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Revised CPUE in Icelandic Shrimp Fishery at Flemish Cap in 2004-2006

by

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Abstract

The shrimp fishery of Iceland in 2004 – 2006 was carried out by one vessel as compared to three in 2003. In this paper there is logbook information on the Icelandic fishery for the years 1993 through 2006. Due to suspicion of misreporting between 3M and 3L after writing of the 2006 paper on Icelandic shrimp fisheries the CPUE was now recalculated by dropping all suspicious fishing trips that included shrimp fishing in both division 3M and 3L in the years 2004-2006. The catch rate (standardized to the same size of trawl) of Icelandic vessels in January-September which was very high or about 290 kg/hour in the years 2001-2003 decreased to 236 kg/hour in 2004, to increase again to 284 kg/hour in 2005 and further to 387 kg/hour in 2006 according to the 2006 paper. When CPUE was recalculated as described below the value for 2004 and 2005 changed to 232 and 262 respectively and in 2006 there was this major correction from 387 kg/hour to only 313 kg/hour.

Introduction

The Spanish investigators (EU) have been measuring the biomass index of northern shrimp at the Flemish Cap since 1988 in their annual bottom trawl survey at Flemish cap. In 1993 the fishery was initiated by Canada, followed closely by Faroe Islands and Iceland.

The fishery was some 24-33 thousand tons in the years 1993-1995 to increase in 1996 to 48 thousand tons. The catch decreased to some 25 thousand tons in 1997 (Anon 2006). The total catch of all countries has since increased to about 63 000 tons in 2003 and have decreased there after to 32 000 tons in 2005 (Anon. 2006). Iceland has been catching a fair deal of the catch in some previous years. In later years however the catch has decreased substantially due to low prizes in shrimp and high prize of oil. In June 2006 the last Icelandic vessel fishing on Flemish Cap was sold.

In this paper the information from the Icelandic side is gathered. From the logbooks comes effort, catch and size of trawl. From this CPUE is calculated. Due to suspicions of misreporting of catch from 3L to 3M resulting in unrealistic CPUEs both in 3M and 3L, the CPUEs for the years 2004 through 2006 are here recalculated.

Materials and Methods

The logbook data include catch and effort. Sometimes information on landings as obtained from the Fisheries Directorate in Iceland exceeds the logbook information. The effort is then raised by dividing the nominal catch of each month/half year with the calculated CPUE from the logbooks. The overall CPUE of the January-July was then obtained by summing nominal catch of all months and corresponding effort. Nominal catch for the whole period was then divided by "nominal effort" to get the CPUE for the period January-July. When twin trawls were used the effort was always multiplied by 1.9 for those but the catch was kept the same. The same method was applied to the

period January –September. In 2006 members of the Scientific Councilof NAFO noticed a big discrepancy between CPUE from one month to another in area subdivision 3M resulting in an extraordinary high CPUE coinciding with a very low CPUE at the same time in the area subdivision 3L. This misreporting appeared to start late in year 2004 (December) and occurred again in both 2005 and 2006. In 2005 the unusually high CPUE occurred in 3M in the months August through September and again in November through December. In the year 2006 there was this sky high CPUE also in January through March in 3M. In all the same months here mentioned the CPUE was extremely low in 3L compared to that of similar size Canadian vessels fishing in the 3L area (Orr, personal communication). The effort and positions are considered to be correct due to very strict reporting on positions in the pilot program (every 15 minits) through the satellite. The catch can however through book keeping tricks be moved from one area to the other.

In order to correct this CPUE, all data from fishing trips that contained catch from both areas 3M and 3L were removed from the data base from December 2004 to March 2006. Assuming that the landing of shrimp for the whole fishing trips is allways correct the CPUE for the fishing trips when staying for the whole time in Division 3M was considered correct. The data for CPUE in Division 3L were found to be of no use.

For calculation of CPUE to the standard size of trawl of 3000 meshes, the catch and effort of a period like January to July was calculated in the manner decribed above. At the same time the average size of trawl (no. of standard meshes in cirqumference of the belly) be it single or double was calculated. The CPUE for trawl size 3000 meshes was then considered to be proportional to the mean size of trawl in the same period. The same was done for the period January through September.

