Northwest Atlantic Fisheries Organization

Serial No. N6229 **NAFO SCR Doc. 13/67**

NAFO/ICES PANDALUS ASSESSMENT GROUP – OCTOBER 2013

The Fishery for Northern Shrimp (*Pandalus borealis*) in Denmark Strait / off East Greenland 1978 - 2013.

by

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Abstract

Northern shrimp (*Pandalus borealis*) occurs off East Greenland from Cape Farewell to about 70°N in depths down to about 800 m. North of 65°N the stock spans the adjacent Greenlandic and Icelandic economic zones. The stock has been assessed as a single population by evaluation of fishery dependent data only, until 2011, where data from an annual survey series starting in 2008 became available. The stock is managed by catch quotas in the Greenlandic zone. There is no management related restrictions on the fishery in the Icelandic zone. The fishery in the Icelandic zone ceased in 2006.

A multinational fleet of large factory trawlers exploited the stock taking annual catches between 11 500 tons and 14 000 tons from 1994 to 2003. Since then catches have decreased to 1 235 tons in 2011, the lowest level seen since the fishery started in 1978. In 2012 the catch was 2 109 tons. The catch in 2013 until July was 1 700 tons. A biomass index decreased steadily from 1987 to 1993, but then showed an increasing trend until the beginning of the 2000s. It fluctuated without trend until 2008 and then nearly doubled in 2009. Since then the biomass index has been declining and is now lower than during the late 1990's. The index of harvest rates have declined since 1993 and recent levels are the lowest of the time series.

Introduction

Northern shrimp (*Pandalus borealis*) occurs off East Greenland in ICES Divisions XIVb and Va. The stock is distributed from Cap Farewell, up through the Denmark Strait to about 70°N in depths down to around 800 meters. The highest concentrations occur from 150-600 m. There is no evidence of distinct sub-populations and the stock is assessed as a single population. Until 2011 the assessment was based on fishery dependent data only, and was largely done by evaluation of trends in biomass indices. Surveys have been performed since 2008 (Siegstad 2013).

The exploitation of this stock began in the late 1970's initiated by Icelandic trawlers. It soon became a multinational fishery with annual catches increasing rapidly to more than 15 000 tons during the following 10-year period. Total catches fluctuated around 12 000 tons from 1994 to 2003 (Table 1, Fig. 2A), and have been decreasing since then, reaching a record-low catch of 1 235 tons in 2011. The catch in 2012 was 2 109 tons and in 2013 until July was 1 702 tons. The fishery was originally conducted north of 65°N on both sides of the territorial midline between Greenland and Iceland. However, in 1993 a fishery was also initiated in various smaller areas south of 65°N extending south to the Cap Farewell. At any time access to fishing grounds depends on ice conditions.

Since 1994 fleets from Greenland, EU, the Faroe Islands and Norway have participated in the fishery in the Greenlandic zone. The fishery is managed by a Total Allowable Catch (TAC) in the Greenlandic EEZ. Icelandic vessels operate exclusively in the Icelandic EEZ and the fishery is unrestricted by management initiatives. Annual catches in the Greenlandic zone from 1999 to 2005 accounted for 70-99 % of the total catches. Since 2006 there has been no fishery in the Icelandic zone. Vessels taking part in the fishery on both sides of the national midline are large factory trawlers in the range of 1000-4000 GRT.

This paper presents and analyses data from the shrimp fishery off East Greenland to provide a basis for the assessment of the shrimp stock in this area; i.e. time series of catch, fishing effort, geographical distribution and CPUE based biomass indices and indices of harvest rate.

Materials and methods

RAW DATA

Logbooks from Greenland, Iceland, Faroe Islands and EU since 1980 and from Norway since 2000 supplied data on catch and effort (hours fished) on a by haul basis. From 1998 approximately 40% of all hauls were performed with double trawl and since 2004 more than 60% of all hauls were performed with double trawl. The 2013 assessment included both single and double trawl in the standardized catch rates calculations. The catches in the Greenland EEZ were corrected for "overpacking" according to Hvingel 2003.

Catches and corresponding effort were compiled by year and by areas north and south of 65°N. CPUE was calculated and applied to the total catch of the year to estimate the total annual effort. The geographical distribution of the fishery is shown by plotting the unstandardised CPUE by statistical units of 7.5' latitude and 15' longitude (Fig. 4).

CATCH RATE INDICES

Three standardised CPUE indices were constructed: one for each of the areas north and south of 65°N and a combined index series representing the total area. The indices were based on logbook data from Greenlandic, Faeroese, EU and Norwegian vessels, operating exclusively in the Greenlandic zone and from the Icelandic fleet fishing exclusively in the Icelandic zone (north of 65°N). Until 2005 Norwegian fishery data was considered to have too sparse information on the different areas fished and data was therefore not included in the standardized catch rates calculations. In 2006 Norwegian fishery data was included in the catch rates calculations after a positive evaluation of new logbook data from the Greenland Fishery and Licence Control (GFLK), where Norwegian fishery data has been recorded in standard format since 2000.

For the indices of the northern areas and the total areas this involved a two-step process. In the first step multiplicative General Linear Modelling (GLM) techniques were used to standardise the CPUE data from the Greenlandic and Icelandic zones separately. There is no area overlap between the vessels fishing in the two zones. Therefore annual CPUE indices cannot be derived from a single GLM-run as such a model will not be able to estimate the relative fishing power of the vessels. The "first step" was performed following the method described in Hvingel *et al.* (2000). The multiplicative models included the following variables: (1) individual vessel fishing power, (2) seasonal availability of shrimp, (3) spatial availability of shrimp, (4) annual mean CPUE and (5) single and double trawl. Input data were mean CPUE by vessel, area, month and year. The calculations were done using the SAS statistical software (Anon., 1988). The main effects model was represented in logarithmic form:

$$\ln(CPUE_{mjki}) = \ln(u) + \ln(A_m) + \ln(S_j) + \ln(V_k) + \ln(Y_i) + e_{mjki}$$

Where $CPUE_{ijki}$ is the mean CPUE for vessel k, fishing in area m in month j during year i (k = 1,...,n; m = 1,…,a; j = 1,…,s; i = 1,…,y); ln(u) is overall mean ln($CPUE$); A_m is effect of the mth area; S_j is the effect of the jth month; V_k is the effect of the kth vessel; Y_i is the effect of the ith year; e_{mjki} is the error term assumed to be normally distributed $N(0,\sigma^2/n)$, where n is the number of observations in the cell. The standardised CPUE indices are the antilog of the year coefficient.

For the model pertaining to the Greenlandic zone 82 of 118 vessels met the criteria for inclusion in the analysis (at least three years of fishing in the area). The month effect was reduced to 9 levels by grouping months with similar indices of relative shrimp availability. The area effect had two levels - one for each of the fishing areas north and

south of 65°N. The year*area cross-effect was calculated to give separate indices for the northern and southern areas.

In the Icelandic zone 126 different Icelandic vessels had been registered in the area from 1987 to 2005. Almost no fishery has been conducted in 2005 (21 tons) and there has been no fishery since 2006. The 61 vessels qualifying for the index were collapsed into 18 groups consisting of 1-8 vessels of equal fishing power. The month effect was reduced to 6 levels. No area effect was included. A two level trawl effect was introduced to account for the effect of twin trawling.

Results and diagnostically output from the GLM run show that data from the Icelandic zone in 2005 was unsuitable to further analyses and therefore not included. This analysis has not been repeated since 2006 (Siegstad and Hvingel 2006).

The index of the area south of 65°N
From this first step of calculations the biomass index for the areas south of 65°N came directly as the 'year-area south' cross effect of the Greenlandic zone model (see appendix 1).

