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Further studies on herring caught on Georges Bank in November and December 1966

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During the research cruise of R/V Wieczno 1,758 herring were analyzed in detail and 10,000 length measurements were made. The results of the measurements are given in Fig. 1.

In November and December the yield of herring averaged 1,100 kg per 1 hour trawling. This was considerably lower than the results obtained by Polish trawlers from August to October.

The length of analyzed fish varied between 17 to 36 cm, with individuals of 17-22 cm occurring in small number (0.5%). As in 1965 the curve of length composition has one peak. From a comparison of the size of herring captured in 1965 and 1966, it appears that the modal length-class increased by 1 cm from 29.0-29.9 cm in 1965 to 30.0-30.9 cm in 1966 (Fig. 1). The length increase by 1 cm in modal class shows that the same year-classes which were predominant in 1965 were also predominant in 1966.

The analyzed fish were from a post-spawning population and most of the individuals had gonads in Stage II of maturity. The condition of these fish was poor in comparison to full herring. The length/weight relationship of herring, as determined by the equation

$$W = kl^n$$

where:

W - the weight of fish in grams
l - the length of fish in cm
k and n - constant coefficients,

is similar to the results obtained for spent herring captured in September 1965 (Fig. 2).

Age analyses showed that most of the fish belonged to the 1960, 1961 and 1959 year-classes; therefore, they were the same ones as those found in 1965. Age composition of the analyzed herring is given in Fig. 3. The 1960 year-class was dominant (51%). The 1961 year-class was next in importance (20.2%) but is to be considered of poor abundance. More attention is to be given to the 1963 year-class which, although it made up only 7.5% of the catches, still occurred in greater number than the fish of the 1962 year-class. It is to be expected that in the following years the 1963 year-class will become more important.

The investigations on age composition of herring were performed aboard the research vessel and the analysis included also the samples taken aboard commercial fishing vessels. The latter showed that in commercial catches in August and September herring belonging to the 1960 and 1959 year-classes were predominant (67% and 15% respectively). The 1963 and 1964 year-classes did not occur, though they were present in the catches made by the research vessel R/V Wieczno. It should be added here that these young year-classes occurred on the fishing grounds at depths up to 80 m.

Mean lengths of fish of the same age-groups for the years 1965 and 1966 are presented in Table 1.

Table 1. The average length (cm) of herring in age-groups I-VIII.

Year	Age-group							
	I	II	III	IV	V	VI	VII	VIII
1965	-	26.0	27.6	29.0	30.5	31.8	32.8	33.5
1966	21.1	25.2	27.7	29.2	30.5	32.4	33.1	33.9

The table shows that in 1966 fish of the same age-groups were in general larger than in 1965, though it has to be taken into consideration that in 1965 the measurements were performed in September, while in 1966 in November-December. An exception is noted for age-group II, in which the fish captured in 1966 were smaller.

The average lengths, given above, were applied for the characteristics of the rate of growth of herring and determined by the use of the von Bertalanffy equation:

$$l_t = L^\infty (1 - e^{-K(t-t_0)}) \quad (\text{Beverton and Holt, 1957})$$

where:

- l_t - length at age t
- L^∞ - asymptote of curve of growth in length
- K - one of the two main parameters of the von Bertalanffy growth equation
- t_0 - arbitrary origin of growth curve

The parameters of this equation computed on the basis of the 1966 data are: $L^\infty = 35.6$ cm; $K = 0.297$; $t_0 = -1.9$. The parameters obtained according to the 1965 data were: $L^\infty = 37.6$ cm; $K = 0.195$ and $t_0 = -3.8$ (Draganik, 1966). The curve of the growth rate of herring is presented in Fig. 4. Although mean lengths of fish of the same age-groups differ but slightly in the years 1965 and 1966, the parameters of the von Bertalanffy equation for the data from these years show some differences (K is different by 0.1).

In order to determine whether these differences are of essential character, the range of fluctuations of L^∞ and K values has been determined with the approximation up to 95% on the basis of the data collected in 1966. From the computations it appears that the values of these parameters are within: for L^∞ between 34.1 and 38.2 cm and for K between 0.195-0.403. The values for L^∞ and K obtained according to the 1965 data were found to range within the same limits.