Catch and Effort data

In 2005 and 206 the fishery was carried out since January (Table 1). The catch in 2006 was 2 100 tons (Table 2). Iceland increased the total allowable catch (TAC) for Icelandic vessels from 6 800 tons in 1999, to about 10 000 tons for years 2000 to 2002 and to 13 500 for year 2003. In spite of this high TAC the total catch was only 5 300 tons in year 2001, 5 700 tons in 2002 and 4 700 in 2003. Iceland decreased the TAC in 2004 to 5 000 tons. Since 2004 there was only one vessel fishing for shrimp. The catch has decreased from 4000 tons in 2005 to 2 100 tons in 2006 when the last Icelandic vessel was sold.

The average size of gear used was about 3000 meshes in most years, but increased to about 3500 meshes in the years 1999 to 2001 and to 4 460 meshes in 2004 - 2006. The trawl size being by far the largest in the series (Fig 1). So the unstandardized CPUE (no correction for size of trawl) of 2006 gives an impression of the shrimp stock being quite large and the raw CPUE is 465 kg/hour (was 565 in the misreported data, Skuladottir 2006) or much higher than the highest catch per hour in the series. Therefore it makes more sense to look at CPUE at a standard trawl size (Fig. 2). There the CPUE in 2006 is the second highest in the series. At the same time the use of twin trawls has increased from less than 50% in 1993 to about 99% in the years 2004 – 2006 (Table 2).

Whe the fishery was virgin the CPUE at a standard 3000 meshes trawl was 344 kg/hr for the period January – September. The mean CPUE for the year 1997 was the lowest ever for Iceland or 203 kg per trawling hour for the period January through September (Table 2). In 1998 the mean CPUE for the same period was much higher or 266 kg and decreased slightly in 1999 and 2000 to increase in 2001 through 2003 to about 290 kg/hour. In 2004 CPUE decreased to 232 kg/hour or to the level of the years 1998 to 2000. In 2005 the CPUE increased somewhat or to **262** kg/hour instead of the previously estimated 284 kg/hour (Skuladottir 2006). Now it is perhabs better to look at the period January through July as there was no fishery after June in year 2006. So in the same manner as with the period January through September CPUE decreased from the virgin high of 363 kg/hr, reached the low 192 kg/hr in 1997 to increase to 290-305 kg/hr in the years 2001-2003. After the intensive fishery in 2003 when 63 000 tons were landed (Anon. 2006) the CPUE decreased to 228 kg/hr in 2004. After this the CPUE increased gradually to **313** kg/hr in 2006, instead of the previously wrongly estimated 387 kg/hr (Skuladottir 2006). This happened at the same time as the landings of all fleets declined drastically due mostly to economic reasons in the years 2004-2005.

Biological Samples

The length frequency distributions of Icelandic samples shown by Skuladottir (2006), from 2005 through 2006 were found to be correctly labelled as concerns areas and will not be presented here again (Skuladottir b, 2006, working paper).

References

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Table 1. Catch (tons) effort (trawling hours *1.9 when double trawl) and unstandardized CPUE (kg/hr) of Icelandic vessels at Flemish Cap.
The CPUE data corrected in 2007 for years 2004, 2005 and 2006 by omitting fishing trips that included both 3M and 3L (see text)