The combined index of the area north of 65°N
In the second calculation step the biomass index for the areas north of 65°N was derived by combining the year coefficients of the Icelandic zone model and the year effects for the northern areas in the Greenlandic zone model (i.e. the 'year-area north' cross effect, see appendix 1). A Monte Carlo Markov Chain (MCMC) sampling process was used to construct distributions of likelihoods of possible values of the combined index. This was done within the programming framework WinBUGS v.1.4, (www.mrc-bsu.cam.ac.uk/bugs). The individual CPUE series for the p^{th} fleet, μ_{pi}, was assumed to reflect an overall biomass series, Y_i, and a constant fleet coefficient, v_p, so that:

$$\mu_{pi} = v_p Y_i \exp(e_{pi})$$

The error, e_{pi}, were considered to be distributed with mean zero and variance σ_{pi}^2. The error term was assumed that e_{pi}, have variances inversely proportional to the area of fishing ground, a_p, covered by fleet p. The factor, a_p, was taken to be the area of sea bottom between 150-600 m. Hence, σ_{pi}^2 was calculated by:

$$\sigma_{pi}^2 = \frac{cv_{pi}^2}{a_p}$$

Where cv_{pi} is the annual fleet specific coefficient of variation as calculated in the GLM-run. The area weighting factors, a_p, for the Greenlandic area north of 65° and the Icelandic zone were estimated to be 0.9 and 0.1 respectively.

The combined index of the total area
In a similar second calculation step a single combined index of the development of the population biomass in the whole area was derived by aggregating the overall year coefficients from the Greenlandic zone model (appendix 2) and the year coefficients from the Icelandic zone model (Siegstad and Hvingel 2006). This was also done by the method described above using an area-weighting factor of 0.875 for the Greenlandic zone data and thus 0.125 for the Icelandic zone data.

HARVEST RATE INDICES

Indices of harvest rate were calculated by dividing total annual catch of the area by the respective standardised CPUE indices.

Results and Discussion

Geographical distribution of the fishery
The fishery was originally conducted north of 65°N in the Dohrnbank-Stredebank area on both sides of the territorial midline between Greenland and Iceland and on the slopes of Storfjord Deep. In 1993 a fishery was also initiated south of 65°N in various smaller areas extending south to the Cap Farewell. Since 2008 most of the fishery (more than 90 %) has been conducted north of 65°N (Table 2, Fig. 1).

Catch

As the fishery developed, catches increased rapidly to more than 15 000 tons in 1987-88, but declined thereafter to about 9 000 tons in 1992-93 (Fig. 1A, Table 1 and 2). Following the area expansion of the fishery south of 65°N in 1993 catches increased again reaching 11 900 tons in 1994. From 1994 to 2003 catches fluctuated between 11 500 and 14 000 tons (Fig. 1A). In 2004 the catches started decreasing, from 10 000 tons in 2004 to a low of 1 235 tons in 2011. In 2012 the catch taken was 2 109 tons. The catch until July 2013 was 1 702 tons.

In the northern area the amount caught declined by about 85% from 1988 to 2001, i.e. from 15 000 tons to 2 200 tons (Fig. 1A, Table 2). Catches more than doubled in the period 2002-2004 (Table 2, Fig. 1A), but have been decreasing since reaching a low of 1 150 tons in 2011. The catch in 2012 was 1 890 tons.

Catches in the southern area increased from 1 900 tons in 1993 (the first year of fishery in this area) to about 11 700 tons in 2001 (Fig. 1A). Since then catches in the southern area has declined, reaching a low of 89 tons in 2011. In 2012 the catch was 215 tons.

From 1996 to 2005 catches in the area south of 65°N accounted for between 50% and 85% of the total catch (Fig. 1A). Since then catches in the area south of 65°N has been decreasing. The proportion of the catch taken in the southern area has been about 10% since 2008. No fishing has been conducted in the southern area in 2013 until July.

Fishing effort

The high increase in catches during the first ten-year period was mainly driven by increased fishing effort (Fig. 1B, Table 2). Between 1981 and 1989, total effort increased from about 20 000 hours to a peak of nearly 120 000 hours and has declined since (Table 2, Fig. 1B). In 2011 total effort was the lowest ever seen, being 3 327 hours. In 2012 the effort was 6 513 hours.

The historic development of fishing effort spent in the northern area follows the one described for the total area closely – except for 2001, when a lot of effort shifted to the south.

In the southern areas, effort increased from about 10 000 hours in 1993 to 25 000 hours in 1997. In 1999 it reached a low of 7 500 hr's but increased again to 20 000 hr's in 2001. Since then effort in the southern area has been declining (Fig. 1B, Table 2) and only 25 hours was spent fishing in the southern area in 2011. Since 2010 less than 3% of total effort has been spent in the southern area.

Catch rate

Catch rates (total area) decreased from 278 kg/hr to 109 kg/hr in the period 1980-1989, but has shown an increasing trend since then reaching 502 kg/hr in 2003 (Fig. 1C, Table 2). From 2004 to 2008 the catch rate was between 365 and 420 kg/hr. In 2009 the catch rate was 640 kg/hr, the highest value ever obtained, but has since then been between 371 and 213 kg/hr.

In the southern area CPUE increased from 204 kg/hr in 1993 to 925 kg/hour in 1999. Until 2008 the mean CPUE in this area fluctuated between 450 and 700 kg/hr with a mean of 600 kg/hr. Since then catch rates has increased reaching a high of 3 576 kg/hr in 2011. –However only 7 hauls were conducted in the southern area in 2011. The catch rate in 2012 fell to 1267 kg/hr, but is based on only 60 hauls. The catch rate in 2010 was 1571kg/hr, but is also based on a low number of hauls (72).

Catch rates in the northern area follow the same trend as the overall figures until 1993 as the fishery in the southern areas had not yet been initiated. From 1995-2002 CPUE's have fluctuated around 225 kg/hr except for an extreme low of 129 kg/hr in 1996. From 2003 to 2007 annual mean CPUE fluctuated around 350 kg/hr. In 2009 the catch rate reached a value of 607kg/hr, the highest value ever obtained. Since then the catch rate has been between 347 and 213 kg/hr.

The catch rate for the total area has reflected the catch rate for the northern area during the last 6 years. This is because 90% of the total catch has been taken in the northern area and the effort spent in the southern areas has been 9% from 2008-2009 and less than 3% during the last 4 years.

Standardised catch rate indices

The CPUEs for the southern area in 2011 to 2013 were omitted from the GLMs because of the low number of hauls conducted in this area during the last 3 years.

Results of the two multiple regression analysis to standardise catch rates showed that all main effects were highly significant ($p<0.01$). The r-squared of the models for Greenland and Iceland were 68% and 78%, respectively. The model-diagnostical outputs (see appendix) indicate that the model and error structures were correct. All first-order interactions between the effects of YEAR, MONTH and VESSEL were also highly significant, suggesting that the effect of YEAR on CPUE differ from month to month and from vessel to vessel. The contributions of these interactions to the variability within the data set however were small compared to that of the main effects. Thus, the basic model without interactions was considered a good description of the data.

The combined CPUE index for the total area (Fig. 2, Table 3) indicated that the stock more than halved during the period 1987-1993. Since then it has been rebuilding reaching the level of 1987 in the mid 1990's. The mean index values then increased until the end of the 1990s, and stabilized at a level one third above that of 1987. Since then the biomass index has been fluctuating without a trend until 2009 where the index more than doubled compared to 1987. Since then the combined index has been declining and is now lower than during the late 1990's.

The CPUE index series of the northern areas (Fig. 2, Table 3) declined from 1987 to 1993. Thereafter an increasing trend was observed and by the turn of the century the index values had reached the level seen at the offset of the time series. From 2004 to 2007 the mean index values stabilised at a level one third above that of 1987. In 2008 the index started increasing reaching a record high level in 2009. Since then the index has been going down and is now lower than the late nineties.

The CPUE index series of the southern area (Fig. 3, Table 3) increased until 1999 and has since then fluctuated without a trend. No index for the southern area was calculated in 2011 to 2013.

The standardisation method used accounts for the increase in efficiency from renewal of the fleet but does not account for the technological improvements, which results from the upgrading of older vessels. The standardised effort may therefore be underestimated in which case the standardised CPUE time series interpreted as a biomass index is expected to give a slightly optimistic view of the stock development (for further discussion of the CPUE index as a stock indicator see Hvingel *et al.*, 2000).

