Among these many different sizes of herring, from the young fry up to the mature and oldest fish, we find several groups, differing either in biological respects or in regard to habitat and manner of life. It is therefore impossible here (contrary to what may be the case in the study of the human population of a town or a country) to make at any one place or at any one time a selection from the individuals in the sea sufficiently representative to permit of immediate conditions as to the composition of the mass. In each catch made we find individuals, which may be representative with regard to size and age of the biological group (i.e., the mature herring) to which they belong, but not to the whole stock of herrings.

It is necessary, therefore, to take many samples from different shoals of fish at different places, endeavouring to combine observations resulting so as to form, as it were, a complete picture. Moreover, it is in some respects impossible to find any standard by which to judge of the respective quantitative values of the different groups, even though it may be possible to accurately determine the composition in point of size of each separate group. The investigations of the different (biological) groups of herring have, however, shown that repeated study from season to season can give a most valuable general idea of the variations and fluctuations in the preponderance of the different ages or year-classes within the different groups; e.g. within the fat herring and spring herring. The combined study of the statistics of the fisheries (the catches of the fishermen) and the fluctuation with regard to the year-classes, in the most important groups of herrings, have proved sufficient to demonstrate that the cause of fluctuations in the fisheries is to be found in the great fluctuations in the number of individuals occurring in the fish born or developed in the different years (fluctuations in the year-classes).

For a fuller proof of this statement, I may refer the reader to my publication mentioned above. Here I must confine myself to the most striking and important instance found in this direction, namely, to the fluctuation in the year-classes within the shoals of the Norwegian spring herring.

The spring herring of the Norwegian west coast have been studied in the years from 1907 to 1915. In each of these years samples have been collected from the seine catches of the fishermen, and the age of each herring in the sample has been determined by the methods described above. On the basis of this large amount of material, the percentage of the different year-classes represented in the samples has been calculated in order to get definite information as to the question: are different ages every year represented by the same numbers, or do fluctuations occur from year to year?

The results of all these age determinations for the years 1907-14 are given on fig. 15, where percentage curves are shown for each of the eight years. The curve for 1907 shows that there were in this year, no less than five fairly rich and fairly evenly represented year-classes (the 4 to 8-year-old fish). This even proportion is broken in 1908 by the appearance of a very great number of 4-year-old individuals (the summit of the curve) which, accordingly, were born in the year 1904, the 1904 year-class. In all the following years this year-class maintains a great preponderance over all the other year-classes. In 1909 the 5-year, in 1910 the 6-year, in 1911 the 7-year-old fish being by far the most numerous. It has been calculated that the Norwegian spring herrings in the years 1907-13 were caught to the number of 3,312,000,000 individuals, taken altogether, and that of this total no less than 1,776 millions belonged to the 1-year-class, the individuals born in the year 1904. The immense number of this year-class is further believed to have been the great cause of the rise in the Norwegian spring herring fisheries, which in the years 1908-13 (when the year-class in increasing numbers belonged to the spawning shoals) increased from 625,000 to no less than 1,500,000 hectolitres.

The extensive investigations of the Norwegian fisheries have further demonstrated that this same year-class of herrings played the greatest role also amongst the fat herring in the years (1907-10) when great numbers of the individuals of this year-class still were immature and belonged to the fat herring shoals.