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Northern prawn (*Pandalus borealis*) length distribution and fecundity in Flemish Cap

by

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INTRODUCTION

During July-August, 1990, the third EEC survey in Flemish Cap was made, following similar procedures that in previous ones (Vázquez, 1991). The treatment with northern prawn (Pandalus borealis) was just like that of 1989 and very similar to that of 1988.

MATERIAL AND METHODS

From the hauls with significant quantities of northern prawn, we took a sample of 1 - 1.5 kg that was immediately frozen for further analysis at the laboratory. In 1988 meditions were made during the survey, and we only froze subsamples for the length-weight relationship and to separate females in primiparous and multiparous.

LENGTH DISTRIBUTION : Once at the laboratory, samples were thawed out one by one, classified by sex and measured to the lower milimeter, as in previous years. We have used the oblique caparace length described by Horsted and Smidt (1956) from the base of the eye to the posterior lateral edge of the caparace. The most commonly used oblique caparace length is the one described by Rasmussen (1953) from the base of the eye to the posterior dorsal edge of the caparace. Both measurements have a good linear correlation (Teigsmark, 1983).

In previous publication (Escalante et al, 1990) we have used sampling data of length distribution as population typifier. In this work we made estimations of population length distribution in the area for the three consecutive years, 1988, 1989 and 1990. So, differences observed cannot be due to different intensities of sampling.

LENGTH-WEIGHT RELATIONSHIP : Females were separated in two groups: primiparous (first time spawned) and multiparous (spawned previously) basing ourselves on the condition of sternal spines (McCrary, 1971) and subsamples of individuals were weighted (after a little draining time) to the nearest 0.1 gr. Length-weight regression lines were estimated with the BMDP 6D program, as in previous years.

Proportion between primiparous and multiparuos varies much according to years. This variation must correspond to a real phenomenon and not be an artefact of sampling, because the used criterium (sternal spines) is almost clear, although diferences also appear when the determinations were carried out by the same person. Length distribution supports this interpretation as it will be commented later.

FECUNDITY : In this year we have kept some ovigerous females to study fecundity. Individuals were kept in formaldehid 4% during 24 hours, to hardem them, and then kept in isopropilic alcohol 40% in individual plastic bags. Once at the laboratory we have followed the procedure described by Lund (1990): Cutting pleopods with the eggs attached, putting them on a Petri's disc, separating them and counting eggs in a binocular lens without any other previous treatment.

In this analysis we have used the oblique caparace length to the dorsal edge of caparace because it is the measurement used by Teigsmark (1983) and by Lund (1990).

Seventy individuals were kept for this analysis. This number turned out to be insufficient to make a more detailed work, specially because many of them had not maintained all the eggs. Sometimes we had very well conserved eggs, most of them intact, while other times we had a lot of empty shells, with their content scattered through all the egg mass. We don't know the reason of this difference but it would be interesting to know the meaning of the time passed in formaldehid.

The proportion of ovigerous females increased during the time of the survey. That fact indicates that it coincides with the beginning of the spawning period. The extreme dates found for the spawning period of other populations in the North Atlantic Ocean are between the end of July and the end of August, in the coldest waters areas (0-2 C) like Spitsbergen, North of Norway, Bearing Sea (Rasmussen, 1953) and Greenland (Horsted and Smidt, 1956) and midle Octuber-midle November in the hotest waters areas (6-8 C) like that of the Oslo fiord (Hjoort and Ruud, 1938), South of Norway and Denmark (Rasmussen, 1953).

Comparing with this bibliographic data, the spawning date observed in Flemish Cap northern prawn (living at 2.5-3 C) seems to be earlier than the expected one by the water temperture in the zone.

RESULTS

BIOMASS : Data calculated for the three years are:

YEAR	average catch by mile	estimated biomass
1988	1.54 kg ± 0.28	2164 Tm
1989	1.37 kg ± 0.24	1923 Tm
1990	1.52 kg ± 0.21	2117 Tm

LENGTH DISTRIBUTION : In figure 1 the length in the three consecutive years 1988, 1989 and 1990 for males, females and total population is represented. Data used are population's estimations.

At this time of the year we can clearly appreciate three modal classes. The first one, with a mode between 20-21 mm is composed only by males. The second one has a mode between 24-27 mm and is composed by males and/or primiparous females depending on the year: in 1989 only males and in 1990 only females. Third modal class, with a mode between 29-30 mm, is composed only by females. Comparing the three consecutive years we must note the higher proportion of males in 1990, in relation to the previous years. In 1989 the large (and multiparous) females were more frequent and in 1988 and 1990 the small (and uniparous) ones.