INDICES OF HARVEST RATE

The standardised effort i.e. the index of harvest rate, have shown a decreasing trend since the mid 1990s for the total area (Table 3, Fig. 3) reaching its lowest levels from 2008 to 2013. The separate indices for the Northern and Southern areas are also shown in Fig. 3 and they follow the trend seen for the total area. No standardised effort for the southern area was calculated for 2011 to 2013.

Conclusions

Total catches fluctuated around 12000 tons from 1994 to 2003 (Table 1, Fig. 1A). Catches has since decreased. In 2011 the total catch was 1 235 tons, the lowest level ever caught. Total catch in 2012 was 2 109 tons. The catch in 2013 until July was 1702 tons.

The combined CPUE index for the total area (Fig. 2, Table 3) indicated that the stock more than halved during the period 1987-1993. Since then it has been rebuilding reaching the level of 1987 in the mid 1990's. The mean index values then increased until the end of the 1990s, and stabilized at a level one third above that of 1987. Since then the biomass index has been fluctuating without a trend until 2009 where the index more than doubled compared to 1987. Since then the combined index has been declining and is now lower than during the late 1990's.

Since the mid 1990s exploitation rate index (standardized effort) has decreased, reaching the lowest levels seen in the time series.

State of the stock: Standardized CPUE data for all the areas combined indicates an increasing trend in the fishable biomass from 1993 to beginning of the 2000s and has fluctuated without trend until 2009. Since 2010 the standardised CPUE index has been going down and is now below the level seen in the period from 1994 to 2009.

References

ANON., 1988. SAS/STAT User's Guide, Release 6.03 Edition. Cary, NC: SAS Institute Inc., 1988. 1028 pp.

HVINGEL, C., H. LASSEN and D.G. PARSONS (2000). A biomass index for northern shrimp (*Pandalus borealis*) in Davis Strait based on multiplicative modelling of commercial catch-per-unit-effort data (1976 - 1997). *J. Northw. Atl. Fish. Sci. vol.26:25–36.*

HVINGEL, C. 2003. Correction of reported past catches of Northern Shrimp within the Greenland EEZ to conform to a revision of reporting practices. NAFO SCR Doc., No. 03/74 Ser. No. N4913. 3 pp.

SIEGSTAD, HELLE 2013. Results of the Greenland Bottom Trawl Survey for Northern shrimp (P*andalus borealis*) off East Greenland (ICES Subarea XIV b)), 2008-2013. *NAFO SCR Doc*., No.13/062 Serial No. N6224

SIEGSTAD, HELLE and HVINGEL, C. An Assessment of the Shrimp Stock in Denmark Strait/off East Greenland - 2006. *NAFO SCR Doc*., No.06/078 Serial No. N5328

Table 1. Catch (tons) of shrimp by the fishery in Denmark Strait/off East Greenland from 1978 to July 2013. Values for the fishery in the Greenland EEZ by EU, Faeroe Islands, France, Greenland and Norway are corrected according to Hvingel 2003.

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
North of 65°N																			
EU (DK,EST,LTU)	-	0	878	727	926	255	554	442	626	703	554	454	476	450	199	138	250	302	26
Faroe Islands	-	0	5296	892	922	554	836	843	910	754	847	738	1029	1265	1355	689	462	931	995
France	-	0	63	442	518	364	626	803	976	1305	616	472	62	148	0	0	0	0	0
Greenland	-	0	250	1256	1395	1835	2815	3248	7232	8396	9304	7408	7580	5283	2496	1771	1326	2390	359
Iceland	363	485	759	125	0	43	742	1794	1150	1330	1431	1326	281	465	1750	2553	1514	1151	566
Norway	-	1001	3079	2522	2372	2161	2662	2566	2535	2586	2561	2601	3052	3146	3102	1831	2180	2402	1544
Total	363	1486	10325	5964	6133	5212	8235	9696	13428	15073	15313	12999	12480	10757	8901	6982	5731	7176	3490
South of 65°N																			
Denmark (EU)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	60	613	731	1167
Faroe Island	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	280	974	295	402
Greenland	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1141	3603	2667	5295
Norway	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	424	1011	720	1590
Total	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1904	6201	4412	8453
Total area																			
EU (DK,EST,LTU)	-	0	878	727	926	255	554	442	626	703	554	454	476	450	199	198	863	1033	1193
Faroe Islands	-	0	5296	892	922	554	836	843	910	754	847	738	1029	1265	1355	968	1436	1225	1397
France	-	0	63	442	518	364	626	803	976	1305	616	472	62	148	0	0	0	0	0
Greenland	-	0	250	1256	1395	1835	2815	3248	7232	8396	9304	7408	7580	5283	2496	2912	4929	5057	5655
Iceland	363	485	759	125	0	43	742	1794	1150	1330	1431	1326	281	465	1750	2553	1514	1151	566
Norway	-	1001	3079	2522	2372	2161	2662	2566	2535	2586	2561	2601	3052	3146	3102	2255	3190	3122	3133
Total	363	1486	10325	5964	6133	5212	8235	9696	13428	15073	15313	12999	12480	10757	8901	8886	11932	11588	11944
Total all areas	363	1486	10325	5964	6133	5212	8235	9696	13428	15073	15313	12999	12480	10757	8901	8886	11932	11588	11944
Advised TAC	-	-	-	-	4200	4200	4200	5000	-	-	-	100003	100003	100003	8000	5000	5000	5000	5000
Effective TAC[1]	-	-	-	8000	4500	5725	5245	6090	75255	75255	87255	90255	14100	14500	13000	9563	9563	9563	9563

[1]For Greenland zone only; no restrictions in Iceland zone

Table 1 (continued). Catch (tons) of shrimp by the fishery in Denmark Strait/off East Greenland from 1978 to July 2013. Values for the fishery in the Greenland EEZ by EU, Faeroe Islands, France, Greenland and Norway are corrected according to Hvingel 2003.

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013[2]
North of 65°N																	
EU (DK,EST,LTU)	85	401	793	459	72	816	861	482	304	618	421	389	892	1345	927	1411	1532
Faroe Islands	635	1268	867	956	214	1029	1062	894	615	342	319	612	1325	781	0	0	0
France	0	0	0	0	0	-	-	-	-	-	-	-	-	-	-	-	-
Greenland	105	646	614	115	650	638	695	578	454	223	802	14	844	426	183	481	170
Iceland	2856	1421	769	132	10	1231	703	411	29	0	0	0	0	0	0	0	0
Norway	797	1628	1783	2759	1291	1630	2861	2700	2614	2704	1771	1514	883	769	36	2	0
Total	4478	5364	4827	4420	2237	5344	6183	5065	4016	3887	3314	2529	3945	3321	1146	1893	1702
South of 65°N																	
Denmark (EU)	1657	1300	1095	1900	2473	2309	1827	1022	644	683	431	251	28	101	36	0	0
Faroe Island	656	138	453	340	2402	1013	303	255	176	227	169	14	28	134	0	0	0
Greenland	4701	3950	4966	5235	4943	4333	4194	3488	2737	316	639	0	447	178	53	215	0
Norway	2261	670	378	157	1855	1098	197	186	180	76	48	0	107	0	0	0	0
Total	9276	6057	6893	7632	11674	5985	6522	4951	3737	1302	1286	266	610	413	89	215	0
Total area																	
EU (DK,EST,LTU)	1742	1701	1888	2358	2545	2548	2688	1504	948	1301	852	640	920	1446	963	1411	1532
Faroe Islands	1292	1406	1321	1296	2616	1322	1365	1149	791	569	488	627	1354	915	0	0	0
France	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Greenland	4806	4595	5581	5349	5593	4484	4890	4066	3191	539	1441	14	1292	605	236	696	170
Iceland	2856	1421	769	132	10	1231	703	411	29	0	0	0	0	0	0	0	0
Norway	3059	2298	2160	2917	3147	1743	3059	2886	2794	2780	1819	1514	990	769	36	2	0
Total	13754	11422	11719	12053	13911	11329	12705	10016	7753	5189	4600	2794	4555	3735	1235	2109	1702
Total all areas	13754	11422	11719	12053	13911	11242	12637	9985	7753	5189	4600	2794	4555	3735	1235	2109	1702
Advised TAC	5000	5000	9600	9600	9600	9600	9600	12400	12400	12400	12400	12400	12400	12400	12400	12400	12400
Effective TAC[1]	9563	9563	10600	12600	10600	10600	10600	15043	12400	12400	12400	12400	12835	11835	12400	12400	12400

[1]For Greenland zone only; no restrictions in Iceland zone

[2]Catch until July

Table 2. Catch (tons), effort (hrs) and Catch-Per-Unit-Effort (kg/hr) by trawlers fishing in Denmark Strait / off East Greenland in areas north and south of 65°N and total area.

