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The determination of parameters of the growth equation of Bertalanfy and preliminary assessment of the natural mortality rates of Nova Scotian herring

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ABSTRACT

The parameters of growth equation of Bertalanfy K, t_o, L are determined by the method of Hoendorf (1966), Ford (1933), Walford (1946).

Preliminary assessment of natural mortality of herring from Nova Scotia is given.

INTRODUCTION

For assessment of the size of fish population stocks by modern mathematical methods the growth parameters K, t_o, L are to be derived.These values are used in the equations by Beverton and Holt (1957), Murphy (1965), Katty and Qasim (1968) et al.

MATERIAL AND METHODS

The following material was used for determination of the growth parameters: Canadian data for 1969-1971 - for herring from Division 4X (Sampling Yearbook, vol.14,15, 16); Soviet data for 1967-1971 and 1969-1971 - for Divisions 4W and 4V accordingly. The parameters of growth equation were determined according to Hoendorf (1963). For determination of mean theoretical maximum length both

the method of Hoendorf, and graphic method of Ford (Ford, 1933) and Walford (Walford, 1946) were used.

The assessment of natural mortality was made according to Beverton and Holt (Beverton and Holt, 1959) and Gulland (Gulland, 1965).

RESULTS

The calculations showed (tables 1,2,3) that the parameter values obtained were within the real ranges. The deviations of calculated length compared with the observed one did not exceed 3.3%. The values of mean theoretical maximum length determined by two methods are characterized by insignificant deviations which fact indicates their reliability.

The data obtained suggest that growth rate of herring from Nova Scotia is somewhat lower than that of herring from Georges Bank region. According to our calculations for Georges Bank herring K=0.23, while for Nova Scotian herring the values of K were 0.23, 0.27, 0.22 (for Divisions 4X,4W and 4V accordingly).

The coefficient of K can be used for preliminary assessment of natural mortality. Beverton and Holt (1959) and Gulland (1965) give corresponding ratios of these values M=1.2 K and M=1.5 K. On the base of dependence data and on averaging the values obtained, the natural mortality rates for Nova Scotian herring by Division 4X, 4W and 4V can be found. These are 0.3, 0.4 and 0.3 accordingly.

CONCLUSIONS

1. Nova Scotian herring growth rate is somewhat lower compared with that of Georges Bank herring which was determined from deriviation of growth parameters according to Bertalanfy.

2. The calculated preliminary natural mortality rates of Nova Scotian herring (Divisions 4X, 4W and 4V) exceed of Georges Bank herring which is being adopted by ICNAF Working Group.

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Table 1. The calculation of growth parameters for herring from Division 4X

t	l_t	l_t calculated	Errors Dif.	Errors D%
1	10.2	9.9	0.3	3.03
2	15.2	16.3	-1.1	6.74
3	21.6	21.4	0.2	0.93
4	25.5	25.4	0.1	0.4
5	29.2	28.6	0.6	2.1
6	31.2	31.2	0	0
7	32.8	33.2	-0.4	1.2
8	34.0	34.8	-0.8	2.3
9	35.1	36.1	-1.0	2.77

K= 0.23
t_o= -0.2
L= 40.97 41 cm SD=± 3.36

Table 2. The calculation of growth parameters for herring from Division 4W

t	l_t	l_t calculated	Errors Dif.	Errors D%
1	11.0	10.7	0.3	2.8
2	17.0	17.3	-0.3	1.7
3	23.9	22.4	1.5	6.7
4	26.1	26.2	-0.1	0.4
5	29.0	29.2	-0.2	0.7
6	31.5	31.6	-0.1	0.3
7	32.8	33.1	-0.3	0.9
8	34.3	34.4	-0.1	0.3
9	35.9	35.5	0.4	1.1

K= 0.27
t_o= -0.2
L= 38.7 cm SD= ± 2.9

Table 3. The calculation of growth parameters for herring from Division 4V

t	l_t	l_t calculated	Errors	
			Dif.	D%
1	17.0	16.3	0.7	4.3
2	22.5	20.7	1.8	8.7
3	24.6	24.2	0.4	1.6
4	26.7	27.0	-0.3	1.1
5	29.2	29.3	-0.1	0.3
6	30.6	31.1	-0.5	1.6
7	32.7	32.6	0.1	0.3
8	33.6	33.7	-0.1	0.3
9	34.7	34.7	0	0
10	35.4	35.4	0	0
11	36.0	36.0	0	0
12	37.1	36.5	0.6	1.6

