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Northern Shrimp (*Pandalus borealis*) Stock on Flemish Cap in June-July 1993

by

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The shrimp population (Pandalus borealis) during the survey on Flemish Cap in June-July 1993 was analyzed. The survey was conducted from June 23th to July 8th. Results are presented in this paper and compared with those previously observed.

MATERIAL AND METHODS

The survey was conducted following the same method as in previous year (Vázquez, 1993). The 1993 survey comprise 101 valid tows. Two of the deepest strata: 14 and 18, were not sampled. Only one tow was made in stratum 17. Shrimp biomass in missing strata were calculated assuming the constancy of the ratio between the biomass in that stratum and the biomass in strata of the same depth range zone, as well as in the above and below contiguous depth range zones. The previuous five surveys were used to calculate a mean value of this ratio.

Whenever shrimp appeared in the trawls, samples of approximately 1 Kg were taken. Samples were conserved by freezing for laboratory analysis, following the same procedures as in previous years (Mena, 1992).

Sex was identified by observation of the endopod of the first pleopod (Rasmussen, 1953). Individuals changing sex were included with the males. Females were classified into inmature (first time spawners) and mature (spawned previously) according to their sternal spines (McCrary, 1971). No ovigerous females were found this year as also occured in 1992 survey, because the spawning period in this zone begins at the end of July or early August (Mena, 1991) and the survey was earlier.

The oblique carapace length (OCL): distance from the base of the eye to the posterior dorsal edge of the carapace (Shumway et al., 1985) was used as a size reference. The lateral carapace length (CL) (Horsted and Smidt, 1956) was used in all previous surveys. The relationship between both measurement was analyzed with data from 1992 survey. Length frequency distributions from all previous surveys were

actually transformed to the equivalent oblique carapace length size reference.

RESULTS

Total shrimp biomass by the swept area method in the last six years is shown in the Table 1. The increase observed in 1991 and 1992 was followed for a notable reduction in 1993.

Length frequencies by sex are shown in Table 2. Length frequencies by strata (Table 3) follow the characteristic distribution of this species observed in previuos years: shrimps do not appear in depths shallower than 257 m (140 fathoms). The smaller individuals (OCL between 13 and 18.5 mm) occupy shallower strata, between 259 and 368 m (141-240 fathoms). Individuals greater than 18.5 mm of OCL are distributed in depths between 259 m (141 fathoms) and 552 m (300 fathoms). Shrimps are scarce in greater depths than 552 m.

Shrimp biomass estimated by strata from 1988 to 1993 is shown in Table 4. Strata characterized by the abundance or scarcity of shrimps are approximately the same every year, which indicates that their distribution pattern is stable.

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TABLE 1 - Total biomass estimated by swept area method and average catch per mile.

Year	Biomass(t)	Average catch per mile (Kg)
1988	2164	1.54 ± 0.28
1989	1923	1.37 ± 0.24
1990	2139	1.53 ± 0.21
1991	8211	5.83 ± 0.71
1992	16531	11.75 ± 1.86
1993	9256	6.57 ± 1.04

TABLE 2 - Length frequencies by sex.

Length	Ind	M	F: inmat	mat	ovig
10.0 -		1			
10.5 -					
11.0 -					
11.5 -					
12.0 -					
12.5 -					
13.0 -		52			
13.5 -		182			
14.0 -		377			
14.5 -		1085			
15.0 -		2580			
15.5 -		3145			
16.0 -		3584			
16.5 -		2680			
17.0 -		1449			
17.5 -		379			
18.0 -		531			
18.5 -		666	11		
19.0 -		1314	8	19	
19.5 -		3017	24	17	
20.0 -		2306	50		
20.5 -		2862	88	18	
21.0 -		1777	334	53	
21.5 -		1687	469	78	
22.0 -		741	364	67	
22.5 -		602	303	52	
23.0 -		1364	237	286	
23.5 -		1849	676	586	
24.0 -		1362	1320	971	
24.5 -		846	1343	1791	
25.0 -		520	2109	4012	
25.5 -		275	2168	5993	
26.0 -		115	2002	6407	
26.5 -		21	1672	6133	
27.0 -		25	1554	4420	
27.5 -			548	2850	
28.0 -			372	2037	
28.5 -		40	176	1330	
29.0 -			16	609	
29.5 -				416	
30.0 -				217	
30.5 -				69	
31.0 -				79	
31.5 -				4	

frequencies x 10000

Ind - indetermined
M - male
F - female
inmat- inmature
mat - mature
ovig - ovigerous

TABLE 3 - Length frequencies by strata ('0000).