	Area north			Area south			Total area		
Year	Catch	Effort	CPUE	Catch	Effort	CPUE	Catch	Effort	CPUE
1980	10325	37198	278				10325	37198	278
1981	5964	19986	298				5964	19986	298
1982	6133	23081	266				6133	23081	266
1983	5212	23855	219				5212	23855	219
1984	8235	34983	235				8235	34983	235
1985	9696	62911	154				9696	62911	154
1986	13428	61863	217				13428	61863	217
1987	15073	79881	189				15073	79881	189
1988	15313	109455	140				15313	109455	140
1989	12999	119629	109				12999	119629	109
1990	12480	72736	172				12480	72736	172
1991	10757	78714	137				10757	78714	137
1992	8901	68349	130				8901	68349	130
1993	6982	52381	133	1904	9335	204	8886	61003	146
1994	5731	31417	182	6201	18371	338	11932	49428	241
1995	7176	33953	211	4412	13157	335	11588	46927	247
1996	3490	27029	129	8453	24589	344	11944	51049	234
1997	4478	22175	202	9276	25992	357	13754	47519	289
1998	5364	20881	257	6057	10498	577	11422	31205	366
1999	4827	19388	249	6893	7449	925	11719	25742	455
2000	4420	17474	253	7632	10705	713	12053	28096	429
2001	2237	9822	228	11674	20435	571	13911	29933	465
2002	5344	20052	267	5985	8546	700	11329	22843	496
2003	6183	18053	342	6522	9317	700	12705	25295	502
2004	5065	15848	320	4951	8972	552	10016	27450	365
2005	4016	11251	357	3737	8004	467	7753	19257	403
2006	3887	10413	373	1302	2436	534	5189	12851	404
2007	3314	8977	369	1286	1974	651	4600	10951	420
2008	2529	6106	414	266	585	454	2794	6691	418
2009	3945	6500	607	610	617	989	4555	7117	640
2010	3321	10282	323	413	263	1571	3735	10546	354
2011	1146	3302	347	89	25	3576	1235	3327	371
2012	1893	6343	298	215	170	1267	2109	6513	324
2013*	1702	7975	213	0	8	-	1702	7983	213

*until July

Table 3. Means and standard errors (se) of standardised CPUE and effort index values based on logbook information from trawlers fishing in Denmark Strait/off East Greenland in areas north and south of 65°N and total area.

	Area north				Area south				Total			
	Std.CPUE		Std. Effort		Std.CPUE		Std. Effort		Std.CPUE		Std. Effort	
Year	mean	se	mean	se	mean	se	mean	se	mean	se	mean	se
1987	1.00	-	1.00	-					1.00	-	1.00	-
1988	0.89	0.09	1.14	0.11					0.88	0.08	1.15	0.00
1989	0.63	0.06	1.37	0.13					0.60	0.05	1.43	0.12
1990	0.63	0.06	1.32	0.13					0.61	0.05	1.36	0.12
1991	0.53	0.05	1.34	0.13					0.51	0.04	1.39	0.12
1992	0.43	0.04	1.37	0.13					0.42	0.04	1.42	0.13
1993	0.35	0.04	1.31	0.13	1.00	-	1.00	-	0.39	0.04	1.50	0.14
1994	0.83	0.09	0.46	0.05	2.25	0.18	1.45	0.11	1.08	0.10	0.73	0.07
1995	0.68	0.07	0.70	0.07	1.89	0.18	1.23	0.11	0.85	0.08	0.90	0.08
1996	0.62	0.07	0.38	0.04	2.63	0.21	1.69	0.13	1.08	0.10	0.73	0.07
1997	0.82	0.10	0.36	0.05	2.49	0.21	1.95	0.16	1.33	0.13	0.69	0.06
1998	1.05	0.13	0.34	0.04	2.85	0.27	1.12	0.10	1.40	0.14	0.54	0.05
1999	0.90	0.12	0.35	0.05	3.68	0.43	0.98	0.11	1.60	0.17	0.49	0.05
2000	1.10	0.12	0.27	0.03	3.56	0.34	1.13	0.10	1.65	0.16	0.48	0.05
2001	0.97	0.13	0.15	0.02	2.71	0.21	2.27	0.17	1.65	0.16	0.56	0.05
2002	1.00	0.13	0.35	0.05	3.33	0.29	0.94	0.08	1.88	0.18	0.40	0.04
2003	0.97	0.11	0.42	0.05	2.79	0.25	1.23	0.11	1.47	0.14	0.57	0.05
2004	1.35	0.14	0.25	0.03	2.72	0.30	0.96	0.10	1.62	0.16	0.41	0.04
2005	1.35	0.16	0.20	0.02	3.45	0.38	0.57	0.06	1.91	0.20	0.27	0.03
2006	1.40	0.17	0.18	0.02	3.24	0.45	0.21	0.03	1.76	0.19	0.20	0.02
2007	1.24	0.15	0.18	0.02	3.58	0.55	0.19	0.03	1.56	0.17	0.20	0.02
2008	1.55	0.20	0.11	0.01	2.28	0.63	0.06	0.01	1.81	0.23	0.10	0.01
2009	2.32	0.29	0.11	0.01	4.41	1.13	0.07	0.02	2.57	0.31	0.12	0.01
2010	1.18	0.14	0.19	0.02	3.49	1.40	0.06	0.02	1.36	0.15	0.18	0.02
2011	1.27	0.20	0.06	0.01	-	-	-	-	1.37	0.22	0.06	0.01
2012	0.98	0.14	0.13	0.02	-	-	-	-	1.09	0.15	0.13	0.02
2013*	0.63	0.09	0.18	0.03	-	-	-	-	0.73	0.11	0.16	0.02

* Until July

Figure 1. Catch (A), fishing effort (B) and catch-per-unit-effort (C) by shrimp trawlers fishing in Denmark Strait/off East Greenland. Series are given for the areas north and south of 65°N and overall. (Data for 2013 is part-years data, until July).

