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The Icelandic Shrimp Fishery (*Pandalus borealis* Kr.) at Flemish Cap in 1993-2005

by

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Abstract

One Icelandic vessel went fishing for shrimp in the waters at Flemish Cap in 2004 and 2005. In this paper there is logbook information on the Icelandic fishery for the years 1993 through 2005. The standardized catch rate of Icelandic vessels in January-July (standardized to size of trawl) which was very high in the years 2001-2003 decreased to from 302 kg/hour in 2003 to 227 kg/hr in 2004 to increase again to 260 kg/hr in 2005. Provisional catch of 2005 is 2 100 tons.

The biological samples show that the 2001 year-class is above average in all months. The 2002 year-class appears to be quite strong as one year olds in 2003 and two year olds in 2004. The 2003 year-class is not noticeable throughout year 2004 and 2005.

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. Since then the fishery decreased to some 25 thousand tons in 1997. The total catch of all countries has since increased to just above 62 thousand tons in 2003 to decrease again to 47 thousand tons. 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.

In this paper all the information from the Icelandic side is gathered. From the logbooks come effort, catch and size of trawl. From this CPUE is calculated. From the biological samples taken by Icelandic observers some various information on length and sex distribution of shrimp.

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.

For calculation of standardized CPUE to the standard size of trawl of 3 000 meshes circumference, the catch and effort of a period like January to July was calculated in the manner described above. At the same time the average size of trawl (no. of standard meshes (40 mm) in circumference of the belly) be it single or double was calculated.

The CPUE for trawl size 3 000 meshes was then considered to be proportional to the mean size of trawl in the same period.

Icelandic observers have sampled shrimp onboard Icelandic vessels since 1996 at Flemish Cap. The shrimp was measured fresh to the nearest 0.5 mm using Vernier callipers. Observers then sorted each length class into males transitionals and females using the method of Rasmussen (1953) and the females further into primiparous and multiparous using the sternal spine criterion of McCrary (1971).

Catch and Effort data

In 2005 the fishery was carried out since January (Table 1). The catch in 2005 so far is 2 072 tons (Table 2). Iceland decreased the total allowable catch (TAC) for Icelandic vessels from 13 500 for year 2003 to some 4 000 tons for 2005. There is no prosperity in the fisheries due to low prizes on shrimp and high cost of fuel.

The CPUE for the year 1997 was the lowest ever for Iceland or 192 kg per trawling hour for the period January through July (Table 2). In 1998 the mean CPUE for the same period was much higher or 294 kg and decreased slightly in 1999 and 2000 to increase in 2001 to 2003 to 294-305 kg/hour. In 2004 the CPUE was only 227 kg/hour and far below average, following the peak year of 2003 when probably too much shrimp was caught at Flemish Cap, namely 62 thousand tons (Skuladottir and Guðmundsdottir, 2004), the advised catch by Scientific Council of NAFO being 45 thousand tons for the most recent years. In 2005 the CPUE is increasing again to 260 kg/hour, which is near the average.

The average size of gear used was about 3000 meshes in most years (Skuladottir, 2004), but increased to about 3500 meshes in the years 1999 to 2001 and to 4 460 meshes in 2004 and 2005. The trawl size in year 2004 and 2005 is by far the largest so the unstandardized CPUE of 2005 of 386 kg/hour as compared to 260 when standardized to that of 3 000 meshes gives an impression of the shrimp stock being larger than ever before. Therefore it makes more sense to look at CPUE at a standard trawl size. At the same time the use of twin trawls has increased in 1998 from a little less than 60% in 1995-1997 to about 93%- 99% in the years 2003-2005.

Length frequencies and age groups

The length frequency distributions of Icelandic samples from 2003 through 2005 are shown by months in Figures 1-3. One year olds (2002 year-class) are seen late in year 2003 in the months September through December. This year-class can be followed in 2004 as two year olds and appears to be very prominent. The 2003 year-class is may be hinted at the size 10-11 mm in December 2004 (Fig. 2), but in 2005 the 2003 year-class seems practically invisible. As age assessments have not yet been carried out, further speculations will have to wait till later.

