Letters to the Editor.

Dear Sir,

In the Journal du Conseil Vol. IX No. 3 (1934) A. Bückmann in his General Article on the International Plaice Investigations during recent years writes on p. 311: "Diese Ansicht [i. e. the theory of A. C. Johansen that the plaice larvae in the Baltic do not transform into the bottom stage near the coasts, but in deeper water] erfuhr Widerspruch durch Blegvad, wurde aber neuerlich durch Kändler (26) und Poulsen (32) endgültig bestätigt". Permit me to say that this conclusion is not — to put it mildly — quite correct. Kändler and Poulsen have found a fairly large stock of the 0-group of plaice in the deeper waters east of Rügen *in the autumn* of some years, and have shown that the individuals taken in deeper water were smaller as a rule than those taken in more shallow water; but all their material comprises fish which are nearly *six months old.* The authors are therefore not entitled to conclude that the individuals which were found in deeper water *have stayed there since they reached the bottom stage;* they may quite as well originate from areas near the coasts. The fact that the individuals from the deeper water were smaller than those in shallower water may be explained by the feeding conditions being less favourable in the firstnamed places. While Kändler in August 1934 found large quantities of the 0-group plaice east of Rügen in fairly deep water ("Der Fischmarkt", H. 1. Januar 1935), I got in the same month big catches of plaice of the 0-group on the shores of Bornholm. As long as the newly transformed bottom stages have not been found in deep water in the Baltic we cannot say that Johansen's theory has been finally proved.

Yours faithfully

H. Blegvad.

Copenhagen, Feb. 8th, 1935.

IN a paper by Dr. Lissner, entitled "On Races of Herrings", which appeared in Volume IX, No. 3 of the Journal du Conseil, there appear two statements concerning the results of my herring investigations which need correction and explanation.

On page 348, Dr. Lissner states: "... it should be mentioned that Hodgson holds the opinion that the period lying between two spawning times of a herring is not always one year, but may be much

shorter or longer. Hodgson comes to this conclusion by his investigations on the breadth of the first zone in the scales of the herring."

Now, I have never held this opinion, and so far as I know, there is no evidence that herrings spawn more than once in any year. In my "Investigations into the Age, Length and Maturity of the Herring of the Southern North Sea" (Fishery Invest. Ser. II, Vol. XI, No. 7, 1929) I said, "The results of the growth calculations lead to the conclusion that autumn-spawned fish may spawn in winter, or autumn or summer in the same way that winter-spawned fish may do." This is just another way of saying that fish which are born in the autumn do not necessarily spawn in the autumn, but may spawn in the winter or spring. It does not mean that the interval between two spawning times may be greater or less than one year.

Next the author makes the following claim: "In making the assumption that the body characters of the herrings are influenced considerably by the environment we have a very simple explanation for Hodgson's observation of differences in the width of the first growth zone on the scale. For, if external influences are capable of altering the number of vertebrae and fin rays and the growth of the herrings, they should also influence the size of the scale formed during the first year of the life of the fish, which is said to be an expression of the growth of the herring."

Such a claim as this can very simply be examined and found to be a totally inadequate explanation of the differences in the modal size of the first zone of the herring scale. Let us for example consider certain herrings which are generally known as big fish such as the Norwegian spring herrings. Compared with those of the southern North Sea, these herrings are enormous, yet the size of their first growth zone is much smaller than many of the herrings of the North Sea. Again, the Baltic herrings are very small even in comparison with those of the North Sea, yet their first growth zone is much larger than the Norwegian l_1. Variations in vertebrae and growth zones do not seem to be comparable.

From my own observations, I have come to the conclusion that the factor which governs the size of this first zone on the scale is Time.

The Norwegian herrings which are born in the spring (February—March) have been found to have a calculated length l_1 of between 7.1 and 7.5 cm., and the product of the spawning at the eastern end of the Channel has been traced to herrings whose l_1 is between 7 and 8 cm. This latter spawning occurs during the months of January and February, so from the point of view of time, these two lots of fish compare very well with each other so far as the length l_1 is concerned.

Next, fish which have been traced to autumn and summer spawnings in the North Sea have been found to have calculated lengths l_1 of 9—11 cm. and 12—13 cm. respectively, and when we come to look at the small Baltic herrings we find that their l_1 varies from 10—12 cm. Now, according to Hessle the spawning time of these fish is from April until October with maxima at about June and September so we

see that a range of 10—12 cm. is comparable with the North Sea fish which are born in summer and autumn.

In my paper already quoted above, I have pointed out that the size of young herrings seems to depend more on the time at which they were hatched from the egg than on their geographical distribution, and in the cases mentioned it will be seen that the hydrographical conditions of the areas in question are very different.

In recent years much criticism has been aimed at those of us who have paid much attention to the first growth zone of the scale, and when S t o r r o w came to the conclusion that a fish which was born in the spring may not of necessity spawn at the same period, the late A. C. J o h a n s e n wrote that his argument was "a fragile basis for such a far-reaching conclusion" and then tried to explain the differences in the size of the growth zones by assuming that the herring must have either grown very quickly or very slowly as the circumstances required. Surely it is difficult to believe that a quick-growing spring-spawned herring is larger than a slow-growing autumn-spawned fish at the time that the first ring is formed on the scale, although the latter may be five or six months older than the former. But on the assumption of differential growth rate nothing is impossible.

In conclusion, I should like to add that one of the main features of growth-calculation is the rigidity of the results obtained. For many years the Norwegian fish were found to have a length l_1 which was approximately constant, and the same thing was obvious for the herrings which were spawned in the eastern part of the Channel, so that if Dr. L i s s n e r expects to find marked differences in the breadth of the first zone of the scale from year to year, the chances are that he would be disappointed.

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