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An analyses of logbooks of Greenland Halibut Stock Component in NAFO Division 1A Inshore.

by

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Abstract

This paper presents an analyses of logbooks data of the commercial gillnet and longline fishery of Greenland halibut in NAFO Division 1A inshore. The majority of the inshore fishery is concentrated in the Disko Bay and the districts surrounding Uummannaq and Upernavik. Logbooks have been mandatory for vessels larger than 30'ft since 2008 and constitute the basic of the estimation of a gillnet and longline standardized CPUE-series for the Disko Bay, Uumannaq and Upernavik districts.

Introduction

Greenland halibut can be found in all waters around Greenland both offshore and inshore but the highest concentrations has always been found in NAFO division 1A inshore. The stock is considered to be recruited from the stock in the Davis Strait, but the adults appear resident in the fjords and are isolated from the offshore spawning stock (Riget and Boje, 1989). As a result, the inshore component probably does not contribute significantly to the spawning stock in the Davis Strait (Boje, 1994). In samples from Disko Bay <10% of females in the reproductive age, were mature during the assumed peak spawning period in spring (Simonsen and Gundersen 2005) and only sporadic spawning has been observed in the inshore area (Jørgensen and Boje, 1994). The inshore component is assumed not to be self-sustainable, but dependent on recruits and immigration from the offshore area (Bech, 1995).

Description of the fishery

Longline fishery constitutes the majority of the total landings. In the late 1990s, the first regulations limiting areas open to gillnet fishery were introduced, limiting gillnet fishery to the winter season. Competence to regulate seasons and areas open to gillnet fishery, was transferred to municipalities in 2004, and areas open to gillnet fishery has expanded since then. The gillnet fishery is regulated by a minimum mesh-size of 110 mm (half meshes) although increased illegal use of cod gillnets (80mm) used to target Greenland halibut has been observed since 2008. Licences requirements were introduced in 1998 and in 2008 TAC and quota regulations were introduced for the inshore fishery.

The fishery in the Disko bay has always been highly concentrated around the bank just south of Ilulissat and typically more than one third of the Disko Bay catches are from small area (see SCR Doc.17/041). Other important fishing grounds in the Disko Bay is the deep Kangia ice fjord (>900m) and the northern part of the Disko Bay concentrated around the settlements Saqqaq and Qeqertaq and the ice fjord Torssukattak east of the settlements. The fishery in Uummannaq is scattered all over the fjord near settlements (see SCR Doc.17/041). Particular in the deep South-eastern part of the fjord from Uummannaq and towards East where depths of more than 1500 meters are common and large iceberg producing glaciers are located holds the more important fishing areas. The Upernavik area consists of several large ice fjords, but the main fishing grounds are the deep Ikeq fjord (Upernavik Icefjord) and Gulteqarffik (Giesecke Icefjord) and the shallower fjords surrounding Upernavik and the settlements in the area Use of gillnets have been prohibited in Upernavik, but derogations have been given for a fishery outside the Icefjords since 2002.



Logbook data

Logbooks have been mandatory for vessels greater than 30'ft (9,4 m) since 2008. Data on the all inshore landings are reported to the Greenland Fishery Licence Authority (GFLK). Factories receiving the catch gather information on the fishery, including effort and location on individual fishing events and send the data to GFLK on a weekly basis.

Logbook CPUE

A general linear model (GLM) with year, month and boat as factors was applied to the longline and gillnet fishery logbook data since 2008. Only longline setting with more than 200 hooks and gillnets with catches between 50 and 200 kg/gillnet were included to omit obvious outlier values. CPUE observations were log-transformed prior to the GLM analysis. Least-mean square estimates were used as standardized CPUE series.

Disko Bay

The longline logbook catch's in 2007 and 2008 were very low (Table 1) and were not included in the analyses. In most years the logbook catch constituted around 30% of the total longline catch (Table 1). The GLM model explained 22% of the total variation (Appendix 1). The mean log-CPUE and the standardised log-CPUE series was rather similar showing a decreasing trend since 2009, however the log-CPUE increased from 2015 to 2016 (Fig. 1).

The gillnet logbook catch's constituted ca. 32 to 54% of the total gillnet catch in the period from 2011 and onward (Table 1). The GLM model explained 28% of the total variation (Appendix 2). The standardized gillnet log-CPUE series has been rather stable since 2011 (Fig. 2).

Umannaq

The longline logbook catch's constituted around 15% except in 2007 when logbooks was not mandatory, and therefore omitted in the analyses (Table 2). In most years with known separation of the total catch on longline and gillnet catch's, the logbook longline catch constituted around 15% of the total longline catch (Table 2). The GLM model explained 19% of the total variation (Appendix 3). No change in the standardized gillnet log-CPUE had occurred from 2015 to 2016 after it was at a somewhat higher level in the period from 2010 to 2014 (Fig. 3).

The gillnet logbook catch's constituted ca. 26 to 53% of the total gillnet catch in the period from 2011 to 2014 but decreased to about 7% in 2015 and 2016 (Table 2). The GLM model explained 27% of the total variation (Appendix 4). After a drop in 2012 the standardized gillnet log-CPUE had been stable (Fig. 4).

Upernavik

The longline logbook catch's constituted a lower part of the total longline catch in 2015 and 2016 (ca. 16%) compared to earlier years (Table 3). The GLM model included longline CPUE data from 2007 to 2016 and explained 25% of the total variation (Appendix 5). Since 2007 the longline CPUE has gradually decreased and were in 2015 and 2016 at the lowest level observed in the period. (Fig. 5).

The gillnet logbook catch's constituted ca. 20 to 37% of the total gillnet catch in the period from 2009 to 2014 but decreased to about 9% in 2015 and 2016 (Table 3). The GLM model explained 37% of the total variation (Appendix 6). Similar to the longline CPUE has the gillnet CPUE gradually decreased since 2009 and was in 2016 at its lowest observed in the period (Fig. 6).

Discussion

A gradual shift towards using illegal (legal for cod) 80mm gillnets (halfmesh) from mandatory 110 mm gillnets has been observed in recent years in the Disko Bay, Using more fine meshed gillnets will mean a greater overlap between the selection curve and the underlying population and therefore a more efficient gear. The use of finer meshed gillnets is a way for the fishermen to compensate for a decreasing stock (where larger fish have been lost and smaller fish remain) and maintain a higher CPUE.