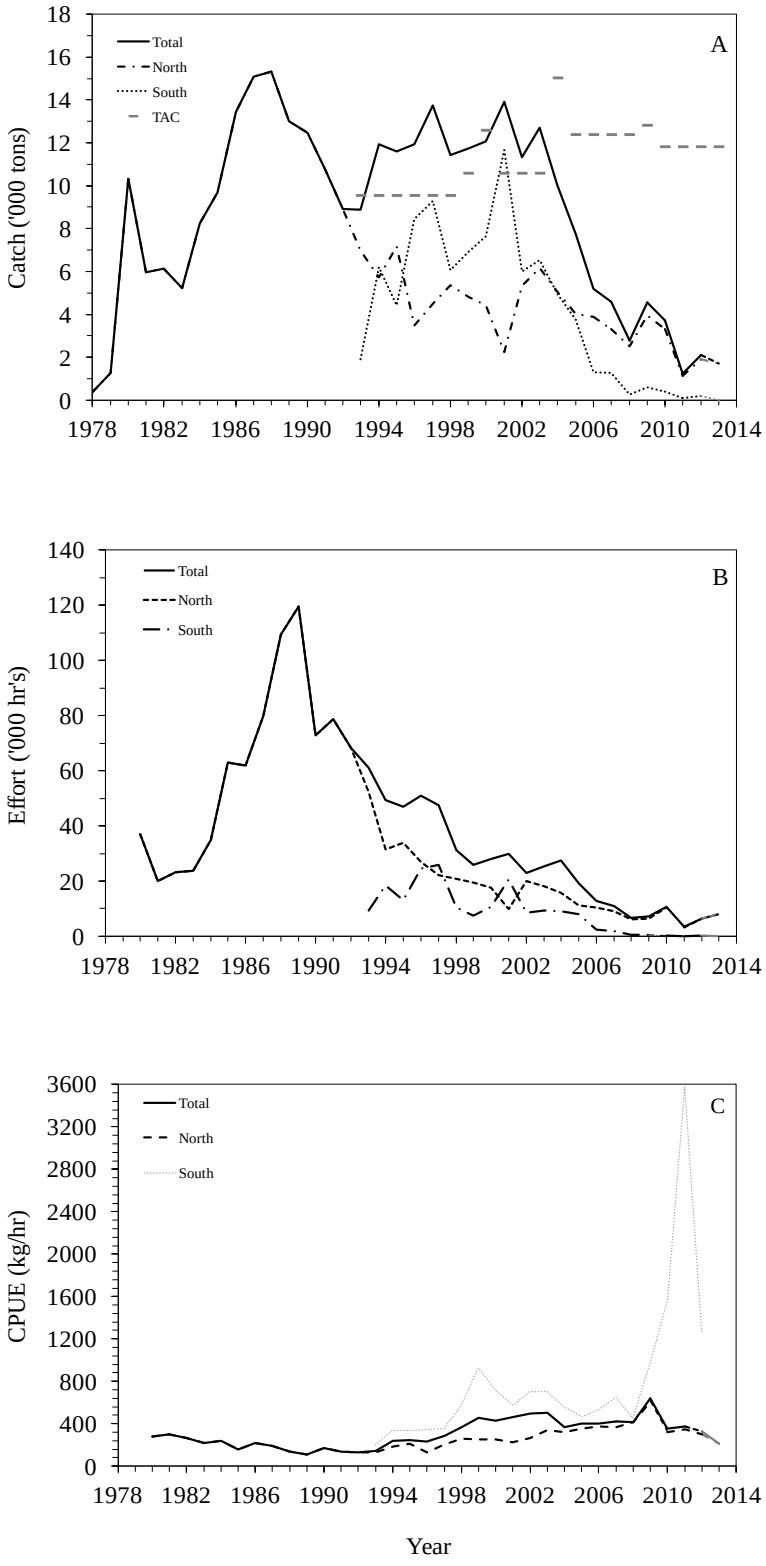


Figure 2. Standardized Catch-Per-Unit-Effort indices of the shrimp fishery in Denmark Strait and off East Greenland in the areas south of 65°N, overall fishery north of 65°N (both in Greenland and Iceland EEZ), and overall standardized CPUE for the stock (Estimates for 2013 are based on data until July). No index for the southern area was calculated since 2010 due to a low number of hauls (less than 10 each year).

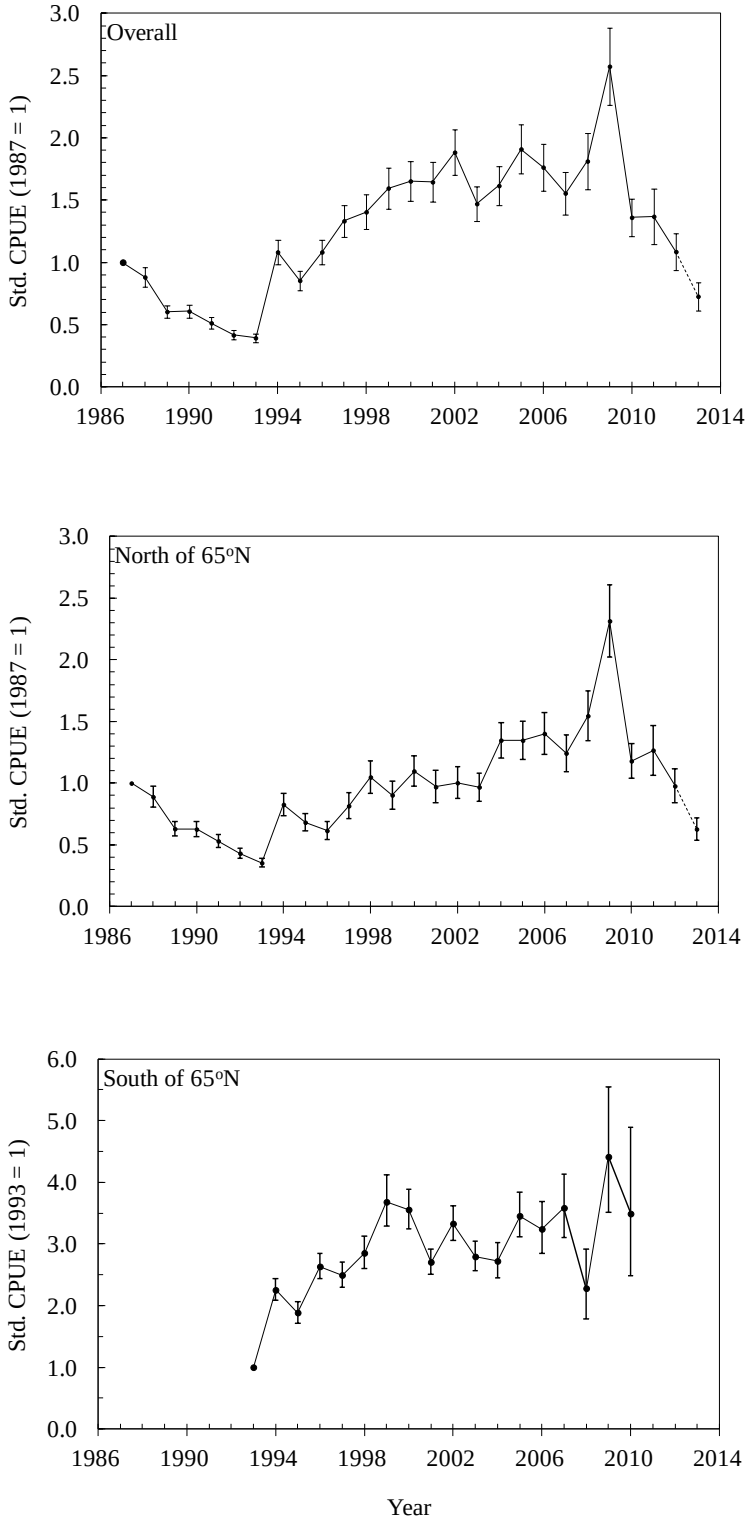


Figure 3. Standardised effort indices of the shrimp fishery in Denmark Strait and off East Greenland in the areas north of 65°N, south of 65°N and overall (Estimates for 2012 are based on data until July).

