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

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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 remained at the same level in 2011. The increase was due to increased effort in Div. 0B and Div. 1CD. Survey trawlable biomass in Div. 1CD was estimated as the highest level in the times series. This also applied to the offshore biomass in the Greenland shrimp fish survey. A survey in Div. 0B gave a trawlable biomass slightly below the estimate from Div. 1CD. The recruitment of the 2010 year class in the entire survey area was the highest on record. A recruitment index for the offshore nursery areas showed that the 2010 year class was the lowest seen since 1990. A combined standardized CPUE series from Div. 0A + 1AB increased between 2010 and 2011, but has been relatively stable since 2001. The combined CPUE series from Div. 1CD+0B increased in 2011 and the CPUE is among the highest 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 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 (excluding inshore areas in Div. 1A) was 27,000 tons. The TAC remained at 27,000 tons in 2011.

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 remains at that level – 26,815 tons- in 2011 (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 2003 and from 2005 to 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.

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 13,125 tons (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 (6,390 tons) and 2011 (6,260 tons) (Table 1).

The catches in Div. 0A in 2011 were taken by single trawl (180 tons) and twin trawl (2,909), while 3,171 tons was taken by gill net. The single trawl catches decreased about 200 tons and the twin trawl catches decreased by about 400 tons while the gill net catches increased by about 500 tons compared to 2010. The long lines fishery in the area has apparently stopped. The fishery was prosecuted by Canadian vessels.

Catches in Div. 0B 2011 amounted to 6, 865 tons which is at the same level as in 2010 (6,835 tons). Offshore gillnetters took 2,119 tons while single- and double trawlers took 2,096 tons and 2,567 tons, respectively. The gillnet catches were at the same level as in 2011 while the single trawl catches increased by about 300 tons and the twin trawl catches decreased with the same amount between 2010 and 2011. A small longline fishery took 81 tons compared to 113 tons 2010. From inshore Cumberland Sound were reported 54 tons (not included). All catches were taken by Canadian vessels.

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 (13,690 tons). Almost all catches have been taken offshore (Table 2). The inshore catches amounted to 253 tons in 2011.

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 2007-2011 (6,472 tons in 2011). All catches were taken off shore by trawlers from Faeroe Islands, Russia (SCS 12/05) and Greenland (SCS 12/10).

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 (7,218 toms). Catches were taken by vessels from Greenland (SCS 12/10), Norway, EU-Germany (SCS 12/13) and Russia (SCS 12/05). All catches offshore were taken by trawl except 72 tons taken by a longliner. 253 tons were taken inshore in Div. 1B-1F, mainly by gill net.

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 2011 a total of 67 hauls were made (SCR 12/03). The biomass of Greenland halibut was estimated as 86 591 tons, which is an increase compared to 75 522 tons in 2010 and the highest in the time series. The abundance in was estimated at $74.978*10^6$ which is an increase compared to $64.868*10^6$ in 2010 and above the average for the time series ($68.000 *10^6$) (Fig. 2b). The weighted mean catch per tow also showed an increase from 1.44 tons km^{-2} in 2010 to 1.66 tons km^{-2} in 2011 (Fig. 2c). The overall length distribution in Div. 1CD was totally dominated by a mode at 50 cm where the mode used to be at 47-50 cm.

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

There was no survey in 2011. 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)

Canada has conducted 6 surveys in the southern part of Div. 0A, beginning in 1999. The biomass increased from 68,700 tons to 86,200 tons in 2004 then declined to 74,272 tons in 2010 (Fig. 2e). 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 2010 was estimated at $1.1*10^8$ which is slightly below estimates from 2008 of 1.16×10^8 (Fig. 2e). Mean biomass per tow decreased from 1.67 t/ km^2 in 2008 to 1.53 t/km^2 in 2010 which is the lowest in the time series. The overall length distribution ranged from 6 cm to 99 cm with a mode at 39 cm, similar to that seen in previous surveys (SCR 11/017).

In 2010 the survey also covered the northern part of division 0A from 73°N to 75°35'N, which had not been surveyed since 2004. The biomass and abundance had increased from 45,877 tons and $4.85\ 10^{*7}$ to 46,489 tons and $6.74*10^7$, respectively (Fig. 2e). In 2010 the depth stratum 750-1000 m was not fully surveyed due to ice, which underestimates the biomass and abundance. The mean catch per tow increased from 0.85 ton /km2 to 1.18 ton km2. The increase in

mean catch per tow was primarily seen in strata > 1000 m. The length ranged from 21 to 78 cm with a single mode at 39 cm and there were more small, < 45 cm, fish in 2010 compared to 2004 (SCR 11/017).

Division 0B was surveyed in 2012, the third time this area has been surveyed using M/Tr Pâmiut. Previous surveys were conducted in 2000 and 2001. Prior to this there had been a survey conducted in 1986 using the RV Gadus Atlantica. Total estimated biomass and abundance were 83,043 tons and $8.30x10^7$, respectively. Biomass has increased compared to previous years (Fig. 2e). Abundance was lower than in 2001 but higher than in 2000. Biomass and abundance were reduced at depths 1251-1500 and fewer fish <45 cm were present at depths 1001-1500 m in 2011 compared to 2000 and 2001. Lengths ranged from 6 cm to 92 cm with 30% <45 cm. The length distribution had a single mode at 51 cm, an increase in modal length compared to 2001 (45 cm) and 2000 (42 cm) (SCR 12/23).

Greenland shrimp-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 been adjusted for that.

Estimated total trawlable biomass of Greenland halibut in the offshore areas (not including Disko Bay) has fluctuated between 9,258 and 31,100 tons during 1992 – 2010. In 2011 the biomass was estimated as 27,104 tons compared to 22,487 tons in 2010. The 2011 estimate is the third highest estimate in the time series and above the average for the time series which dates back to 1992 (Fig. 2f).

The abundance was estimated at 477 mill compared to 315 mill in 2011 and the highest in the time series. The increase in biomass was primarily seen in Div. 1AS (68 °50' N - 70°37.5'N). While the increase in abundance was seen especially in Div. 1AN and but also in Div. 1AS. As in almost all years most of the abundance was comprised of one-year-old fish, 76% in 2011 (SCR 12/16).

In the inshore Disko Bay the biomass increased from 12,193 tons in 2010 to 15,736 tons in 2011 but it is still below the level seen in 2003-2006 (28,299 - 16,538 tons). The abundance was estimated as $222*10^6$ which is almost double the estimate on $117*10^6$ from 2011 and among the highest in the time series.

Recruitment

A recruitment index was provided from the Greenland shrimp trawl 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 (Fig. 3).

Further, a recruitment index was provided from the off shore nursery area in Div. 1AS-1B. Catches were standardized as catch in number per hour as described by Bech (1995). Data were plotted by year classes to visualize the relative year class strength and development in relative abundance (Fig. 4). In recent years the allocation of stations in the shrimp trawl survey has been changed in order to minimize the variance in the estimation of biomass and abundance of shrimp. To minimize the effect of that the CPUE index has been recalculated using stations > 300 m only. This generally increases the mean number per hour but do not change the trend in the index.

The recruitment index declined since the relatively large 1991 year-class, but the recruitment has been above the level in the 1980's. The recruitment increased again with the 1995-year class, which was the largest on record. The 1996 year-class seemed to be small but the recruitment has increased gradually until the 2000 year-class. Until the 2006 year class the recruitment has been around or a little above average. Since then the recruitment has been below average (552 age

one caught per hour) and the 2010 year class was estimated at 279 age one caught per hour, which is the lowest since 1990. This seems to be in contradiction with the observation of the lagers over all recruitment observed in 2011. The increase in abundance was seen primarily in Div. 1AN and Disko Bay, which are not included in the index. There was also seen an increase in abundance in Div. 1AS (a part of the recruitment area), but this was deducted in a similar reduction in Div. 1BN (the other part of the recruitment area) (SCR 12/16). Further the index only includes hauls at depth > 300 m, because it is where most of the abundance usually is found. In 2011 the Greenland halibut was generally distributed at shallower depth than previously observed.

In Disko Bay the recruitment has been good in recent years although the recruitment of year classes 2002-2005 has been gradually decreasing. The recruitment increased again and the 2006 year class was the third largest on record. The 2007 and 2008 year classes were low but the recruitment increased in 2010 where the 2009 year class was estimated to 927 no hr^{-1}. The 2011 was estimated to 678 specimens caught per hour, which is below the average for the time series (885 hr^{-1}). The overall abundance in Disko Bay was also among the highest observed. In 2011 the Greenland halibut was generally distributed at shallower water than usual. If stations between 250 and 300 m are included in the index it would be about 3 times as high.

Generally there is a steep decline between CPUE at age 1 and age 2 and 3+ which also was observed in the 2011 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.

2.2 Commercial fishery data.

Length distribution

SA 0

Length distributions were available from the gill net, single trawl and twin trawl fishery in both Div.0A and Div. 0B.

The catch in the gill net fishery in Div. 0A was dominated by a mode at 64 cm, similar to that seen in previous years. The length distributions in the trawl fishery had a mode at 49 cm (Fig. 5). The mode use to be around 48 cm in both types of gear.

The catches in the gill net fishery in Div. 0B was dominated by a mode 64 cm. The length distributions in the single and twin trawl fishery in Div. 0B had modes at 49 cm and 53 cm, respectively. The modes have been around 51 cm, for both types of gear in recent years (Fig. 5).

SA1

Length frequencies were available from Greenland and Russian trawl fisheries in Div. 1A (SCS 12/05) and from Russian (SCS 12/05) and Norwegian trawl and longline fishery in Div. 1D.

In Div. 1A the mode was at 47 cm in the Russian trawl fishery (Fig. 6) and at 49 cm with a minor mode at 47 cm in the Greenlandic trawl fishery (Fig. 7). In recent years the trawl catches have been dominated by fish on 44-52 cm.

In Div. 1D the catches by Russia and Norway showed clear modes around 50-53 cm (Fig. 8 and 9). The mode in catches has been within this range for several years. A small Norwegian longline fishery had catches with a mode at 55 cm and fish were generally larger than in the trawl fishery.

Age distribution.

An age length key from Div. 1A and 1D based on scales was presented by Russia (SCS 12/05).

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 forTonnage:

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 2011 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 2012 with the 2011 data. Catches (t) and hours fished with values less than 10 were removed.

Div. 0A
In Div. 0A the standardized CPUE index increased slightly between 2010 and 2011, but generally the standardized catch rates have been relatively stable since 2002 (Fig. 11a) (Appendix 1). The increase could also be seen in the un-standardized catch rates for both single and twin trawl gears (Fig. 10a).

Un-standardized CPUE for gillnets has increased gradually from 5.36 t/100 nets in 2004 to 12.79 t/100 nets in 2011 (Fig. 10c).

Div. 0B
In Div. 0B the overall CPUE index increased to the highest observed level in 2009 but declined in 2010 and to increase slightly again in 2011. The CPUE is slightly above the level seen in the 90's (Fig. 11c) (Appendix 2). The un-standardized catch rates for both twin and single trawls increased in 2011 (Fig. 10b).

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.

SA1
Un-standardized catch rates were available for the Greenland trawl fishery in Div. 1A and 1D (SCS 12/10), and the EU-German fishery in Div. 1D (SCS 12/13). Further, catch rates were available from logbooks submitted 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 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. CPUE for trawlers 1000-2000 Gross Tons single trawlers has been increasing since 2006 but declined between 2009 and 2010 to increase again in 2011 and is now the second highest in the time series (Fig.10e).

