

large numbers to play a momentous part in the general economy. Still careful study distinctly reveals the fact that the plants of the sea are in striking disproportion to the animals. The most reliable results so far obtained are those due to Lohmann's researches in Kiel Bay. He studied the quantities of all the plankton organisms for a whole year with great thoroughness, and calculated the volume of the various groups in the plankton of the different water-masses at all seasons. To us his most interesting discovery is that the plants on an average made up 56 per cent and the animals 44 per cent of the total plankton. In the winter months the plants were easily outnumbered by the animals, and from December to February they formed scarcely a third of the total plankton. In the summer, on the other hand, they predominated, and made up sometimes even as much as three-quarters of the whole. Plants which are reproduced by division must necessarily decrease rapidly whenever vigorous augmentation ceases, if animals are constantly consuming numbers of them.

The life-cycle of animals, with its growth-period in youth and propagation in maturity, is more complicated than that of plants, and gives them a better chance of withstanding unfavourable conditions of existence. A lower temperature necessarily reduces their intensity of breathing, and thus diminishes their consumption of nourishment, and it may be also that they can go without feeding for a comparatively long time, during which they live upon reserve matter that they have accumulated at more favourable seasons. Damas made some interesting studies of the life-cycle of the larger copepods, and found that propagation may require a higher temperature than what is necessary for conserving vital energy, and that therefore these forms can delay their propagation until the conditions of existence become more favourable, so that the young animals may have the rich nutriment required for their growth. *Calanus finmarchicus*, the commonest large copepod of the Norwegian Sea, abounds wherever the temperature is over 2° C., in both its half-grown and full-grown stages, but propagation does not begin till the temperature rises to 4° C., either owing to warmer water-masses arriving from the south, or to heating at the surface from the atmosphere.

Lohmann has endeavoured to calculate the relation between the augmentation of the algæ and their consumption by animals throughout the year in Kiel Bay. He assumes that there is a daily accession of 30 per cent to the volume of the algæ, and

Life-cycle of animals.

Relation between production and consumption of algæ.