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Modal Analysis for Davis Strait Shrimp Samples

by

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INTRODUCTION

In January 1987, the Scientific Council concluded that some experts on shrimp should meet at some time in June 1987 to analyse data from West Greenland shrimp samples (NAFO, 1987). In response to that directive and in advance of a special meeting on shrimp ageing, scientists from Canada and Greenland analysed data from a number of years for age composition. This paper presents a brief overview of those analyses and a brief discussion on problems of interpretation.

MATERIALS AND METHODS

Shrimp samples from selected stations from the Greenland shrimp research surveys in the Davis Strait (NAFO Div. 0A, 1A, 1B and 1C - Fig. 1) in July-August 1983 to 1986 were analysed for age composition. Oblique carapace lengths (Rasmussen, 1953) were measured to the nearest 0.1 mm using Vernier calipers and subsequently combined to 0.5 mm. Shrimp were separated into male and female components based on the characteristics of the endopod of the first pleopod (Rasmussen, 1953). Females were further separated into primiparous (first time spawners) and multiparous (spawned previously) groups based on the condition of the sternal spiens (McCrary, 1971). Modal analyses (Macdonald and Pitcher, 1979) were performed on male length distributions only, to obtain estimates of the mean for each normal component.

Modal analysis were conducted by two of the authors independently. Results were compared and tabulated by year.

RESULTS

Results of the independent analysis show that there was good agreement between the two (Table 1). Results were virtually identical in several instances and in cases where differences occurred, they were related to problems in the interpretation of the tails of the distribution or where overlapping was severe.

Seven components were identified with means at roughly 7, 10-12, 13-14, 15-17, 28-19.5, 20-22 and greater than 22 mm, as illustrated in Table 2. Although the seven modes were not evident in all samples, when summarized for all years, some consistency is evident (Fig. 2). The plot does not show any trend in mean size related to latitude (Fig. 1).

DISCUSSION

The method of modal analysis is very sensitive to the number of components selected at the outset. Despite this, the agreement achieved between the individuals is noteworthy. However, at this point, it is uncertain whether or not the modes represent year-classes, given that there are no other data to support these conclusions. In an attempt to resolve these difficulties, it would be appropriate to investigate the parameters associated with the estimates (standard deviations, proportions), analyse further samples from areas where individual size-groups were prominent and attempt to follow modal progression over time.

Table 1. Results (mean carapace lengths) of independent modal analyses of Davis Strait shrimp samples.

