

cod (see Fig. 557) plainly show winter-growth along their edges, that is to say, vigorous summer-growth had not yet set in, and as a matter of fact the temperatures were low (between 2° and 4° C., see Station 72, Fig. 95, p. 110) just where the cod were taken.

These variations of growth put their stamp on the fish, the shape of which depends on its growth-history. And in waters, like those off the Norwegian coast, subject to great variation and extending south and north through so many degrees of latitude, an infinite variety in growth-types appear as a natural consequence. Some of these types may perhaps, through generations, be subjected to the accumulating influence of surroundings, thus possibly giving rise to races. Other and minor variations in growth may perhaps be considered as

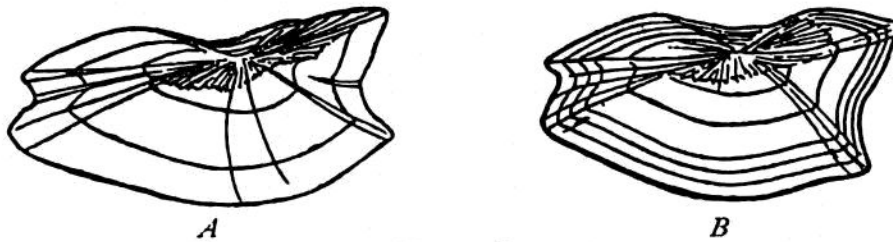


FIG. 558.

Interoperculum of plaice (*Pleuronectes platessa*). A, ♂ 21 cm. long, North Sea, three years old; B, ♀ 21 cm. long, Baltic Sea, six years old. (From Heincke.)

temporary or individual variations due to surroundings only, and not subject to the laws of heredity.

The way in which individuals vary according to surroundings might profitably be studied by experiments in transplantation and marking of various types. Heincke¹ has made some very interesting investigations on the growth of the plaice, and found that in waters so widely different as the North Sea and the Baltic the growth of the plaice varied greatly. Fig. 558 shows the gill covers of two plaice of the same size, both 21 cm. long; the North Sea plaice is only 3 years old, while the Baltic plaice is no less than 6 years old. Similar distinct types of growth have been discovered in the herring during the international investigations, Dahl having first drawn attention to the existence of such types; Lea continued these investigations with a large amount of material, and claims that among others two growth-types may be recognised, one belonging to the north-eastern part of the North Sea (the Norwegian west coast), and the other to the Kattegat (see Fig. 559).

¹ *Die Beteiligung Deutschlands an der internationalen Meeresforschung, IV.-V. Jahresbericht*, Berlin, 1908.