

Further Investigations on the Fluctuations in the  
Stock of Mackerel in the North Sea

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In "Annales Biologiques", Vol. 15 p. 194, a short report was given on the results of length measurements carried out on mackerel caught by a narrow-meshed herring trawl during the cruises of F.R.S. "Anton Dohrn" in the North Sea in 1956-58. The length distribution showed great variations from year to year, and it was possible to follow the 1955 year-class from its first appearance as O-group in the late winter of 1956 up to the autumn of 1958 when it had spawned as III-group. The growth of this year-class was clearly to be recognized by the advancing of a separated peak in the length curves as the neighbouring 1954 and 1956 year-classes were very scarcely represented. The 1957 year-class proved also to be poor, it was present as O-group by quite a number in the catches of October 1957, but was nearly missing as I-group in October 1958. Not before 1958 an abundant year-class arose, dominating by 89% in the trawl catches in the autumn. The report was concluded by the remark that the investigations in 1956-58 suggest very strong fluctuations in the stock of mackerel in the North Sea although one must be cautious in drawing such conclusions from trawl catches of pelagic fish.

In the meantime the investigations were continued, and the results of further three years may be published and put to discussion. Length measurements of trawl catches of mackerel are at hand from July 1959 (1404 ind.), October 1959 (1744 ind.), March/April 1960 (2597 ind.), July 1960 (2422 ind.), October 1960 (3395 ind.), March/April 1961 (5864 ind.), and September/October 1961 (2127 ind.). I am very obliged to Dr. K. Schubert (Institut für Seefischerei, Hamburg) and his co-operators for the kindness to carry out the comprehensive measurements and to put the material at my disposal. The results together with those of 1956-58 are given in the Figure. It is not difficult to attribute the different peaks in the length curves to distinct age-groups or year classes.

The 1958 year-class was most abundant in October 1958 (O-group), scarce in July 1959, but again prevailing in October 1959 (I-group). It is well marked in the length curves of April and July 1960 (II-group), reaching a mean length of 27-28 cm.

In the meantime the new 1959 year-class appeared in the catches in fairly good numbers in October 1959 (O-group), but was only less frequent in April 1960 (I-group). In October 1960 the bulk of the fishes culminating at 28-29 cm in length was formed by this year-class. In April 1961 it took the same place in the length curve (II-group) and advanced to 31 cm until October 1961 as a well separated peak.

The following 1960 year-class was scarce as O-group in October 1960, but clearly marked in April 1961 (I-group), and proved to be quite frequent in October 1961 when the new 1961 year-class was present in some specimens only.

The correctness of this age analysis based only on the advancing maxima in the length distribution from year to year, was proved by otoliths taken in October 1961. They showed clearly that the two peaks in the length range at 27 and 31 cm belonged to the age-groups I and II (1960 and 1959 year-classes).

In the years under consideration we have observed the rise of four abundant year-classes, namely those of 1955, 1958, 1959 and 1960. The intermediate 1956 and 1957 year-classes were poor. This statement is in good accordance with the results of Dutch investigations on the length and age composition of mackerel landings from the North Sea in 1959 and 1960. J.J. Zijlstra and K.H. Postuma write with regard to 1959 (Ann. Biol. Vol. 16, p. 234):

"The age distribution of the landings in the different areas for the entire year shows that the 2- and 3- ringers were

nearly absent. The 4-ringers, however, were predominant in all areas."

In the following report on 1960 we read (Ann. biol. Vol. 17, p. 230):

"In 1960 a new good year-class appeared in the catches as 2-ringers; of the remainder of the catches, 30%-50% were formed by 5-ringers; in the years 1958 and 1959, 2-ringers were scarce."

The rich year-classes under discussion are those of 1955 and 1958, the poor ones are the 1956 and 1957 year-classes.

Looking on the graph containing the length curves of mackerel catches by a narrow-meshed herring trawl at 12 successive cruises during 6 years (1956-61), one is surprised by the large changes from year to year for the same season. Hardly one picture is similar to another. In the autumn catches for instance, we observe the main maximum in 1956 at 22-23 cm, in 1957 at 27-28 cm, in 1958 at 13 cm, in 1959 at 25-26 cm, in 1960 at 28 cm and in 1961 two equal maxima occur at 27 and 31 cm. Moreover it is very striking to find out that the peak at a certain length does not always belong to the same age-group. In October 1957 fish measuring 26-29 cm in length belonged to the age-group II, whereas in October 1960 the same sizes (26-30 cm) were represented by the I-group. Obviously we cannot conclude with certainty from the size even of young mackerel on their age as the rate of growth varies in the years under consideration.