	January - July				August - December			
Year	Month	CPUE	Effort	Catch	Month	CPUE	Effort	Catch
1993					Aug	320.4	1334	427.4
					Sep	349.8	1034	361.7
					Oct	231.7	334	77.4
	Jun	380.2	1767	671.8	Nov	306.8	588	180.4
	Jul	342.4	1097	375.6	Dec	236.5	537	127.0
	Subtotal	365.7	2864	1047.4	Subtotal	306.7	3827	1173.9
	Total	365.7	2918	1067.0	Total	306.7	3834	1176.0
1994	Jan	228.5	144	32.9	Aug	175.3	1657	290.4
	Feb	371.8	510	189.6	Sep	126.9	476	60.4
	Mar	295.5	531	156.9	Oct	125.4	492	61.7
	Jun	256.4	1297	332.5	Nov	115.5	181	20.9
	Jul	212.9	2653	564.8	Dec	75.0	8	0.6
	Subtotal	248.6	5135	1276.7	Subtotal	154.2	2814	434
	Total	248.6	6693	1664.0	Total	154.2	4123.7	636
1995	Feb	280.0	65	18.2	Aug	178.0	4869	866.9
	Mar	246.8	711	175.5	Sep	134.1	2928	392.5
	Apr	149.9	1487	222.9	Oct	166.3	2088	347.2
	May	260.1	2617	680.7	Nov	144.4	1074	155.1
	June	248.9	3733	929.2	Dec	174.5	740	129.1
	Jul	249.5	6625	1653.0				
	Subtotal	241.5	15238	3679.5	Subtotal	161.6	11699	1890.8
	Total	241.5	16932	4088.5	Total	161.6	21868	3534.4
1996	Jan	207.2	1755	363.7	Aug	165.4	8156	1349.4
	Feb	251.7	1326	333.7	Sep	167.1	8089	1351.7
	Mar	261.8	4604	1205.1	Oct	129.7	5482	711.2
	Apr	211.2	10754	2271.2	Nov	137.9	1456	200.8
	May	189.1	12749	2410.2	Dec	158.1	253	40.0
	Jun	202.5	13933	2821.5				
	Jul	235.9	11963	2821.5				
	Subtotal	214.2	57084	12226.9	Subtotal	155.9	23436	3653.1
	Total	214.2	64760	13871.0	Total	155.9	43689	6810.0
1997	Jan	175.8	413	72.6	Aug	206.7	4252	879.0
	Feb	214.7	621	133.3	Sep	202.4	3476	703.6
	Apr	135.0	514	69.4	Oct	222.0	2519	559.1
	May	141.4	3736	528.2	Nov	192.5	1039	200.0
	Jun	167.7	5386	903.2	Dec	176.9	429	75.9
	Jul	209.2	5802	1213.7				
	Subtotal	177.3	16472	2920.4	Subtotal	206.4	11715	2417.6
	Total	177.3	19478	3453.3	Total	206.4	14681	3029.6
1998	Feb	217.2	297	64.5	Aug	256.4	3184	816.3
	Mar	206.8	812	167.9	Sep	184.5	5028	927.5
	Apr	229.5	880	202.0	Oct	196.3	3612	708.9
	May	261.4	2820	737.2	Nov	204.6	1761	360.3
	Jun	330.7	3537	1169.7	Dec	222.5	644	143.3
	Jul	285.3	4117	1174.7				
	Subtotal	282.1	12463	3516.0	Subtotal	207.8	14229	2956.3
	Total	282.1	12657	3570.8	Total	207.8	14447	3001.5
1999	Feb	350.5	382	133.9	Aug	250.8	3642	913.4
	Mar	289.4	1851	535.7	Sep	235.5	1371	322.9
	Apr	253.0	3483	881.2	Oct	255.6	2150	549.6
	May	249.5	5941	1482.3	Nov	256.2	2173	556.8
	Jun	285.8	5993	1712.7	Dec	230.6	989	228.1
	Jul	280.4	5224	1464.6				
	Subtotal	271.5	22874	6210.4	Subtotal	249.0	10325	2570.8
