THE FASCINATION OF MARINE PHYTOPLANKTON

by

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In their pre-occupation with the absorbing problems of land plants, many botanists are apt to forget that the upper layers of the sea, covering two thirds of the world's surface, contain countless millions of tiny, one-celled plants which form the basis of the complex food cycle of the larger marine animals. The main photosynthetic groups concerned are diatoms, dinoflagellates and infinitesimally small microflagellates, which are now regarded as the greatest providers of the bulk or biomass of the phytoplankton.

The structure of a diatom is essentially like that of a box, either cylindrical or oblong, in which the lid representing the older half of the cell, overlaps the base, or younger half of the cell. One has to become accustomed to recognising each species in two views: both from above (i.e. in valve view), and from the side (i.e. girdle view, where the lid of the box overlaps with the base). There are of course many modifications of this basic structure; patterns of wall sculpture and variety of protuberance or appendage providing generic and specific differences. Not for nothing are marine diatoms called the jewels of the sea. After one has studied them for a while it is easy to see why there were so many "diatomaniacs" last century - for these little plants are extraordinarily beautiful and intricate in design, when viewed under a high-power microscope.

I shall describe only a few of the major types which cause "blooms" by their periodic burst of cell division in coastal New Zealand waters. Perhaps the commonest form is the disc-like Coscinodiscus, varying in thickness of the girdle, and with many different complex patterns of punctae and areolae on the surface of its valves. One species, C. gigas, was collected in October last year in very large numbers as a pure bloom in the sheltered waters of Port Fitzroy, Great Barrier Island.

Another very common diatom is the stick-like Thalassiothrix nitzschioides, with numerous pores arranged in rows down the long axis of the valves. Chains of cells are formed in stellate and zig-zag patterns, through the clinging of the new cell by one gelatinous corner to its parent.

Perhaps on excursions to Muriwai on the west coast of Auckland some members may have noted an olive-green discolouration of the sea, and a slimy deposit on the sandy beach. Yes, it is formed by a most prolific bloom of an unusual diatom, Chaetoceros armatum, a short chain form with irregular spines or setae at the corners of each cell and with a strange geographic distribution. It is known on Toheroa beaches in New Zealand, but elsewhere only in a restricted part of the northern hemisphere. The great quantity of its production on the west coast beaches of the North Island may prove to be related to

upwelling of water some hundreds of years old (as proved by carbon dating), and very rich in nutrient material.

But what of the dinoflagellates? Less abundant on the whole than diatoms in New Zealand waters, they too can suddenly bloom, giving rise to what fisherman know (and dread in some parts of the world) as red tides. Their cell walls are made up on plates fitted together to form a mosaic. Each organism has two flagella, one encircling the main part of the cell in a deep groove, the other trailing behind out of a small groove. The two commonest genera are Ceratium, with three long horns, rather like an anchor, and Peridinium, with two projections, often conical in shape, at the base. The dinoflagellates, especially a globular, animal-like form called Noctiluca, may produce a brilliant luminescence at night.

Very little is known yet about the tiniest flagellates, most of which require oil immersion to be seen at all. But there is no doubt that herein lies a profitable field of research, and one which of necessity must be followed up in the near future. Dr. Richard Norris, a Fulbright scholar from Minnesota, U.S.A., has already begun valuable work in this field here at the N.Z. Oceanographic Institute, Department of Scientific and Industrial Research.

A word about collecting phytoplankton - you will need a very fine-meshed conical net, with about 200 meshes to the inch, made of bolting silk or nylon. A jar can be tied in at the base of the narrow end to avoid the expense of a special plankton bucket. Material is best examined fresh, but if some time is going to elapse between collecting and examining under the microscope, it is as well to add 3-5% neutral formalin. Preservative helps to concentrate the organisms present, otherwise centrifuging may be necessary.

If any further information is required, I cannot recommend too strongly the excellent book by Professor A. Hardy: "The Open Sea - The World of Plankton", published in the New Naturalist Series.

(Members who are able to acquire Professor Hardy's delightful book are indeed fortunate. Apart altogether from the value and interest of the letter press, the volume is illustrated by fine photographs and also by very fine colour reproductions of Professor Hardy's exquisite water colours of the strange and often extremely beautiful creatures he has collected from "the vasty deep". If you can't buy this book, borrow it! Ed.)

We are indeed glad to receive a communication from our good friend, Mr. Ross McKenzie of Clevedon, and as usual it is an interesting one. Mr. McKenzie is concerned about the distribution of our two native species of Weinmannia, which are both endemic.