Sample	Analysis A	Analysis B
83-218		18.51
		20.09
	21.27	21.83
83-236		13.08
	14.88	14.95
	18.14	17.97
	20.58	20.23
		21.04
83-240		12.97
	13.45	13.80
	16.15	16.28
	18.63	18.47
		19.63
	21.65	21.64
83-245	11.89	11.89
	16.47	16.40
	18.26	18.25
	20.80	20.85
83-203	13.53	13.51
	17.66	17.67
	20.15	20.16
	22.59	22.59
83-234	18.80	18.70
	21.02	21.22
	22.81	23.10
83-216		11.62
	15.70	15.70
	19.39	19.26
	22.00	21.74
83-217	12.01	12.00
	16.33	16.33
	19.33	19.34
	21.96	22.00
83-221		7.03
	10.46	10.43
	14.78	14.73
	18.57	18.57
		20.52
83-220	16.88	16.87
	19.24	19.23
	21.15	21.09
83-223	14.34	
	18.55	
	20.95	
83-234		10.43
		13.12
		15.58
	16.64	17.68
	18.54	19.39
	21.10	21.51
		23.11
83-229		12.17
	14.74	14.71
		19.30
	21.21	21.49
		23.75
84-203	16.80	16.80
	18.69	18.69
	21.09	21.09
84-221	15.05	14.53
	17.94	17.84
	19.49	
84-220	15.90	14.87
	18.00	18.42
	19.41	
84-217	15.19	15.15
	18.60	18.58
84-218	15.92	15.92
	18.37	18.19
	20.62	19.47
		21.34
		23.61
84-216	15.66	15.60
	18.82	18.78
	22.22	22.24
84-223	14.06	14.03
	18.83	19.02
	21.13	21.18
84-222	15.68	
	17.42	17.40
	20.87	21.22
84-229	13.91	13.98
	18.20	18.25
	21.94	21.94
84-234	17.54	
	19.22	19.00
	21.24	21.48
	23.05	
84-230	19.81	19.63
	21.16	21.15
	22.85	22.83
84-236	14.90	15.34
	17.43	17.47
	20.42	20.44
84-240	15.98	15.96
	19.53	19.52
84-245	10.73	10.73
	14.40	14.38
	18.68	18.77
	21.03	21.38
85-203		13.76
	18.71	19.19
	21.58	21.74
85-216	13.57	13.51
	15.25	
	16.98	17.14
	18.26	
	19.38	
	21.01	21.77
85-217	16.77	16.66
	19.66	19.62
85-218	20.40	20.40
	22.33	22.33
85-234	19.33	19.35
	22.03	22.03
85-223	18.88	
	20.31	20.35
	21.91	22.20
85-220	17.25	17.27
	20.47	20.47
85-231	20.37	20.38
	23.69	23.74
85-236	18.70	18.63
	21.38	21.32
86-203	18.31	18.21
	21.91	21.77
86-216	13.59	13.49
	16.63	16.64
	19.47	19.61
86-217	16.78	17.99
	18.34	
	20.48	20.79
86-218		17.78
	20.34	20.92
	21.08	
86-222	19.38	
	21.22	21.47
	22.98	23.55
86-234	20.80	20.75
	22.60	22.62
	18.46	17.63
	21.60	21.41
86-231	18.49	18.47
	21.79	21.79
86-220	13.85	13.57
	16.79	16.50
	19.19	19.27
	21.21	21.51
86-221	11.70	11.68
		15.38
86-223	16.89	18.42
	21.49	21.91
	22.58	
86-229	16.97	15.65
	19.28	19.73
	21.58	21.73
86-237	15.67	15.48
	18.87	19.53
	20.51	21.70
	22.11	
86-245		15.47
	19.07	19.71
	20.29	22.48
86-240	13.44	13.82
	15.68	
	18.39	18.43
	20.95	
86-236	7.70	
	11.39	11.39
	15.93	15.93
	20.26	20.27
86-230	18.20	18.15
	20.95	22.10
	22.77	

Table 2. Summary of modal analysis by year (means indicated).

Sample No.	Component 1	2	3	4	5	6	7
			1983				
221	7.0	10.4		14.7	18.6	20.5	
216		11.6		15.7	19.3	21.8	
217		12.0		16.3	19.3	22.0	
245		11.9		16.5	18.3	20.8	
234				16.6	18.5	21.1	
236				14.9	18.1	20.4	
223				14.3	18.6	21.0	
234					18.8	21.0	23.0
229		12.2		14.7	19.3	21.5	23.8
203			13.5		17.7	20.2	22.6
240			13.5	16.2	18.5	21.6	
			1984				
245		10.7	14.4		18.7	21.1	
229			13.9		18.2	21.9	
223			14.0		18.9	21.1	
203				16.8	18.7	21.1	
222				15.7	17.4	21.0	
236				15.1	17.4	20.4	
218				16.0	18.2	20.6	
221				14.7	18.0	19.5	
220				15.5	18.2	19.4	
217				15.2	18.6		
216				15.6	18.8		22.2
240				16.0	19.5		
234				17.5	19.1	21.4	23.0
230					19.7	21.2	22.8
			1985				
203			13.8		18.9	21.6	
216			13.5	15.16	18.19	21	
217				16.7	19.6		
220				17.3		20.5	
223					18.9	20.3	22.0
218						20.4	22.3
231						20.4	23.7
234					19.3		22.0
236					18.7		21.3
			1986				
236	7.7	11.4		15.9		20.3	
221		11.7		15.4			
240			13.6	15.7	18.4	21.0	
220			13.8	16.7	19.3	21.4	
216			13.6	16.6	19.6		
229				15.7	19.5	21.7	
245				15.5	19.7	22.5	
237				15.5	19.5	21.7	
217				16.8	18.3	20.5	
218					17.8	20.9	
203					18.3	21.9	
234					18.0	21.5	
231					18.5	21.8	
223					18.4	21.9	
230					18.2	21.0	22.8
222					19.4	21.4	23.3
234						20.8	22.6