K= 0.22
t_o= -1.5
L= 38.5cm

SD= ± 3.2%

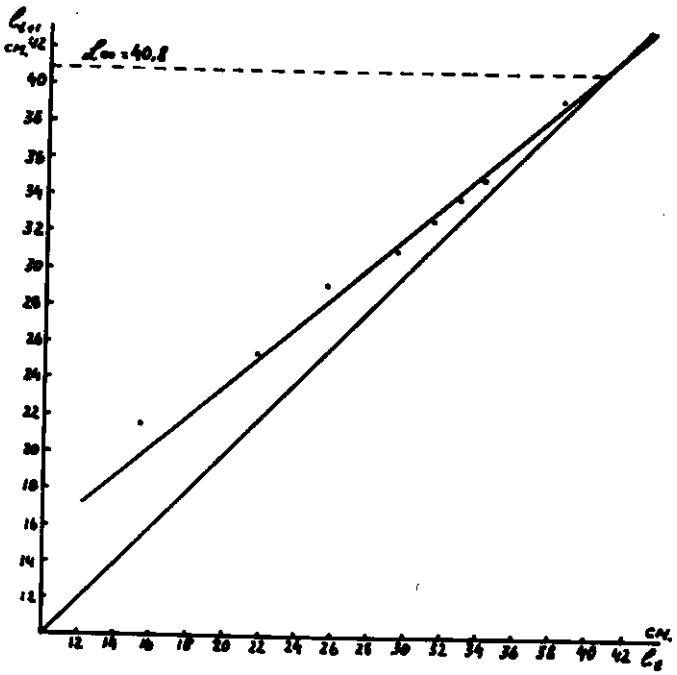

Fig. 1. Determination of mean theoretical maximum length of herring from Div. 4X (by method of Ford (Ford, 1933) and Walford (Walford, 1946)).

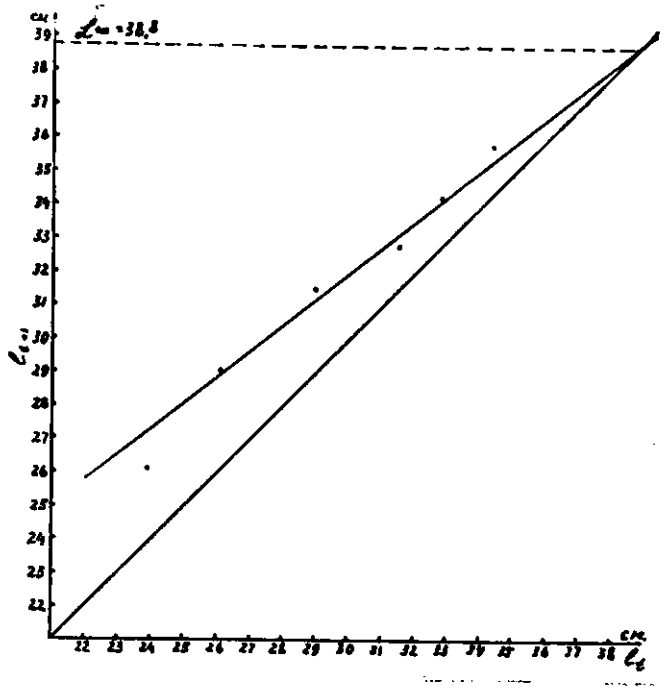

Fig. 2. Determination of mean theoretical maximum length of herring from Div. 4W (by method of Ford (Ford, 1933) and Walford (Walford, 1946)).

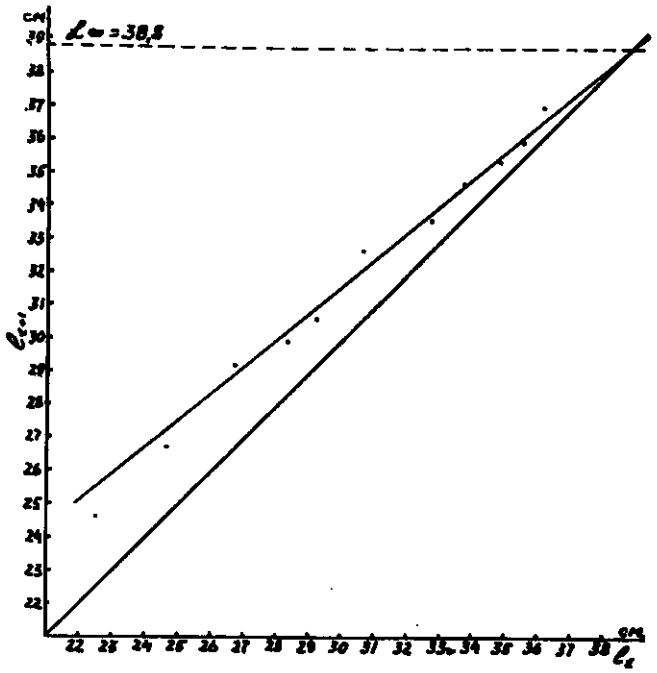

Fig. 3. Determination of mean theoretical maximum length of herring from Div. 4V (by method of Ford (Ford, 1933) and Walford (Walford, 1946)).