077	1.24	0.2141
year	1990	-0.377716825 B	0.08278651	-4.56	<.0001
year	1991	-0.323152867 B	0.08042316	-4.02	<.0001
year	1992	-0.204007150 B	0.07033990	-2.90	0.0038
year	1993	-0.350987295 B	0.07453667	-4.71	<.0001
year	1994	-0.362176939 B	0.07983239	-4.54	<.0001
year	1995	-0.276360852 B	0.10025184	-2.76	0.0059
year	1996	-0.393520167 B	0.09359762	-4.20	<.0001
year	1997	-0.556765834 B	0.08836431	-6.30	<.0001
year	1998	-0.417774431 B	0.09595387	-4.35	<.0001
year	1999	-0.402468651 B	0.08787750	-4.58	<.0001
year	2000	-0.284151915 B	0.08740687	-3.25	0.0012
year	2001	-0.200761835 B	0.08900640	-2.26	0.0243
year	2002	-0.307658273 B	0.07470944	-4.12	<.0001
year	2003	-0.217791961 B	0.06770625	-3.22	0.0013
year	2004	-0.145892730 B	0.06685410	-2.18	0.0293
year	2005	-0.112858486 B	0.06561904	-1.72	0.0858

year	2006	-0.025221892 B	0.06486025	-0.39	0.6975
year	2007	-0.166378571 B	0.06271185	-2.65	0.0081
year	2008	-0.011560152 B	0.06532014	-0.18	0.8596
year	2009	0.003690565 B	0.06584995	0.06	0.9553
year	2010	-0.090066445 B	0.06542294	-1.38	0.1689
year	2011	0.070409983 B	0.06483230	1.09	0.2777
year	2012	-0.146665643 B	0.06318954	-2.32	0.0205
year	2013	0.000000000 B	.	.	.
MD	1	-0.155845867 B	0.09156316	-1.70	0.0890
MD	2	-0.404707052 B	0.11787301	-3.43	0.0006
MD	3	-0.290700984 B	0.20443031	-1.42	0.1553
MD	4	-0.036322915 B	0.10383399	-0.35	0.7265
MD	5	0.266540018 B	0.07945146	3.35	0.0008
MD	6	-0.173827183 B	0.07611825	-2.28	0.0226
MD	7	-0.252302338 B	0.06771328	-3.73	0.0002
MD	8	-0.154154910 B	0.06480252	-2.38	0.0176
MD	9	-0.134078152 B	0.06340086	-2.11	0.0347
MD	10	-0.144174867 B	0.06298067	-2.29	0.0223
MD	11	-0.164562990 B	0.06368179	-2.58	0.0099
MD	12	0.000000000 B	.	.	.
kode	2126	-0.217690485 B	0.07699103	-2.83	0.0048
kode	2127	-0.142802023 B	0.05273083	-2.71	0.0069
kode	3125	-1.111553020 B	0.11309963	-9.83	<.0001
kode	5126	0.013093983 B	0.16926948	0.08	0.9384
kode	5127	0.038751744 B	0.08327112	0.47	0.6418
kode	6124	-2.470493477 B	0.21161904	-11.67	<.0001
kode	6125	-0.644591842 B	0.06422788	-10.04	<.0001
kode	6126	-0.456836445 B	0.05579023	-8.19	<.0001
kode	6127	-0.086314280 B	0.05697463	-1.51	0.1301
kode	14124	-0.534951687 B	0.09290192	-5.76	<.0001
kode	15126	0.202292592 B	0.09994678	2.02	0.0432
kode	20126	-0.860818158 B	0.07183388	-11.98	<.0001
kode	20127	-0.867517767 B	0.08410345	-10.31	<.0001
kode	21926	0.277511343 B	0.08967088	3.09	0.0020
kode	21927	0.155785958 B	0.05366940	2.90	0.0038
kode	61926	-0.159543025 B	0.08606909	-1.85	0.0641
kode	61927	0.000000000 B	.	.	.

NOTE: The X'X matrix has been found to be singular, and a generalized inverse was used to solve the normal equations. Terms whose estimates are followed by the letter 'B' are not uniquely estimable.

The GLM Procedure
Least Squares Means

year	lcph LSMEAN	Standard Error	Pr > |t|
1988	-0.26533983	0.15569859	0.0887
1989	-0.17883735	0.15540808	0.2501
1990	-0.75459653	0.06776197	<.0001
1991	-0.70003257	0.06418358	<.0001
1992	-0.58088685	0.05311320	<.0001
1993	-0.72786700	0.05790390	<.0001
1994	-0.73905664	0.06437516	<.0001
1995	-0.65324056	0.09088914	<.0001
1996	-0.77039987	0.08428980	<.0001
1997	-0.93364554	0.07860714	<.0001
1998	-0.79465414	0.08993987	<.0001
1999	-0.77934836	0.08209911	<.0001
2000	-0.66103162	0.07724505	<.0001
2001	-0.57764154	0.08318849	<.0001
2002	-0.68453798	0.06802889	<.0001
2003	-0.59467167	0.05952888	<.0001
2004	-0.52277243	0.05708152	<.0001
2005	-0.48973819	0.05608769	<.0001
2006	-0.40210160	0.05555355	<.0001
2007	-0.54325828	0.05140689	<.0001
2008	-0.38843986	0.05813790	<.0001
2009	-0.37318914	0.05858890	<.0001
2010	-0.46694615	0.05833348	<.0001
2011	-0.30646972	0.05738547	<.0001
2012	-0.52354535	0.05602652	<.0001
2013	-0.37687970	0.05177907	<.0001