

THE AIMS OF FUTURE RESEARCH IN THE ALGAE

V. J. CHAPMAN

Since the beginning of this century very considerable progress has been made in our knowledge of the algae. Up to then interest centered, as was perhaps natural, around morphology and systematics, and at the same time compilation of floras proceeded apace. Now, more attention is being given to the ecology, physiology and reproduction of the algae, but these branches are still in their infancy. This change in outlook does not imply that no future progress can occur in morphology and systematics, but it does mean that the greatest advances of the future can be expected to be made in these younger branches. For this reason research in them should be encouraged, though the older aspects should not be neglected since they still offer many problems that remain to be solved.

Morphology and systematics are an essential background to any botanical subject, and the more complete our knowledge of them, the more likelihood is there of sound and substantial advances in other branches. Today one of the most important needs in algal systematics would seem to be a continuation, with greater intensity, of the attack being made upon the smaller microscopic algae, especially the marine forms. In recent years much has been achieved in this direction for soil and fresh-water species and Pringsheim with his cultures (Biol. Reviews 16: 198. 1941) has indicated the best method to be adopted. Here one may perhaps express a hope that someone will soon publish a book describing all these forms with the provision of a key for their identification. There are still, especially in tropical and sub-tropical marine habitats, a number of species which require investigation and description. One may mention here the encrusting species of all groups: these have been studied fairly thoroughly in Europe and to a somewhat lesser extent in North America. Because they are so inconspicuous and often are not found in fruit, relatively few phycologists have studied them and many are regarded as rare. Persistent search in England has shown that this is not correct and that the majority have a far wider distribution than has been ascribed to them. This will no doubt be found to be true in other countries. Our knowledge of such forms in tropical and sub-tropical regions is exceedingly scanty and the position is not much better in the southern hemisphere.

There are certain genera, such as *Enteromorpha*, which I have been studying for some years, and *Cladophora*, which require to be investigated with a view to monographic treatment. At present it is quite impossible to identify with any degree of certainty some of the Cladophorae, more especially the tropical and sub-tropical forms. Valuable studies of this character have been undertaken by Kylin (Lunds Univers. Arssk. 20: 1924) for the Delessariaceae in the Rhodophyceae and by

Parke (Hartley Bot. Lab. Pub. **9**: 1933) for the Mesogloiaceae. Even the common species of *Fucus* are in need of further investigation in spite of excellent work upon them by the earlier phycologists, e. g. Sauvageau. The salt marsh forms of this genus are particularly difficult to determine and yet they play an important part in the algal ecology of salt marshes. Numerous varieties of *Fucus* species have been described and it is only by collecting and examining forms from many different localities that their status will finally be determined.

If we turn from systematics to morphology a principal need would seem to be a study of the developmental stages among members of the Fucales. In recent years Delf (Journ. Bot. Lond. **75**: 273. 1937, and **77**: 129. 1939) and her school have done much towards elucidating the development of the reproductive organs in the lesser-known species of this group, but the young stages have been largely neglected, a fact which can be ascribed to the difficulties of identifying them in the field or with growing them in culture. It is important that this problem should be overcome because it is of very considerable significance in ecology. A very valuable start in this direction has been made by Nienburg (Wiss. Meeres. Abt. Kiel **21**: 51. 1931). Culture studies of certain algae have recently forced us to realize that we have not yet determined all those species which have very different forms for their sexual and asexual generations. It has recently been shown (J. Behlan, Beih. Biol. Pflanz. **27**: 221. 1939) that *Chlamydomonas variabilis* and *Carteria ovata* are alternate generations of the same species and also (P. Kornmann, Planta **28**: 464. 1938) that the same applies to *Halicystis ovalis* and *Derbesia marina*. These are comparable to the older classic example of *Cutleria* and *Aglaozonia*. With the improved culturing technique we must re-investigate the life-histories of many species with a view to ascertaining whether they behave similarly. Bliding (Svensk. Bot. Tidskr. **27**: 233. 1933) has shown by such means that two well-marked forms of *Enteromorpha prolifera* are simply two generations of a single species. The investigations of Knight (Trans. Roy Soc. Edin. **56**: 307. 1929), Schussnig and Kothbauer (Oest. Bot. Zeit. **83**: 81. 1934) and Papenfuss (Bot. Gaz. **96**: 421. 1935), which show that *Ectocarpus siliculosus* may have a different life cycle in different parts of the world, lead us to the conclusion that we must not be satisfied with a single study of a life history, however complete it may appear to be. The Chaetophorales is an order for which it is very desirable to have some advance in our knowledge of life cycles and chromosomal conditions. Such knowledge will prove to be of the greatest value phylogenetically.