Depth (m):	186-257	259-368					372-552			554-736			
Strata:	6	7	8	9	10	11	12	13	15	16	17	19	total
length													
10.0 -		1											1
10.5 -													
11.0 -													
11.5 -													
12.0 -													
12.5 -													
13.0 -		50				2							52
13.5 -		86	16		80								182
14.0 -	1	119	24		148	84							377
14.5 -	1	559	89	3	376	56							1085
15.0 -	3	1190	278	2	736	319	51						2580
15.5 -	3	1535	351	1	662	447	146						3145
16.0 -	1	1791	492		809	325	164						3584
16.5 -	1	912	323	2	794	534	113						2680
17.0 -	1	486	222	1	405	256	78						1449
17.5 -		93	117		114	46		9					379
18.0 -		134	77		236	74		9					531
18.5 -		409			139	77	51						677
19.0 -		628	8		412	171	113	9					1341
19.5 -	1	1864	77		872	119		37	89				3058
20.0 -		538	101	13	885	367	298	46	93	14			2356
20.5 -	3	1526	162	61	571	342	127	18	152	4			2968
21.0 -	2	728	162	15	433	541	228	55					2164
21.5 -	1	688	231	2	434	494	222	27	133			2	2234
22.0 -		421		26	201	325	153	37		9			1172
22.5 -		169	77	5	125	136	206	9	203	9		19	957
23.0 -	2	210	284	51	133	147	664		349	47		2	1887
23.5 -	5	627	146	14	360	404	790	27	634	79		24	3111
24.0 -	5	664	344	18	557	820	614	24	531	54	5	19	3653
24.5 -		665	497	127	549	425	607		1052	25		32	3980
25.0 -	2	1183	453	209	894	1042	1062	51	1616	31	5	91	6641
25.5 -	3	1442	505	148	1245	1073	1807	76	1906	48	5	177	8436
26.0 -	1	1387	805	186	907	829	1874	94	2266	62	19	92	8524
26.5 -	1	619	291	111	586	533	2090	170	3095	70	28	232	7826
27.0 -	1	269	223	24	222	366	2346	126	2086	92	38	205	5999
27.5 -		109	8	62	106	229	1146	79	1365	126	46	122	3398
28.0 -		84	138		18	68	922	61	947	58	28	86	2409
28.5 -		84					365	42	796	163	14	81	1546
29.0 -							200	6	271	76	33	42	625
29.5 -							112	22	176	32	23	51	416
30.0 -							52	17	74	31	5	38	217
30.5 -							14	6	17	16	5	11	69
31.0 -								6	50	11	5	8	79
31.5 -												4	4

TABLE 4 - Total biomass stimated by strata (t).

trata	Depth (fathoms)	1988	1989	1990	1991	1992	1993
1 -	70- 80	-	-	-	-	-	-
2 -	81-100	-	-	-	-	-	-
3 -	101-140	-	-	-	5	-	1
4 -	"	-	-	-	-	-	-
5 -	"	-	-	-	4	8	-
6 -	"	-	-	2	19	3	3
7 -	141-200	18	20	212	713	2134	1404
8 -	"	9	51	46	158	1130	545
9 -	"	57	47	24	150	88	109
10 -	"	115	44	188	1499	2278	972
11 -	"	89	-	105	733	2714	794
12 -	201-300	786	582	313	1733	3329	1786
13 -	"	64	58	41	63	28	120
14 -	"	255	218	407	814	1640	(1161)
15 -	"	404	328	558	1485	2522	2029
16 -	301-400	308	234	239	171	303	133
17 -	"	2	10	-	-	-	36
18 -	"	-	-	-	-	-	(-)
19 -	"	56	331	4	663	354	163
total (t)		2164	1923	2139	8211	16531	9256