The results of these investigations show that the rate of growth, as determined separately from material collected in 1965 and 1966, was approximately the same in both years.

References

1. Beverton, R., Holt, S., 1957. On the Dynamics of Exploited Fish Populations. Fish. Invest., Ser. II. 19., London.
2. Draganik, B., 1966. Age, rate of growth and sexual maturity of herring captured on Georges Bank, 29 August-1 October 1965. ICNAF Res.Doc. 66/48. Serial No. 1650.

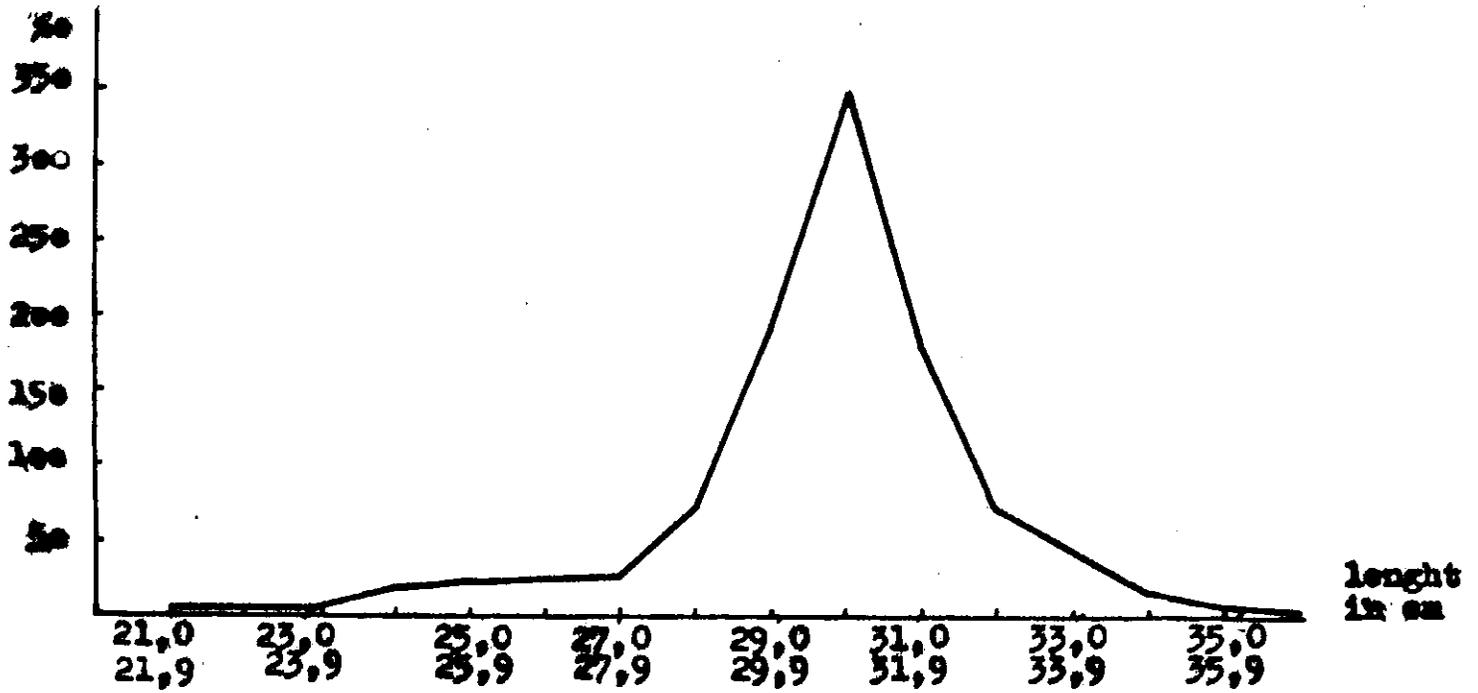


Fig. 1. Length composition of herring from Georges Bank, 1966.