Table 1. Disko bay logbooks data

Year	Total catch of Longline	No of Longline settings	Total longline logbook catch (t)	Total catch of gillnet	No of gillnet settings	Total gillnet logbook catch
2007		262				
2008		338				
2009		727			55	32
2010	7286	2035	1707 (23.4%)	1591	19	13 (0.8%)
2011	6043	2593	1764 (28.2%)	1368	1063	698 (51.0%)
2012	6901	2766	2147 (31.1%)	996	456	321(32.3%)
2013	7545	3221	2461 (32.6%)	1524	1225	828 (54.3%)
2014	7193	2708	2175 (30.2%)	1979	1167	934 (47.2%)
2015	7129	2340	1674 (32.8%)	1546	1249	809 (52.3%)
2016		2211	2104 (%)		1341	896 (%)

Table 2. Uumannaq logbooks data

Year	Total catch of Longline	No of Longline settings	Total longline logbook catch (t)	Total catch of gillnet	No of gillnet settings	Total gillnet logbook catch
2006		57	46			
2007		409	302			
2008		390	353			
2009		356	290			
2010	5617	466	389 (6.9%)	610		
2011	5046	691	762 (15.1%)	1179	355	353 (29.9%)
2012	5847	871	969 (16.6%)	357	172	188 (52.7%)
2013	6639	1254	1140 (17.2%)	369	131	159 (35.5%)
2014	7800	1190	1312 (16.8%)	407	92	106 (26.0%)
2015	7279	1179	1055 (14.5%)	962	63	71 (7.4%)
2016		1305	1351 (%)		83	73 (%)

Table 3. Upernavik logbooks data

Year	Total catch of Longline	No of Longline settings	Total longline logbook catch (t)	Total catch of gillnet	No of gillnet settings	Total gillnet logbook catch
2006		170	158			
2007		1932	1607			
2008		1849	1491			
2009		1819	1611		151	
2010	5443	2534	2114 (38.8%)	411	239	84 (20.4%)
2011	6176	2471	1992 (32.3%)	362	572	122 (33.7%)
2012	6204	2153	2136 (34.4%)	514	632	188 (36.6%)
2013	5606	1415	1235 (22.0%)	433	619	159 (36.7%)
2014	6964	1822	1820 (26.1%)	409	153	106 (25.9%)
2015	5491	996	877 (16.0%)	782	381	71 (9.1%)
2016		896	730 (%)		378	73 (%)

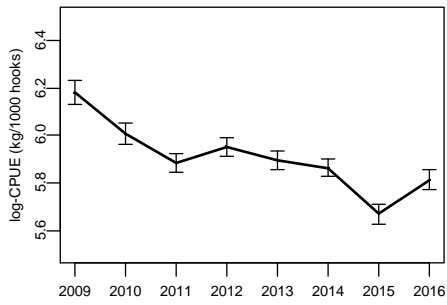


Fig. 1. Standardized mean and 95% CI of longline CPUE in Disko Bay.

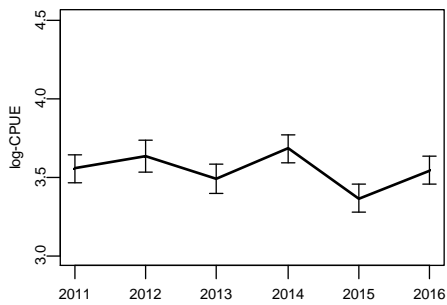


Fig. 2. Standardized mean and 95% CI of gillnet CPUE in Disko Bay.

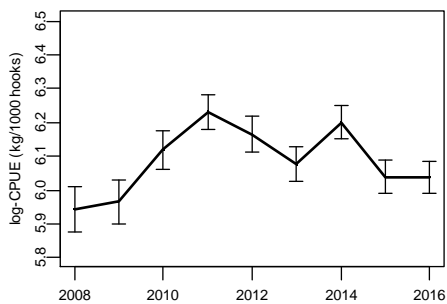


Fig. 3. Standardized mean and 95% CI of longline CPUE in Uumannaq.

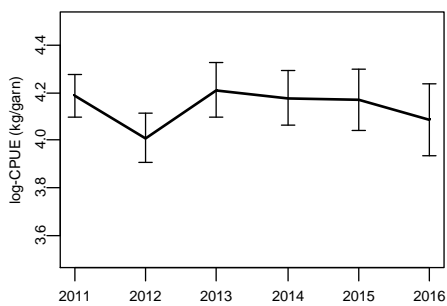


Fig. 4. Standardized mean and 95% CI of gillnet CPUE in Uumannaq.

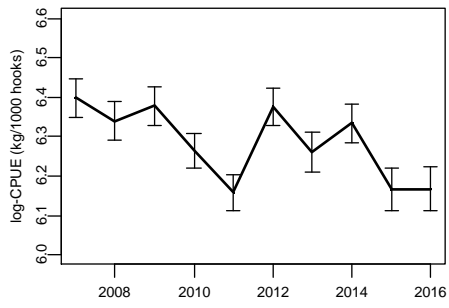


Fig. 5. Standardized mean and 95% CI of longline CPUE in Upernavik.

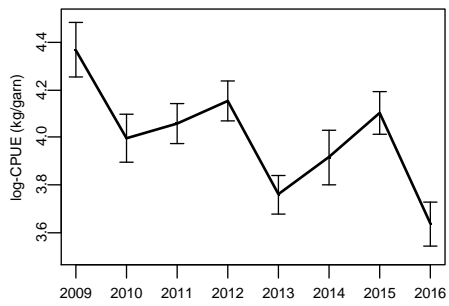


Fig. 6. Standardized mean and 95% CI of gillnet CPUE in Upernavik.

Appendix 1

Disko logline GLM (log-CPUE ~ intercept + Year + Month + Boat)

```
lm(formula = lcpue ~ Year + Month + Boat)
```

Residuals:

```
      Min       1Q   Median       3Q      Max
-5.6145 -0.2410  0.0397  0.2900  2.9706
```

Coefficients:

	Estimate	Std. Error	t value	Pr(> t)	
(Intercept)	6.268909	0.051467	121.804	< 2e-16	***
Year2010	-0.174493	0.022131	-7.885	3.33e-15	***
Year2011	-0.297692	0.021718	-13.707	< 2e-16	***
Year2012	-0.229655	0.021600	-10.632	< 2e-16	***
Year2013	-0.288252	0.021279	-13.546	< 2e-16	***
Year2014	-0.317641	0.021962	-14.463	< 2e-16	***
Year2015	-0.512902	0.022327	-22.972	< 2e-16	***
Year2016	-0.369236	0.022852	-16.158	< 2e-16	***
Month2	-0.212071	0.030885	-6.867	6.79e-12	***
Month3	-0.269751	0.039843	-6.770	1.32e-11	***
Month4	-0.325434	0.029289	-11.111	< 2e-16	***
Month5	-0.294475	0.020737	-14.201	< 2e-16	***
Month6	-0.101562	0.019707	-5.154	2.58e-07	***
Month7	-0.166126	0.019901	-8.348	< 2e-16	***
Month8	-0.156792	0.020395	-7.688	1.57e-14	***
Month9	-0.228622	0.020292	-11.266	< 2e-16	***
Month10	-0.209878	0.020262	-10.358	< 2e-16	***
Month11	-0.134917	0.020987	-6.429	1.32e-10	***
Month12	-0.091905	0.022380	-4.107	4.03e-05	***
BoatAA	0.027081	0.093429	0.290	0.771926	
BoatAA	0.366157	0.048031	7.623	2.59e-14	***
BoatAA	0.211848	0.049768	4.257	2.09e-05	***
BoatAA	0.315582	0.203854	1.548	0.121621	
BoatAA	0.436155	0.107226	4.068	4.77e-05	***
BoatAA	-0.057697	0.160996	-0.358	0.720066	
BoatAA	0.108097	0.052735	2.050	0.040396	*
BoatAG	0.540825	0.247639	2.184	0.028980	*
BoatAJ	0.078682	0.048248	1.631	0.102958	
BoatAK	0.280633	0.098442	2.851	0.004366	**
BoatAK	0.078069	0.085625	0.912	0.361909	
BoatAN	-0.016431	0.056357	-0.292	0.770638	
BoatAN	0.123754	0.053510	2.313	0.020748	*
BoatAN	0.227769	0.178143	1.279	0.201063	
BoatAN	0.287051	0.057522	4.990	6.08e-07	***
BoatAN	0.134658	0.067374	1.999	0.045660	*
BoatAN	0.175837	0.126432	1.391	0.164314	
BoatAN	-1.060438	0.488989	-2.169	0.030123	*
BoatAN	0.246707	0.051429	4.797	1.62e-06	***
BoatAP	0.325138	0.097156	3.347	0.000820	***
BoatAR	0.058517	0.111419	0.525	0.599450	
BoatBJ	0.253236	0.068166	3.715	0.000204	***
BoatCE	-0.230432	0.083294	-2.766	0.005672	**
BoatDO	-0.248246	0.147552	-1.682	0.092503	.
BoatER	-0.334579	0.203628	-1.643	0.100380	
BoatER	0.042037	0.189523	0.222	0.824469	
BoatGA	-0.019913	0.052038	-0.383	0.701970	
BoatGE	0.019354	0.066169	0.292	0.769913	
BoatHE	0.065630	0.110308	0.595	0.551868	
BoatIL	0.290615	0.050184	5.791	7.11e-09	***
BoatIN	0.210757	0.105112	2.005	0.044971	*
BoatIP	0.138077	0.153749	0.898	0.369161	

BoatIV	0.156757	0.070564	2.222	0.026329	*
BoatJE	0.116348	0.063493	1.832	0.066899	.
BoatJE	0.150368	0.065779	2.286	0.022268	*
BoatJE	0.247032	0.047221	5.231	1.70e-07	***
BoatJE	0.059058	0.053483	1.104	0.269505	.
BoatJO	0.490710	0.050036	9.807	< 2e-16	***
BoatJO	-0.066704	0.247662	-0.269	0.787675	.
BoatJO	-0.492832	0.284774	-1.731	0.083539	.
BoatJO	-0.273015	0.347296	-0.786	0.431809	.
BoatJO	0.024827	0.177957	0.140	0.889048	.
BoatJO	-0.001280	0.189579	-0.007	0.994614	.
BoatJO	0.314772	0.488940	0.644	0.519724	.
BoatJO	0.215395	0.115501	1.865	0.062215	.
BoatJO	-0.036503	0.153732	-0.237	0.812314	.
BoatJO	0.334209	0.153412	2.179	0.029381	*
BoatJO	0.048032	0.189619	0.253	0.800033	.
BoatJO	0.164101	0.247770	0.662	0.507779	.
BoatJO	-0.304504	0.488904	-0.623	0.533405	.
BoatJO	-1.588698	0.488854	-3.250	0.001157	**
BoatJO	0.248089	0.284836	0.871	0.383772	.
BoatJO	0.800434	0.347245	2.305	0.021172	*
BoatJO	0.295934	0.488904	0.605	0.544987	.
BoatJO	0.237831	0.247629	0.960	0.336850	.
BoatJO	-0.180709	0.488896	-0.370	0.711665	.
BoatJO	0.070509	0.284589	0.248	0.804326	.
BoatJO	0.044499	0.147545	0.302	0.762965	.
BoatJO	0.414887	0.160583	2.584	0.009784	**
BoatJO	-0.047555	0.189512	-0.251	0.801869	.
BoatJO	0.074416	0.189600	0.392	0.694700	.
BoatJO	0.144714	0.488896	0.296	0.767232	.
BoatJO	0.231870	0.222509	1.042	0.297392	.
BoatJO	-0.090706	0.284571	-0.319	0.749922	.
BoatJO	0.132450	0.488940	0.271	0.786477	.
BoatJO	1.348687	0.488896	2.759	0.005810	**
BoatJO	0.290215	0.123331	2.353	0.018626	*
BoatJO	0.277949	0.153665	1.809	0.070497	.
BoatJO	-0.150353	0.488904	-0.308	0.758443	.
BoatJO	0.337053	0.347245	0.971	0.331736	.
BoatJO	0.952559	0.284774	3.345	0.000825	***
BoatJO	-0.553317	0.488940	-1.132	0.257790	.
BoatJO	-0.382581	0.222353	-1.721	0.085340	.
BoatJO	0.243550	0.147774	1.648	0.099345	.
BoatJO	-1.587480	0.488892	-3.247	0.001168	**
BoatJO	0.174052	0.347245	0.501	0.616210	.
BoatJO	0.291629	0.203846	1.431	0.152552	.
BoatJO	0.257289	0.126480	2.034	0.041942	*
BoatJO	0.393175	0.488896	0.804	0.421286	.
BoatJO	0.080138	0.247770	0.323	0.746368	.
BoatJO	0.360472	0.488904	0.737	0.460945	.
BoatJO	0.201874	0.284687	0.709	0.478265	.
BoatJO	0.084002	0.189543	0.443	0.657639	.
BoatJO	-1.388157	0.488940	-2.839	0.004529	**
BoatJO	0.097836	0.347195	0.282	0.778109	.
BoatJO	-0.369042	0.488904	-0.755	0.450357	.
BoatJO	0.153524	0.247598	0.620	0.535231	.
BoatJO	-0.455337	0.488940	-0.931	0.351725	.
BoatJO	-1.149876	0.347195	-3.312	0.000928	***
BoatJO	-0.085691	0.153686	-0.558	0.577143	.
BoatJO	0.834930	0.488904	1.708	0.087698	.
BoatJU	0.276129	0.086934	3.176	0.001494	**
BoatJU	0.547195	0.168585	3.246	0.001173	**
BoatJU	0.324184	0.053336	6.078	1.24e-09	***
BoatJU	0.182473	0.050486	3.614	0.000302	***

