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Age structure in northern shrimp (*Pandalus borealis*) on Flemish Cap
(NAFO Div 3M) in some periods in 1995-1996.

by

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INTRODUCTION

Several authors have investigated the age structure of northern shrimp on Flemish Cap, see e.g. Aschan (1993), Nicolajsen (1994), Parsons & Veitch (1993, 1994, 1995), Skúladóttir & Einarson (1993).

MATERIALS AND METHODS

Biological samples and length measurements have been obtained from Faroese vessels by Faroese observers for different periods in 1994-1996, Figs 1 and 2. The total oblique carapace length distribution was investigated by modal analysis with the MIX program (MacDonnald & Pitcher, 1979). The procedure was first to give mean OCL and sigmas and keep them fixed and then let the program calculate proportions (option 4). Then proportion and mean was kept fixed and sigmas were calculated (option 6). Then the mean and sigmas were kept fixed and proportions calculated (option 6). Finally none of the three parameters were fixed and the calculations were repeated (option 6). In one instance it was necessary to keep one of the means fixed so that the program would not change it to an unrealistic value. In the fitting process the sigmas were constrained by letting the MIX program calculate them proportional to the coefficient of variation.

RESULTS

The result from the modal analysis by MIX is shown in Tabs. 1-4. The catches are dominated by the two year classes 1992 and 1993. The proportion values of the 1992 year class varies between 0.51-0.78 and for the 1993 year class varies between 0.14-0.31 excluding the outlayer in Feb 1996. The proportion of all other year classes is less than 0.10 again excluding the Feb 1996 values.

Mean OCL and their sigmas are shown in Tabs. 3 and 4. The means are in good accordance with the growth curve (Nicolajsen, 1996). Sigmas increased with age as expected from observation and the constraints mentioned above and were between 0.78-1.95. Coefficient of variation lay in the range 0.0463-0.0703.

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SKÚLADÓTTIR, U., and S. EINARSSON. 1993. The Icelandic shrimp (*Pandalus borealis*) fishery at the Flemish Cap in 1993, with a preliminary analysis of age structure. *NAFO Scientific Council research documents*, 93/101, 9 p.

Table 1 Results of modal analysis of OCL distributions of shrimp from Flemish Cap, 1995-1996. (Continues).

3M shrimp, 4th quarter 95

Fitting Normal components

Proportions and their standard errors			
.51329	.26886	.17120	.04665
.01018	.01111	.01684	.01822

Means and their standard errors			
17.7674	22.4190	26.1040	28.4638
.0279	.0719	.2171	.4091

Sigmas (CONSTANT COEF. OF VAR. = .0525) and standard error			
.9329	1.1771	1.3706	1.4945
.0177			

Degrees of freedom = 42 - 1 + 0 - 0 - 8 - 3 = 30

Chi-squared = 129.571 (P = .0000)

* WARNING * GOODNESS-OF-FIT TEST MAY BE INVALID; 3 EXPECTED COUNTS ARE < 1

3M shrimp, all, Mar 96

Fitting Normal components

Proportions and their standard errors				
.01428	.67636	.20843	.00841	.09252
.00118	.00545	.02869	.05829	.02913

Means and their standard errors				
12.5398	18.5557	23.6509	25.5797	27.3125
.0808	.0189	.2066	FIXED	.3061

Sigmas (CONSTANT COEF. OF VAR. = .0697) and standard error				
.8736	1.2927	1.6477	1.7821	1.9028
.0105				

Degrees of freedom = 48 - 1 + 0 - 0 - 9 - 1 = 37

Chi-squared = 320.198 (P = .0000)

Table 1 Results of modal analysis of OCL distributions of shrimp from Flemish Cap, 1995-1996. (Continued).

