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Growth and Age Composition of Sprat Stock (Sprattus sprattus L.) in the Waters around Gotland

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In accordance with Segerstråle the area of investigations is called Gotland Sea. The Gotland Sea is an important overwintering and spawning area of sprat in the Baltic proper. Sprat concentrations there are found from November/December up to the end of spawning time in summer. Therefore the Gotland Sea is of special importance with regard to the commercial sprat fishery in the Baltic Sea.

This paper shows some results of investigations on Gotland Sea sprat started in 1964.

Growth of sprat

The length-growth of age-groups of sprat in the Gotland Sea area in the period 1964 to 1970 was as follows:

age-group	1	2	3	4	5	6	7	8	9
l_t cm	8.75	10.47	11.23	11.88	12.46	12.98	13.49	13.72	13.93

The growth data of age groups were used for determination of growth parameters by the von Bertalanffy equation. The following parameters were found:

L_∞ : 14.446 cm; k: 0.298; t_0: -2.01

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In connection with the results of age investigations in the same area and same time these growth parameters are thought to be mean values of the sprat unit of central Baltic proper.

Backcalculation of the growth in the first year (l_1) using otoliths were made too. The backcalculation of l_1 was made in connection with Parrish & Sharman (1962) by the equation:

$$l_1 = \frac{r_1}{r} \cdot 1 + A \left(1 - \frac{r_1}{r} \right)$$

Measurements were carried out from the otolith centre to the rostrum. A was estimated as -0.90.

Backcalculations of l_1 by 1549 sprats of the Gotland Sea were made. The mean value was l_1 : 7.61 $\pm$ 0.02 cm.

T-tests of the mean values of l_1 for the Gotland Sea sprat, the sprat of the Bornholm Basin (l_1 : 7.58 $\pm$ 0.07 n = 198) and the Arkona Basin sprat (l_1 : 7.72 $\pm$0.04 n = 603) showed the insignificance of the differences between these values. But significant differences exist between the mean values of l_1 for the sprat of Mecklenburg Bay, Southern Belt Sea (l_1 : 10.36 $\pm$ 0.06 n = 394), and the sprat stocks of the Baltic proper.

Estimation of weight-growth of Gotland Sea sprat resulted in the following parameters for the period 1969 - 1973:

age-group	1	2	3	4	5	6	7	8	9
weight, g	4.8	7.3	9.6	11.7	13.5	15.0	16.2	17.1	17.8

W_∞ : 20.4 g; k : 0.27 ; t_o : -2.58

Age composition

The Gotland Sea sprat stock is composed by several age groups, the most frequent of them are the age groups 3 to 6. Older sprats are common. The oldest sprats were found to have an age of 14 years. There is a permanent immigration of sprats of age-groups 3 to 6 in to the Gotland Sea. In this way the Gotland Sea seems to be a meeting-place of the age-groups of sprat older than 2 years of the Baltic proper. Estimations of total mortality by the catch-per-unit-effort-method resulted in negative mean values of Z up to the age group 5 for the period 1964 - 1970.

The mean age of the stock and dominant age groups were as follows:

year	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973
mean age	4.5	4.8	4.8	4.6	3.2	3.5	3.6	4.3	4.6	3.3
dominating age-group	4	5	5	4	1	2	3	4	5	1

Occasionally extraordinary strong year classes, e.g. 1967 and 1972, appear in the eastern Baltic sprat populations. Such a year class is influencing distinctly the age composition of the Gotland Sea sprat stock from age group 1 onwards whereas in other years the first two age-groups participate only in small portions.

References:

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