BoatKA	0.067073	0.222297	0.302	0.762862	
BoatKA	0.100800	0.051237	1.967	0.049158	*
BoatKA	-0.411898	0.099386	-4.144	3.42e-05	***
BoatKR	0.448863	0.073524	6.105	1.05e-09	***
BoatKU	0.090373	0.049626	1.821	0.068609	.
BoatL.	0.445220	0.053119	8.381	< 2e-16	***
BoatLA	0.202414	0.048018	4.215	2.51e-05	***
BoatLA	0.259065	0.060255	4.299	1.72e-05	***
BoatLI	-0.006245	0.061721	-0.101	0.919403	
BoatM.	0.342915	0.178059	1.926	0.054138	.
BoatMA	0.005752	0.047382	0.121	0.903385	
BoatMA	-0.030480	0.118150	-0.258	0.796425	
BoatMA	0.266626	0.057510	4.636	3.57e-06	***
BoatMA	0.067805	0.054892	1.235	0.216756	
BoatMA	-0.156789	0.137653	-1.139	0.254711	
BoatMA	-0.055555	0.100749	-0.551	0.581348	
BoatMA	0.225573	0.120643	1.870	0.061534	.
BoatMI	0.389079	0.060572	6.423	1.37e-10	***
BoatMI	-0.012115	0.050288	-0.241	0.809632	
BoatMI	-0.102949	0.049045	-2.099	0.035826	*
BoatNA	0.384563	0.074671	5.150	2.63e-07	***
BoatNA	-0.895008	0.060529	-14.786	< 2e-16	***
BoatNÃ	-0.054509	0.049285	-1.106	0.268737	
BoatNA	0.521543	0.113350	4.601	4.23e-06	***
BoatNE	-0.328410	0.115026	-2.855	0.004307	**
BoatNI	-0.064454	0.057191	-1.127	0.259758	
BoatNI	-0.213152	0.094785	-2.249	0.024538	*
BoatNI	0.689538	0.048951	14.086	< 2e-16	***
BoatNI	0.017563	0.104128	0.169	0.866060	
BoatNI	-0.083737	0.488960	-0.171	0.864025	
BoatNO	0.052983	0.059188	0.895	0.370712	
BoatNO	0.106245	0.051591	2.059	0.039472	*
BoatNO	-0.065953	0.093335	-0.707	0.479812	
BoatNU	0.037525	0.068210	0.550	0.582232	
BoatNU	-0.053430	0.084529	-0.632	0.527340	
BoatNU	0.017160	0.347115	0.049	0.960573	
BoatNU	-0.165154	0.133397	-1.238	0.215706	
BoatNU	0.405890	0.123546	3.285	0.001021	**
BoatNU	0.296239	0.079615	3.721	0.000199	***
BoatNU	-0.005727	0.061832	-0.093	0.926203	
BoatNU	0.393395	0.048387	8.130	4.56e-16	***
BoatNU	0.324110	0.091240	3.552	0.000383	***
BoatOV	0.270952	0.129954	2.085	0.037084	*
BoatPA	0.294100	0.048671	6.043	1.55e-09	***
BoatPA	0.185413	0.049465	3.748	0.000179	***
BoatPI	0.197169	0.127631	1.545	0.122402	
BoatPI	0.423028	0.052095	8.120	4.94e-16	***
BoatPI	-0.093505	0.054394	-1.719	0.085625	.
BoatQA	0.724519	0.070203	10.320	< 2e-16	***
BoatQA	0.234534	0.080558	2.911	0.003603	**
BoatQI	1.306349	0.284537	4.591	4.44e-06	***
BoatRA	0.147921	0.053368	2.772	0.005582	**
BoatRE	0.345013	0.160364	2.151	0.031455	*
BoatRI	0.134110	0.052049	2.577	0.009985	**
BoatSA	0.160688	0.047432	3.388	0.000706	***
BoatSA	0.041384	0.112834	0.367	0.713795	
BoatSA	0.128502	0.055972	2.296	0.021697	*
BoatSE	0.193964	0.065030	2.983	0.002861	**
BoatSE	-0.163569	0.087971	-1.859	0.062994	.
BoatSU	-0.279067	0.060200	-4.636	3.58e-06	***
BoatTI	0.053101	0.049180	1.080	0.280275	
BoatUI	0.515384	0.048533	10.619	< 2e-16	***
BoatUL	0.437543	0.160249	2.730	0.006332	**

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.4867 on 18424 degrees of freedom

Multiple R-squared: 0.2227, Adjusted R-squared: 0.2152

F-statistic: 29.99 on 176 and 18424 DF, p-value: < 2.2e-16



Appendix 2

Disko gillnet GLM (log-CPUE ~ intercept + Year + Month + Boat)

```
lm(formula = lcpue ~ Year + Month + Boat)
```

Residuals:

Min	1Q	Median	3Q	Max
-5.2861	-0.3642	0.0895	0.4746	1.9319

Coefficients:

	Estimate	Std. Error	t value	Pr(> t)	
(Intercept)	3.336371	0.282517	11.809	< 2e-16	***
Year2012	0.075720	0.045412	1.667	0.095484	.
Year2013	-0.064981	0.035070	-1.853	0.063944	.
Year2014	0.126218	0.036095	3.497	0.000474	***
Year2015	-0.189387	0.036433	-5.198	2.07e-07	***
Year2016	-0.012791	0.035997	-0.355	0.722354	
Month2	0.021560	0.031671	0.681	0.496058	
Month3	-0.171153	0.032394	-5.284	1.31e-07	***
Month4	0.003836	0.032086	0.120	0.904831	
Month11	-1.074845	0.080242	-13.395	< 2e-16	***
Month12	-0.963431	0.141861	-6.791	1.21e-11	***
BoatAA	0.940775	0.285481	3.295	0.000988	***
BoatAA	1.307658	0.285095	4.587	4.59e-06	***
BoatAA	1.263459	0.286816	4.405	1.07e-05	***
BoatAJ	0.484715	0.289455	1.675	0.094065	.
BoatAN	-1.270454	0.514695	-2.468	0.013599	*
BoatAN	0.810958	0.288036	2.815	0.004885	**
BoatAN	0.754863	0.303989	2.483	0.013047	*
BoatAN	0.165314	0.310922	0.532	0.594959	
BoatAN	1.092016	0.304011	3.592	0.000331	***
BoatAQ	-0.015493	0.597464	-0.026	0.979313	
BoatAR	0.867565	0.296770	2.923	0.003475	**
BoatBJ	0.141869	0.340420	0.417	0.676878	
BoatGA	0.241072	0.296794	0.812	0.416676	
BoatIL	1.164896	0.288843	4.033	5.57e-05	***
BoatIV	0.386166	0.466443	0.828	0.407761	
BoatJE	0.841075	0.297420	2.828	0.004700	**
BoatJE	-0.038931	0.300306	-0.130	0.896857	
BoatJE	0.656155	0.286947	2.287	0.022247	*
BoatJO	1.113768	0.342061	3.256	0.001136	**
BoatJU	0.704138	0.338942	2.077	0.037799	*
BoatJU	0.889402	0.291402	3.052	0.002281	**
BoatJU	0.875983	0.292868	2.991	0.002791	**
BoatKA	1.439952	0.794841	1.812	0.070091	.
BoatKA	0.394418	0.287900	1.370	0.170740	
BoatKA	0.170239	0.466136	0.365	0.714964	
BoatKA	-1.709276	0.335716	-5.091	3.65e-07	***
BoatKR	0.872706	0.338973	2.575	0.010059	*
BoatKU	0.355822	0.289972	1.227	0.219833	
BoatL.	0.927903	0.286825	3.235	0.001222	**
BoatLA	0.458315	0.284594	1.610	0.107356	
BoatLA	0.618604	0.292439	2.115	0.034440	*
BoatMA	0.843479	0.285360	2.956	0.003129	**
BoatMA	0.941080	0.288413	3.263	0.001108	**
BoatMA	0.091835	0.298171	0.308	0.758097	
BoatMI	0.692532	0.287684	2.407	0.016100	*
BoatMI	0.600434	0.305663	1.964	0.049531	*
BoatMI	-0.091619	0.397629	-0.230	0.817778	
BoatNA	0.650602	0.330830	1.967	0.049275	*
BoatNÂ	-0.025531	0.284388	-0.090	0.928469	
BoatNA	0.604971	0.311086	1.945	0.051854	.