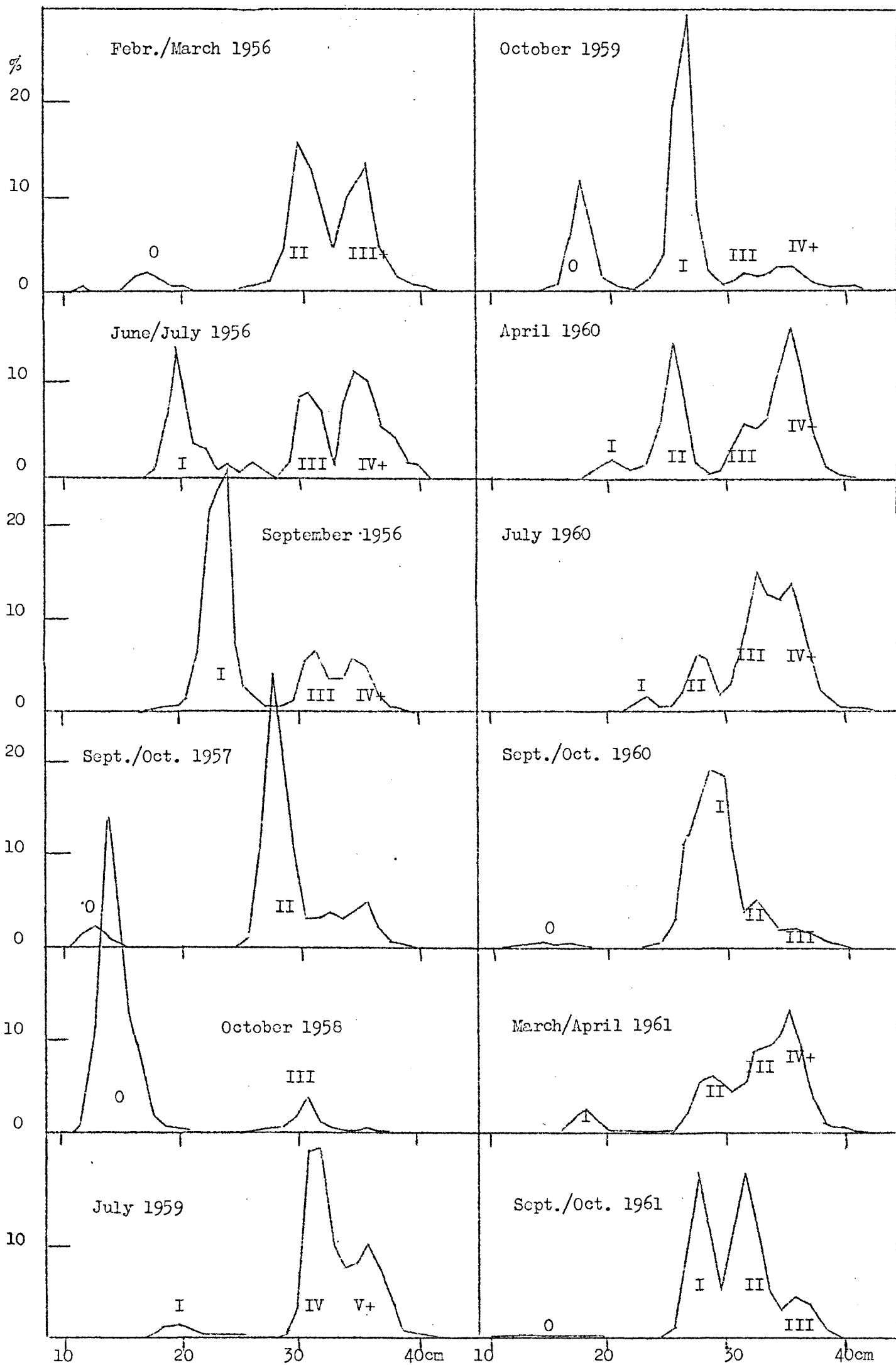
From the length distributions in the graph, it is possible to calculate the average lengths of the age-groups 0-III in the years 1956-61 with sufficient correctness. Ordering them according to year-classes we obtain the following table:

The growth of the 1953-1961 year-classes of mackerel in the first three years of life

Year-class	Age-groups									
	0	I			II			III		
	Oct.	April	July	Oct.	April	July	Oct.	April	July	Oct.
1953	-	-	-	-	-	-	-	30,2	30,5	31,2
1954	-	-	-	-	25,1	-	27,5	-	-	32,5
1955	--	17,1	20,3	23,6	-	-	28,0	-	--	30,7
1956	-	-	-	-	-	-	-	-	-	-
1957	12,4	-	-	-	-	-	<u>31,8</u>	-	-	31,8
1958	13,8	-	19,7	<u>26,2</u>	25,6	27,9	<u>32,4</u>	<u>33,0</u>	-	-
1959	<u>17,6</u>	<u>20,5</u>	<u>21,3</u>	<u>28,4</u>	<u>28,6</u>	-	<u>31,5</u>	-	-	-
1960	14,6	18,5	-	27,7	-	-	-	-	-	-
1961	13,5	-	-	-	-	-	-	-	-	-

From the figures of this table we can read of a remarkable increase of growth which becomes evident for the 1957 year-class in the II-group, for the 1958 year-class in the I-group, and for the 1959 year-class already in the 0-group. This acceleration of growth has happened in the year 1959, and was surely caused by the high water temperatures in that summer. The increase of growth amounts to 3-4 cm, i.e. nearly the increment during the third year of life, and was only a temporary one as already the 1960 year-class showed a slower growth and the 1961 year-class a normal one similar to that of the 1957 and 1958 year-classes.

It will be of great interest to follow the further development of the stock of mackerel in the North Sea in regard to the rate of growth and strength of the year-classes, and their effect on the size and age distribution of the commercial catches and on the yields of the fishery.



Length distribution of mackerel caught by a narrow-meshed herring trawl in the North Sea in 1956-1961.