

Marine Phytoplankton and Productivity

Edited by O Holm-Hansen, L Bolis & R Gilles

Lecture Notes on Coastal and Estuarine Studies, Vol. 8

Springer-Verlag, Berlin-Heidelberg-New York-Tokyo

1984, pp. vii + 175, 335 g, Soft cover, DM 36, approx. US \$ 14.20. ISBN 3-540-13333-X

The essays in this book on marine phytoplankton and productivity deal with areas as diverse as production in polar seas and studies of the oligotrophic eastern Mediterranean. They cover topics from thermodynamic models of phytoplankton growth to the physiology of arsenate uptake by photosynthesizers. Each article sums up the work done in that particular field over the last decade or 15 years. An important aspect of each paper is that it delineates lacunae in the known, thus underlining possibilities for future research.

Recent studies in the Antarctic Ocean have indicated that photosynthesis may be having severely limited thermodynamic effects on cellular enzyme systems (Sakshaug and Holm-Hansen, Chapter 1). As El-Sayed (Chapter 2) points out, the primary production of the southern ocean is not as high as it was believed to be and the course of future exploitation and management of this system in terms of harvestable krill must be reappraised in the light of this knowledge.

Phytoplankton growth models have generally been discussed as hyperbolic functions after Monod (1942). Kiefer's thermodynamic description (Chapter 3) has important implications in that it allows a partitioning between the effect of light and nutrient-limitation on phytoplankton growth. The predictive possibilities implied by the model merit serious consideration.

It is generally recognized that live, normally photosynthesizing natural communities of algae produce and release organic carbon due to a variety of environmental conditions. Research that has led to the above conclusions has been well summarized by Jensen (Chapter 6). The usefulness of these and other metabolites to ocean communities like marine bacteria (Azam and Amerman, Chapter 4) is, however, largely unknown. The latter authors have concluded, using the example of cyclic-AMP, that dissolved organic material is maintained at a low concentration in the ocean due to its rapid uptake and utilization by high-affinity transport systems occurring in small gram-negative bacteria. They have further suggested that chemoreception and motility are of fundamental

importance to marine bacteria. Investigations along these lines are likely to yield profitable results.

Studies on marine phytoplankton can and do cover wide ranging topics from arsenate-phosphate uptake (Benson, Chapter 5) to understanding oligotrophic oceans (Berman, *et al.*, Chapter 9) and the use of dialysis membranes in measuring growth rates of diatom populations (Vargo, Chapter 10). Each of these chapters contains well-reasoned arguments in support of the contentions raised by the several authors.

Yentsch and Phinney (Chapter 11) have recommended the use of a ratio between the efficiencies of chlorophyll *a* fluorescence when excited by wavelengths of 530 and 450 nm. In well-defined frontal regions they have found this ratio useful in delineating nutrient-rich and nutrient-poor areas in terms of their spectral signatures. However, as pointed out by the authors and by Mitchell and Kiefer (Chapter 13), besides nutrient changes, cells are capable of increasing or decreasing their chlorophyll *a* and accessory pigment concentrations in response to light intensity and quality. Thus, the value of such ratio remains to be further substantiated. If further study confirms the usefulness of this ratio, synoptic large scale surface tracking of frontal systems using remote sensors may be easier.

In the light of current technological developments, the invention of a flow cytometer and sorter was inevitable (Yentsch *et al.*, Chapter 12). At US \$ 170,000, however, this piece of esoteric engineering is likely to remain a pleasant dream for most of us.

"Lecture notes on coastal and estuarine studies" is a misnomer, certainly insofar as it is applied to "Marine phytoplankton and productivity". This collection of review articles and publications is a synthesis of current thought pertaining to the several topics discussed and, as such, is more important, and possibly more ephemeral, than the classic definition of lecture notes. The notes are useful to a post-graduate student of marine biology or oceanography, because they are thought-provoking and stimulating. They are also of value to a specialist who seeks to know current

developments in lines of work not his own. The book does not claim to be exhaustive in its approach and its usefulness would be maximized when it is used in conjunction with, rather than as a replacement for, the normal reading that scientists are required to do in any discipline.

The publishers and editorial board are to be

congratulated for bringing out this volume in 1984 when the symposium in which these papers were presented was held in September 1983. When lead times for publication in standard journals is anywhere from 8 months to 2 years, this is no mean achievement.

Aditi Pant