BoatNI	0.412717	0.294609	1.401	0.161294	
BoatNI	1.381215	0.442332	3.123	0.001801	**
BoatNI	0.630807	0.288687	2.185	0.028918	*
BoatNI	0.749313	0.302264	2.479	0.013201	*
BoatNO	0.893065	0.361230	2.472	0.013451	*
BoatNO	0.194743	0.290690	0.670	0.502924	
BoatNU	1.351669	0.346097	3.905	9.50e-05	***
BoatNU	0.917864	0.340304	2.697	0.007011	**
BoatNU	1.465127	0.397946	3.682	0.000234	***
BoatNU	0.431367	0.332860	1.296	0.195043	
BoatNU	0.762222	0.286770	2.658	0.007881	**
BoatPA	1.011911	0.289704	3.493	0.000481	***
BoatPA	0.682745	0.286441	2.384	0.017176	*
BoatPI	1.436591	0.289590	4.961	7.20e-07	***
BoatQA	1.469539	0.290241	5.063	4.24e-07	***
BoatRA	0.284216	0.796202	0.357	0.721130	
BoatRI	0.492902	0.289424	1.703	0.088608	.
BoatSA	-0.015747	0.287016	-0.055	0.956247	
BoatSA	0.826750	0.307379	2.690	0.007171	**
BoatSE	0.220794	0.310716	0.711	0.477359	
BoatSE	0.224168	0.299780	0.748	0.454623	
BoatSU	-0.151252	0.795972	-0.190	0.849298	
BoatTI	0.130682	0.308050	0.424	0.671417	
BoatUI	1.052173	0.286209	3.676	0.000239	***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.7434 on 6426 degrees of freedom
Multiple R-squared: 0.2782, Adjusted R-squared: 0.2699
F-statistic: 33.48 on 74 and 6426 DF, p-value: < 2.2e-16

Appendix 3

Umannaq logline GLM (log-CPUE ~ intercept + Year + Month + Boat)

```
lm(formula = lcpue ~ Year + Month + Boat)
```

Residuals:

```
      Min       1Q   Median       3Q      Max
-4.6871 -0.2305  0.0215  0.2598  2.8324
```

Coefficients:

	Estimate	Std. Error	t value	Pr(> t)	
(Intercept)	6.142703	0.068564	89.591	< 2e-16	***
Year2009	0.022732	0.036056	0.630	0.528409	
Year2010	0.176050	0.035053	5.022	5.22e-07	***
Year2011	0.287609	0.032219	8.927	< 2e-16	***
Year2012	0.221426	0.030804	7.188	7.19e-13	***
Year2013	0.133372	0.029815	4.473	7.81e-06	***
Year2014	0.257556	0.030257	8.512	< 2e-16	***
Year2015	0.095825	0.030405	3.152	0.001630	**
Year2016	0.094745	0.030596	3.097	0.001964	**
Month2	0.116288	0.089814	1.295	0.195443	
Month3	0.050066	0.096495	0.519	0.603885	
Month4	0.054850	0.094299	0.582	0.560814	
Month5	0.066282	0.061929	1.070	0.284521	
Month6	0.181431	0.059468	3.051	0.002289	**
Month7	0.308895	0.059062	5.230	1.74e-07	***
Month8	0.219421	0.059324	3.699	0.000218	***
Month9	0.139783	0.060017	2.329	0.019881	*
Month10	0.078647	0.059853	1.314	0.188888	
Month11	-0.005903	0.062433	-0.095	0.924678	
Month12	0.077353	0.068496	1.129	0.258803	
BoatAA	-0.143938	0.047576	-3.025	0.002491	**
BoatAA	-0.207766	0.063470	-3.273	0.001067	**
BoatAA	-0.255873	0.089593	-2.856	0.004302	**
BoatAA	-0.266115	0.084263	-3.158	0.001594	**
BoatAA	-0.902250	0.087248	-10.341	< 2e-16	***
BoatAA	-0.412467	0.080492	-5.124	3.06e-07	***
BoatAA	-0.188800	0.077541	-2.435	0.014921	*
BoatAG	0.028010	0.036829	0.761	0.446950	
BoatAJ	-0.183854	0.259446	-0.709	0.478568	
BoatAK	-1.596302	0.446799	-3.573	0.000355	***
BoatAK	-0.480048	0.054750	-8.768	< 2e-16	***
BoatAK	-0.254113	0.040782	-6.231	4.88e-10	***
BoatAN	-0.201046	0.041128	-4.888	1.04e-06	***
BoatAN	-0.082954	0.035378	-2.345	0.019061	*
BoatAN	-0.282882	0.059656	-4.742	2.16e-06	***
BoatAN	0.014318	0.035338	0.405	0.685354	
BoatAR	-0.407916	0.159891	-2.551	0.010754	*
BoatBJ	-0.222062	0.034988	-6.347	2.32e-10	***
BoatDO	-0.043041	0.031911	-1.349	0.177446	
BoatER	-0.001915	0.063445	-0.030	0.975918	
BoatGA	-0.984218	0.226561	-4.344	1.42e-05	***
BoatIL	-0.393676	0.226011	-1.742	0.081576	.
BoatIN	-0.169846	0.032799	-5.178	2.29e-07	***
BoatIP	-1.632807	0.138508	-11.789	< 2e-16	***
BoatJE	-0.007458	0.051086	-0.146	0.883936	
BoatJE	-0.660010	0.115031	-5.738	9.97e-09	***
BoatJU	-0.121662	0.084597	-1.438	0.150438	
BoatJU	-0.021773	0.035077	-0.621	0.534815	
BoatJU	-0.049691	0.258393	-0.192	0.847506	
BoatKA	-0.197322	0.054577	-3.615	0.000302	***
BoatKA	-0.359179	0.042139	-8.524	< 2e-16	***

