

O. Pettersson  
and G.  
Ekman.

special study of diatoms before he commenced co-operating about 1890 with the well-known hydrographers, Otto Pettersson and Gustaf Ekman. They commenced their labours in the Skagerrack, that remarkable little sea where so many different water-masses meet and pass each other; and it very soon became clear that different currents might each possess synchronously its own particular flora, and therefore there was the possibility of ascertaining where the water-masses came from, by determining their flora.<sup>1</sup> All that was requisite was to know the distribution of the different species in contiguous parts of the sea. The investigations were accordingly extended, and samples were collected by ordinary steamers in the North Sea, the Norwegian Sea, and the Northern Atlantic, in addition to the collections that were gradually formed chiefly through the efforts of Swedish, Norwegian, and Scottish scientific expeditions. Cleve also studied the annual changes in the plankton, and had weekly collections made at selected stations on the Swedish coast. The scope of his investigations was further enlarged, for his unique knowledge of forms enabled him to determine, not merely all pelagic plants, but also little by little, a whole series of animal-families which proved no less useful than the algæ as "guiding forms" to determine the character and origin of the plankton.

Plankton-  
types.

Cleve believed that he could distinguish a series of plankton-types characteristic of defined marine areas. Particular species were therefore assigned by him to one or other of these main types. But whereas outside the Skagerrack each of the plankton-types had its own characteristic distribution, within this sea the same types were found to predominate, each in its own characteristic season. From February to April there were the same species that we have learnt to connect with the coasts of Greenland and Spitzbergen in the Polar Sea, and from May to June there was a plankton resembling that of the Western Baltic. During the course of summer and autumn there were, first of all, species like those belonging to the southern part of the North Sea, and afterwards Atlantic and more northerly forms. Cleve was led to conclude that these changes in the Skagerrack were due to the fact that it is supplied during the course of the year

<sup>1</sup> "While passing through the Japan Stream the tow-net observations indicated water from two different sources. When in the colder streams there were very many more small diatoms, *Noctiluca*, and Hydromedusæ than in the warmer streams, where the same pelagic animals that were obtained all the way from the Admiralty Islands prevailed. Many similar instances occurred during the cruise, where the approach to land or the presence of shore water was indicated by the contents of the tow-nets" (Narrative of the Cruise, Chall. Exp., vol. i. p. 750, 1885; see also Summary of Results Chall. Exp., pp. 893 and 895, 1895).