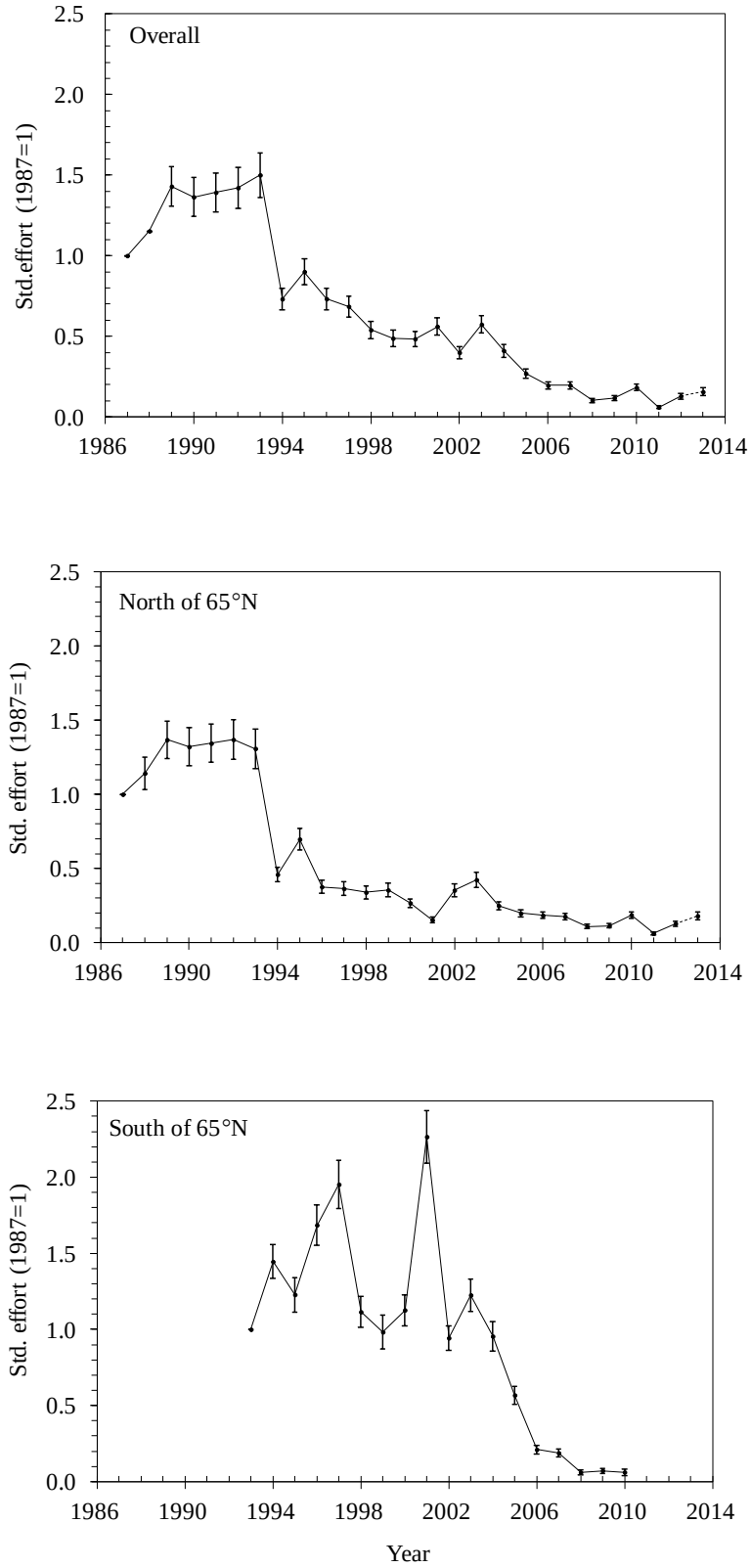
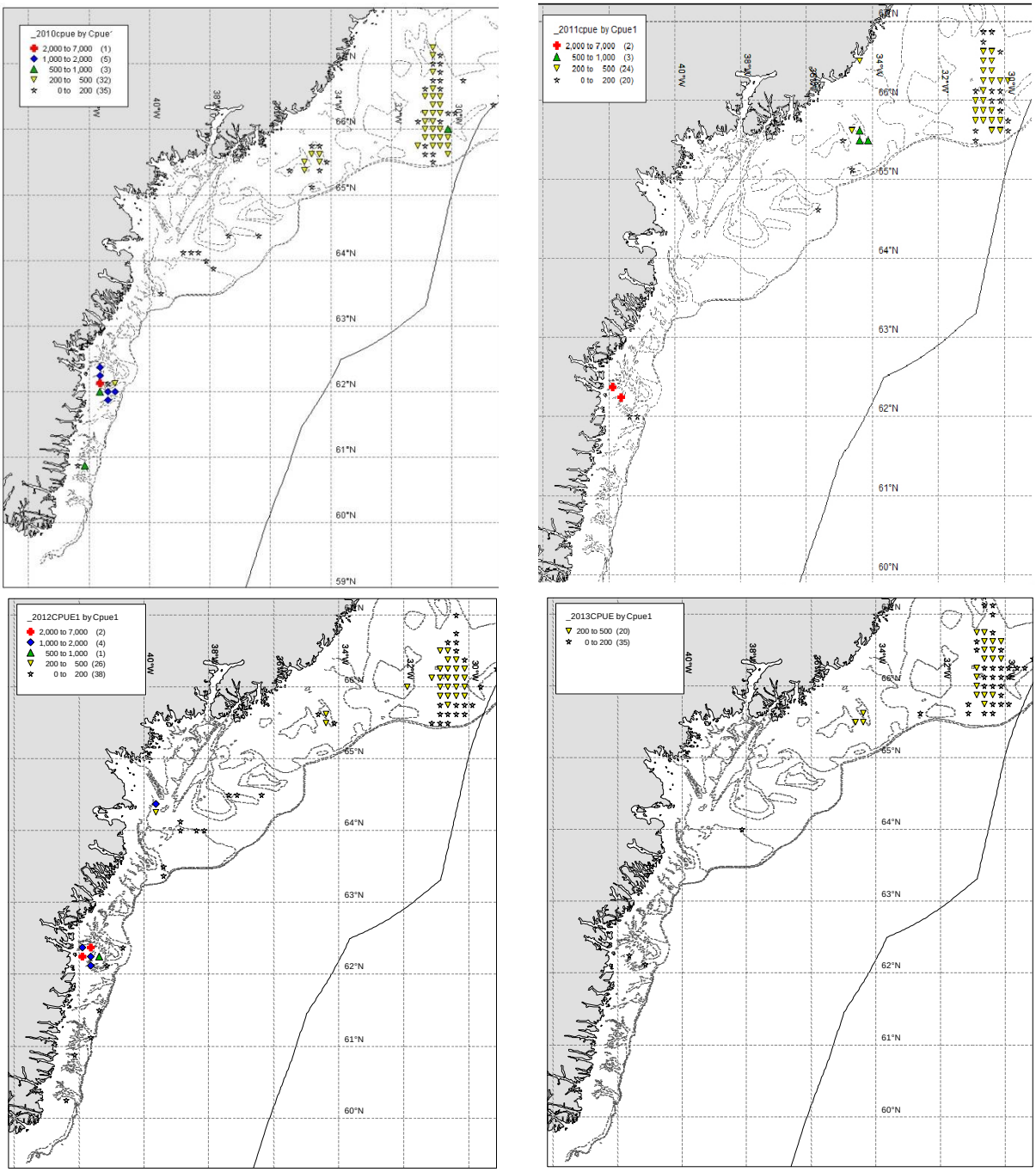


Figure 4. Thematic mapping of different levels of CPUE in the shrimp fishery in Denmark Strait/off East Greenland 2010-2013 (2013 until July).



Appendix 1. Results and diagnostical outputs from GLM run of model for standardising CPUE in the Greenlandic zone including the area effect. Data from Greenlandic, Faeroese, Norway and EU vessels.

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The SAS System                                        23:13 Friday, September 13, 2013

                      The GLM Procedure

                   Class Level Information

Class       Levels  Values

BAAD            16  E005 E008 E013 E020 E025 E031 E033 E044 E048 E052 E060 E067 E072 E073
E078 E081

YEAR            27  87 88 89 90 91 92 94 95 96 97 98 99 100 101 102 103 104 105 106 107
108 109 110 111 112 113 999

MONTH            9  1 2 4 5 6 7 8 11 12

AREA             2  21 22

HOLD             2  2 9


            Number of Observations Read        3289
            Number of Observations Used        3289

Dependent Variable: LNCPUE
Weight: Hauls

                                 Sum of
Source              DF         Squares     Mean Square     F Value    Pr > F
Model               68     51708.23771       760.41526       99.80    <.0001
Error             3220     24535.03136         7.61957
Corrected Total   3288     76243.26907


      R-Square     Coeff Var      Root MSE    LNCPUE Mean
      0.678201      249.3914      2.760358       1.106838


 Source              DF       Type I SS     Mean Square    F Value    Pr > F
 BAAD                15     23731.16721      1582.07781     207.63    <.0001
 YEAR*AREA           44     23666.81790       537.88222      70.59    <.0001
 MONTH                8      4294.15031       536.76879      70.45    <.0001
 AREA                 0         0.00000              .          .         .
 HOLD                 1        16.10230        16.10230       2.11    0.1461