There is not a direct method to fix the age of prawn, but basing on bibliographic data of prawn biology we can interpret the length distribution in this way:

First modal class would be composed by one-year old individuals, conducting as mature males. The second modal class would be made up by two-year old individuals, become or not in females depending on the length reached (Rasmussen, 1953). In fast growing years, like 1990, almost the total of the second modal class is formed by females. In slow growing years, like 1989, most of individuals remain as males for a second year. In intermediate growing years, as 1988, a portion of two-year old individuals become females and the remainder continues as males. The third modal class would be composed by three-year old females, uniparous or multiparous depending on their previous history. In figure 1 we can also see that very few individuals reach the age of four years.

Comparing with bibliographic references we have seen that this growing and madurating rate agrees with that one of the hotest water populations in the East Atlantic Ocean. Sex changes take place at the age of two years old in South Norway and at five years old in Spitsbergen (Rasmussen, 1953).

LENGTH-WEIGHT RELATIONSHIP : Table I shows the results of regression of weight to the power line $W = a * L^b$ in the three studied years.

FECUNDITY : Fecundity values obtained by us shows a similar variability and a higher number of eggs than that one of the Northwest Greenland prawn (750) and similar or little higher than that of the West Greenland prawn (1000), in the length rank 23-25 mm (Lund, 1990).

CL	N	mean	std	cv
23-24 mm	14	1052.1	149.9	0.142
24-25 mm	13	1196.4	173.9	0.145

Relation between length and fecundity follows the power line:

$$Fec = 1.902 * l^{2.017} \qquad N = 46,\ r = 0.5,\ p < 0.001$$

CITED REFERENCES.-

Escalante, J.L., Vazquez, J. y Mena, I. 1990. Northern prawn (Pandalus borealis) stock in Flemish Cap. NAFO SCR Doc., 90/47, 6pp.

Horsted,S.A. and Smidt,E. 1956. The deep sea prawn (Pandalus borealis) in Greenland waters. Meddr. Danm. Fisk.-og HavUnders, I (11): pp 1-118.

Hjort, J. and Ruud, J. T. 1938. Deep sea prawn fisheries and their problems. Hvalradets Skr. no.17.

Lund, H. 1990. Fecundity of shrimp (Pandalus borealis) sampled on fishing grounds at North West Greenland and West Greenland. NAFO SCR Doc., 90/63, 7 pp.

Mc Crary, J. A. 1971. Sternal spines as a characteristic for differentiating between females of same pandalidae. J. Fish. Res. Bd. of Canada, 28: pp 98-100.

Rasmussen, B. 1953. On the geographical variation on growth and sexual developement of the deep sea prawn (Pandalus borealis, Kroyer) FiskDir Skr. Ser. HavUnders., 10 (3): pp 1-160.

Teigsmark, G. 1983. Populations of the deep-sea shrimp (Pandalus borealis, Kroyer) in the Barents Sea. Fisk Dir. Skr. Ser. HavUnders., 17: pp 377-430.

Vázquez, A. 1991. Results from bottom trawl survey of Flemish Cap in July 1990. NAFO SCR Doc., 91/28, 25 pp.

TABLE I .- Length-weigth relationships.

	a	b	r	p	N
MALES					
1988	.00086	2.76	.957	<.001	88
1989	.00079	2.77	.971	<.001	1084
1990	.00087	2.75	.949	<.001	718
PRIMIPAROUS FEMALES					
1988	.00066	2.86	.974	<.001	61
1989	.00061	2.87	.942	<.001	154
1990	.00067	2.85	.967	<.001	225
MULTIPAROUS FEMALES					
1988	.00032	3.07	.902	<.001	41
1989	.00063	2.86	.919	<.001	216
1990	.001	2.72	.960	<.001	154
TOTAL FEMALES					
1988	.00056	2.91	.952	<.001	102
1989	.00066	2.85	.960	<.001	1245
1990	.00082	2.79	.970	<.001	379
TOTAL					
1988	.00049	2.94	.983	<.01	190
1989	.00046	2.96	.987	<.001	2358
1990	.00045	2.96	.987	<.001	1097

Figure 1 .- Length distribution.