are rare, in spite of the proximity to the Gulf Stream, and usually only single specimens are captured. Among the arctic immigrants are *Oikopleura vanhöffeni*, *Calanus hyperboreus*, *Metridia longa* and *Clione limacina*. *Calanus* and *Metridia* probably breed locally. The indraft of water through the eastern channel (i.e. the deeper layers) is fairly constant in its physical characters and carries with it species such as *Euchaeta* and *Euthemisto*, which are successful colonists. Tropical and arctic visitors usually arrive via the superficial water stratum, but the immigrants in the mixed water arrive at all depths, and this source of replenishment is always available.

Little work has yet been done on the food of fishes, and the section dealing with this problem is mainly a review of other people's work, but there are some data in connection with the feeding of whales: The Fin-back-whale feeds on euphausiids and herring; the Blue-back on euphausiids alone, whilst the Pollack whale subsists chiefly on copepods with some euphausiids. By means of photographs Dr. BIGELOW shows that the ability to capture small creatures like copepods depends upon the relative fineness of the bristles on the inner side of the baleen plates.

The data for a comprehensive survey of the phytoplankton is not nearly so large as for the zooplankton, principally owing to the lack of spring samples in most of the years covered by the report. There is sufficient evidence however to show that there is the usual tremendous spring flowering of diatoms; this is succeeded in summer by a peridinian flora — chiefly *Ceratia*, and there is a suggestion of a secondary maximum of diatoms in autumn.

The causes of the vernal flowering of diatoms are considered in a section dealing with the biology of the phytoplankton. Nitrates, silicates and phosphates are all brought under review as possible limiting factors. The supply of nitrogen and silica is shown to be greatest at the time, and phosphoric acid is assumed to be so too, but as Dr. BIGELOW says: "Our Gulf of Maine studies touch only the outer edge of this very complex subject".

There are many points of interest in the report which cannot be touched upon here. Most of the species of animals and plants are described separately and distributional charts given for the most interesting. There is also a series of 36 most excellent photographs illustrating all the different types of plankton, and finally there is a comprehensive bibliography. Our thanks are due to the author for producing this work which will be appreciated by all planktologists. R. E. S.

F. S. RUSSELL. The Vertical Distribution of Marine Macroplankton. V. The Distribution of Animals caught in the Ring-trawl in the Daytime in the Plymouth Area. Journal of the Marine Biological Association of the U. K., N. S., XIV, pp. 557—608 (1927).

In this latest instalment of his series of papers dealing with the vertical distribution of plankton Mr. RUSSELL publishes the details of the captures of invertebrates made in 1925 in daylight hauls of known depth (not in 1926, as is inadvertently stated in his summary). The fishes taken in these

hauls have already been described in part III of the series, reviewed in Vol. II, No. 1 of this Journal.

The paper is, as he states, rather a collection of data than of deductions, the accumulation of observations making it increasingly difficult to formulate definite conclusions as to the causes of the movements of the plankton. The light factor still seems to be the governing motive, but interesting departures from the general scheme are noted. Thus the adult males and the younger copepodite stages of Calanus both vary, but in different directions, from the rules of conduct of the females, the males being less and the young stages more attracted by light than the females. Tomopteris, which in the earlier months of the year was only taken in midwater night hauls, appeared in numbers in July and August in townettings taken by day in the upper layers. In general, however, the records support the conclusion already arrived at by the author that light is the principal factor in the vertical distribution, the relative positions of most of the species remaining the same though their actual depths varied from day to day, evidently in accordance with the intensity of the light. The author makes a strong case for the reliability of non closing nets, when used horizontally at serial depths with sufficiently small intervals between them and hauled for a sufficiently long time, indicating by calculation from an actual example how small is the error introduced by the fishing of the nets whilst being hauled. HJORT has already pointed (Depths of the Ocean, pp. 102, 616) how such nets can be used with profit in very deep water, provided that due allowance is made for the catch taken whilst hauling.

In the paper the numbers of the various species and, where necessary, of the different developmental stages, taken in about 100 hauls on seventeen different occasions, are given in tabular form and commented on, but the correlation of the distribution with the factors which may have influenced it has been deferred until a further series of townettings made in 1926 has been worked out. It is hardly necessary to comment on the value of the information thus supplied in a readily handled form, and the only criticism that presents itself is that more details of the light intensity, which is noted merely as "sunshine" or "dull", would be acceptable.

G. P. F.

A. CANDEIAS. Première Liste des Copépodes des Côtes du Portugal. Bull. de la Société Portuguaise des Sciences Naturelles. Tome X. No. 3. Dec. 1926.

Senhor CANDEIAS here publishes a preliminary list of oceanic copepoda from the coast of Portugal, based on thirteen townettings, all surface gatherings except one, taken between Cape St. Vincent and the Straits of Gibraltar. One station, No. 17, is however evidently wrongly located as the recorded position (37°35′ N., 8°32′30″ W.) places it some miles inland. *Camera lucida* drawings of several of the less well known or unexpected species are given in confirmation of the accuracy of their identification.

Prof. OTTO PETTERSSON has recently put forward a plea for the establish-