3M shrimp, all, Apr 96

Fitting Normal components

Proportions and their standard errors

.03298	.71815	.21228	.03659
.00191	.00591	.00672	.00620

Means and their standard errors

13.1059	19.3895	24.1993	27.6680
.0591	.0212	.0955	.2569

Sigmas (CONSTANT COEF. OF VAR. = .0703) and standard error

.9217	1.3637	1.7019	1.9459
.0102			

Degrees of freedom = 49 - 1 + 0 - 0 - 8 - 1 = 39

Chi-squared = 934.437 (P = .0000)

* WARNING * GOODNESS-OF-FIT TEST MAY BE INVALID; 3 EXPECTED COUNTS ARE < 1

3M shrimp, all, May 96

Fitting Normal components

Proportions and their standard errors

.01001	.64790	.31478	.02730
.00110	.00540	.00547	.00262

Means and their standard errors

15.7378	20.4789	24.8201	28.5957
.0982	.0151	.0320	.1464

Sigmas (CONSTANT COEF. OF VAR. = .0497) and standard error

.7828	1.0186	1.2345	1.4223
.0085			

Degrees of freedom = 42 - 1 + 0 - 0 - 8 - 3 = 30

Chi-squared = 191.908 (P = .0000)

* WARNING * GOODNESS-OF-FIT TEST MAY BE INVALID; 3 EXPECTED COUNTS ARE < 1

3M shrimp, all, Jun 96

Fitting Normal components

Proportions and their standard errors

.01615	.77759	.13547	.03938	.03142
.00176	.00680	.00965	.00791	.00921

Means and their standard errors

14.6690	20.0943	24.1667	27.0372	29.7310
.0940	.0199	.1545	.7012	.3582

Sigmas (CONSTANT COEF. OF VAR. = .0537) and standard error

.7874	1.0786	1.2972	1.4512	1.5958
.0114				

Degrees of freedom = 40 - 1 + 0 - 0 - 10 - 0 = 29

Chi-squared = 205.677 (P = .0000)

3M shrimp, all, Jul 96

Fitting Normal components

Proportions and their standard errors

.66350	.20528	.09358	.03764
.01601	.02282	.01901	.01356

Means and their standard errors

20.3130	24.4151	27.0452	29.9550
.0410	.1866	.4895	.4791

Sigmas (CONSTANT COEF. OF VAR. = .0463) and standard error

.9407	1.1306	1.2524	1.3872
.0288			

Degrees of freedom = 31 - 1 + 0 - 0 - 8 - 0 = 22

Chi-squared = 41.4477 (P = .0073)

Table 2 Proportion of each age group by year class and season, 1995-96.

	Age group	1/2	2/3	3/4	4/5	5/6	6/7
	Year class	1994	1993	1992	1991	1990	1989
1995	4th q.		0.51	0.27	0.17	0.05	
1996	Feb			0.05	0.45	0.34	0.15
	Mar	0.01	0.68	0.21	0.01	0.09	
	Apr	0.03	0.72	0.21	0.04		
	May	0.01	0.65	0.31	0.03		
	Jun	0.02	0.78	0.14	0.04	0.03	
	Jul		0.66	0.21	0.09	0.04	

Table 3 Mean OCL of each age group by year class and season, 1995-96.

	Age group	1/2	2/3	3/4	4/5	5/6	6/7
	Year class	1994	1993	1992	1991	1990	1989
1995	4th q.		17.8	22.4	26.1	28.5	
1996	Feb			20.5	24.6	27.3	29.9
	Mar	12.5	18.6	23.7	25.6	27.3	
	Apr	13.1	19.4	24.2	27.7		
	May	15.7	20.5	24.8	28.6		
	Jun	14.7	20.1	24.2	27.0	29.7	
	Jul		20.3	24.4	27.0	30.0	
	Average	14.01	19.43	23.45	26.66	28.54	29.87

Table 4 Sigmas of OCL of each age group by year class and season, 1995-96.