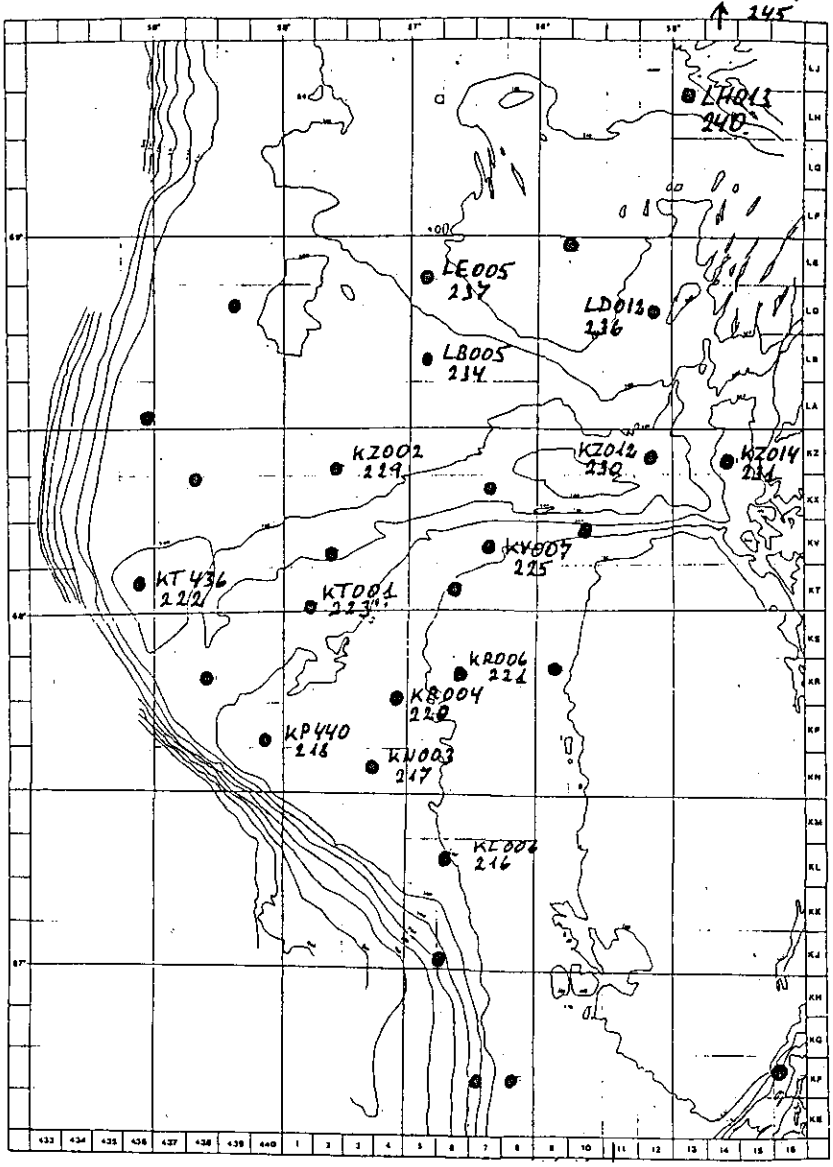

Fig. 1. Sampling sites from shrimp of West Greenland.