BoatKA	-0.677071	0.446032	-1.518	0.129059	
BoatKR	-0.260704	0.150859	-1.728	0.084005	.
BoatKU	-0.622348	0.081345	-7.651	2.24e-14	***
BoatL.	-0.177010	0.078995	-2.241	0.025070	*
BoatLA	-0.256973	0.170598	-1.506	0.132029	
BoatLA	-0.182744	0.036867	-4.957	7.32e-07	***
BoatLI	0.043569	0.225451	0.193	0.846765	
BoatM.	-0.453677	0.099812	-4.545	5.57e-06	***
BoatMA	-0.393239	0.105869	-3.714	0.000205	***
BoatMA	-0.327221	0.032396	-10.101	< 2e-16	***
BoatMI	0.195958	0.131430	1.491	0.136010	
BoatMI	-0.366063	0.114650	-3.193	0.001414	**
BoatMI	-0.515703	0.089880	-5.738	9.97e-09	***
BoatNA	-0.945725	0.126161	-7.496	7.31e-14	***
BoatNA	0.055601	0.073700	0.754	0.450625	
BoatNE	-0.302982	0.037209	-8.143	4.48e-16	***
BoatNI	-0.497363	0.045362	-10.964	< 2e-16	***
BoatNI	-0.619271	0.159715	-3.877	0.000106	***
BoatNI	-0.414736	0.159944	-2.593	0.009532	**
BoatNI	0.685041	0.137192	4.993	6.07e-07	***
BoatNI	-0.389458	0.056617	-6.879	6.52e-12	***
BoatNO	-0.722016	0.114051	-6.331	2.58e-10	***
BoatNO	-0.297244	0.039584	-7.509	6.63e-14	***
BoatNU	0.052061	0.061775	0.843	0.399387	
BoatNU	-0.299281	0.096529	-3.100	0.001939	**
BoatNU	-0.184666	0.131394	-1.405	0.159934	
BoatNU	-0.313178	0.068050	-4.602	4.25e-06	***
BoatOV	-0.606816	0.170332	-3.563	0.000370	***
BoatPA	-0.506034	0.090906	-5.567	2.69e-08	***
BoatPA	-0.243490	0.170494	-1.428	0.153292	
BoatPI	0.178947	0.170370	1.050	0.293593	
BoatPI	-0.572575	0.055772	-10.266	< 2e-16	***
BoatQA	-0.180190	0.258420	-0.697	0.485653	
BoatQA	-0.261856	0.032590	-8.035	1.08e-15	***
BoatQI	-0.049288	0.033082	-1.490	0.136299	
BoatRE	-0.166690	0.067294	-2.477	0.013269	*
BoatSA	-0.283980	0.040501	-7.012	2.56e-12	***
BoatSA	-0.119902	0.060005	-1.998	0.045729	*
BoatSO	-0.527218	0.054559	-9.663	< 2e-16	***
BoatSU	-0.763616	0.316051	-2.416	0.015710	*
BoatTU	-0.161302	0.445854	-0.362	0.717525	
BoatUI	0.200033	0.150817	1.326	0.184769	
BoatUL	-0.041820	0.034128	-1.225	0.220468	

 Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.4448 on 7608 degrees of freedom
 Multiple R-squared: 0.1946, Adjusted R-squared: 0.1848
 F-statistic: 19.77 on 93 and 7608 DF, p-value: < 2.2e-16



Appendix 4

Umannaq gillnet GLM (log-CPUE ~ intercept + Year + Month + Boat)

```
lm(formula = lcpue ~ Year + Month + Boat)
```

Residuals:

```
      Min       1Q   Median       3Q      Max
-1.94906 -0.21063  0.03508  0.24681  1.35888
```

Coefficients:

	Estimate	Std. Error	t value	Pr(> t)	
(Intercept)	4.6351016	0.1822751	25.429	< 2e-16	***
Year2012	-0.1787521	0.0539350	-3.314	0.000958	***
Year2013	0.0229011	0.0552214	0.415	0.678455	
Year2014	-0.0089749	0.0579845	-0.155	0.877030	
Year2015	-0.0192295	0.0599816	-0.321	0.748599	
Year2016	-0.1004988	0.0898378	-1.119	0.263595	
Month2	-0.0337541	0.0383502	-0.880	0.379023	
Month3	-0.3100100	0.1486910	-2.085	0.037372	*
Month4	-0.1267213	0.0790501	-1.603	0.109293	
Month11	-0.0965312	0.0561293	-1.720	0.085830	.
Month12	-0.0392808	0.0567669	-0.692	0.489146	
BoatAA	-0.3381739	0.2157306	-1.568	0.117350	
BoatAG	-0.0294177	0.1858371	-0.158	0.874259	
BoatAN	-0.9632264	0.2165586	-4.448	9.82e-06	***
BoatAN	0.0003269	0.1818792	0.002	0.998566	
BoatAN	-0.4404873	0.2263957	-1.946	0.052024	.
BoatAN	0.0523983	0.4469302	0.117	0.906697	
BoatAN	-0.4980916	0.2110360	-2.360	0.018487	*
BoatBJ	-0.8454099	0.2548420	-3.317	0.000947	***
BoatDO	-0.3834612	0.1912128	-2.005	0.045233	*
BoatIN	-0.7572235	0.1971346	-3.841	0.000131	***
BoatJU	-0.2754409	0.1859675	-1.481	0.138941	
BoatKA	-0.6248246	0.2972340	-2.102	0.035833	*
BoatKA	-0.1978747	0.2162920	-0.915	0.360528	
BoatKR	-0.0538514	0.2326021	-0.232	0.816968	
BoatLA	-0.1376129	0.1923422	-0.715	0.474521	
BoatM.	-0.4386331	0.2110383	-2.078	0.037965	*
BoatMA	-0.3139142	0.1930784	-1.626	0.104352	
BoatNA	-0.5419496	0.2717020	-1.995	0.046398	*
BoatNE	-0.6612467	0.2265449	-2.919	0.003606	**
BoatNO	-0.0486940	0.1850214	-0.263	0.792475	
BoatNU	-0.5366553	0.2461119	-2.181	0.029490	*
BoatNU	-0.9808081	0.2461119	-3.985	7.32e-05	***
BoatNU	-0.2154533	0.1976535	-1.090	0.275995	
BoatOV	-0.1164647	0.2477916	-0.470	0.638467	
BoatQA	-0.1844657	0.1906060	-0.968	0.333425	
BoatQI	0.0470169	0.1842389	0.255	0.798634	
BoatRE	-0.1221052	0.2110360	-0.579	0.563012	
BoatSA	-0.4222325	0.2058160	-2.052	0.040522	*
BoatUL	-0.3318163	0.1853420	-1.790	0.073760	.

