Growth dependent on external conditions.

Some of the general results obtained by these investigations are of great interest; for instance, the growth of fishes has proved to be largely dependent on the temperature. Some chemical investigations corroborate this. Fig. 556 shows the fat-contents of the sprat as determined by H. Bull, compared by Sund with the surface temperature of the sea off western Norway in various seasons of the year. The fat-contents of the sprat increase during summer, when there is a rise in temperature, while both decrease towards the end of the year; it follows from this that the growth of the fish must be influenced by the prevailing temperatures in different waters.

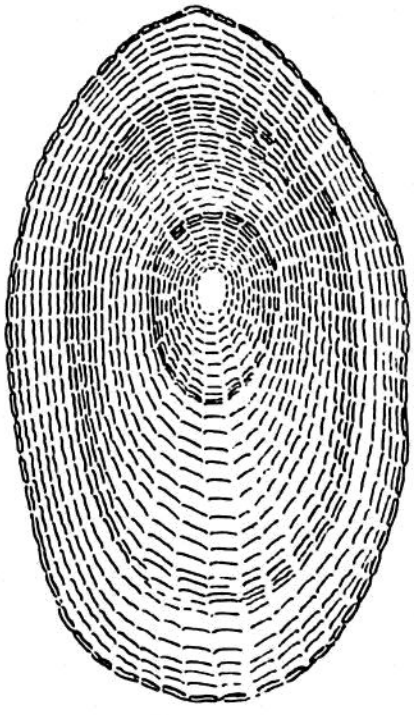

FIG. 557.
Scale of *Gadus callarias*, L. Nat. size of fish, 55 cm. Station 72.

The investigations on the scales of fishes have now given us numerous facts confirming and elucidating this. Thus Damas says that the age of first maturity in the cod undoubtedly varies greatly according to local conditions. Generally the growth of cod-species may be said to decrease, and the age of first maturity to increase, the farther north we go. Thus on the Skagerrack coast a saithe may be 30 cm. long at the end of its first year, while a saithe of corresponding age in northern Norway is not, as a rule, more than 10 cm. in length. In northern waters, therefore, the winter-rings in the scales are much more marked than in more southern waters, for instance, in the North Sea. The duration of the warm season also differs in different waters, and the time when it sets in varies in different localities as well as at different depths (see Fig. 509, which shows that at 200 or 300 metres the highest temperatures do not occur in the summer, but late in the autumn). An examination of cod scales from the Barents Sea proved that in August summer growth had not yet commenced in that area, where the winter season is of very long duration, while the summer is short. It is interesting to compare this with certain observations which we had the opportunity of making during our Atlantic cruise on the banks of Newfoundland, where, as mentioned on pp. 109-114, the cod spawn in July. We here observed cod with large ripe ovaries and found the recently hatched larvæ at the surface. The scales of these