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 2002-2011. Standardized catch rates in Div. 1AB has been declining between 2006 and 2008 but has been increasing since then and is in 2011 on the highest level in the time series (Fig. 11a, Appendix 2).

Div. 1CD
In Div. 1CD the EU-German catch rates have been increasing gradually since 2004 but declined in 2010 to increase again in 2011. (SCS 12/13). In Div. 1CD the CPUE for three Greenland vessels fishing there has been fluctuating between 0.55 ton/hr and 0.85 ton/hr since 2000. In 2011 the CPUE was 0.87 ton hr^{-1} compared to 0.79 ton h^{-1} in 2010 (SCS 12/10).

The un-standardized catch rates for all trawlers fishing in Div. 1CD increased between 2010 and 2011, except for trawlers < 1000 tons where a small trawler new in the fishery had catch rates that were lower than previously seen for that tonnage class. 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.10f).

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 1988-2011 (Fig.11b). 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 and the CPUE is back at the level seen in 2008 and 2009 (Appendix 5). A small trawler new in the fishery was excluded from the analysis.

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 the catch rate has been relatively stable since 2001 (Fig. 11a) (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 and the 2011 estimate is among the highest seen since 1990. (The high catch rates seen in 1988 and 1989 is from a single very large trawler fishing in Div. 1CD) (Fig. 11d) (Appendix 6).

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 2003-2011.

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. 12). F has fluctuated between 0.02 and 0.17 but has been relatively stable around 0.08 since 1997.

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 (1997-2011) for a long lived species like Greenland halibut this model was not accepted.

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 2011 (26,815 tons).

The biomass in Div. 0A and 1A has been stable in recent years.

The standardized CPUE index for Div. 0A declined slightly in 2007 but increased in 2008 and 2009 to decrease again in 2010 to about an average level but increased again in 2011 to the 2008 2009 level. Standardized catch rates in Div. 1AB has been declining between 2006 and 2008 but has been increasing since and is in 2011 on the highest level in the time series. The combined Div. 0A+1AB standardized CPUE series decreased slightly between 2009 and 2010 to increase again in 2011, but has been stable since 2001.

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

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 offshore biomass in the Greenland shrimp survey has been gradually decreasing since 2004, but increased again in 2010 to a level slightly above the average of the time series. The biomass increased further in 2011 to the highest level in the time series.

The recruitment of the 2002-2006 year class in the entire survey area has been stable but the recruitment of the 2007 and 2008 year classes have been gradually decreasing and the 2008 year class is the lowest level seen since the 1997 year class. The estimate of the 2009 year class is slightly above the average of the times series. The 2010 year class is the highest in the time series. The increase between 2009 and 2011 was caused by an increase in abundance in Div. 1A and in Disko Bay.

A recruitment index for the off shore nursery areas (Div. 1A (south of 70°37.5'N) and Div. 1B depth > 300 m) showed that the 2009 year class was a little below average. The 2010 year class was, in the nursery area, the lowest seen since 1990, probably due to a shift en the location of main nursery area.

Standardized CPUE rates in Div. 0B and Div.1CD decreased between 2009 and 2010 but increased again in 2011 and is among the highest seen since 1994. The combined catch rate for Div. 1CD+0B has showed very little variation during the period 1990-2004, but with an increasing trend since then and the 2009 estimate is the highest seen since 1989. CPUE decreased between 2009 and 2010 but increased again in 2011 and the CPUE is, among the highest seen in recent years.

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

5. Biological reference points

Yield per recruit analysis or other age-based methods are not available, for estimating biological reference points. Biomass indices and CPUE series are relatively short and show little variability and are not useful for estimating reference points.

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 2009. Minor (300 ton or less) catches from Div. 0A are included in some of the 0B catches prior to 2001.

															Year										
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
0A																									
CAN							681		82	576	3		517		2628	3561	4142	3751	4209	6634	6173	5257	6627	6390	6260
POL															445										
TOT 0A							681		82	576	3		517		3073	3561	4142	3751	4209	6634	6173	5257	6627	6390	6260
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
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
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

[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

Table 2. Greenland halibut catches (metric tons) by year and country for Subarea 1 (Split on Div. 1AB and Div. 1CD) from 1987 to 2011. The Greenland catches are excl. inshore catches in Div. 1A. Offshore catches in Div. 1A prior to 2001 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
1AB																									
GRL															340[c]	1619[c]	3558[c]	3500[c]	3363[bc]	5530[bc]	5596[bc]	5524[bc]	6094[bc]	5682[bc]	5722[bc]
RUS															85	279	259	241	549	565	575	570	517	654	648
FRO														96	150	150	117	153	125	128	125	149	124	126	102
EU																	73[e]	141[e]							
TOT 1AB														96	575	2048	4007	3908	4037	6223	6296	6243	6735	6462	6472
1CD																									
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
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	1694
RUS							5		296	254		543	552	792	829	654	1328	1214	1147	1222	689	763	1056	1214	1225
EU							46	266	527	455	446	350	330	444[b]	537[b]	536	543[d]	665[f]	549	544	1516	1517	1511	1818	1806
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	7218
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	13690

[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

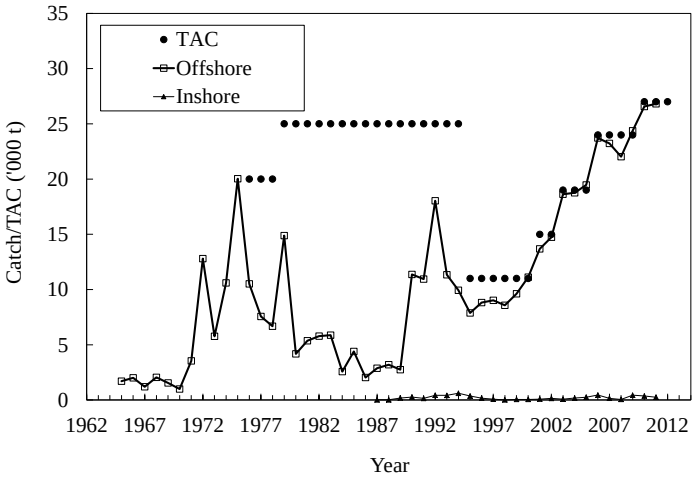

Fig. 1. Catches in SA0 and Div. 1A offshore + Div. 1B-1F and recommended TAC. For TAC before 1995 see text.

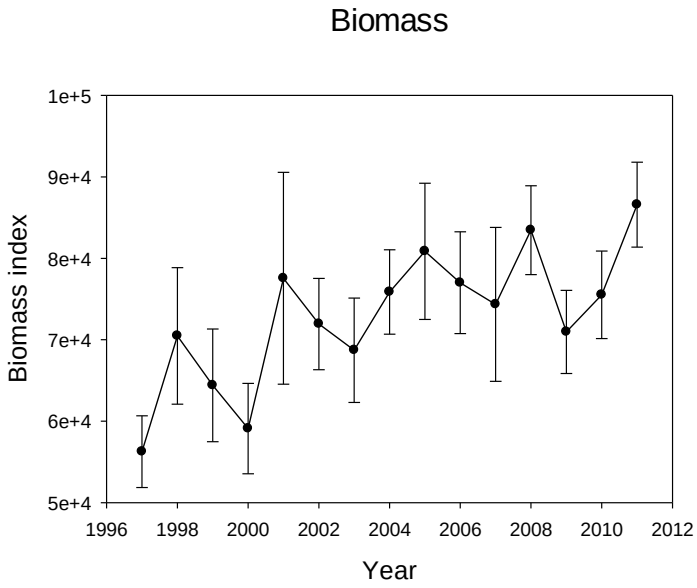

Fig 2a. Biomass index with S.E. from the Greenland deep sea survey in Div. 1CD.

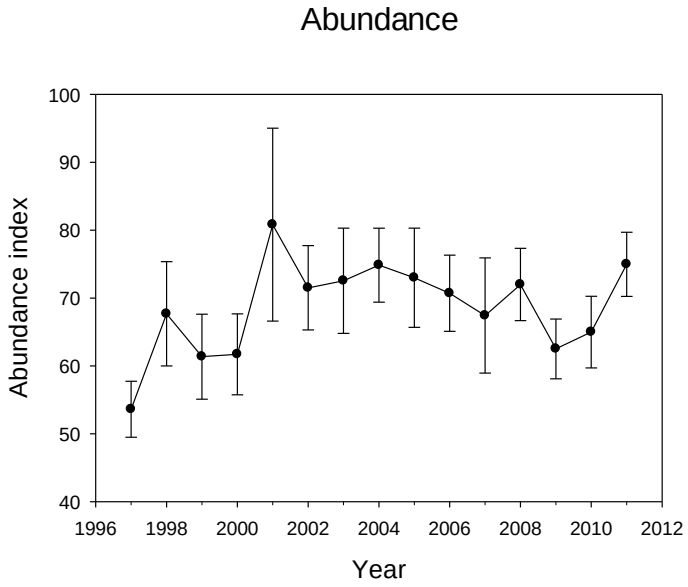

Fig 2b. Abundance with S.E. from the Greenland deep sea survey in 1CD..

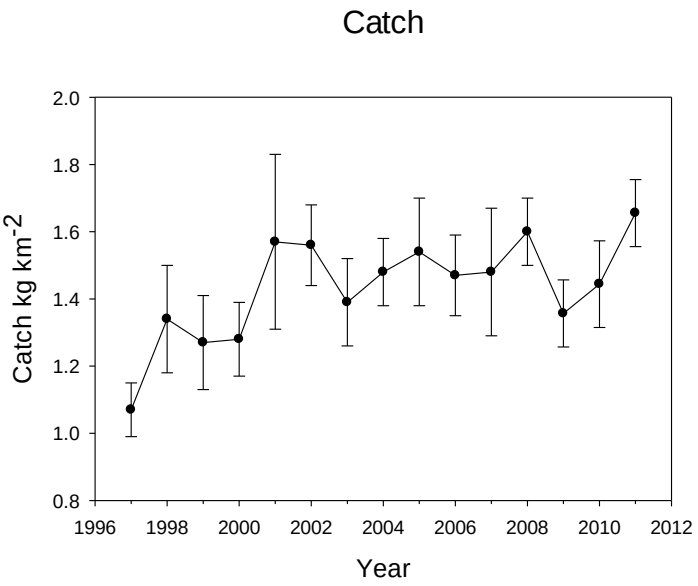

Fig 2c. Mean catch per km^2 swept with S.E. in the Greenland deep sea survey in Div. 1CD.