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

```
Residual standard error: 0.4051 on 856 degrees of freedom
Multiple R-squared:  0.2735,    Adjusted R-squared:  0.2404
F-statistic: 8.265 on 39 and 856 DF,  p-value: < 2.2e-16
```

Appendix 5

Upernavik longline GLM (log-CPUE ~ intercept + Year + Month + Boat)

```
lm(formula = lcpue ~ Year + Month + Boat)
```

Residuals:

Min	1Q	Median	3Q	Max
-7.4958	-0.2681	0.0364	0.3140	2.7628

Coefficients:

	Estimate	Std. Error	t value	Pr(> t)	
(Intercept)	6.8829624	0.0528817	130.158	< 2e-16	***
Year2008	-0.0595575	0.0178629	-3.334	0.000857	***
Year2009	-0.0209042	0.0192994	-1.083	0.278756	
Year2010	-0.1331272	0.0178827	-7.444	1.02e-13	***
Year2011	-0.2395318	0.0181160	-13.222	< 2e-16	***
Year2012	-0.0227983	0.0184569	-1.235	0.216767	
Year2013	-0.1375537	0.0201499	-6.827	8.98e-12	***
Year2014	-0.0643495	0.0192513	-3.343	0.000832	***
Year2015	-0.2321427	0.0232282	-9.994	< 2e-16	***
Year2016	-0.2305738	0.0243354	-9.475	< 2e-16	***
Month2	-0.3131357	0.0683134	-4.584	4.60e-06	***
Month3	-0.9431929	0.1092464	-8.634	< 2e-16	***
Month4	-0.5726135	0.1005688	-5.694	1.26e-08	***
Month5	-0.5512018	0.0509494	-10.819	< 2e-16	***
Month6	-0.4798405	0.0480223	-9.992	< 2e-16	***
Month7	-0.1919731	0.0475051	-4.041	5.34e-05	***
Month8	-0.1842935	0.0473713	-3.890	0.000100	***
Month9	-0.3118615	0.0473600	-6.585	4.68e-11	***
Month10	-0.2460836	0.0476605	-5.163	2.45e-07	***
Month11	-0.1847333	0.0481433	-3.837	0.000125	***
Month12	-0.1194033	0.0609840	-1.958	0.050252	.
BoatA-	-0.3524636	0.0596945	-5.904	3.60e-09	***
BoatAA	0.0154902	0.1076326	0.144	0.885568	
BoatAA	-0.8662874	0.5337295	-1.623	0.104589	
BoatAA	-0.1168791	0.0584701	-1.999	0.045628	*
BoatAA	-0.0136584	0.0309865	-0.441	0.659373	
BoatAA	-0.0290399	0.5337295	-0.054	0.956610	
BoatAA	-1.6203922	0.1091633	-14.844	< 2e-16	***
BoatAA	0.0613412	0.0579582	1.058	0.289901	
BoatAG	-0.2542462	0.0445580	-5.706	1.18e-08	***
BoatAK	-0.6331887	0.3088882	-2.050	0.040389	*
BoatAN	-0.3282594	0.0336418	-9.757	< 2e-16	***
BoatAN	0.0728385	0.0410387	1.775	0.075936	.
BoatAN	-0.0961987	0.0657596	-1.463	0.143516	
BoatAN	0.0937609	0.0436649	2.147	0.031784	*
BoatAN	0.1217877	0.0568761	2.141	0.032265	*
BoatAN	-0.3110552	0.1707399	-1.822	0.068501	.
BoatAN	0.0366738	0.0682397	0.537	0.590980	
BoatAN	0.0371966	0.0514358	0.723	0.469588	
BoatAP	0.2339537	0.0831534	2.814	0.004906	**
BoatAQ	0.2903917	0.0332385	8.737	< 2e-16	***
BoatAQ	-0.0434226	0.0517109	-0.840	0.401077	
BoatAR	-0.2669360	0.1637019	-1.631	0.102988	
BoatAR	0.2209298	0.0386977	5.709	1.15e-08	***
BoatAR	-0.5251063	0.0573892	-9.150	< 2e-16	***
BoatAR	0.1720735	0.0411460	4.182	2.90e-05	***
BoatBJ	-0.3404001	0.1038853	-3.277	0.001052	**
BoatCO	-1.3571700	0.0771271	-17.597	< 2e-16	***
BoatDO	-0.1340077	0.0604859	-2.216	0.026737	*
BoatEL	0.1215836	0.0383799	3.168	0.001538	**
BoatER	-0.0003527	0.0403605	-0.009	0.993027	

