encounter catastrophes which sweep them off in enormous numbers. I come to this conclusion because our investigations on the age-composition of various fish-species have proved the frequency of the different year classes to be so variable (see section on age and growth).

Mixing of Gulf Stream and boreal waters.

As the Gulf Stream flows northwards its waters are gradually cooled, partly because they give off heat to the cold air, and partly because of the admixture of cold water. With the cooling the southern forms disappear, and their place is taken by entirely different boreal species; very little is known about the actual stages of this change.

During the cruise of the "Michael Sars" from the west coast of Scotland to Rockall, and north to beyond the Wyville Thomson Ridge we found vast numbers of Salpæ (*S. fusiformis*), the great majority of which were wholly degenerated. Bjerkan, who is examining our collection of Salpæ, informs me that the mantle and the muscular system of the specimens were generally in a very ragged condition, in many cases only the intestine being distinctly recognisable. Here then, on the border between the Atlantic and the Norwegian Sea, it appears that certain forms die in large numbers, while others degenerate. Gran refers to the degeneration of certain coast diatoms found drifting far out at sea (see p. 342).

When organisms cannot within a certain time regain conditions necessary for them, or to which they can adapt themselves, they invariably die sooner or later. The isolated specimens of such fishes as *Argyropelecus* found in the northernmost parts of the Atlantic undoubtedly represent a few survivors of the change.

The boreal fauna which in northern waters replaces the genuine Atlantic forms also belongs to a great current-cycle. If we look at the current charts (Fig. 193, p. 284 and Fig. 508), we observe that the Gulf Stream receives admixtures from boreal and boreo-arctic currents, which consequently carry boreal organisms. As we have previously seen, we meet with a wealth of boreal forms in deep water even in the Sargasso Sea, and probably much farther south, living below the warm-water fauna of the surface.

Annual changes in velocity of currents.

The velocity of ocean currents is subject to many varieties of periodical and non-periodical changes (see pp. 284-5). The annual changes are of peculiar interest, and are very noticeable in northern waters, though also important in the Atlantic. If we compare the two charts (Figs. 159, p. 227, and 160, p. 228)