References

MCCRARY, J.A. 1971. Sternal spines as a characteristic for differentiating between females of some Pandalidae. *J. Fish. Res. Board Can.*, **28**: 98-100.

RASMUSSEN. B. 1953. On the geographical variation in growth and sexual development of the deep sea prawn (*Pandalus borealis* Kr.). *Norweg. Fish. Mar. Invest. Rep.*, **10** (3): 1-160.

SKÚLADÓTTIR, U. 2004. An update of the Icelandic shrimp fishery (*Pandalus borealis* Kr.) at the Flemish Cap in 1993-2004. *NAFO SCR Doc*., No. 84, Serial No. N5054, 23 p.

SKÚLADÓTTIR, U., and Á. Gudmundsdóttir 2004. An update of the Assessment of the International Fishery for shrimp fishery (*Pandalus borealis*) in Division 3M (Flemish Cap) in 1993-2004. *NAFO SCR Doc*., No. 89, Serial No. N5059, 14 p.

TABLE 1. Catch (tons) effort (trawling hours *1.9 when double trawl) and unstandardized CPUE (kg/hr) of Icelandic vessels at Flemish Cap.

	January - July				August - December					January - July				August - December			
Year	Month	CPUE	Effort	Catch	Month	CPUE	Effort	Catch	Year	Month	CPUE	Effort	Catch	Month	CPUE	Effort	Catch
1993					Aug	320.4	1334	427.4	2001 *	Jan	285.9	538	153.7	Aug	292.6	2094	612.9
					Sep	349.8	1034	361.7		Feb	299.9	1593	477.6	Sep	277.3	1160	321.6
					Oct	231.7	334	77.4		Mar	303.6	2174	660.0	Oct	267.5	1563	418.1
	Jun	380.2	1767	671.8	Nov	306.8	588	180.4		Apr	239.6	45	10.8	Nov	253.4	1210	306.6
	Jul	342.4	1097	375.6	Dec	236.5	537	127.0		May	271.1	917	248.7	Dec	500.8	404	202.5
	Subtotal	365.7	2864	1047.4	Subtotal	306.7	3827	1173.9		Jun	282.9	2777	785.6				
	Total	365.7	2918	1067.0	Total	306.7	3834	1176.0		Jul	296.5	2992	887.2				
										Subtotal	292.1	11036	3223.6	Subtotal	289.5	6431	1861.7
1994	Jan	228.5	144	32.9	Aug	175.3	1657	290.4		Total	292.1	11036	3223.6	Total	289.5	7178	2077.8
	Feb	371.8	510	189.6	Sep	126.9	476	60.4									
	Mar	295.5	531	156.9	Oct	125.4	492	61.7	2002	Jan	292.6	372	108.9	Aug	311.7	1739	542.0
	Jun	256.4	1297	332.5	Nov	115.5	181	20.9		Feb	343.4	705	242.0	Sep	313.2	1054	330.0
	Jul	212.9	2653	564.8	Dec	75.0	8	0.6		Mar	264.6	1786	472.4	Oct	234.7	923	216.7
	Subtotal	248.6	5135	1276.7	Subtotal	154.2	2814	434		Apr	305.7	2056	628.4	Nov	312.9	559	174.9
	Total	248.6	6693	1664.0	Total	154.2	4123.74	636		May	330.8	2439	806.6	Dec	359.9	437	157.1
										Jun	346.0	2113	731.1				
1995	Feb	280.0	65	18.2	Aug	178.0	4869	866.9		Jul	444.6	1241	551.7				
	Mar	246.8	711	175.5	Sep	134.1	2928	392.5		Subtotal	330.6	10710	3541.1	Subtotal	301.6	4711	1420.7
	Apr	149.9	1487	222.9	Oct	166.3	2088	347.2		Total	330.6	10711	3541.1	Total	301.6	7296	2200.3
	May	260.1	2617	680.7	Nov	144.4	1074	155.1									
