

by diurnal and seasonal changes. It is the scene of an intense struggle for existence, and has been the happy hunting-ground of many of our greatest naturalists.

The lower boundary of the littoral area has been called the "mud-line", where the minute organic and inorganic particles derived from the land and surface waters find a resting-place, or form the food-supply of crowds of animals. Sir John Murray regards this line as "the great feeding ground in the ocean", and as the primary haunt from which animals migrated to the deep sea.

The study of the fauna and flora of the open sea has not been long begun. For although the marvellous  
 Pelagial. Johannes Müller, who found time for all sorts of researches, experimented about 1845 in "open-sea fishing with a fine net", and Eschscholtz was another pioneer, little was done before the *Challenger* expedition, and even then attention was mainly concentrated on the great depths.

From his *Challenger* experience Murray was led to conclude (1876) that there was an intermediate pelagic fauna between the surface and the depths. This was denied by Agassiz (1878, 1891) below 200 fathoms; but the later work of Chun (1888-1889) has confirmed Murray's conclusion.

A great step was taken by Hensen (1887), who improved the appliances, instituted a more systematic survey, and introduced the *quantitative method* of estimating the volume of floating organisms in different waters and at different depths, and the proportions in which different species occur. He is responsible for the term "Plankton", applied to floating organisms, and his theory of its uniformity over wide areas gave rise to a lively controversy between him and Hæckel, who strongly maintained its oscillating and extremely variable character. Improvement of plankton-methods, *e.g.* the use of the pump and self-closing tow-nets (still far from practical perfection), their application to lakes and even rivers (*e.g.* by Zacharias); the taking of observations at different seasons throughout the year; and a combination of zoologists and botanists in the