PHYTOPLANKTON.

The plant life of the sea, contrary to common belief, is not limited to the large sea-weeds growing in the narrow fringe around the sea-coast. There are also numerous minute, unicellular, yellow-green plants found in the upper layers of the sea itself, where the sunlight penetrates. These floating plants - the phytoplankton - consist of diatoms, dinoflagellates, and a few other microscopic algae.

It is interesting to note the ways in which these plants adjust themselves to their floating existence. In diatoms for example, there are four classes of structural adaptations:

1. The bladder type - for example Coscinodiscus spp. with relatively large cells, with a thin outer layer of cytoplasm and the centre filled with a light cell sap.

2. The needle or hair type, long and slender as typified by Rizosolenia spp. and Thalassiothrix spp.

3. The ribbon type as shown by Fragillaria spp. and Climacodium spp. Cells are broad and flat and attached to each other in long chains.

4. The branched type, as illustrated by the genera Chaetoceros and Corethron. Here many spines grown as projections resist sinking.

The presence of oil in the cells also helps to reduce the tendency to sink. In the dinoflagellates the cells may have long arms or conspicuous wing-like membranes or parachute-like adaptations, especially in tropical regions where the water is lighter.

The phytoplankton is of fundamental importance to the economy of the sea, because these plants alone can manufacture food from the raw materials dissolved in the sea (carbon dioxide, and nutrient salts), by utilising the energy of the sun.

On these small plants feed the numerous small animals of the plankton -the zooplankton - on them depend many plankton feeding fish such as herrings. On these small fish feed larger fish, then man comes along and catches the larger fish, and so the cycle goes on.

The study of the life of the sea in terms of measurable relationships - Marine Ecology-is comparatively young. At first the work was purely descriptive, but of more recent years attempts have been made to correlate chemical, physical and biological factors. This has shown how dependent the phytoplankton is on such things as sunshine, available quantities of such salts as phosphates, nitrates and the like, temperature, mixing of the water, and many others.

Graphs of these factors over a year or more show seasonal distributions which bear certain relationships to one another. For example, when the production of phytoplankton is high, phosphates etc. are rapidly utilised and are therefore low; on the other hand, when the hours of sunshine are low, phytoplankton production is also low. (In Winter.)

The phytoplankton usually shows two periods when maximum numbers are obtained, one in Spring and one in late Summer. In this, New Zealand results are similar to those of other parts of the world, but along with results from off the coast of New South Wales show the Spring maximum to be one month ahead of the Northern hemisphere.

In enclosed waters the seasonal extremes are more pronounced than in exposed seas, likewise in regions such as the Antarctic where the growing season is confined to a very short period.

Methods of collecting, concentrating, and counting given were as follows:

1. For Qualitative work -the plankton tow net.
2. For Quantitative work - collection by water-bottle, concentration by centrifuging, enumeration by counting cell.

Recent work overseas has shown the significance of the phytoplankton to the fishing industry. 1. Experiments have been carried out fertilising enclosed waters to increase the food supply of the fish by first increasing the phytoplankton. 2. Use of special instruments such as the plankton indicator and the plankton recorder suggest the possibility of forecasting in the first case, the probable fish population at a particular time and place; and with the second the working out of good and bad years for the fishing industry in any particular area.

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