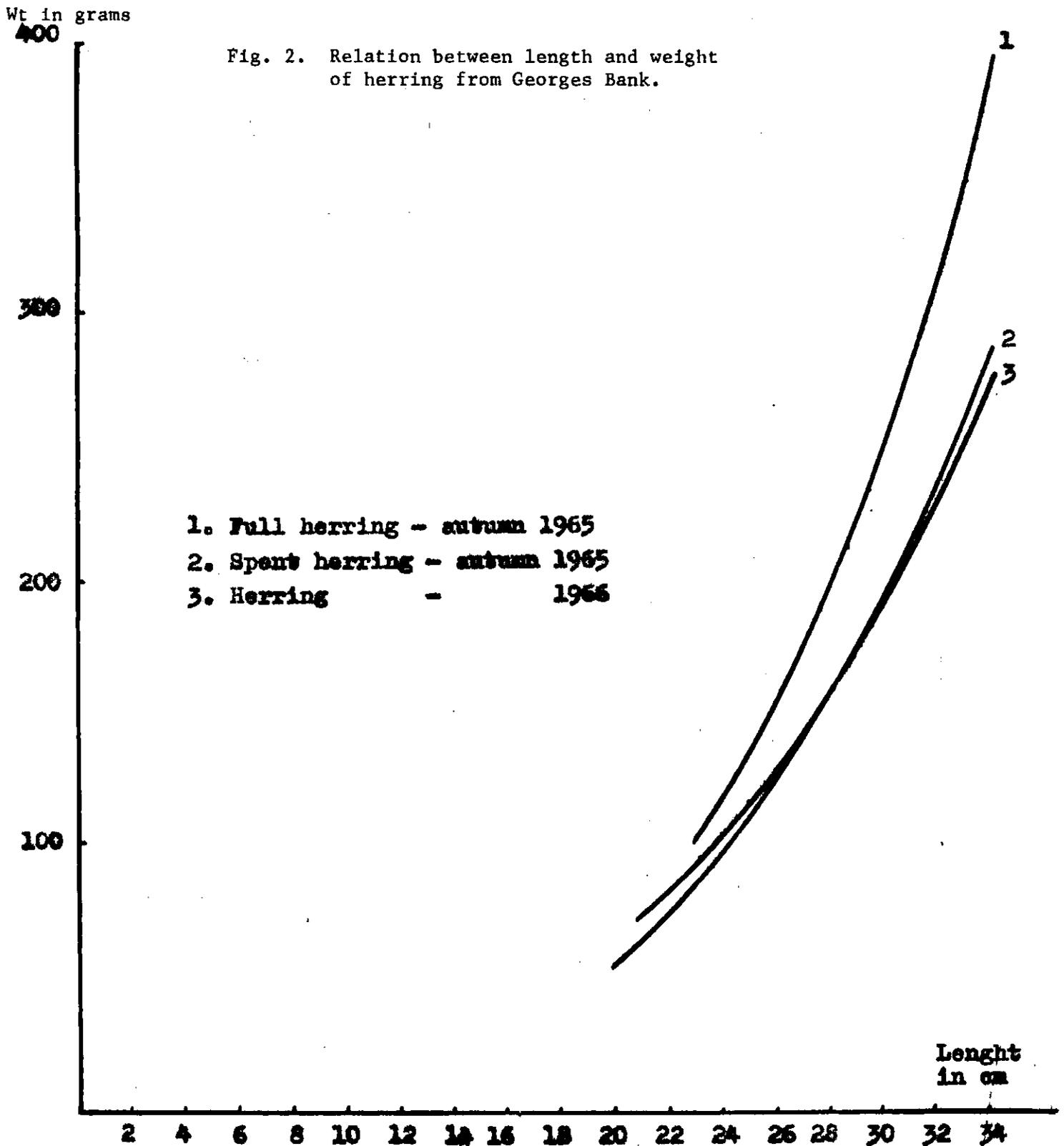


Fig. 2. Relation between length and weight of herring from Georges Bank.

