

Botanica Marina
Vol. XIX, p. 65–74, 1976

Life Forms in the Algae

V. J. Chapman and D. J. Chapman

University of Auckland, Auckland, New Zealand

and

Department of Biology, University of California, Los Angeles, California 90 024, U.S.A.

(Rec. 20. 12. 74)

A review of life-form schemes in the algae is given and a new one is proposed because no previous scheme has had wide acceptance. The new scheme is intended to be a reflection of habitat requirements of response and to be applicable to both marine and freshwater algae. Biological spectra are constructed for saltmarshes, rocky coasts (temperate and tropical) and for fresh waters. A further comparison is made of different belts on saltmarsh and rocky shores. A final comparison is made of biological spectra ranging from the Arctic to the tropics and from the Atlantic to Pacific Oceans.

Introduction

Just as there have been numerous attempts to formulate life-form schemes for the flowering plants, so various workers have proposed a number of different life-form schemes for the algae. A study of intertidal algae reveals an empirical relationship of the different morphological types to the character of the habitat, e.g., rocky shore, sandy shore, saltmarsh, etc. Apart, however, from these local habitat factors there are other more general factors which must be considered in order to account for such phenomena as the dominance of large kelps in colder waters and the abundance of lime-encrusted forms in warmer waters. The former, is, of course, associated with the failure of the gametophyte generation of the large kelps to reproduce in warm waters, and the latter is regarded as related to the physiology of calcification and at a more general level the overall problem of calcification in tropical waters. It is true that large areas of calcareous algae have been reported from arctic regions but the number of species involved is small compared with those found in the tropics. In recent years this aspect of algal ecology has received very little attention. In view of the accumulating knowledge in physiological ecology and the new impetus in population ecology and "adaptive" ecology, we would like to re-examine the life-form concept with the possibility that the idea might indicate further lines along which investigations should be profitable.

An effective system, for example, should provide a quantitative picture of the vegetation in any one area or geographical region, and it would serve as an extremely useful medium for comparing floras from two different regions. Indeed it is in this respect that any system will probably make its greatest contribution. There will, of course, be much the same limitations to any life-form scheme for the algae as there are to any one for the phanerogams. The principle objections are that no life-form scheme indicates the dominant life-form nor is there any indication of the relative abundance of the different categories. The latter can be surmounted if frequency figures are available by calculating the various life-forms in terms of frequency points, as has been done for Raunkiaer's scheme for the phanerogams. At present practically no frequency data are available from algal ecological surveys, and it is probable that in future such data should be obtained. This approach might be well suited for investigation by computer methods.

The earliest attempts at life-form classification were based, as indeed were those also of the phanerogams, upon morphological criteria, though it is obvious now that this is not the most desirable basis. The main developments in this subject have been in the present century and can be regarded as stemming from Oltmann's schema of 1905 which was wholly morphological.