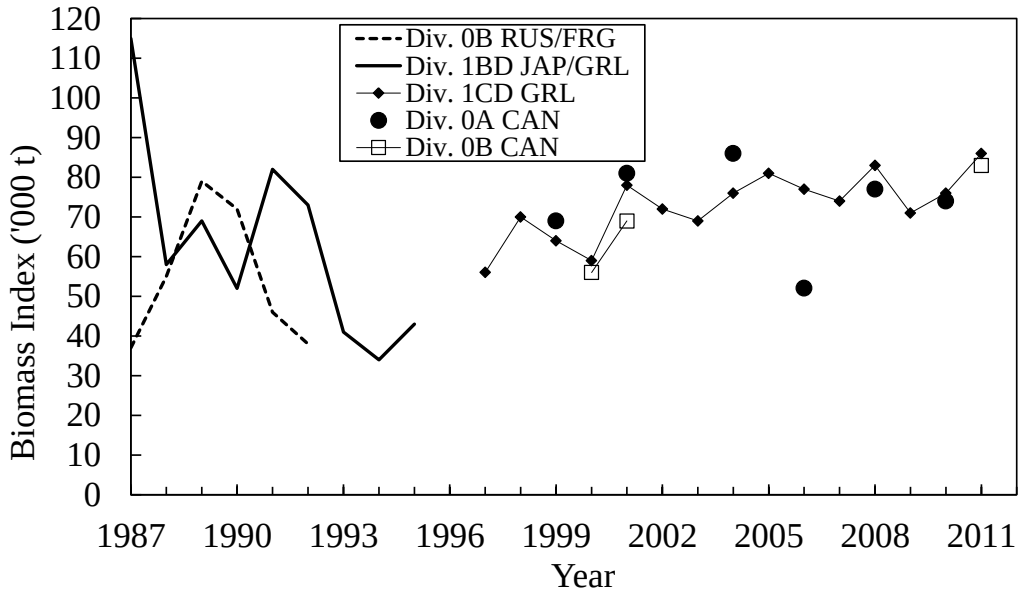

Fig. 2d. Biomass estimates from various surveys in SA 0 and 1. Survey estimates from Div. 0A does not include surveys in the northern part in 2004 and 2010. Note that the survey in Div. 0A in 2006 had incomplete coverage (see text).

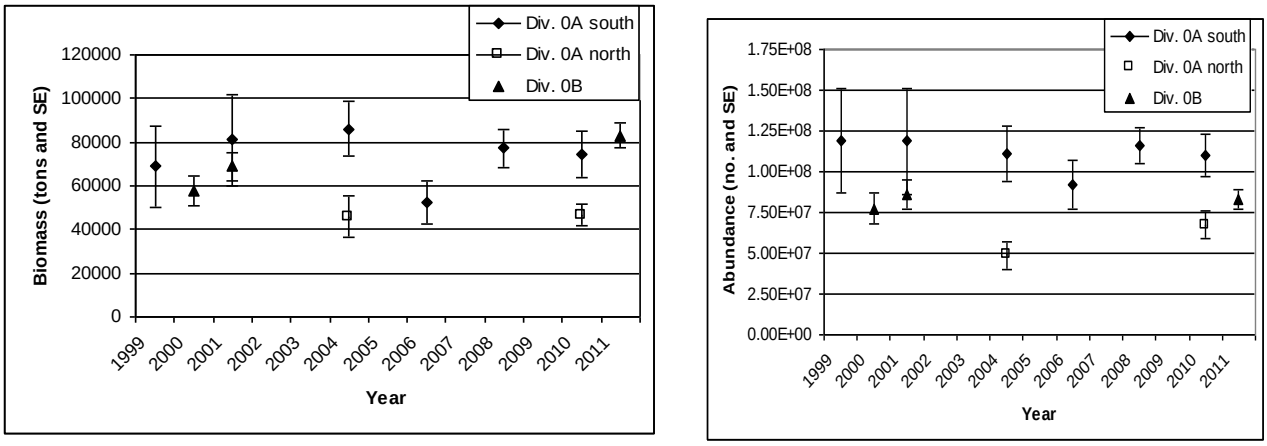

Fig. 2e. Biomass (left) and abundance (right) estimates for Greenland halibut in Subarea 0.

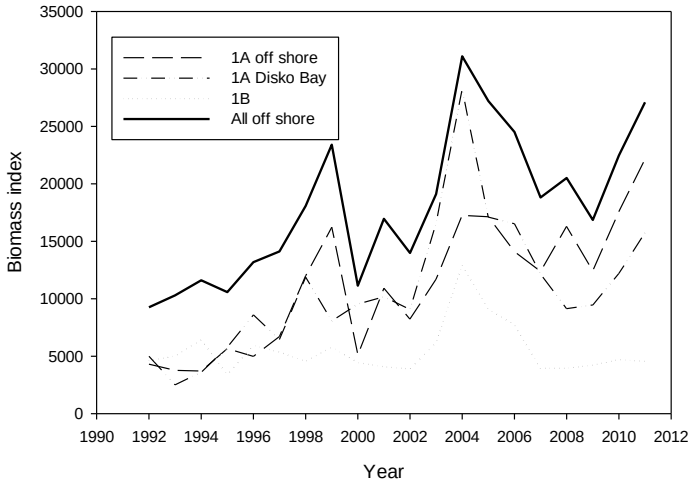

Fig. 2f. Biomass index from the Greenland shrimp survey by most important Divisions and in total offshore (including 1C-1F, which havelittle biomass). Div. Disko Bay is inshore .

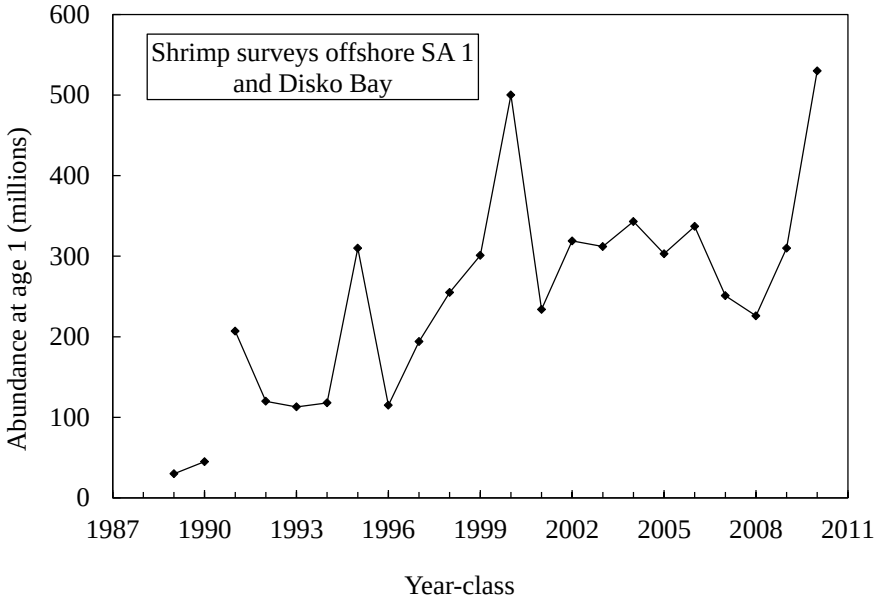

Fig.3. Abundance of age-one Greenland halibut in the entire area covered by the Greenland shrimp survey including inshore Disko Bay and Div. 1AN (North of 70°37.5'N)

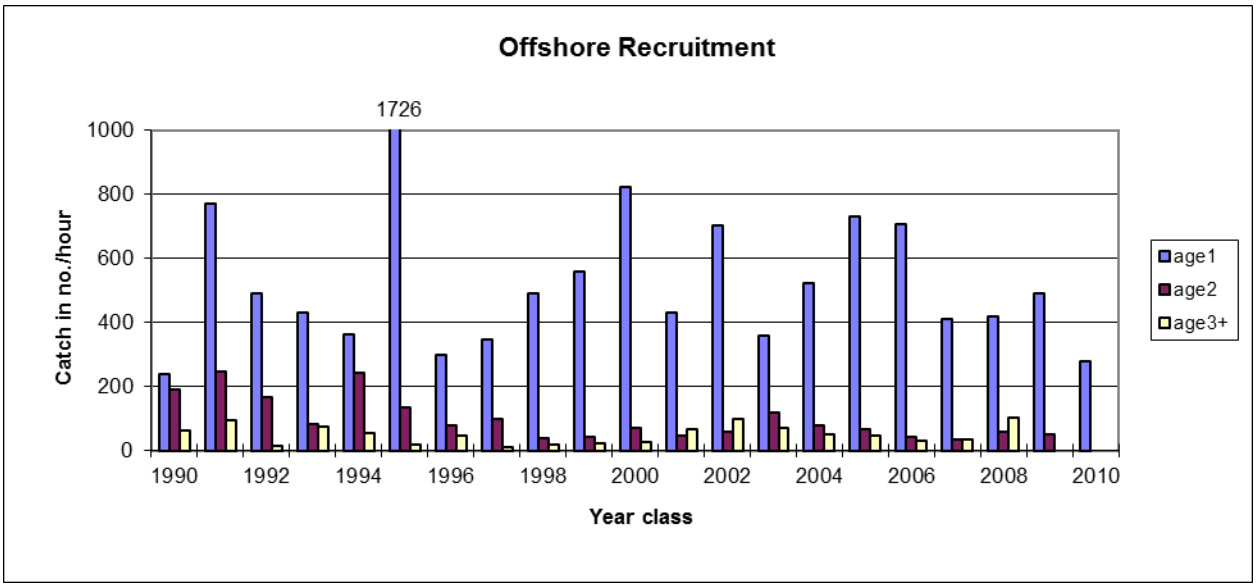

Fig. 4. Year-class strength of Greenland halibut of ages 1-3+ in number per hour trawled in the offshore nursery area (Div 1AS-1B, depths 300-600 m).