- 1. Full herring - autumn 1965
- 2. Spent herring - autumn 1965
- 3. Herring - 1966

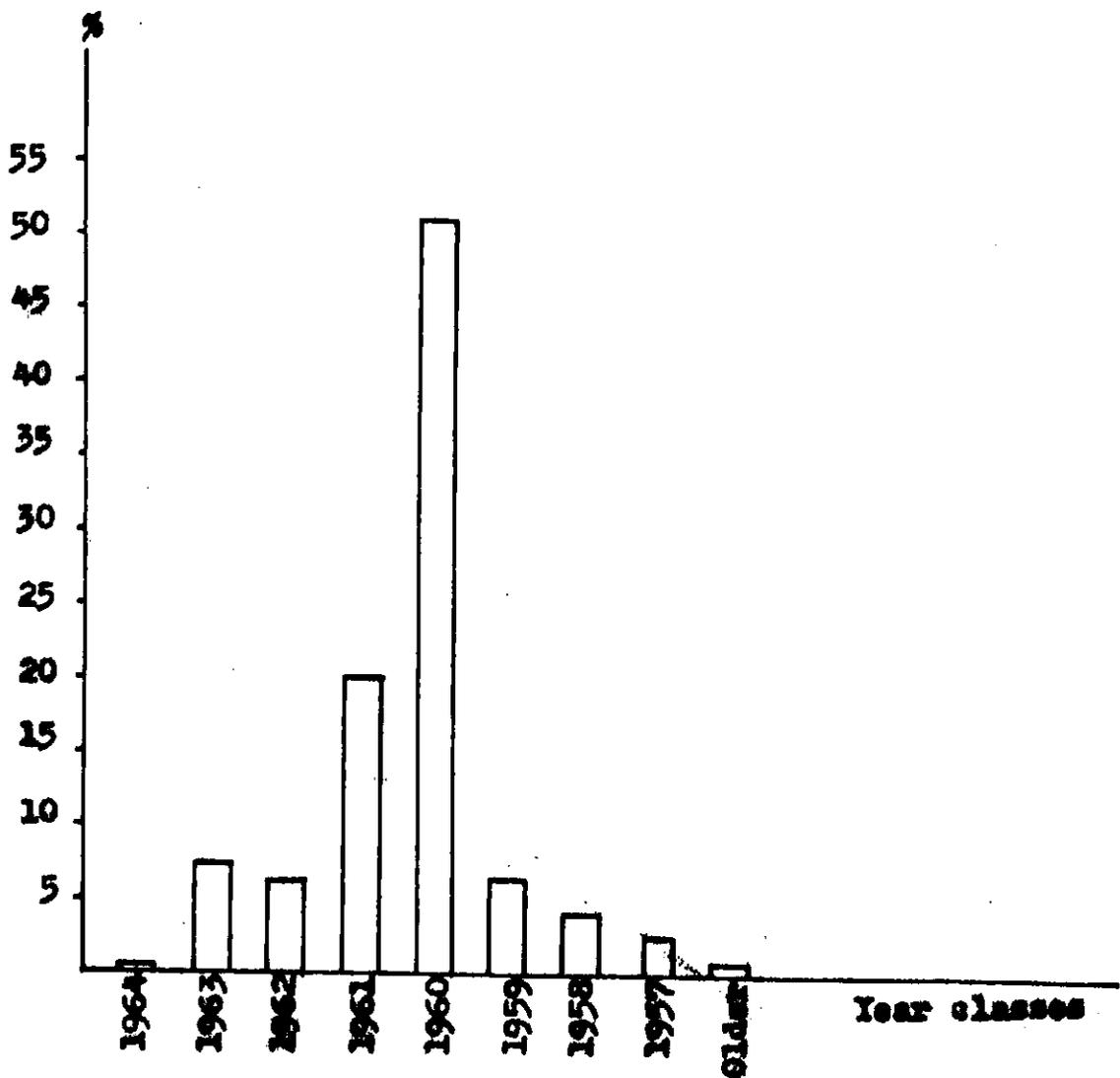


Fig. 3. Age composition of herring from Georges Bank.