	June	248.9	3733	929.2	Dec	174.5	740	129.1	2003	Jan	384.3	162	62.1	Aug	395.9	956	378.6
	Jul	249.5	6625	1653.0						Feb	422.0	715	301.8	Sep	291.6	818	238.5
	Subtotal	241.5	15238	3679.5	Subtotal	161.6	11699	1890.8		Mar	565.1	1303	736.3	Oct	352.4	941	331.6
	Total	241.5	16932	4088.5	Total	161.6	21868.5	3534.4		Apr	430.9	967	416.5	Nov	333.4	727	242.4
										May				Dec	606.8	354	214.8
1996	Jan	207.2	1755	363.7	Aug	165.4	8156	1349.4		Jun	329.7	925	305.1				
	Feb	251.7	1326	333.7	Sep	167.1	8089	1351.7		Jul	287.6	85	24.5				
	Mar	261.8	4604	1205.1	Oct	129.7	5482	711.2		Subtotal	444.2	4157	1846.3	Subtotal	370.3	3796	1405.9
	Apr	211.2	10754	2271.2	Nov	137.9	1456	200.8		Total	444.2	6041	2683.3	Total	370.3	5791	2144.7
	May	189.1	12749	2410.2	Dec	158.1	253	40.0									
	Jun	202.5	13933	2821.5					2004 *	Jan	251.5	403	101.2	Aug	417.2	763	318.2
	Jul	235.9	11963	2821.5						Feb	293.3	892	261.5	Sep	291.5	818	238.5
	Subtotal	214.2	57084	12226.9	Subtotal	155.9	23436	3653.1		Mar	267.9	974	261.0	Oct	328.4	936	307.4
	Total	214.2	64760	13871.0	Total	155.9	43688.7	6810.0		Apr	280.2	1044	292.6	Nov	371.3	928	344.6
										May	315.1	1089	343.0	Dec	606.1	354	214.8
1997	Jan	175.8	413	72.6	Aug	206.7	4252	879.0		Jun	403.5	1015	409.5				
	Feb	214.7	621	133.3	Sep	202.4	3476	703.6		Jul	386.9	967	374.3				
	Apr	135.0	514	69.4	Oct	222.0	2519	559.1		Subtotal	320.1	6383	2043.0	Subtotal	374.7	3799	1423.5
	May	141.4	3736	528.2	Nov	192.5	1039	200.0		Total	320.1	6383	2043.0	Total	374.7	4067	1524.0
	Jun	167.7	5386	903.2	Dec	176.9	429	75.9									
	Jul	209.2	5802	1213.7					2005*	Jan	150.0	4	0.6	Aug	437.4	705	308.4
	Subtotal	177.3	16472	2920.4	Subtotal	206.4	11715	2417.6		Feb	284.4	988	281.0	Sep			
	Total	177.3	19478	3453.3	Total	206.4	14681	3029.6		Mar	344.2	933	321.1				
										Apr	339.9	969	329.4				
1998 *	Feb	217.2	297	64.5	Aug	256.4	3184	816.3		May	442.9	860	380.9				
	Mar	206.8	812	167.9	Sep	184.5	5028	927.5		Jun	431.7	943	407.1				
	Apr	229.5	880	202.0	Oct	196.3	3612	708.9		Jul	449.5	994	446.8				
	May	261.4	2820	737.2	Nov	204.6	1761	360.3		Subtotal	380.8	5691	2166.9	Subtotal	437.4	705	308.4
	Jun	330.7	3537	1169.7	Dec	222.5	644	143.3		Total	380.8	5442	2072.0	Total	#DIV/0!	0	
	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	14446.6	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									

TABLE 2. Nominal catch for the whole year and some averages calculated from the Icelandic logbooks to show trends in CPUEs and size of trawl with years. In calculations of CPUE the effort of twin trawls is multiplied by 1.9. CPUE of January-July (high lighted) adjusted to that of 3 000 meshes trawl is comparable at this time of the year.