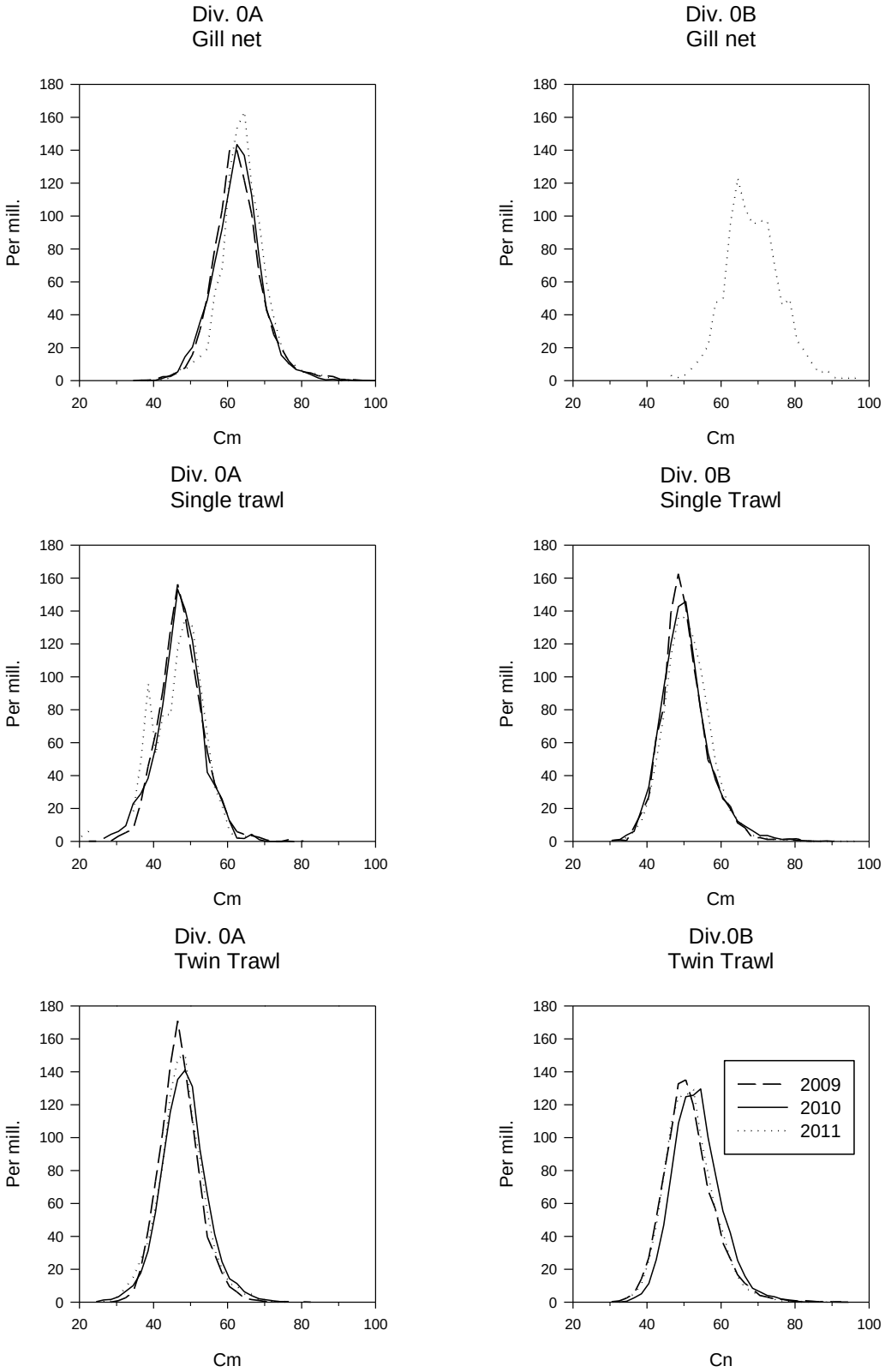

Fig.5. Length distribution from the fishery in Subarea 0 in 2009-2011 in per mill., 2 cm groups.

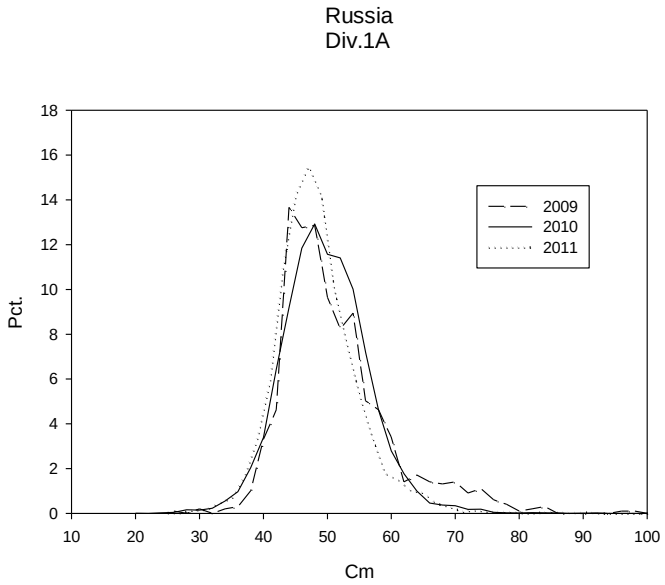

Fig. 6. Length distribution in the Russian trawl fishery in Div. 1A in 2009-2011in percent, 2-cm groups.

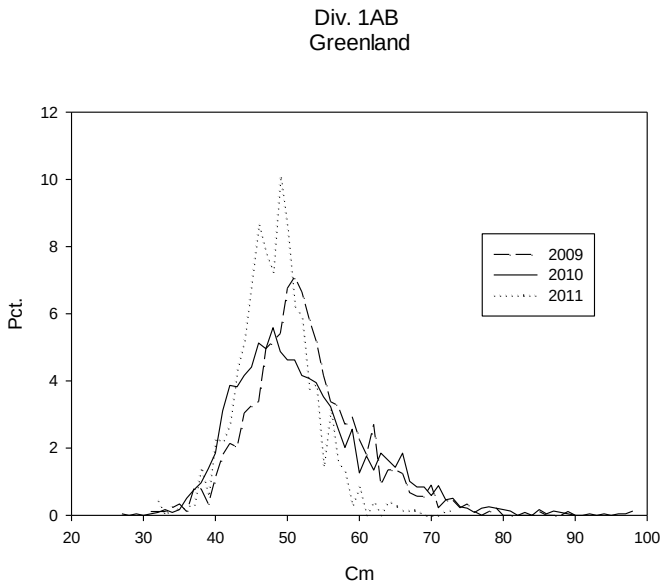

Fig. 7. Length distribution in the Greenland trawl fishery in Div. 1A in 2009-2011in percent, 1-cm groups.

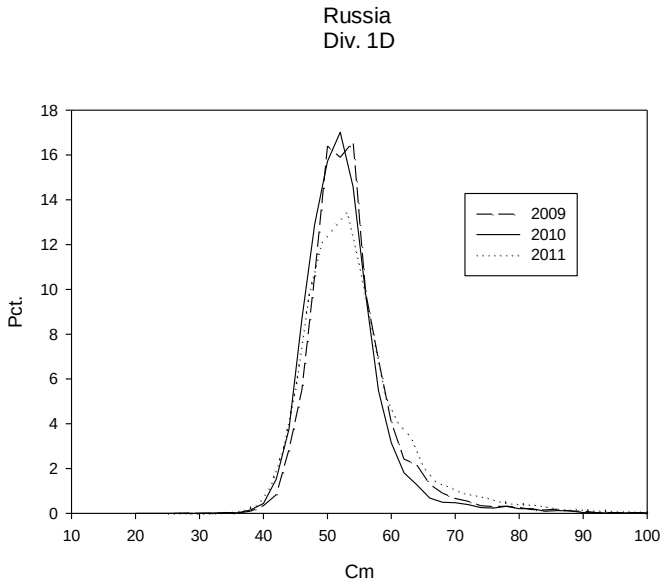

Fig. 8. Length distribution in the Russan trawl fishery in Div. 1D in 2009-2011 in percent, 2-cm groups.

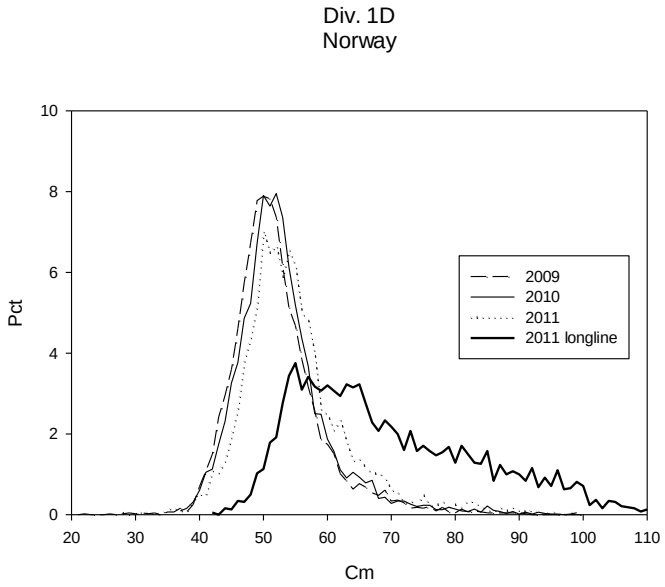

Fig. 9. Length distribution from the Norwegian Trawl fishery in Div. 1D in 2009-2011, and a small Norwegian longline fishery in 2011 in percent, 1-cm groups.

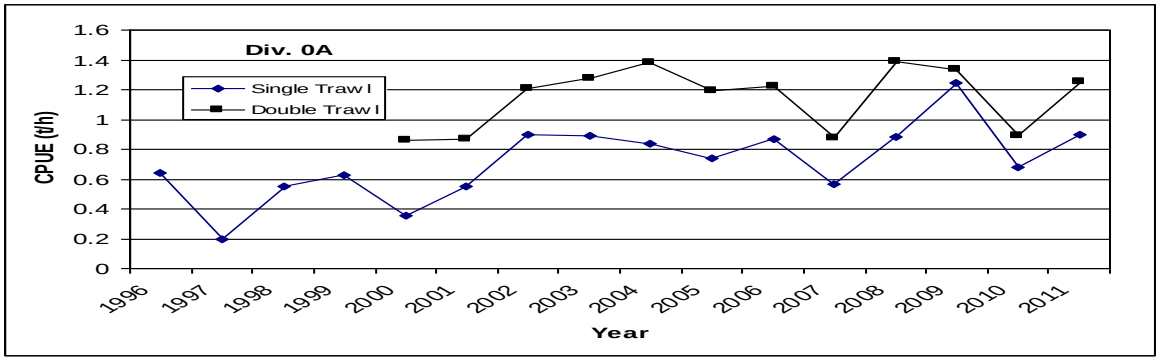

Fig. 10a. Un-standardized CPUE from the trawl fishery in Div. 0A.

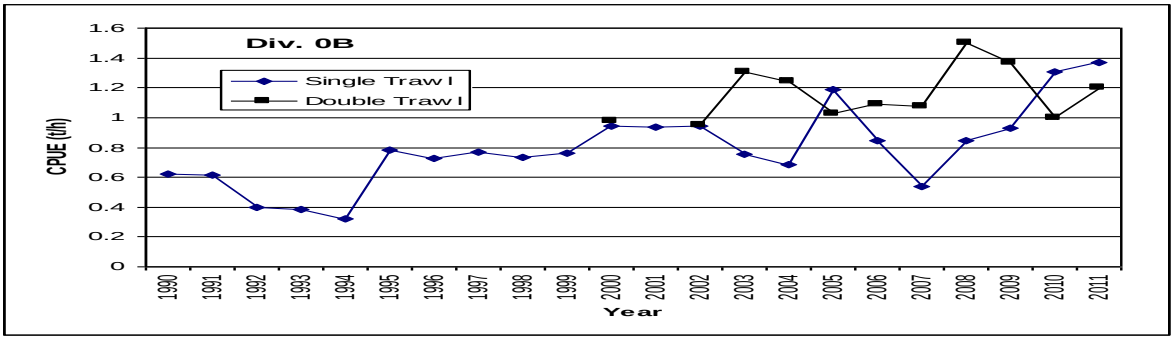

Fig. 10b. Un-standardized CPUE from the trawl fishery in Div. 0B.

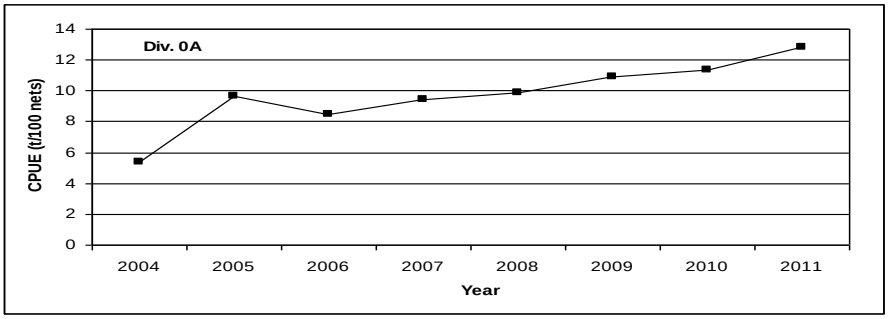

Figure 10c. Un-standardized CPUE from the gillnet fishery in Div. 0A.