(no sampled strata)

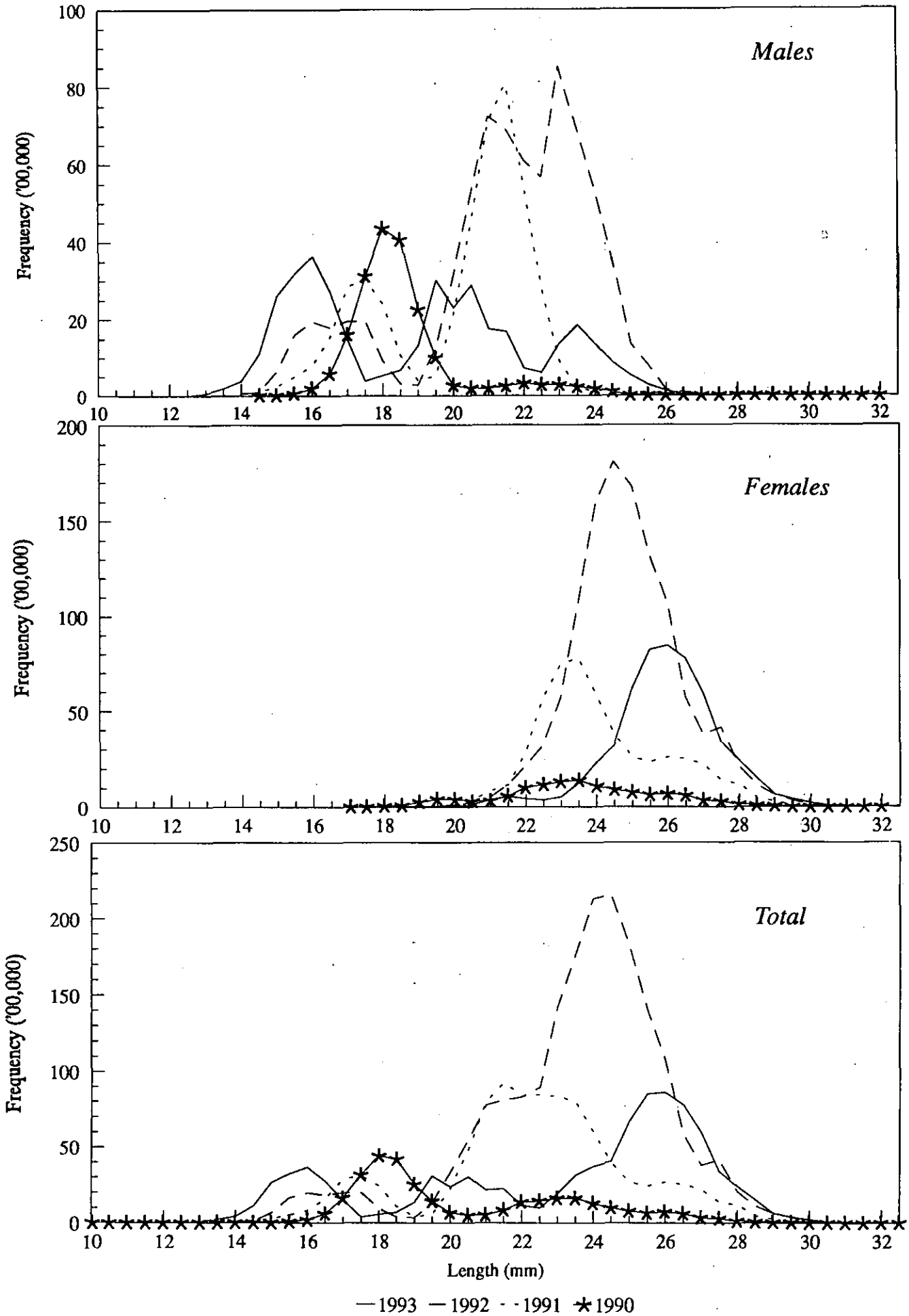

Figure 1. Shrimp length distribution on Flemish Cap, 1990-1993.