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	3063	373	**363**	3102	356	344
1994	2 300	54.4	2994	238	**240**	2951	216	219
1995	7623	38.2	2779	254	**283**	2733	228	251
1996	20681	42.9	2803	206	**218**	2813	198	211
1997	6483	53.4	2780	188	**192**	2921	198	203
1998	6572	74.8	3016	288	**294**	2974	264	266
1999	9217	70.6	3441	280	**252**	3402	276	243
2000	8978	81.4	3528	287	**245**	3528	282	240
2001	5301	63.0	3571	328	**290**	3518	325	289
2002	5741	73.6	3713	370	**305**	3713	363	294
2003	4695	92.6	3949	367	**302**	4004	358	291
2004	3567	98.9	4460	320	**227**	4460	332	250
2005	2072	99.0	4460	386	**260**			
Mean 93-2004	7357	66	3341	292	**268**	3343	283	258

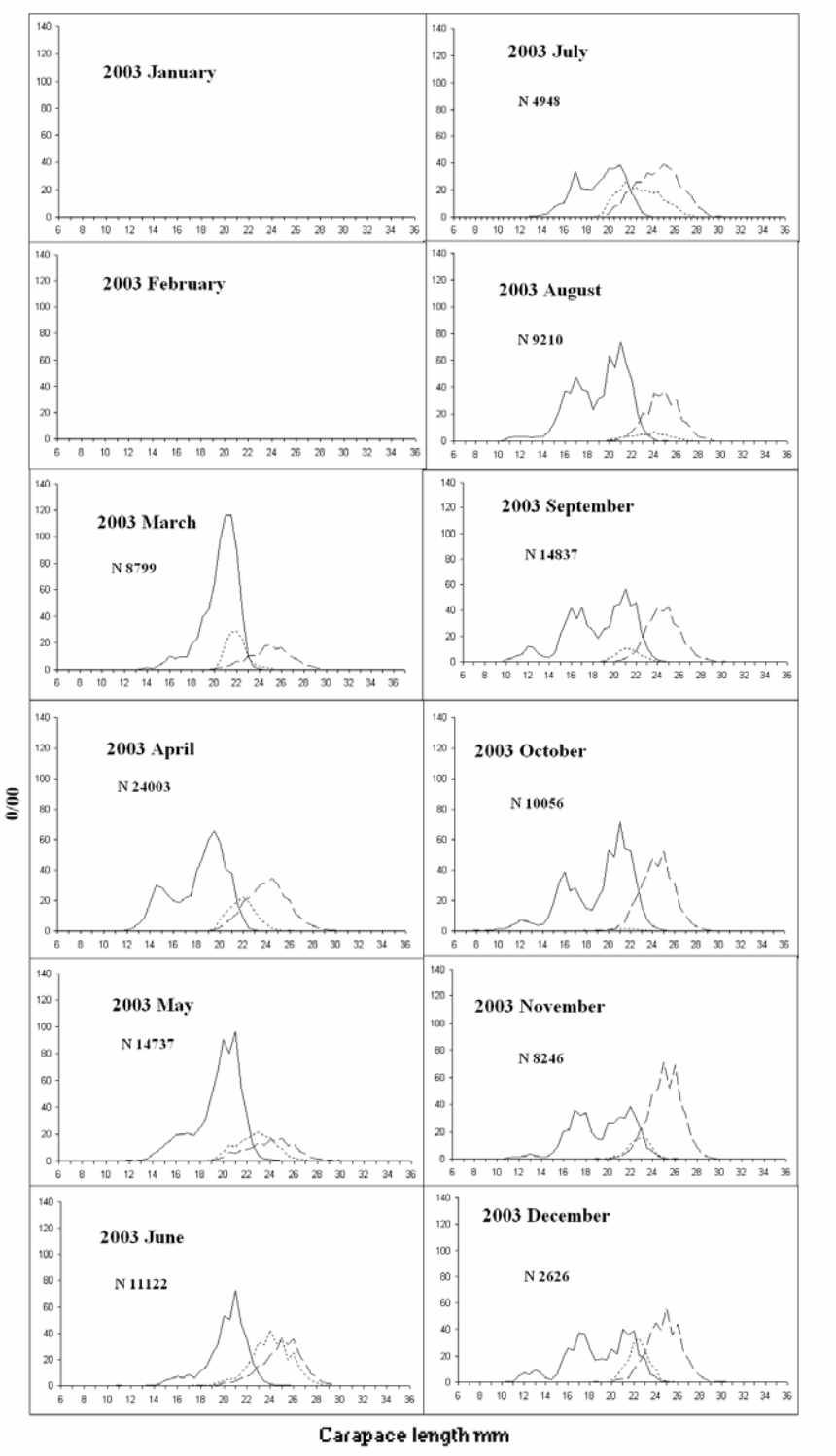

Fig.1. The length frequency distribution of northern shrimp at Flemish Cap by months in 2003.