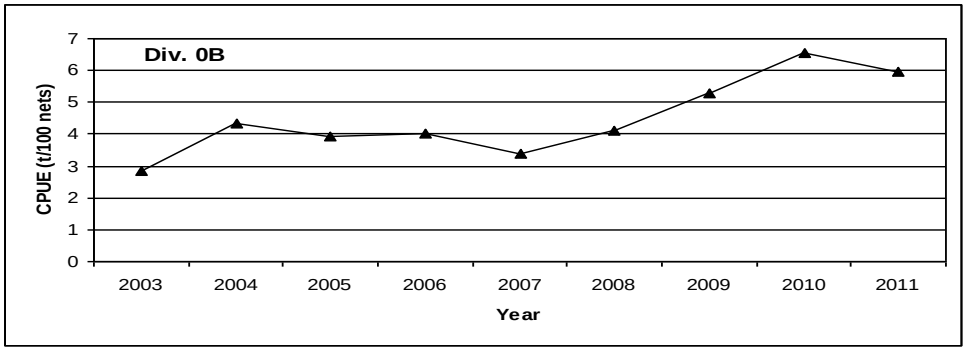

Figure 10d. Un-standardized CPUE from the gillnet fishery in Div. 0B.

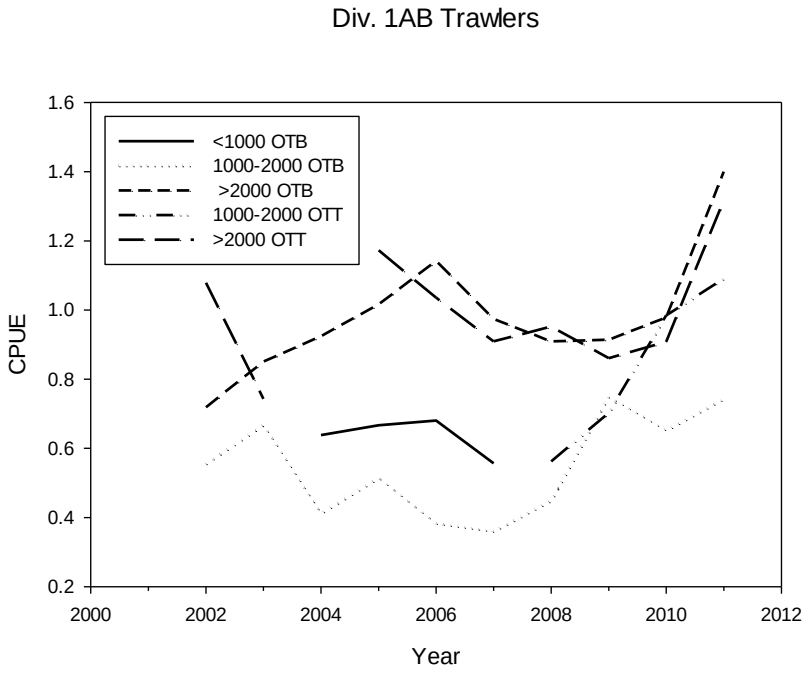

Fig. 10e. Unstandardized trawl CPUE series from Div. 1AB.

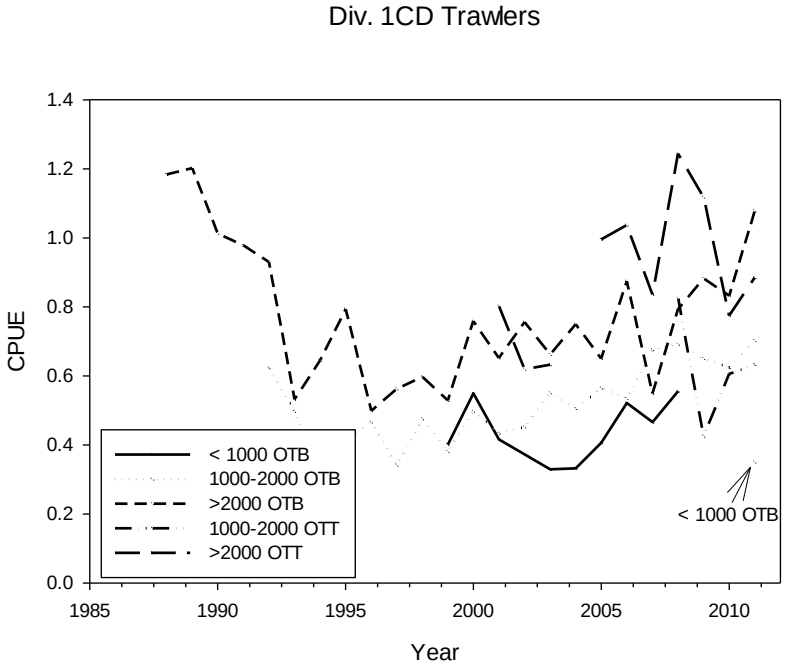

Fig. 10f. Unstandardized catch rates from different fleets fishing in Div. 1CD.

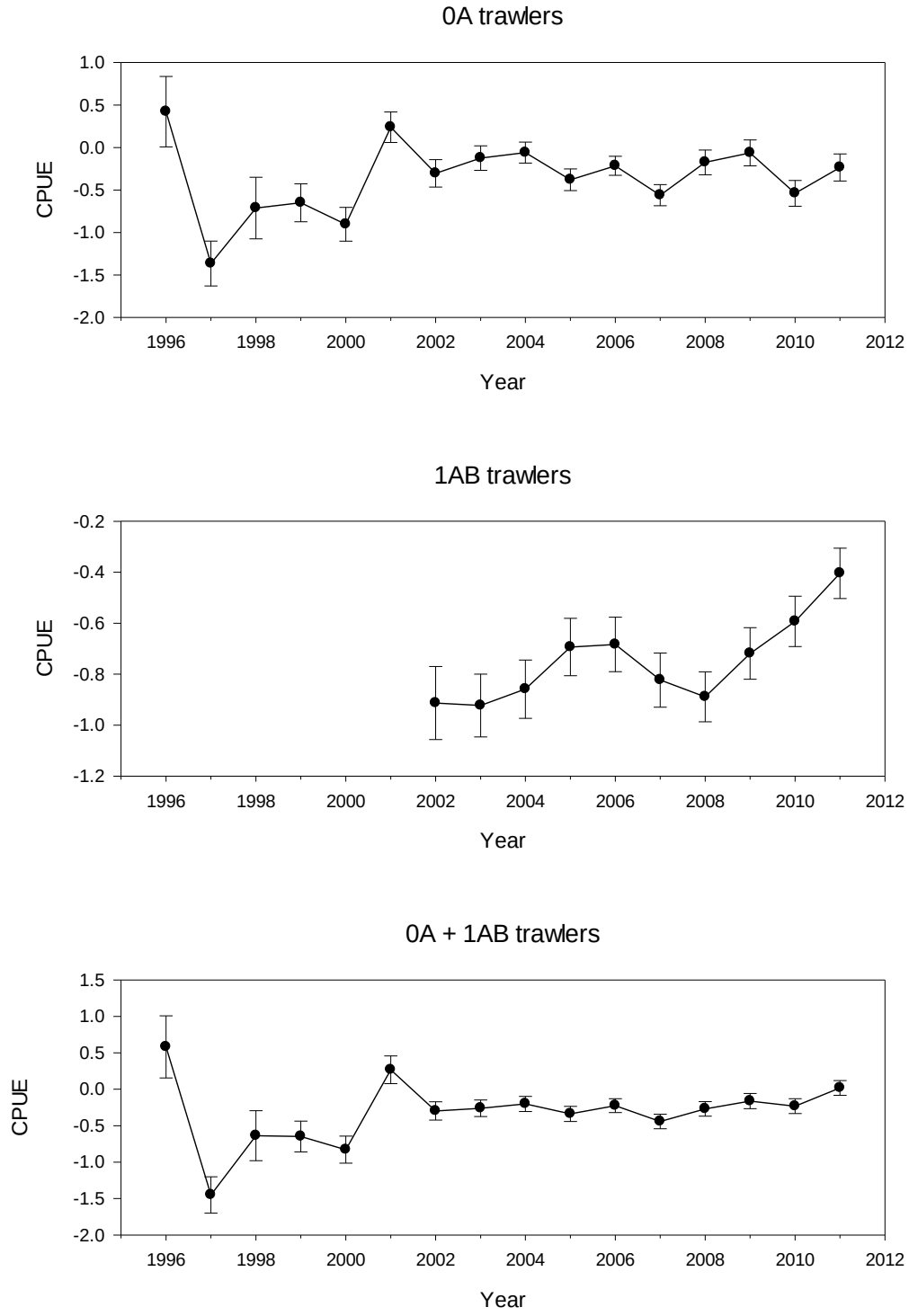

Fig 11a. Standardized CPUE series from trawlers in 0A, Div. 1AB and 0B+1AB combined with +/- S.E.

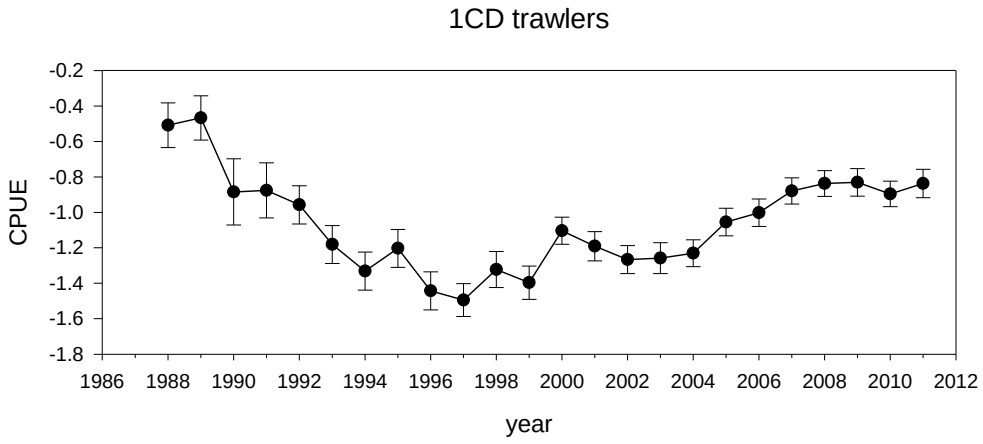

Fig. 11b. Standardized trawl CPUE index from trawlers in Div. 1CD with +/- S.E..

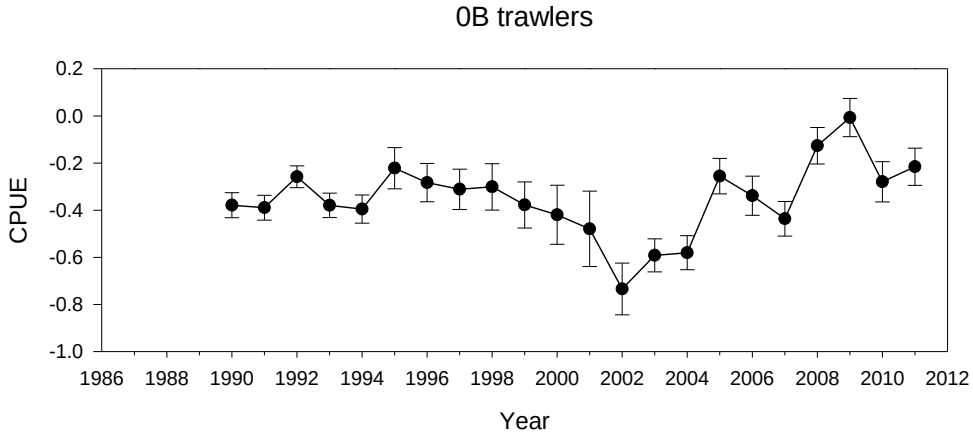

Fig 11c. Standardized CPUE series from trawlers in Div. 0B with +/- S.E.