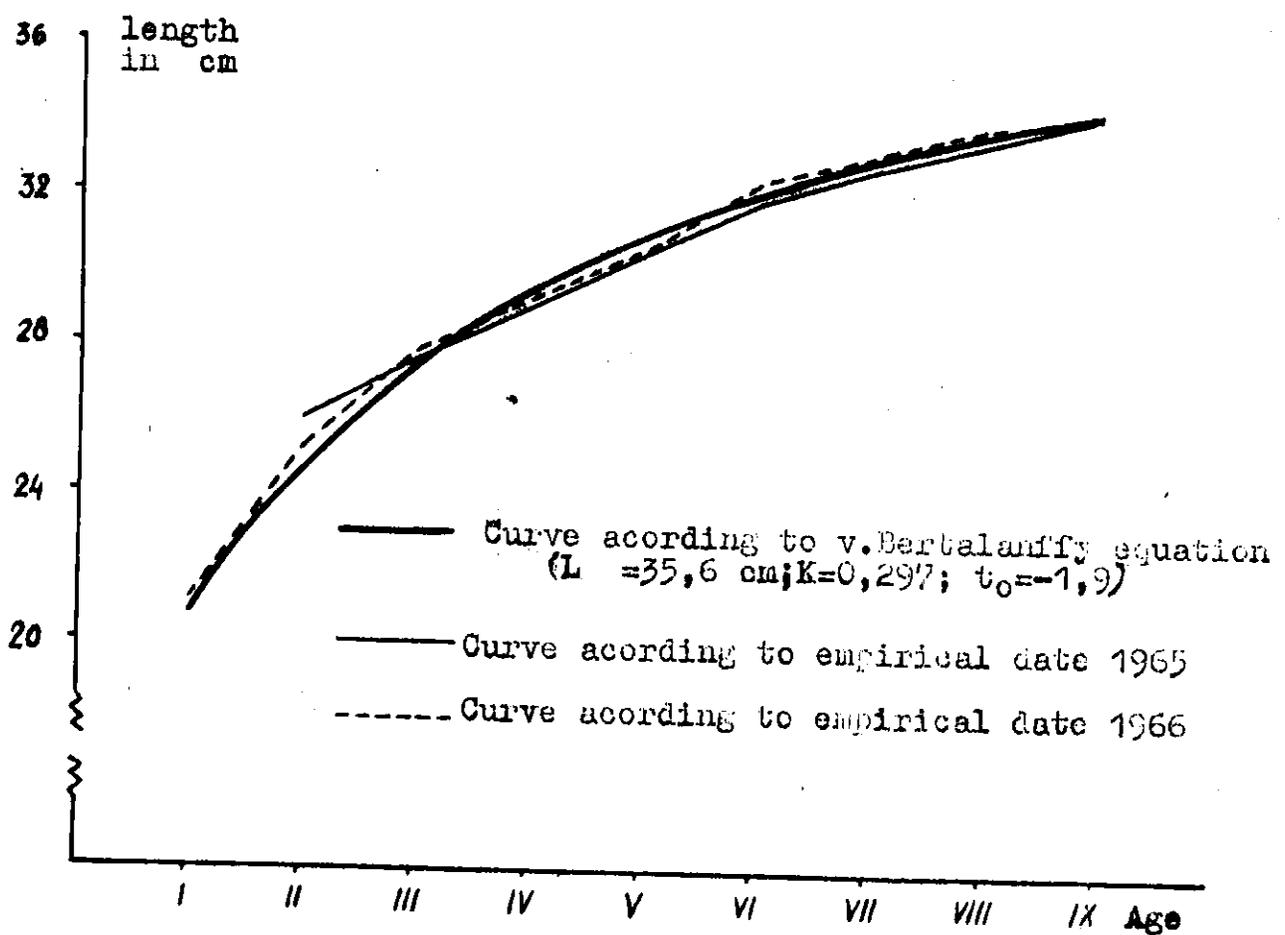


Fig. 4. Growth rate of herring.