	Total	271.5	24009	6518.6	Total	249.0	10837	2698.4
2000	Jan	263.8	1050	277.0	Aug	244.9	2357	577.1
	Feb	280.5	2206	618.8	Sep	239.0	2134	510.2
	Mar	306.3	3297	1009.8	Oct	274.8	1787	491.1
	Apr	280.7	4378	1229.0	Nov	256.1	2984	764.3
	May	231.9	4943	1146.6	Dec	267.5	798	213.5
	Jun	304.3	3679	1119.6				
	Jul	250.1	3064	766.4				
	Subtotal	272.7	22618	6167.2	Subtotal	254.1	10060	2556.2
	Total	272.7	22618	6167.2	Total	254.1	11051	2807.8
2001	Jan	285.9	538	153.7	Aug	292.6	2094	612.9
	Feb	299.9	1593	477.6	Sep	277.3	1160	321.6
	Mar	303.6	2174	660.0	Oct	267.5	1563	418.1
	Apr	239.6	45	10.8	Nov	253.4	1210	306.6
	May	271.1	917	248.7	Dec	500.8	404	202.5
	Jun	282.9	2777	785.6				
	Jul	296.5	2992	887.2				
	Subtotal	292.1	11036	3223.6	Subtotal	289.5	6431	1861.7
	Total	292.1	11036	3223.6	Total	289.5	7178	2077.8
2002	Jan	292.6	372	108.9	Aug	311.7	1739	542.0
	Feb	343.4	705	242.0	Sep	313.2	1054	330.0
	Mar	264.6	1786	472.4	Oct	234.7	923	216.7
	Apr	305.7	2056	628.4	Nov	312.9	559	174.9
	May	330.8	2439	806.6	Dec	359.9	437	157.1
	Jun	346.0	2113	731.1				
	Jul	444.6	1241	551.7				
	Subtotal	330.6	10710	3541.1	Subtotal	301.6	4711	1420.7
	Total	330.6	10711	3541.1	Total	301.6	7296	2200.3
2003	Jan	384.3	162	62.1	Aug	395.9	956	378.6
	Feb	422.0	715	301.8	Sep	291.6	818	238.5
	Mar	565.1	1303	736.3	Oct	352.4	941	331.6
	Apr	430.9	967	416.5	Nov	333.4	727	242.4
	May				Dec	606.8	354	214.8
	Jun	329.7	925	305.1				
	Jul	287.6	85	24.5				
	Subtotal	444.2	4157	1846.3	Subtotal	370.3	3796	1405.9
	Total	444.2	6041	2683.3	Total	370.3	5791	2144.7
2004 *	Jan	251.9	412	103.8	Aug	410.3	738	302.8
	Feb	293.5	891	261.5	Sep	280.6	803	225.3
	Mar	267.9	974	261.0	Oct	328.4	936	307.4
	Apr	280.2	1044	292.6	Nov	400.0	604	241.6
	May	315.1	1089	343.0	Dec			
	Jun	403.5	1015	409.5				
	Jul	386.9	967	374.3				
	Subtotal	320.0	6392	2045.6	Subtotal	349.6	3081	1077.1
	Total	320.0	6392	2045.6	Total			
2005*	Jan	157.9	4	0.6	Aug	437.4	705	308.4
	Feb	284.4	988	281.0	Sep	276.9	316	87.5
	Mar	344.2	933	321.1	Oct	378.7	840	318.3
	Apr	339.9	969	329.4	Nov	404.3	632	255.5
	May	442.9	860	380.9	Dec			
	Jun	431.7	943	407.1				
	Jul	449.5	994	446.8				
	Subtotal	380.8	5691	2166.9	Subtotal	388.9	2493	969.7
	Total	380.8	5848	2226.9	Total			
2006*	Jan							
	Feb							
	Mar							
	Apr	392.1	776	304.2				
	May	384.3	929	357.0				
	Jun	870.4	147	127.6				
	Subtotal	426.1	1851	788.8				
	Total							