	Age group	1/2	2/3	3/4	4/5	5/6	6/7	coeff.
	Year class	1994	1993	1992	1991	1990	1989	var.
1995	4th q.		0.93	1.18	1.37	1.49		0.0525
1996	Feb			0.97	1.16	1.29	1.41	0.0525
	Mar	0.87	1.29	1.65	1.78	1.90		0.0697
	Apr	0.92	1.36	1.70	1.95			0.0703
	May	0.78	1.02	1.23	1.42			0.0497
	Jun	0.79	1.08	1.30	1.45	1.60		0.0537
	Jul		0.94	1.13	1.25	1.39		0.0463
	Average	0.84	1.10	1.31	1.48	1.53	1.41	

Northern shrimp, Flemish Cap, NAFO Div 3M
Oblique carapace length distribution

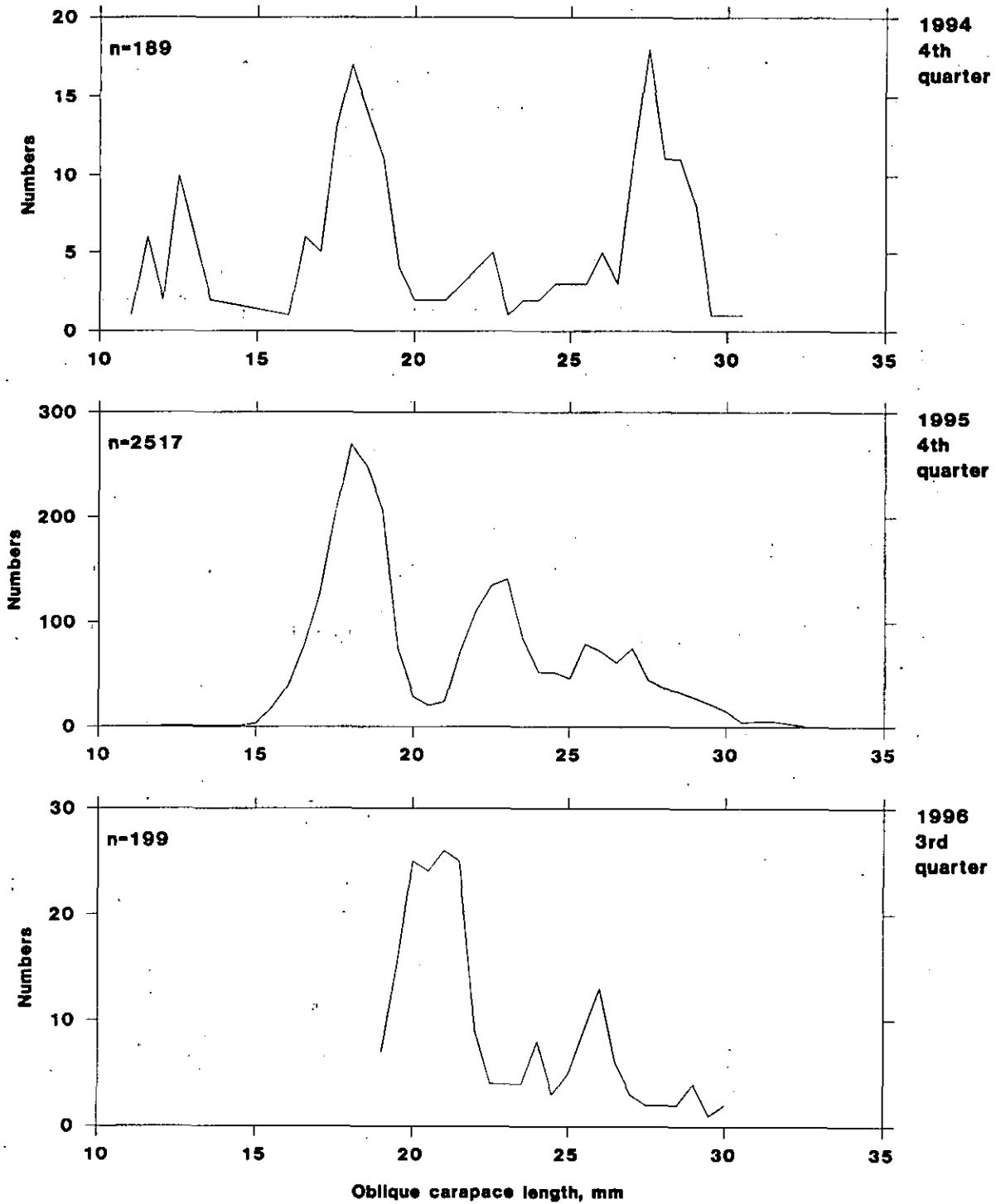


Figure 1 Total OCL distribution in NAFO Div 3M, 4th quarter 1994 and 1995, and 3rd quarter 1996.