BoatER	0.2628888	0.1448516	1.815	0.069559	.
BoatHA	-0.0551241	0.0588839	-0.936	0.349209	
BoatHA	0.3223268	0.0289762	11.124	< 2e-16	***
BoatHI	0.1878483	0.0294742	6.373	1.90e-10	***
BoatIN	-0.0321933	0.0507179	-0.635	0.525598	
BoatIP	-0.6601789	0.0715668	-9.225	< 2e-16	***
BoatJE	0.2623073	0.0728230	3.602	0.000317	***
BoatJE	-0.3106619	0.2403249	-1.293	0.196140	
BoatJU	-0.1129793	0.0376742	-2.999	0.002714	**
BoatJU	-0.0989997	0.0440394	-2.248	0.024590	*
BoatJU	-0.2905350	0.1450256	-2.003	0.045156	*
BoatJU	-0.5555057	0.0648278	-8.569	< 2e-16	***
BoatKA	-0.1693499	0.1445141	-1.172	0.241270	
BoatKA	-0.0283427	0.0404637	-0.700	0.483657	
BoatKA	-0.7659231	0.3087047	-2.481	0.013107	*
BoatKL	0.0457624	0.0293609	1.559	0.119104	
BoatKU	-0.0279218	0.0836758	-0.334	0.738618	
BoatKU	-0.5646102	0.1167492	-4.836	1.34e-06	***
BoatL.	0.2201426	0.0834821	2.637	0.008371	**
BoatLA	0.1346110	0.2032554	0.662	0.507803	
BoatLA	0.1489505	0.0564134	2.640	0.008290	**
BoatLY	-1.4005780	0.1401724	-9.992	< 2e-16	***
BoatM.	-0.0152789	0.1093678	-0.140	0.888897	
BoatMA	-0.2637559	0.0302431	-8.721	< 2e-16	***
BoatMA	-0.8575457	0.1400154	-6.125	9.28e-10	***
BoatMA	0.0068061	0.1166717	0.058	0.953482	
BoatMA	-1.1697777	0.5337803	-2.191	0.028429	*
BoatMI	0.0565438	0.0353284	1.601	0.109501	
BoatNA	0.3915563	0.0396408	9.878	< 2e-16	***
BoatNA	0.3295473	0.1020933	3.228	0.001249	**
BoatNA	0.1001280	0.0291066	3.440	0.000583	***
BoatNE	0.5486370	0.2401769	2.284	0.022365	*
BoatNI	-0.5605328	0.0563265	-9.951	< 2e-16	***
BoatNI	0.0432280	0.0743601	0.581	0.561023	
BoatNI	0.2008120	0.0320296	6.270	3.70e-10	***
BoatNI	-0.2340724	0.0284039	-8.241	< 2e-16	***
BoatNI	-0.0584961	0.2397740	-0.244	0.807262	
BoatNI	0.4590037	0.0623661	7.360	1.92e-13	***
BoatNI	-0.1911134	0.0299317	-6.385	1.76e-10	***
BoatNO	-0.4530357	0.1218753	-3.717	0.000202	***
BoatNO	0.0363694	0.0472161	0.770	0.441146	
BoatNU	0.3816253	0.0701912	5.437	5.49e-08	***
BoatNU	-0.3544460	0.0303794	-11.667	< 2e-16	***
BoatNU	-0.1449716	0.0461523	-3.141	0.001686	**
BoatNU	-0.2688073	0.1040034	-2.585	0.009757	**
BoatOL	-0.0829104	0.0788243	-1.052	0.292888	
BoatPA	-0.0942308	0.3087637	-0.305	0.760227	
BoatPI	0.1564798	0.0572786	2.732	0.006303	**
BoatPI	-0.4463365	0.0665726	-6.705	2.08e-11	***
BoatQA	-0.1296222	0.1191475	-1.088	0.276648	
BoatQI	0.0243494	0.0398515	0.611	0.541205	
BoatQU	0.0957126	0.1400776	0.683	0.494437	
BoatRA	-0.5762750	0.2679446	-2.151	0.031511	*
BoatRE	0.0280272	0.0485121	0.578	0.563449	
BoatSA	-0.0835451	0.2190820	-0.381	0.702954	
BoatSU	0.2535652	0.3777137	0.671	0.502028	
BoatSV	-0.8388525	0.1320909	-6.351	2.20e-10	***
BoatTH	-0.0939213	0.1400170	-0.671	0.502366	
BoatTI	-0.8088721	0.3777129	-2.142	0.032247	*
BoatTU	-0.2847762	0.0291598	-9.766	< 2e-16	***
BoatTU	0.3964217	0.0302384	13.110	< 2e-16	***
BoatTU	0.5143746	0.3212887	1.601	0.109401	
BoatUL	-0.4362283	0.1251761	-3.485	0.000493	***


```
BoatUL          0.1110331  0.0897567  1.237 0.216087
BoatUU          -0.0857511  0.0569370  -1.506 0.132067
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.5328 on 17771 degrees of freedom
Multiple R-squared:  0.2476,    Adjusted R-squared:  0.2427
F-statistic: 50.84 on 115 and 17771 DF,  p-value: < 2.2e-16
```

Appendix 6

Upernavik gillnet GLM (log-CPUE ~ intercept + Year + Month + Boat)

```
lm(formula = lcpue ~ Year + Month + Boat, data = uul)
```

Residuals:

```
      Min       1Q   Median       3Q      Max
-4.0109 -0.2854  0.0286  0.3188  1.9464
```

Coefficients:

```
              Estimate Std. Error t value Pr(>|t|)
(Intercept)   3.967035   0.188092  21.091 < 2e-16 ***
Year2010     -0.372635   0.064791  -5.751 9.72e-09 ***
Year2011     -0.308941   0.055945  -5.522 3.62e-08 ***
Year2012     -0.216487   0.055313  -3.914 9.28e-05 ***
Year2013     -0.612056   0.059318 -10.318 < 2e-16 ***
Year2014     -0.454538   0.068298  -6.655 3.34e-11 ***
Year2015     -0.268008   0.059118  -4.533 6.02e-06 ***
Year2016     -0.1735342   0.061188 -12.018 < 2e-16 ***
Month2       -0.002081   0.049247  -0.042 0.96630
Month3        0.158947   0.051347   3.096 0.00198 **
Month4        0.235813   0.049705   4.744 2.19e-06 ***
Month11       0.373918   0.053210   7.027 2.58e-12 ***
Month12       0.569176   0.065869   8.641 < 2e-16 ***
BoatAA        0.598590   0.199121   3.006 0.00267 **
BoatAN       -0.140750   0.216150  -0.651 0.51499
BoatAN        1.122172   0.285382   3.932 8.60e-05 ***
BoatAN        1.088159   0.237126   4.589 4.63e-06 ***
BoatAQ        0.854607   0.219171   3.899 9.85e-05 ***
BoatAR        0.520006   0.249318   2.086 0.03709 *
BoatEL       -0.763683   0.264253  -2.890 0.00388 **
BoatER        0.242157   0.199588   1.213 0.22511
BoatHA        0.311176   0.195705   1.590 0.11193
BoatHI        0.392429   0.190972   2.055 0.03997 *
BoatJU        0.128563   0.199169   0.645 0.51865
BoatKL       -0.320424   0.194713  -1.646 0.09994 .
BoatLA        0.106522   0.409950   0.260 0.79500
BoatMA        0.409011   0.191276   2.138 0.03257 *
BoatNA       -0.567120   0.548326  -1.034 0.30109
BoatNA        0.073548   0.200904   0.366 0.71433
BoatNI        0.240001   0.284194   0.844 0.39846
BoatNI       -0.330976   0.265150  -1.248 0.21203
BoatNI        0.218650   0.190661   1.147 0.25155
BoatNI       -0.024770   0.191283  -0.129 0.89697
BoatNU       -0.010472   0.187819  -0.056 0.95554
BoatNU       -0.388537   0.192905  -2.014 0.04408 *
BoatTU       -0.258535   0.198611  -1.302 0.19311
BoatUL        1.020072   0.223540   4.563 5.23e-06 ***
```

```
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
Residual standard error: 0.5131 on 3088 degrees of freedom
Multiple R-squared:  0.3716,    Adjusted R-squared:  0.3643
F-statistic: 50.72 on 36 and 3088 DF,  p-value: < 2.2e-16
```