 Source              DF     Type III SS     Mean Square    F Value    Pr > F
 BAAD                15      8880.30900       592.02060      77.70    <.0001
 YEAR*AREA           43     15606.29678       362.93713      47.63    <.0001
 MONTH                8      4272.89270       534.11159      70.10    <.0001
 AREA                 1      1971.30349      1971.30349     258.72    <.0001
 HOLD                 1        16.10230        16.10230       2.11    0.1461


                                          Standard
 Parameter               Estimate             Error    t Value   Pr > |t|
 Intercept          1.072967867 B      0.11092669       9.67     <.0001
 YEAR*AREA 87 21    0.693422187 B      0.07093767       9.78     <.0001
 YEAR*AREA 88 21    0.493594187 B      0.06691924       7.38     <.0001
 YEAR*AREA 89 21    0.108764301 B      0.06606757       1.65     0.0998
 YEAR*AREA 90 21    0.099417939 B      0.06595288       1.51     0.1318
 YEAR*AREA 91 21   -0.100676639 B      0.06522059      -1.54     0.1228
 YEAR*AREA 92 21   -0.310088872 B      0.06832104      -4.54     <.0001
 YEAR*AREA 94 21    0.352033321 B      0.08364607       4.21     <.0001
 YEAR*AREA 94 22    0.812371133 B      0.07665924      10.60     <.0001
```

YEAR*AREA	95 21	0.172882175 B	0.07535129	2.29	0.0218
YEAR*AREA	95 22	0.634222850 B	0.09252539	6.85	<.0001
YEAR*AREA	96 21	0.067986892 B	0.09118840	0.75	0.4560
YEAR*AREA	96 22	0.968343319 B	0.07775416	12.45	<.0001
YEAR*AREA	97 21	0.385846958 B	0.11226422	3.44	0.0006
YEAR*AREA	97 22	0.914065359 B	0.08133914	11.24	<.0001
YEAR*AREA	98 21	0.725042108 B	0.10317482	7.03	<.0001
YEAR*AREA	98 22	1.048292939 B	0.09151033	11.46	<.0001
YEAR*AREA	99 21	0.524832157 B	0.10736217	4.89	<.0001
YEAR*AREA	99 22	1.303160761 B	0.11169754	11.67	<.0001
YEAR*AREA	100 21	0.673554695 B	0.08199078	8.22	<.0001
YEAR*AREA	100 22	1.268582001 B	0.09014560	14.07	<.0001
YEAR*AREA	101 21	0.533204314 B	0.11109122	4.80	<.0001
YEAR*AREA	101 22	0.995395845 B	0.07600175	13.10	<.0001
YEAR*AREA	102 21	0.510989967 B	0.10836774	4.72	<.0001
YEAR*AREA	102 22	1.202785568 B	0.08365563	14.38	<.0001
YEAR*AREA	103 21	0.547272257 B	0.08459180	6.47	<.0001
YEAR*AREA	103 22	1.027643140 B	0.08714319	11.79	<.0001
YEAR*AREA	104 21	0.888325715 B	0.07991567	11.12	<.0001
YEAR*AREA	104 22	1.001551793 B	0.10363561	9.66	<.0001
YEAR*AREA	105 21	0.859758079 B	0.08866592	9.70	<.0001
YEAR*AREA	105 22	1.239492436 B	0.10463936	11.85	<.0001
YEAR*AREA	106 21	0.899148783 B	0.09257385	9.71	<.0001
YEAR*AREA	106 22	1.176141671 B	0.13038289	9.02	<.0001
YEAR*AREA	107 21	0.778624580 B	0.09274690	8.40	<.0001
YEAR*AREA	107 22	1.276469548 B	0.14283940	8.94	<.0001
YEAR*AREA	108 21	0.993093292 B	0.10418081	9.53	<.0001
YEAR*AREA	108 22	0.824323528 B	0.24478433	3.37	0.0008
YEAR*AREA	109 21	1.397867077 B	0.09910697	14.10	<.00010001
YEAR*AREA	109 22	1.484441980 B	0.22805306	6.51	<.00010001
YEAR*AREA	110 21	0.727203288 B	0.08929577	8.14	<.00010001
YEAR*AREA	110 22	1.249907713 B	0.33814668	3.70	0.00020002
YEAR*AREA	111 21	0.781334397 B	0.13510609	5.78	<.00010001
YEAR*AREA	112 21	0.530806719 B	0.10908124	4.87	<.00010001
YEAR*AREA	113 21	0.085767809 B	0.11669498	0.73	0.46244624
YEAR*AREA	999 21	-0.515482899 B	0.07117305	-7.24	<.00010001
YEAR*AREA	999 22	0.000000000 B	.	.	.

Parameter		Estimate		Standard Error	t Value	Pr > |t|
BAAD	E005	-1.163358187	B	0.10203859	-11.40	<.0001
BAAD	E008	-1.070284264	B	0.09793863	-10.93	<.0001
BAAD	E013	-0.969395416	B	0.09908529	-9.78	<.0001
BAAD	E020	-0.882620176	B	0.09634984	-9.16	<.0001
BAAD	E025	-0.787348483	B	0.09498420	-8.29	<.0001
BAAD	E031	-0.719386940	B	0.09390930	-7.66	<.0001
BAAD	E033	-0.657591363	B	0.09517248	-6.91	<.0001
BAAD	E044	-0.560121185	B	0.09196270	-6.09	<.0001
BAAD	E048	-0.508617064	B	0.09536599	-5.33	<.0001
BAAD	E052	-0.444221474	B	0.10035317	-4.43	<.0001
BAAD	E060	-0.383615596	B	0.09358773	-4.10	<.0001
BAAD	E067	-0.298673162	B	0.09112104	-3.28	0.0011
BAAD	E072	-0.227707551	B	0.09289917	-2.45	0.0143
BAAD	E073	-0.186634447	B	0.09434632	-1.98	0.0480
BAAD	E078	-0.112928770	B	0.09416503	-1.20	0.2305
BAAD	E081	0.000000000	B	.	.	.
MONTH	1	0.321073925	B	0.02970196	10.81	<.00010001
MONTH	2	0.284333198	B	0.02960369	9.60	<.00010001
MONTH	4	0.155801125	B	0.02861598	5.44	<.00010001
MONTH	5	0.095347799	B	0.04088934	2.33	0.01980198
MONTH	6	-0.046624887	B	0.07771058	-0.60	0.54865486
MONTH	7	0.341238793	B	0.07125552	4.79	<.00010001
MONTH	8	0.058859788	B	0.05193637	1.13	0.25722572
MONTH	11	-0.258737253	B	0.03132303	-8.26	<.00010001
MONTH	12	0.000000000	B	.	.	.
AREA	21	0.000000000	B	.	.	.
AREA	22	0.000000000	B	.	.	.
HOLD	2	0.041970284	B	0.02887110	1.45	0.14611461
HOLD	9	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.

Contrast	DF	Contrast SS	Mean Square	F Value	Pr > F
E005 v E008	1	16.61160715	16.61160715	2.18	0.1399
E008 v E013	1	24.00235284	24.00235284	3.15	0.0760
E013 v E020	1	19.08169116	19.08169116	2.50	0.1136
E020 v E025	1	30.41370561	30.41370561	3.99	0.0458
E025 v E031	1	19.37251777	19.37251777	2.54	0.1109
E031 v E033	1	16.00150487	16.00150487	2.10	0.1474
E033 v E044	1	50.56525256	50.56525256	6.64	0.0100
E044 v E048	1	11.92867640	11.92867640	1.57	0.2109
E048 v E052	1	9.56424170	9.56424170	1.26	0.2626
E067 v E072	1	29.43606222	29.43606222	3.86	0.0494
E072 v E073	1	7.94813632	7.94813632	1.04	0.3072
E073 v E078	1	20.26616815	20.26616815	2.66	0.1030
E078 v E081	1	10.95873966	10.95873966	1.44	0.2305
m01 v m02	1	16.4266793	16.4266793	2.16	0.1421
m02 v m04	1	227.2428962	227.2428962	29.82	<.0001
m04 v m05	1	21.1966267	21.1966267	2.78	0.0954
m05 v m06	1	23.9046238	23.9046238	3.14	0.0766
m06 v m07	1	120.3232801	120.3232801	15.79	<.0001
m07 v m08	1	98.0425115	98.0425115	12.87	0.0003
m08 v m11	1	312.4329089	312.4329089	41.00	<.0001
m11 v m12	1	519.9014235	519.9014235	68.23	<.0001

Appendix 2. Results and diagnostical outputs from GLM run of model without area interaction for standardising CPUE in Greenlandic zone. Data from Greenlandic, Faeroese, Norway and EUvessels.

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The SAS System                                        20:41 Friday, September 13, 2013

                      The GLM Procedure

                   Class Level Information

Class       Levels  Values

BAAD            16  E001 E005 E012 E015 E022 E035 E042 E050 E055 E061 E064 E068 E073 E077
E080 E081

YEAR            27  88 89 90 91 92 93 94 95 96 97 98 99 100 101 102 103 104 105 106 107
108 109 110 111 112 113 999

MONTH            8  2 3 4 6 7 8 11 12

HOLD             2  2 9


            Number of Observations Read        3817
            Number of Observations Used        3817


Dependent Variable: LNCPUE
Weight: Hauls

                              Sum of
 Source             DF          Squares     Mean Square     F Value    Pr > F              Model
49     58237.91368      1188.52885      133.02    <.0001              Error            3767
33658.42095         8.93507                                Corrected Total  3816     91896.33463


      R-Square     Coeff Var      Root MSE    LNCPUE Mean
      0.633735      254.0972      2.989159       1.176384


 Source             DF       Type I SS     Mean Square     F Value    Pr > F
 BAAD               15     22822.58041      1521.50536      170.28    <.0001
 YEAR               26     32502.66855      1250.10264      139.91    <.0001
 MONTH               7      2831.31900       404.47414       45.27    <.0001
 HOLD                1        81.34571        81.34571        9.10    0.0026


 Source             DF     Type III SS     Mean Square     F Value    Pr > F
 BAAD               15     15154.88133      1010.32542      113.07    <.0001
 YEAR               26     29299.01481      1126.88519      126.12    <.0001
 MONTH               7      2865.20554       409.31508       45.81    <.0001
 HOLD                1        81.34571        81.34571        9.10    0.0026
```