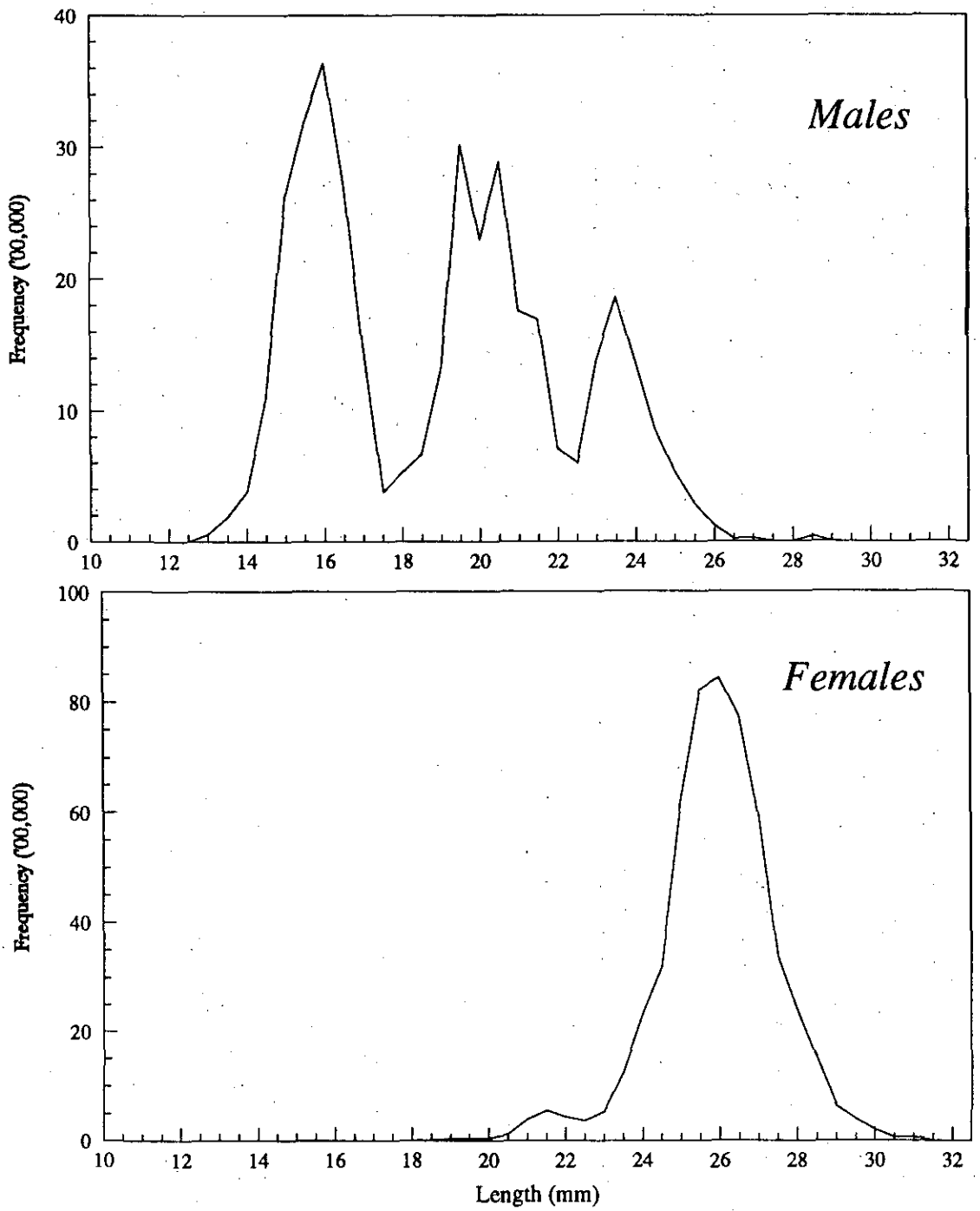

Figure 2. Shrimp length distribution on Flemish Cap in June-July 1993.