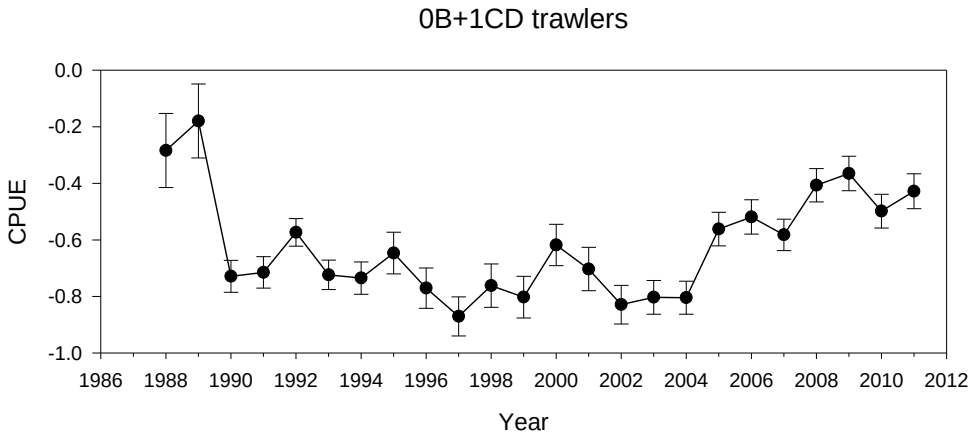

Fig. 11d. Combined standardized trawl CPUE index from trawlers in Div. 0B +1CD with +/- S.E.

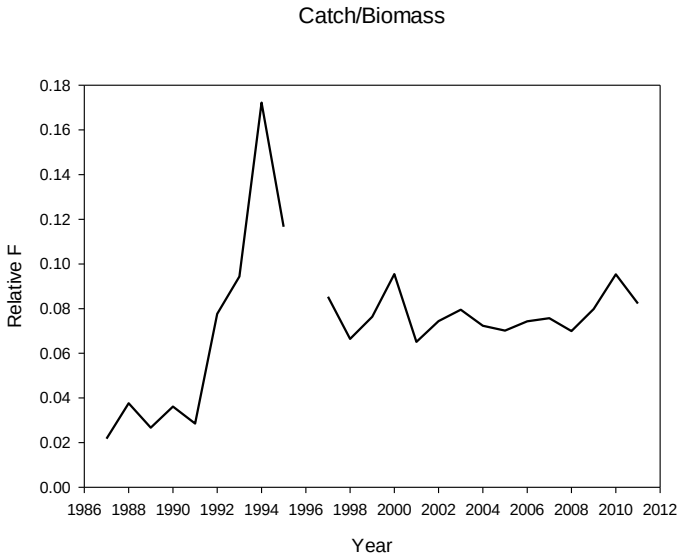

Fig 12. Relative F (catch/swept area biomass) in Div.1CD.

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

Greenland halibut, 0A trawlers 49
12:53 Sunday, June 3, 2012

The GLM Procedure

Class Level Information

Class	Levels	Values
Year	16	1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011
md	5	7 8 9 10 11
kode	5	2126 2127 5127 21926 21927

Number of Observations Read 134
Number of Observations Used 134

Greenland halibut, 0A trawlers 50
12:53 Sunday, June 3, 2012

The GLM Procedure

Dependent Variable: lcph

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	23	16.76093770	0.72873642	6.11	<.0001
Error	110	13.12565906	0.11932417		
Corrected Total	133	29.88659676			

R-Square	Coeff Var	Root MSE	lcph Mean
0.560818	-412.8934	0.345433	-0.083662

Source	DF	Type I SS	Mean Square	F Value	Pr > F
Year	15	10.08951414	0.67263428	5.64	<.0001
md	4	2.04649098	0.51162275	4.29	0.0029
kode	4	4.62493257	1.15623314	9.69	<.0001

Source	DF	Type III SS	Mean Square	F Value	Pr > F
Year	15	8.25633745	0.55042250	4.61	<.0001
md	4	1.33065251	0.33266313	2.79	0.0299
kode	4	4.62493257	1.15623314	9.69	<.0001

Parameter		Estimate	Standard Error	t Value	Pr > |t|
Intercept		-0.040540301 B	0.15841188	-0.26	0.7985
Year	1996	0.655537865 B	0.49667515	1.32	0.1896
Year	1997	-1.130324088 B	0.29126835	-3.88	0.0002
Year	1998	-0.478104467 B	0.37614201	-1.27	0.2064
Year	1999	-0.415730726 B	0.24694615	-1.68	0.0951
Year	2000	-0.669088255 B	0.21997516	-3.04	0.0029
Year	2001	0.473684265 B	0.24381996	1.94	0.0546
Year	2002	-0.069644938 B	0.18814612	-0.37	0.7120
Year	2003	0.110046658 B	0.18228812	0.60	0.5473
Year	2004	0.174939652 B	0.17700131	0.99	0.3251
Year	2005	-0.144887254 B	0.17629676	-0.82	0.4129
Year	2006	0.019321379 B	0.16075538	0.12	0.9046
Year	2007	-0.326297842 B	0.15951102	-2.05	0.0432
Year	2008	0.059647400 B	0.17617823	0.34	0.7356
Year	2009	0.171173053 B	0.18282533	0.94	0.3512
Year	2010	-0.304521762 B	0.17905435	-1.70	0.0918

Greenland halibut, 0A trawlers 51
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The GLM Procedure

Dependent Variable: lcph

Parameter		Estimate	Standard Error	t Value	Pr > |t|
Year	2011	0.000000000 B	.	.	.
md	7	0.313722949 B	0.13339637	2.35	0.0205
md	8	0.203041274 B	0.10629152	1.91	0.0587
md	9	0.208170522 B	0.09437036	2.21	0.0295
md	10	0.280368909 B	0.08980233	3.12	0.0023
md	11	0.000000000 B	.	.	.
kode	2126	-0.397867720 B	0.11316400	-3.52	0.0006
kode	2127	-0.295661557 B	0.07299459	-4.05	<.0001
kode	5127	-1.320447159 B	0.40784856	-3.24	0.0016
kode	21926	0.040199197 B	0.12062621	0.33	0.7396
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.

Greenland halibut, 0A trawlers 52
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The GLM Procedure
Least Squares Means

Year	lcph LSMEAN	Standard Error	Pr > |t|
1996	0.42130285	0.41452466	0.3117
1997	-1.36455911	0.26436734	<.0001
1998	-0.71233949	0.36279268	0.0521
1999	-0.64996574	0.22378942	0.0044
2000	-0.90332327	0.19847376	<.0001
2001	0.23944925	0.17994301	0.1860
2002	-0.30387996	0.16132152	0.0622
2003	-0.12418836	0.14402953	0.3904
2004	-0.05929537	0.12362640	0.6324
2005	-0.37912227	0.12691475	0.0035
2006	-0.21491364	0.11183801	0.0572
2007	-0.56053286	0.12436661	<.0001
2008	-0.17458762	0.14583287	0.2338
2009	-0.06306197	0.15251007	0.6800
2010	-0.53875678	0.15137245	0.0006
2011	-0.23423502	0.15921631	0.1441

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

Greenland halibut, 1AB trawlers 1
12:53 Sunday, June 3, 2012

The GLM Procedure

Class Level Information

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

Number of Observations Read 126
Number of Observations Used 126

Greenland halibut, 1CD trawlers 2
12:53 Sunday, June 3, 2012

The GLM Procedure

Dependent Variable: lcph

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	20	10.62652813	0.53132641	8.06	<.0001
Error	105	6.92493937	0.06595180		
Corrected Total	125	17.55146751			

R-Square	Coeff Var	Root MSE	lcph Mean
0.605450	-103.3592	0.256811	-0.248464

Source	DF	Type I SS	Mean Square	F Value	Pr > F
year	9	1.94608371	0.21623152	3.28	0.0015
MD	7	1.78321236	0.25474462	3.86	0.0009
kode	4	6.89723206	1.72430802	26.14	<.0001

Source	DF	Type III SS	Mean Square	F Value	Pr > F
year	9	2.75952757	0.30661417	4.65	<.0001
MD	7	2.26266361	0.32323766	4.90	<.0001
kode	4	6.89723206	1.72430802	26.14	<.0001

Parameter		Estimate		Standard Error	t Value	Pr > |t|
Intercept		0.5673470700	B	0.28486390	1.99	0.0490
year	2002	-.5114042789	B	0.13717983	-3.73	0.0003
year	2003	-.5187346462	B	0.11700529	-4.43	<.0001
year	2004	-.4548342697	B	0.11080166	-4.10	<.0001
year	2005	-.2856068868	B	0.10953473	-2.61	0.0104
year	2006	-.2741340719	B	0.10735626	-2.55	0.0121
year	2007	-.4131883234	B	0.10370755	-3.98	0.0001
year	2008	-.4922346534	B	0.09857589	-4.99	<.0001
year	2009	-.3117920247	B	0.09479258	-3.29	0.0014
year	2010	-.1855502517	B	0.09439321	-1.97	0.0520
year	2011	0.0000000000	B	.	.	.
MD	1	0.0140399531	B	0.38211054	0.04	0.9708
MD	6	-.4186614935	B	0.33064786	-1.27	0.2082
MD	7	-.5750088569	B	0.27984971	-2.05	0.0424
MD	8	-.3156313319	B	0.27366180	-1.15	0.2514
MD	9	-.2847276809	B	0.27229002	-1.05	0.2981

Greenland halibut, 1AB trawlers 3
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The GLM Procedure

Dependent Variable: lcph

Parameter		Estimate		Standard Error	t Value	Pr > |t|
MD	10	-.1174033543	B	0.27233024	-0.43	0.6673
MD	11	-.1138218787	B	0.27419311	-0.42	0.6789
MD	12	0.0000000000	B	.	.	.
kode	6125	-.4214211399	B	0.08727669	-4.83	<.0001
kode	6126	-.5961427571	B	0.06999431	-8.52	<.0001
kode	6127	-.0437631847	B	0.06713694	-0.65	0.5159
kode	61926	-.3159460557	B	0.09244576	-3.42	0.0009
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	-0.44591367	0.13111292	0.0010
2003	-0.45324403	0.10978429	<.0001
2004	-0.38934366	0.09996979	0.0002
2005	-0.22011627	0.09701125	0.0253
2006	-0.20864346	0.09058355	0.0232
2007	-0.34769771	0.08987741	0.0002
2008	-0.42674404	0.08196436	<.0001
2009	-0.24630141	0.08449714	0.0043
2010	-0.12005964	0.08143238	0.1434
2011	0.06549061	0.08160039	0.4240

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

Greenland halibut, 0A+1AB trawlers 53
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The GLM Procedure

Class Level Information

Class	Levels	Values
year	16	1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011
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 260
Number of Observations Used 260

Greenland halibut, 0A+1AB trawlers 54
12:53 Sunday, June 3, 2012

The GLM Procedure

Dependent Variable: lcph

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	31	24.51039554	0.79065792	7.30	<.0001
Error	228	24.69139589	0.10829560		
Corrected Total	259	49.20179143			