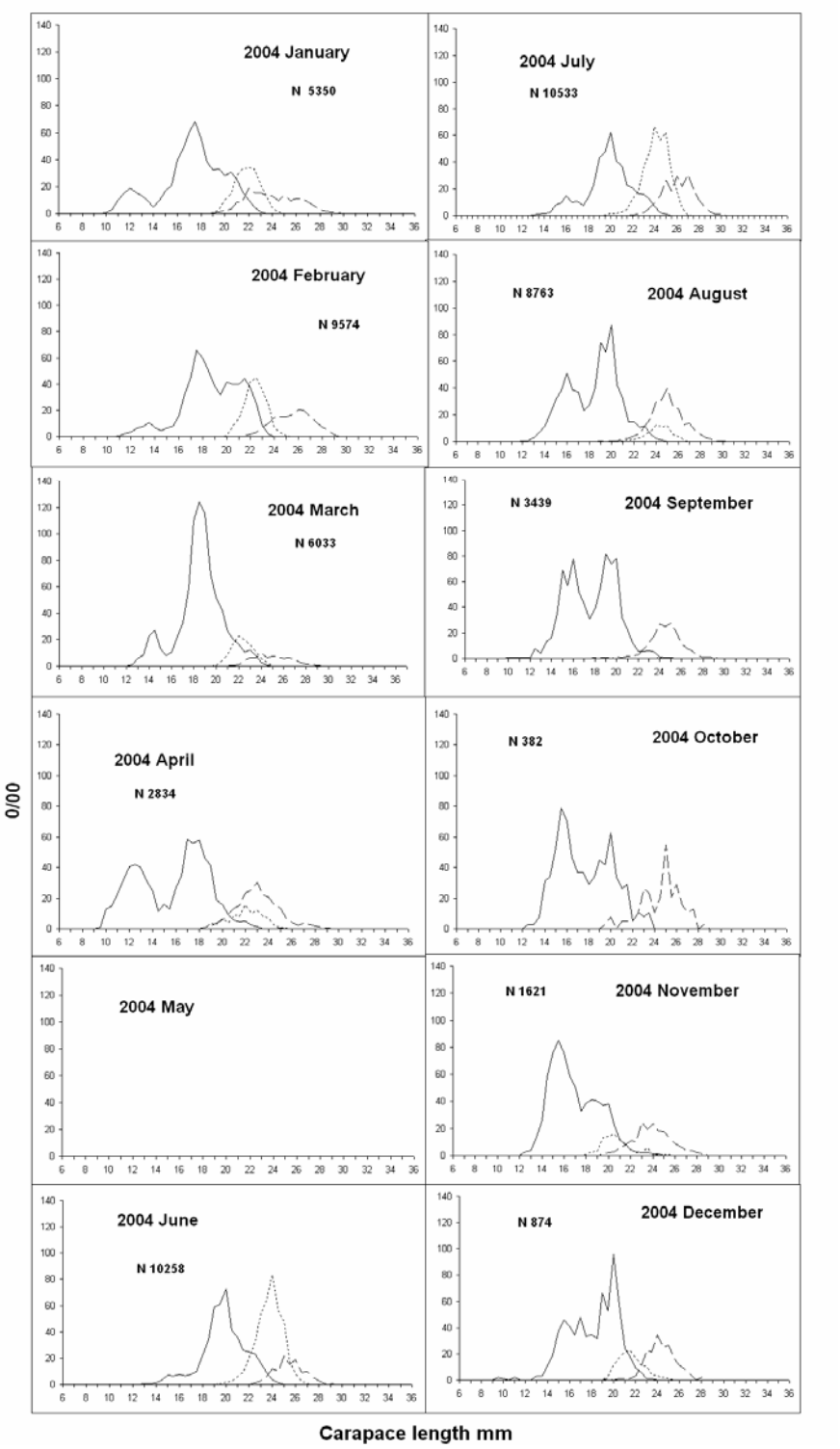

Fig.2. The length frequency distribution of northern shrimp at Flemish Cap by months in 2004.