Parameter		Estimate		Standard Error	t Value	Pr > |t|
Intercept		2.149991600	B	0.10086175	21.32	<.0001
BAAD	E001	-1.991244595	B	0.16580550	-12.01	<.0001
BAAD	E005	-1.581016555	B	0.10508276	-15.05	<.0001
BAAD	E012	-1.458409676	B	0.09681095	-15.06	<.0001
BAAD	E015	-1.335509277	B	0.10192046	-13.10	<.0001
BAAD	E022	-1.246389980	B	0.09531900	-13.08	<.0001
BAAD	E035	-1.133834109	B	0.09334739	-12.15	<.0001
BAAD	E042	-1.016323281	B	0.09451265	-10.75	<.0001
BAAD	E050	-0.932019790	B	0.09228048	-10.10	<.0001
BAAD	E055	-0.857743103	B	0.09728669	-8.82	<.0001
BAAD	E061	-0.697220858	B	0.09298240	-7.50	<.0001
BAAD	E064	-0.628180430	B	0.10255626	-6.13	<.0001
BAAD	E068	-0.535433203	B	0.09370031	-5.71	<.0001
BAAD	E073	-0.470770550	B	0.09349327	-5.04	<.0001
BAAD	E077	-0.369988067	B	0.09627708	-3.84	0.0001
BAAD	E080	-0.255617271	B	0.10766469	-2.37	0.0176
BAAD	E081	0.000000000	B	.	.	.
YEAR	88	-0.192353547	B	0.04789494	-4.02	<.0001
YEAR	89	-0.602034100	B	0.04732222	-12.72	<.0001
YEAR	90	-0.582411605	B	0.04739514	-12.29	<.0001
YEAR	91	-0.771144280	B	0.04731949	-16.30	<.0001
YEAR	92	-0.990191850	B	0.05219433	-18.97	<.0001
YEAR	93	-1.037181078	B	0.05233761	-19.82	<.0001
YEAR	94	0.002163217	B	0.05392809	0.04	0.9680
YEAR	95	-0.236425395	B	0.05372093	-4.40	<.0001
YEAR	96	0.016896103	B	0.05512726	0.31	0.7592
YEAR	97	0.252986517	B	0.06013674	4.21	<.0001
YEAR	98	0.340739950	B	0.06614226	5.15	<.0001
YEAR	99	0.464699680	B	0.07381493	6.30	<.0001
YEAR	100	0.443359613	B	0.05842990	7.59	<.0001
YEAR	101	0.428132093	B	0.05778476	7.41	<.0001
YEAR	102	0.571576355	B	0.06291671	9.08	<.0001
YEAR	103	0.334600090	B	0.05909024	5.66	<.0001
YEAR	104	0.424686243	B	0.06266150	6.78	<.0001
YEAR	105	0.569786354	B	0.06824272	8.35	<.0001
YEAR	106	0.489103863	B	0.07490442	6.53	<.0001
YEAR	107	0.362359789	B	0.07768533	4.66	<.0001
YEAR	108	0.510173590	B	0.09361840	5.45	<.0001
YEAR	109	0.862382965	B	0.08914517	9.67	<.0001
YEAR	110	0.228221128	B	0.07875696	2.90	0.0038
YEAR	111	0.213265746	B	0.13646030	1.56	0.1182
YEAR	112	-0.007071196	B	0.10686893	-0.07	0.9472
YEAR	113	-0.412868129	B	0.11510775	-3.59	0.0003
YEAR	999	0.000000000	B	.	.	.
MONTH	2	0.188882505	B	0.02738380	6.90	<.0001
MONTH	3	0.086488919	B	0.03162272	2.74	0.0063
MONTH	4	0.154472756	B	0.03705757	4.17	<.0001
MONTH	6	0.039488200	B	0.04038087	0.98	0.3282
MONTH	7	0.403292173	B	0.06765691	5.96	<.0001
MONTH	8	0.153557058	B	0.05034060	3.05	0.0023
MONTH	11	-0.224078411	B	0.03149437	-7.11	<.0001
MONTH	12	0.000000000	B	.	.	.
HOLD	2	-0.091043506	B	0.03017385	-3.02	0.0026
HOLD	9	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.

Dependent Variable: LNCPUE
Weight: Hauls

Contrast	DF	Contrast SS	Mean Square	F Value	Pr > F
E001 v E005	1	65.3806126	65.3806126	7.32	0.0069
E005 v E012	1	30.3848686	30.3848686	3.40	0.0653
E012 v E015	1	39.0719206	39.0719206	4.37	0.0366
E015 v E022	1	22.2020131	22.2020131	2.48	0.1150
E035 v E042	1	87.9948745	87.9948745	9.85	0.0017
E042 v E050	1	51.2289795	51.2289795	5.73	0.0167
E050 v E055	1	28.2741394	28.2741394	3.16	0.0753
E055 v E061	1	119.0371551	119.0371551	13.32	0.0003
E061 v E064	1	14.4660676	14.4660676	1.62	0.2033
E064 v E068	1	24.8135563	24.8135563	2.78	0.0957
E068 v E073	1	25.6660904	25.6660904	2.87	0.0902
E073 v E077	1	46.6031429	46.6031429	5.22	0.0224
E077 v E080	1	23.5607445	23.5607445	2.64	0.1045
E080 v E081	1	50.3653533	50.3653533	5.64	0.0176
m02 v m03	1	156.6824248	156.6824248	17.54	<.0001
m03 v m04	1	35.0495847	35.0495847	3.92	0.0477
m04 v m06	1	66.0983975	66.0983975	7.40	0.0066
m06 v m07	1	237.2646366	237.2646366	26.55	<.0001
m07 v m08	1	98.4297808	98.4297808	11.02	0.0009
m08 v m11	1	547.8668693	547.8668693	61.32	<.0001
m11 v m12	1	452.3059714	452.3059714	50.62	<.0001
m12 v m01	1	425.1031350	425.1031350	47.58	<.0001