R-Square	Coeff Var	Root MSE	lcph Mean
0.498161	-201.2400	0.329083	-0.163528

Source	DF	Type I SS	Mean Square	F Value	Pr > F
year	15	8.23696812	0.54913121	5.07	<.0001
MD	7	1.85807652	0.26543950	2.45	0.0193
kode	9	14.41535090	1.60170566	14.79	<.0001

Source	DF	Type III SS	Mean Square	F Value	Pr > F
year	15	8.14643844	0.54309590	5.01	<.0001
MD	7	1.55340526	0.22191504	2.05	0.0501
kode	9	14.41535090	1.60170566	14.79	<.0001

Parameter		Estimate	Standard Error	t Value	Pr > |t|
Intercept		0.408836021 B	0.35570309	1.15	0.2516
year	1996	0.562993639 B	0.45888195	1.23	0.2211
year	1997	-1.469338807 B	0.25207667	-5.83	<.0001
year	1998	-0.656125136 B	0.34278332	-1.91	0.0569
year	1999	-0.666754174 B	0.21104039	-3.16	0.0018
year	2000	-0.848039672 B	0.18420059	-4.60	<.0001
year	2001	0.248001616 B	0.20819957	1.19	0.2348
year	2002	-0.315827553 B	0.12210466	-2.59	0.0103
year	2003	-0.279668944 B	0.11141636	-2.51	0.0128
year	2004	-0.219610992 B	0.10607398	-2.07	0.0395
year	2005	-0.356277331 B	0.10479521	-3.40	0.0008
year	2006	-0.243322223 B	0.09801451	-2.48	0.0138
year	2007	-0.460834702 B	0.09778458	-4.71	<.0001
year	2008	-0.288598826 B	0.10063182	-2.87	0.0045
year	2009	-0.180830369 B	0.09916698	-1.82	0.0695
year	2010	-0.250212503 B	0.09840834	-2.54	0.0117

Greenland halibut, 0A+1AB trawlers 55
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The GLM Procedure

Dependent Variable: lcph

Parameter		Estimate		Standard Error	t Value	Pr > |t|
year	2011	0.000000000	B	.	.	.
MD	1	0.162094612	B	0.48344579	0.34	0.7377
MD	6	-0.265210427	B	0.41785877	-0.63	0.5263
MD	7	-0.278122219	B	0.34689934	-0.80	0.4235
MD	8	-0.188801043	B	0.34318247	-0.55	0.5828
MD	9	-0.171286930	B	0.34234776	-0.50	0.6173
MD	10	-0.041841933	B	0.34244993	-0.12	0.9029
MD	11	-0.217695723	B	0.34348727	-0.63	0.5269
MD	12	0.000000000	B	.	.	.
kode	2126	-0.186786159	B	0.10885350	-1.72	0.0875
kode	2127	-0.187559759	B	0.08163284	-2.30	0.0225
kode	5127	-1.326445110	B	0.39195643	-3.38	0.0008
kode	6125	-0.387907162	B	0.10630386	-3.65	0.0003
kode	6126	-0.585686367	B	0.08864891	-6.61	<.0001
kode	6127	-0.088887964	B	0.08434283	-1.05	0.2930
kode	21926	0.263875225	B	0.11294082	2.34	0.0203
kode	21927	0.122348158	B	0.07915476	1.55	0.1236
kode	61926	-0.273423732	B	0.11509284	-2.38	0.0183
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	0.58167442	0.42602281	0.1735
1997	-1.45065803	0.25052469	<.0001
1998	-0.63744436	0.34319595	0.0645
1999	-0.64807340	0.21136595	0.0024
2000	-0.82935890	0.18575239	<.0001
2001	0.26668239	0.19018641	0.1622
2002	-0.29714678	0.12578148	0.0190
2003	-0.26098817	0.11395239	0.0229
2004	-0.20093022	0.10430196	0.0553
2005	-0.33759655	0.10357833	0.0013
2006	-0.22464145	0.09517251	0.0191
2007	-0.44215393	0.09998832	<.0001
2008	-0.26991805	0.09989246	0.0074
2009	-0.16214959	0.10468055	0.1228
2010	-0.23153173	0.10168898	0.0237
2011	0.01868078	0.10177390	0.8545

Appendix 4. Standardized CPUE index from trawlers in Div. 0B

Greenland halibut, 0B trawlers 17
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The GLM Procedure

Class Level Information

Class	Levels	Values
Year	22	1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011
md	10	1 4 5 6 7 8 9 10 11 12
kode	13	2126 2127 3125 5126 5127 14124 15126 15127 20126 20127 21926 21927 41927

Number of Observations Read 557
Number of Observations Used 557

Greenland halibut, 0B trawlers 18
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The GLM Procedure

Dependent Variable: lcph

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	42	161.2982010	3.8404334	56.08	<.0001
Error	514	35.2000258	0.0684825		
Corrected Total	556	196.4982267			

R-Square	Coeff Var	Root MSE	lcph Mean
0.820863	-44.77638	0.261692	-0.584441

Source	DF	Type I SS	Mean Square	F Value	Pr > F
Year	21	105.5333817	5.0253991	73.38	<.0001
md	9	12.6946795	1.4105199	20.60	<.0001
kode	12	43.0701397	3.5891783	52.41	<.0001

Source	DF	Type III SS	Mean Square	F Value	Pr > F
Year	21	6.89015475	0.32810261	4.79	<.0001
md	9	11.21146848	1.24571872	18.19	<.0001
kode	12	43.07013974	3.58917831	52.41	<.0001

Parameter		Estimate		Standard Error	t Value	Pr > |t|
Intercept		0.213676450	B	0.16170006	1.32	0.1869
Year	1990	-0.163000330	B	0.09833595	-1.66	0.0980
Year	1991	-0.173735741	B	0.09897105	-1.76	0.0798
Year	1992	-0.042552146	B	0.09388788	-0.45	0.6506
Year	1993	-0.163660598	B	0.09801852	-1.67	0.0956
Year	1994	-0.179594268	B	0.10249846	-1.75	0.0803
Year	1995	-0.006077898	B	0.12032259	-0.05	0.9597
Year	1996	-0.067303536	B	0.11173622	-0.60	0.5472
Year	1997	-0.095635469	B	0.11163941	-0.86	0.3920
Year	1998	-0.085349316	B	0.11689970	-0.73	0.4657
Year	1999	-0.161998813	B	0.11288430	-1.44	0.1519
Year	2000	-0.203847492	B	0.13793319	-1.48	0.1401
Year	2001	-0.263473194	B	0.16942397	-1.56	0.1205
Year	2002	-0.518447533	B	0.12074518	-4.29	<.0001
Year	2003	-0.375795811	B	0.08862316	-4.24	<.0001
Year	2004	-0.364633792	B	0.08962303	-4.07	<.0001

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The GLM Procedure

Dependent Variable: lcph

Parameter		Estimate	Standard Error	t Value	Pr > |t|
Year	2005	-0.039871183 B	0.09301331	-0.43	0.6683
Year	2006	-0.122956171 B	0.10707773	-1.15	0.2514
Year	2007	-0.220610640 B	0.10084186	-2.19	0.0291
Year	2008	0.089193550 B	0.08909970	1.00	0.3173
Year	2009	0.208833285 B	0.09275373	2.25	0.0248
Year	2010	-0.063619117 B	0.10258090	-0.62	0.5354
Year	2011	0.000000000 B	.	.	.
md	1	0.079920867 B	0.09626488	0.83	0.4068
md	4	0.169611736 B	0.09153902	1.85	0.0645
md	5	0.441290770 B	0.06487925	6.80	<.0001
md	6	-0.033787610 B	0.06653619	-0.51	0.6118
md	7	-0.255767510 B	0.05760288	-4.44	<.0001
md	8	-0.160580303 B	0.05491468	-2.92	0.0036
md	9	-0.236772444 B	0.05272939	-4.49	<.0001
md	10	-0.296203574 B	0.05011569	-5.91	<.0001
md	11	-0.172810127 B	0.05054594	-3.42	0.0007
md	12	0.000000000 B	.	.	.
kode	2126	-0.493240078 B	0.16048268	-3.07	0.0022
kode	2127	-0.255067533 B	0.14196146	-1.80	0.0730
kode	3125	-1.085859428 B	0.17633227	-6.16	<.0001
kode	5126	-0.389790205 B	0.18655203	-2.09	0.0372
kode	5127	-0.161158151 B	0.15773902	-1.02	0.3074
kode	14124	-0.697903055 B	0.16159482	-4.32	<.0001
kode	15126	0.053786226 B	0.16280815	0.33	0.7413
kode	15127	0.037159848 B	0.17508595	0.21	0.8320
kode	20126	-1.012605307 B	0.15465801	-6.55	<.0001
kode	20127	-1.030722505 B	0.15933427	-6.47	<.0001
kode	21926	-0.020263965 B	0.18572351	-0.11	0.9132
kode	21927	0.080236264 B	0.14544866	0.55	0.5814
kode	41927	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.

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The GLM Procedure
Least Squares Means

Year	lcph LSMEAN	Standard Error	Pr > |t|
1990	-0.37855892	0.05302749	<.0001
1991	-0.38929433	0.05292165	<.0001
1992	-0.25811074	0.04639701	<.0001
1993	-0.37921919	0.05185225	<.0001
1994	-0.39515286	0.05970208	<.0001
1995	-0.22163649	0.08726987	0.0114
1996	-0.28286213	0.08145204	0.0006
1997	-0.31119406	0.08580003	0.0003
1998	-0.30090791	0.09848872	0.0024
1999	-0.37755740	0.09780365	0.0001
2000	-0.41940608	0.12516662	0.0009
2001	-0.47903179	0.15982864	0.0029
2002	-0.73400612	0.10986428	<.0001
2003	-0.59135440	0.07008573	<.0001
2004	-0.58019238	0.07242112	<.0001
2005	-0.25542978	0.07516530	0.0007
2006	-0.33851476	0.08286762	<.0001
2007	-0.43616923	0.07335287	<.0001
2008	-0.12636504	0.07748248	0.1035
2009	-0.00672531	0.08116608	0.9340
2010	-0.27917771	0.08536233	0.0011
2011	-0.21555859	0.07889406	0.0065

Appendix 5. Standardized CPUE index for trawlers in Div.1CD.