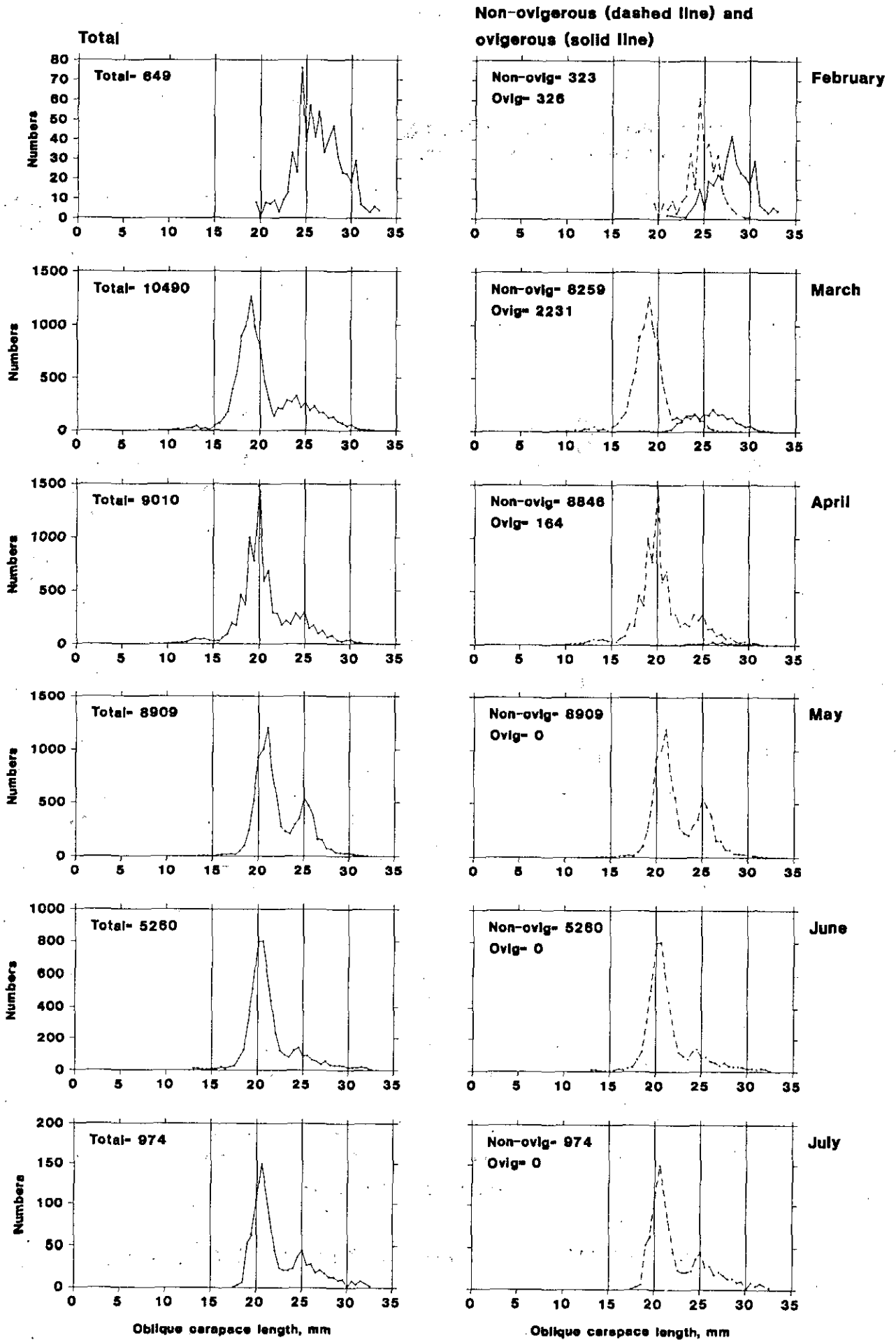


Figure 2 Total OCL distribution and separated into non-ovigerous and ovigerous in NAFO Div 3M, in the period Feb-Jul 1996.