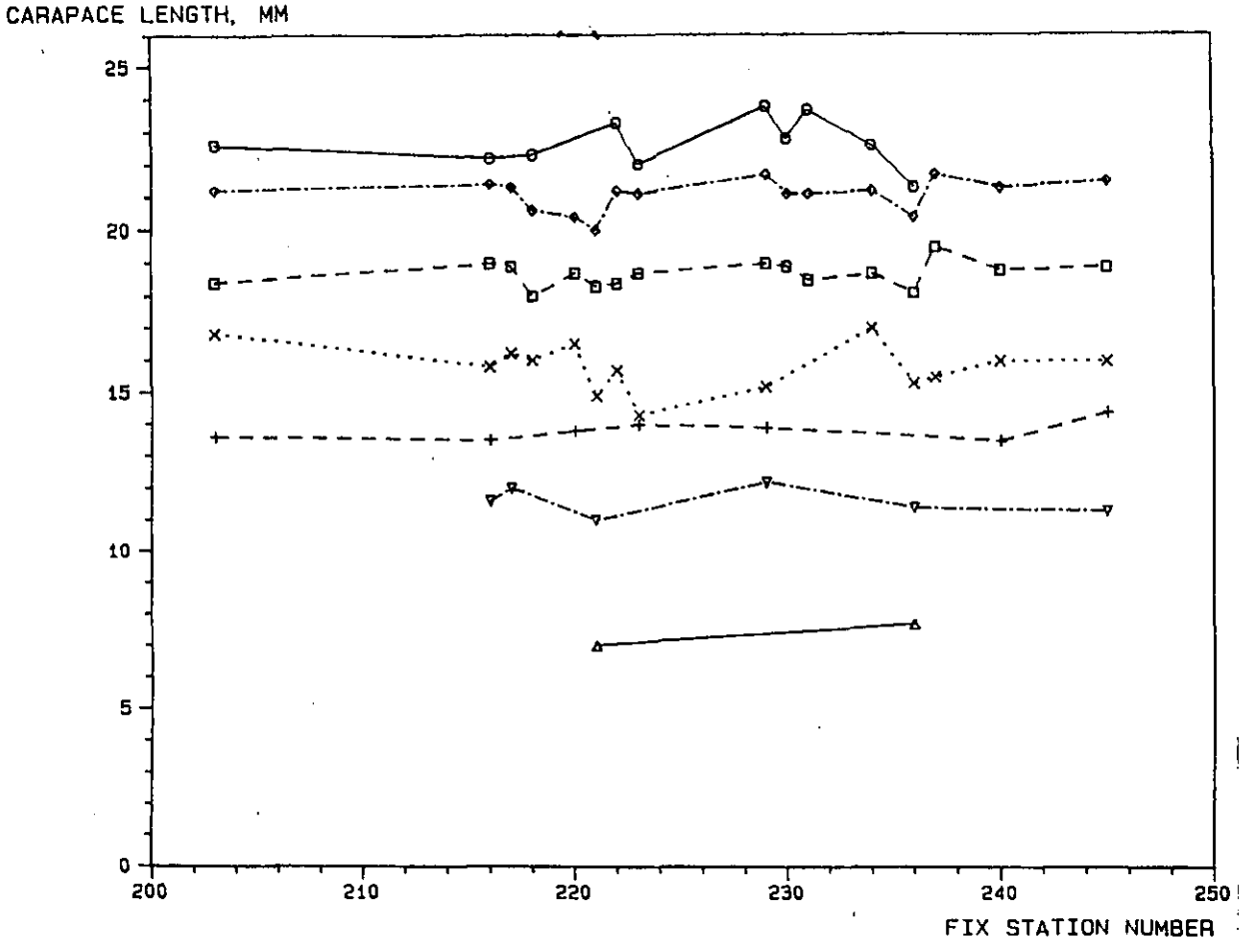

Fig. 2. Average mean carapace lengths of shrimp from sampling stations in Davis Strait, 1983-86.