* In years 2004-2006 data have been removed that contained fishing trips in Division 3M and 3L. All months presented contain pure fishing trips on Division 3M.

Table 2. Nominal catch for the whole year and some averages calculated from the Icelandic logbooks to show trends in CPUEs and size of circumference of trawl. In calculations of CPUE the effort of twin trawls is multiplied by 1.9. The adjusted CPUE of January-July and January-September to that of 3000 meshes trawl are high lighted .

Year	Nominal Catch Tons	Twin trawls % of catch	Mean trawl size No. of meshes January-July	Unstandardized CPUE January-July	**CPUE at size 3000 trawl January-July**	Mean trawl size No. of meshes January-Sept	Unstandardized CPUE January-Sept	**CPUE at size 3000 trawl January-Sept.**
1993	2 243	43.4	3086	373	**363**	3102	356	**344**
1994	2 300	54.4	2975	238	**240**	2952	216	**219**
1995	7623	38.2	2689	254	**283**	2734	229	**251**
1996	20681	42.9	2838	206	**218**	2813	198	**212**
1997	6483	53.4	2932	188	**192**	2922	198	**203**
1998	6572	74.8	2939	288	**294**	2974	264	**266**
1999	9217	70.6	3340	280	**252**	3402	276	**243**
2000	8978	81.4	3521	287	**245**	3528	282	**240**
2001	5301	63.0	3391	328	**290**	3518	325	**277**
2002	5741	73.6	3641	370	**305**	3712	363	**293**
2003	4695	92.6	3949	398	**302**	4000	386	**289**
2004	3567*	98.9	4460	339	**228**	4460	345	**232**
2005	4014*	99.0	4463	386	**260**	4463	390	**262**
2006	2099*	99.0	4462	465	**313**			
Mean 93-2006	7081	70	3478	314	**270**	3429	294	**256**

* Nominal Catch overestimated due to misreporting of catch from 3M to 3L.

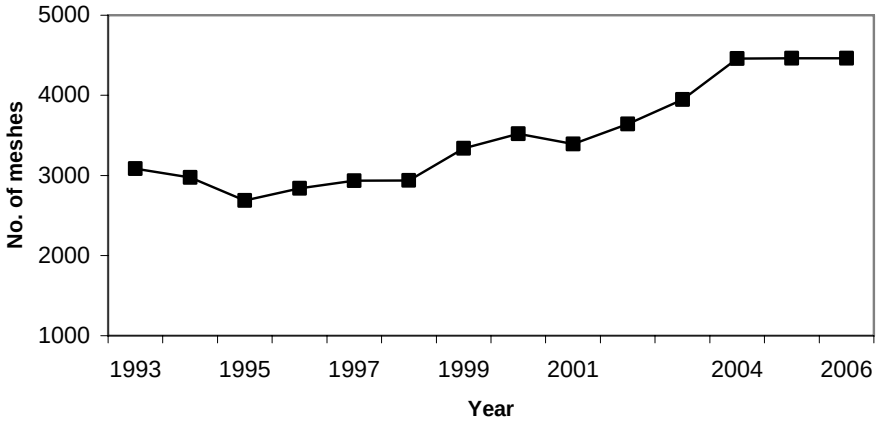

Fig. 1. Mean size of Icelandic shrimp trawls as the number of meshes in the cirqumference of the belly.

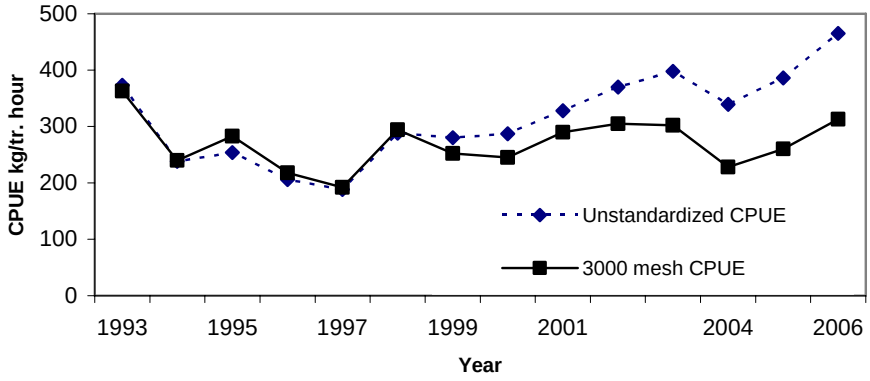

Fig.2. CPUE standardized to that of a 3000 mesh trawl compared to unstandardized CPUE for the months January through July every year.