In physiological studies the greatest advances will probably come from biochemistry, especially studies concerned with the pigments. The classification of the algae is primarily based upon pigmentation and hence the discovery of any unusual features, e. g. the phaeophycean pigment fucoxanthin in *Polysiphonia violacea*, in *Zygnema pectinata* and

the Chrysophyceae (P. W. Carter, I. M. Heilbron, and B. Lythgoe) (Proc. Roy. Soc. **128**: 82. 1939), may lead to far-reaching systematic conclusions. Apart from this the rôle of growth substances in the algae has been but little studied and further investigation may show that they play as important a part in algal development as they do in the phanerogams. Most phycologists would now subscribe to the existence of 'sun' and 'shade' algae, but there is not the same agreement upon the criteria that determine to which group any given species should be assigned. Further work upon this problem is necessary in order to arrive at a definite working basis.

Since ecology is such a young branch of phycology there are innumerable problems, any one of which would repay study. Some, however, are more outstanding or of greater urgency than others. So far there has been too little attention paid to the operation of critical levels. The existence of these was first discussed by Colman (Journ. Mar. Biol. Ass. U. K. **18**: 435. 1933) and since then by David (Ph.D. Thesis, Aberystwyth. 1941). There is no doubt that such levels are of prime importance but further studies are essential before we can really understand their significance. It is also probable that in different localities the critical levels will vary and this should provide a clue to the dominant factors. More or less associated with this problem is the non-tidal exposure factor. The importance of this on salt marshes has already been emphasized (V. J. Chapman, Journ. Ecol. **27**: 160. 1939) but it has not yet been studied for the rocky littoral. It is believed that the incidence of these periods, when no inundation occurs, has a profound effect upon the occurrence of many species, especially when the periods operate during the germling phase. Whether the effect is due to actual lack of water or to loss of water or to some other cause has also to be determined. These remarks particularly apply to the fucoids and here we can appreciate how important it will be when we can distinguish with certainty in the field from their very earliest stages, the germlings of the different species. Up to the present, largely because of this difficulty, insufficient attention has been paid to the germling phase. In the case of *Ascophyllum*, for example, this would seem to be all-important because it is absent from areas exposed to strong wave action: young plants are not to be found in such places so that the inhibitory effect takes place at a very early stage.

Studies of recolonization after denudation or on new surfaces, such as those by Rees (Journ. Ecol. **28**: 403. 1940), David (l. c.) and Bokenham (Ann. Nat. Mus. **9**: 1938), will lead to important conclusions and help us to understand the interrelations between different species on the shore. Such work has already shown that colonization by *Fucus* is commonly preceded by the development of an *Enteromorpha* mat. It has been suggested that this mat provides the necessary humidity for the *Fucus* germling, but it may equally well provide a suitable substrate

for attachment. In any case the function of this mat in promoting the attachment of germlings requires investigation. The part played in the different communities by microscopic and encrusting species is not properly appreciated, though in this case it is partly due to a lack of adequate systematic knowledge. Yet again studies of areas associated with peculiar environmental conditions, such as that of the Baltic by T. Levring (Ph.D. Thesis, Lund, 1940), cannot help but lead to important results. The abnormal conditions induce morphological changes or ecological variations which can often be correlated with the operation of a single factor. Such areas are not common, but it is important that they should be investigated wherever they occur.

Studies of geographical distribution may be regarded as a part of ecology and here there is almost a virgin field. Some work can be carried out with the use of existing floras, but in many areas the floras cannot be employed because of the unsatisfactory condition of their systematics and uncertainty of synonymy. Plant geographical studies of the phanerogams have led to extremely important conclusions, and there is no reason to suppose that similar studies of the algae will not do likewise.

In fossil botany the principal interest, so far as the algae are concerned, would seem to be with that new group, the Nematophytales (W. H. Lang, *Phil. Trans. B.* **227**: 245. 1937). It is to be hoped that further material will be discovered that will provide decisive proof as to whether they were algae or not. If an algal nature is confirmed then they will take their place as perhaps the most interesting algae of all time.

GONVILLE AND CAIUS COLLEGE
CAMBRIDGE, ENGLAND



Chapman, V. J. 1943. "The Aims of Future Research in the Algae." *Farlowia :a journal of cryptogamic botany* 1(1), 5-8. <https://doi.org/10.5962/p.315968>.

View This Item Online: <https://www.biodiversitylibrary.org/item/33558>

DOI: <https://doi.org/10.5962/p.315968>

Permalink: <https://www.biodiversitylibrary.org/partpdf/315968>

Holding Institution

Missouri Botanical Garden, Peter H. Raven Library

Sponsored by

Missouri Botanical Garden

Copyright & Reuse

Copyright Status: In copyright. Digitized with the permission of the rights holder.

Rights Holder: Harvard University Herbaria

License: <http://creativecommons.org/licenses/by-nc-sa/3.0/>

Rights: <https://biodiversitylibrary.org/permissions>

This document was created from content at the **Biodiversity Heritage Library**, the world's largest open access digital library for biodiversity literature and archives. Visit BHL at <https://www.biodiversitylibrary.org>.