Greenland halibut, 1CD trawlers 1
19:32 Saturday, June 2, 2012

The GLM Procedure

Class Level Information

Class	Levels	Values
year	24	1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011
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 269
Number of Observations Used 269

Greenland halibut, 1CD trawlers 2
19:32 Saturday, June 2, 2012

The GLM Procedure

Dependent Variable: lcph

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	39	47.85001396	1.22692343	19.49	<.0001
Error	229	14.41343356	0.06294076		
Corrected Total	268	62.26344753			

R-Square	Coeff Var	Root MSE	lcph Mean
0.768509	-46.23270	0.250880	-0.542646

Source	DF	Type I SS	Mean Square	F Value	Pr > F
year	23	17.96712332	0.78117927	12.41	<.0001
MD	11	9.56666391	0.86969672	13.82	<.0001
kode	5	20.31622673	4.06324535	64.56	<.0001

Source	DF	Type III SS	Mean Square	F Value	Pr > F
year	23	12.23968441	0.53216019	8.45	<.0001
MD	11	6.57098383	0.59736217	9.49	<.0001
kode	5	20.31622673	4.06324535	64.56	<.0001

Parameter		Estimate		Standard Error	t Value	Pr > |t|
Intercept		0.200692029	B	0.09303487	2.16	0.0320
year	1988	0.328803116	B	0.14263842	2.31	0.0221
year	1989	0.369840254	B	0.13700683	2.70	0.0075
year	1990	-0.047206545	B	0.19337481	-0.24	0.8074
year	1991	-0.038674039	B	0.16309681	-0.24	0.8128
year	1992	-0.119992146	B	0.11935706	-1.01	0.3158
year	1993	-0.344064726	B	0.11814288	-2.91	0.0039
year	1994	-0.494209145	B	0.11854033	-4.17	<.0001
year	1995	-0.366080265	B	0.11768409	-3.11	0.0021
year	1996	-0.605563966	B	0.11764257	-5.15	<.0001
year	1997	-0.657994834	B	0.10489314	-6.27	<.0001
year	1998	-0.485544561	B	0.11238849	-4.32	<.0001
year	1999	-0.559836702	B	0.10631272	-5.27	<.0001
year	2000	-0.266429847	B	0.10094200	-2.64	0.0089
year	2001	-0.353978680	B	0.09655163	-3.67	0.0003
year	2002	-0.429345546	B	0.09435734	-4.55	<.0001

Greenland halibut, 1CD trawlers 3
19:32 Saturday, June 2, 2012

The GLM Procedure

Dependent Variable: lcph

Parameter		Estimate	Standard Error	t Value	Pr > |t|
year	2003	-0.421006946 B	0.10028646	-4.20	<.0001
year	2004	-0.393704826 B	0.09415331	-4.18	<.0001
year	2005	-0.217314716 B	0.09473382	-2.29	0.0227
year	2006	-0.164503542 B	0.09299800	-1.77	0.0782
year	2007	-0.042147399 B	0.09619853	-0.44	0.6617
year	2008	0.000124352 B	0.09053369	0.00	0.9989
year	2009	0.006566723 B	0.09512530	0.07	0.9450
year	2010	-0.058756531 B	0.08937572	-0.66	0.5116
year	2011	0.000000000 B	.	.	.
MD	1	-0.415016812 B	0.09957493	-4.17	<.0001
MD	2	-0.985671891 B	0.13028652	-7.57	<.0001
MD	3	-0.905563503 B	0.26653888	-3.40	0.0008
MD	4	-0.434906667 B	0.19752881	-2.20	0.0287
MD	5	-0.318283621 B	0.11985433	-2.66	0.0085
MD	6	-0.547832656 B	0.09308691	-5.89	<.0001
MD	7	-0.423559355 B	0.07934151	-5.34	<.0001
MD	8	-0.331972703 B	0.06864335	-4.84	<.0001
MD	9	-0.183088651 B	0.06151100	-2.98	0.0032
MD	10	-0.221877947 B	0.05797536	-3.83	0.0002
MD	11	-0.143791876 B	0.05809203	-2.48	0.0140
MD	12	0.000000000 B	.	.	.
kode	6124	-2.489598357 B	0.17084892	-14.57	<.0001
kode	6125	-0.500237970 B	0.06622191	-7.55	<.0001
kode	6126	-0.391933583 B	0.05771211	-6.79	<.0001
kode	6127	-0.057405524 B	0.05961976	-0.96	0.3366
kode	61926	-0.331551981 B	0.11951338	-2.77	0.0060
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.

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The GLM Procedure
Least Squares Means

year	lcph LSMEAN	Standard Error	Pr > |t|
1988	-0.50825656	0.12621865	<.0001
1989	-0.46721943	0.12458167	0.0002
1990	-0.88426623	0.18633647	<.0001
1991	-0.87573372	0.15509681	<.0001
1992	-0.95705183	0.10762736	<.0001
1993	-1.18112441	0.10723050	<.0001
1994	-1.33126883	0.10738356	<.0001
1995	-1.20313995	0.10727516	<.0001
1996	-1.44262365	0.10711352	<.0001
1997	-1.49505452	0.09258115	<.0001
1998	-1.32260424	0.10181954	<.0001
1999	-1.39689638	0.09407702	<.0001
2000	-1.10348953	0.07707402	<.0001
2001	-1.19103836	0.08260425	<.0001
2002	-1.26640523	0.07901105	<.0001
2003	-1.25806663	0.08696819	<.0001
2004	-1.23076451	0.07569371	<.0001
2005	-1.05437440	0.07790782	<.0001
2006	-1.00156322	0.07716023	<.0001
2007	-0.87920708	0.07390264	<.0001
2008	-0.83693533	0.07257351	<.0001
2009	-0.83049296	0.07751996	<.0001
2010	-0.89581621	0.07191357	<.0001
2011	-0.83705968	0.08018385	<.0001

Appendix 6. Combined Standardized CPUE index for trawlers in Div. 1CD and Div. 0B.

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The GLM Procedure

Class Level Information

Class	Levels	Values
year	24	1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011
MD	12	1 2 3 4 5 6 7 8 9 10 11 12
kode	19	2126 2127 3125 5126 5127 6124 6125 6126 6127 14124 15126 15127 20126 20127 21926 21927 41927 61926 61927

Number of Observations Read 826
Number of Observations Used 826

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The GLM Procedure

Dependent Variable: lcph

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	52	201.1417783	3.8681111	51.61	<.0001
Error	773	57.9367655	0.0749505		
Corrected Total	825	259.0785439			

R-Square	Coeff Var	Root MSE	lcph Mean
0.776374	-47.96015	0.273771	-0.570830

Source	DF	Type I SS	Mean Square	F Value	Pr > F
year	23	92.60399676	4.02626073	53.72	<.0001
MD	11	23.59207243	2.14473386	28.62	<.0001
kode	18	84.94570915	4.71920606	62.96	<.0001

Source	DF	Type III SS	Mean Square	F Value	Pr > F
year	23	13.16997585	0.57260765	7.64	<.0001
MD	11	12.15414166	1.10492197	14.74	<.0001
kode	18	84.94570915	4.71920606	62.96	<.0001

Parameter		Estimate		Standard Error	t Value	Pr > |t|
Intercept		0.132604609	B	0.07885460	1.68	0.0930
year	1988	0.144147399	B	0.13776849	1.05	0.2957
year	1989	0.248386769	B	0.13637334	1.82	0.0689
year	1990	-0.301000884	B	0.07531386	-4.00	<.0001
year	1991	-0.287082385	B	0.07556571	-3.80	0.0002
year	1992	-0.145526226	B	0.06953784	-2.09	0.0367
year	1993	-0.295660616	B	0.07191451	-4.11	<.0001
year	1994	-0.307376238	B	0.07566663	-4.06	<.0001
year	1995	-0.218668153	B	0.08657757	-2.53	0.0117
year	1996	-0.342769775	B	0.08351462	-4.10	<.0001
year	1997	-0.442971596	B	0.08060570	-5.50	<.0001
year	1998	-0.334092256	B	0.08601431	-3.88	0.0001
year	1999	-0.374777971	B	0.08224289	-4.56	<.0001
year	2000	-0.190046684	B	0.08480634	-2.24	0.0253
year	2001	-0.275144274	B	0.08482478	-3.24	0.0012
year	2002	-0.401513836	B	0.07718684	-5.20	<.0001

Parameter		Estimate		Standard Error	t Value	Pr > |t|
year	2003	-0.375600365	B	0.06992515	-5.37	<.0001
year	2004	-0.376927999	B	0.06877109	-5.48	<.0001
year	2005	-0.133796988	B	0.07056978	-1.90	0.0583
year	2006	-0.090786409	B	0.07314490	-1.24	0.2149
year	2007	-0.154137740	B	0.07262593	-2.12	0.0341
year	2008	0.021301664	B	0.06745302	0.32	0.7522
year	2009	0.062723210	B	0.07048509	0.89	0.3738
year	2010	-0.070342134	B	0.07099298	-0.99	0.3221
year	2011	0.000000000	B	.	.	.
MD	1	-0.193075316	B	0.07151291	-2.70	0.0071
MD	2	-0.881446522	B	0.13255793	-6.65	<.0001
MD	3	-0.638333210	B	0.28318618	-2.25	0.0245
MD	4	0.013167835	B	0.08426679	0.16	0.8759
MD	5	0.258523924	B	0.05747620	4.50	<.0001
MD	6	-0.211590814	B	0.05611893	-3.77	0.0002
MD	7	-0.291496008	B	0.04762625	-6.12	<.0001
MD	8	-0.192854044	B	0.04415831	-4.37	<.0001
MD	9	-0.197416643	B	0.04156366	-4.75	<.0001
MD	10	-0.243205294	B	0.03961357	-6.14	<.0001
MD	11	-0.138062887	B	0.04010212	-3.44	0.0006
MD	12	0.000000000	B	.	.	.
kode	2126	-0.332520862	B	0.08925317	-3.73	0.0002
kode	2127	-0.041662688	B	0.06073554	-0.69	0.4929
kode	3125	-0.968008661	B	0.11088508	-8.73	<.0001
kode	5126	-0.019585760	B	0.12788029	-0.15	0.8783
kode	5127	0.086453635	B	0.07821301	1.11	0.2693
kode	6124	-2.487918652	B	0.18055650	-13.78	<.0001
kode	6125	-0.587390503	B	0.06914715	-8.49	<.0001
kode	6126	-0.431786748	B	0.06111420	-7.07	<.0001
kode	6127	-0.073767495	B	0.06256320	-1.18	0.2387
kode	14124	-0.513170059	B	0.08634270	-5.94	<.0001
kode	15126	0.231176076	B	0.09044302	2.56	0.0108
kode	15127	0.205797624	B	0.11219343	1.83	0.0670
kode	20126	-0.822021135	B	0.07168522	-11.47	<.0001
kode	20127	-0.838145332	B	0.08027579	-10.44	<.0001
kode	21926	0.149768783	B	0.12752201	1.17	0.2406
kode	21927	0.286022300	B	0.06683756	4.28	<.0001
kode	41927	0.149505462	B	0.14055793	1.06	0.2878
kode	61926	-0.340027811	B	0.12811972	-2.65	0.0081
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	-0.28363120	0.13120937	0.0309
1989	-0.17939183	0.13083029	0.1707
1990	-0.72877949	0.05657496	<.0001
1991	-0.71486099	0.05587344	<.0001
1992	-0.57330483	0.04875520	<.0001
1993	-0.72343922	0.05217078	<.0001
1994	-0.73515484	0.05741374	<.0001
1995	-0.64644676	0.07367857	<.0001
1996	-0.77054838	0.07159889	<.0001
1997	-0.87075020	0.06895136	<.0001
1998	-0.76187086	0.07690852	<.0001
1999	-0.80255657	0.07373038	<.0001
2000	-0.61782529	0.07310270	<.0001
2001	-0.70292288	0.07673328	<.0001
2002	-0.82929244	0.06830381	<.0001
2003	-0.80337897	0.05962756	<.0001
2004	-0.80470660	0.05845105	<.0001
2005	-0.56157559	0.05934140	<.0001
2006	-0.51856501	0.06083187	<.0001
2007	-0.58191634	0.05554599	<.0001
2008	-0.40647694	0.05882393	<.0001

2009	-0.36505539	0.06087748	<.0001
2010	-0.49812074	0.05958443	<.0001
2011	-0.42777860	0.06168442	<.0001