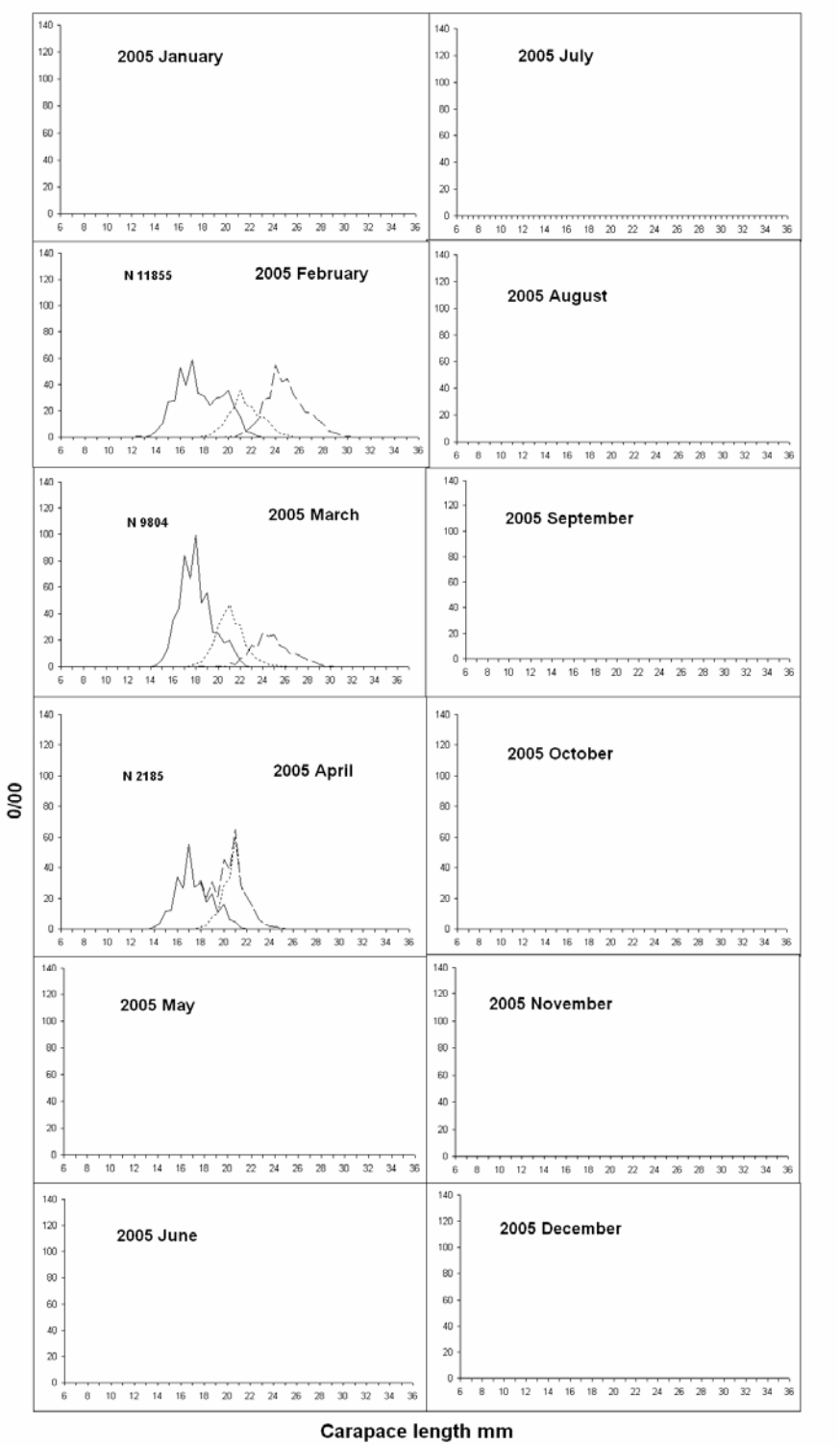

Fig.3. The length frequency distribution of northern shrimp at Flemish Cap by months in 2005.