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MARINE PHYTOGEOGRAPHY

VALERIE MAY

From a comparative study of marine floras we may at some date be able to demonstrate the evolution of sea plants in both time and space. At present it is impossible to complete this comparative study since the algal exploration of many parts of the world is incomplete. Further, algal taxonomy lags far behind the corresponding study of land plants. Thus any theory of phytogeography based on our present knowledge of marine plants rests on an insecure foundation.

Variation in algal communities, within small areas, can be explained satisfactorily in terms of changes in exposure to dessication or heavy seas, changes in mineral and gaseous supplies, in intensity of light and heat, depth of water, and the nature of the sea floor. On this there are superimposed seasonal changes in the flora and interaction or competition between organisms.

When a comparison is made of more widely separated districts, however, such explanations are inadequate. The original conception of algal distribution was that each species had a centre of growth from which it was disseminated following the lines of the coast, each species being influenced by local factors such as depth of water. This idea accounted for local richness in certain groups of the flora and also the similarity between the algal floras bordering an ocean. Exceptions were quickly noted, however, many plants (e.g. *Codium tomentosum*) being reported as cosmopolitan in distribution. Later work, as explained below, has suggested that this supposed cosmopolitan distribution may, in at least some cases, be due to taxonomic errors.

By 1849 we find Harvey coming to the conclusion that temperature zones were highly important. Thus, in number of species, the "browns" (Melanophyceae) predominated in the tropics, the "reds" (Rhodophyceae) reached a maximum in the temperate zones, and the "greens" (Chlorophyceae) were polar or universal.

Zoning by temperature may well be a misnomer for zoning by light intensity, as has been emphasized by Tilden.

Besides this zoning by latitude, a certain amount of data indicates zoning by longitude; for instance in the Codiaceae, A. & E. S. Gepp (1911) state that five large genera are widely distributed in both hemispheres,

seven genera are in the Eastern Hemisphere only, one in the West Indies region and one in the Mediterranean Sea. Only very few species occur in both hemispheres. This grouping would seem due to some barrier (past or present) preventing east-west migration.

Discontinuity of distribution has been attributed to the presence, or past existence, of barriers such as land masses, ocean deeps, or sandbank deserts. Likewise, wide dispersal has been explained as due to distribution by birds, ships, etc., and by ocean currents (speed as well as direction being important because the time of life of motile spores is limited). Svedelius (1924) suggested that the present distribution of algae may be due to geological changes in land and sea allowing migration by way of water connections from the Indian Ocean to the Mediterranean Sea via Suez, and from the Pacific to the Atlantic Ocean via Panama. Our present knowledge is too meagre to test this theory.

Fossil evidence is unsatisfactory because algal forms are usually soft, and hence their remains are scarce except for the specialized calcareous seaweeds of many so-called "coral" reefs. Lucas (1927) reported the discovery of *Bytholotrephis gracilis* James & Hall, from Victoria, Australia, "apparently identical" with forms found in the Lower Ordovician beds of North America. Another fossil species was like one found in England. Lucas assumed that *Bytholotrephis* was an "elemental or generalised type," dominant in England, North America, Australia, etc. This idea of an elemental or generalized type represents a theory that at one time uniform conditions and marine floras existed throughout the world. Later more temperate conditions prevailed north and south of the tropics and the floras of these zones, subjected to similar environments, changed along similar lines. Finally, it was suggested that, in the frigid zones, we would have identical representatives which were absent from temperate or torrid zones. This argument may hold for plankton (which are not considered in this article) but Gain (1912) has shown that great differences exist between the marine floras of the Arctic and Antarctic. For instance, he noted that not one species of the large groups of Fucaceae and Laminariaceae was common to both zones, although all species of these groups belong to cool regions.

May (1940) applied Jaccard's Coefficient of Correlation to the marine floras (Chlorophyceae and Melanophyceae only) of Australia, New Zealand, Britain, and North America; also of Australia-Cape of Good Hope. From figures published by Gain (reference given above) the coefficient percentages for the Arctic and Antarctic floras are:

Chlorophyceae 10.5 Melanophyceae 6.9 Rhodophyceae 7.8

All these coefficients are surprisingly alike and show that the degree of uniformity of the floras of the places examined is fairly constant. The correlation tends to be higher among the Chlorophyceae than the Melanophyceae. The Chlorophyceae include more so-called "cosmopolitan" species.

It seems the wide distributions reported for so-called "cosmopolitan" plants may very well be due to faulty systematic work. Setchell (1914) examined *Scinaia furcellata*, previously reported as "cosmopolitan." He found that this species was in reality limited in distribution. Plants reported under this specific name as occurring in other districts were either different species or even different genera. Thus the "cosmopolitan" distribution resolved itself into there being a group of more or less closely related species, each occupying its own limited region.

Ectocarpus confervoides, on the other hand, appears to be truly cosmopolitan, but different phases of its life history predominate in different places. The reason for this is not understood, although the appearance of many algae is known to change with habitat, i. e. the form assumed depends on the environment.

Weber van Bosse (1904) reported that many characters used in classifying plants "were not implicitly to be relied upon in all species." These characters included manner of ramification, diameter of conceptacles, and the number or manner in which they appear on the joints, characters which are still widely used. Perhaps the present unsatisfactory condition of algal systematics could best be overcome by more care being paid to the criteria used in classification. Certainly we need more knowledge of the specific limits of the plants we deal with before a phytogeographic comparison between floras can be satisfactory.

To conclude, phytogeography of marine plants is an almost untouched field. Without more work of systematic nature and further collections being made, this study is unable to advance beyond vague hypotheses. All we can say with certainty is that latitude and the presence or absence of barriers (either geological or present-day) between suitable habitats appear to control the distribution of marine vegetation.

NATIONAL HERBARIUM
SYDNEY, AUSTRALIA

BIBLIOGRAPHY

- Gain, L.** La Flore Algologique des Régions Antarctiques et Subantarctiques. Deuxième Expédition Antarctique Française (1908-1910) Commandée par le Dr. Jean Charcot. 218 pp. 8 pl. Masson, Paris. 1912.
- Gepp, A. & E. S. Gepp.** The Codiaceae of the Siboga Expedition. Monographie LXII of: Uitkomsten op Zoologisch, Botanisch, Oceanographisch en Geologisch Gehied. 150 pp. 22 pl. Leiden. 1911.
- Lucas, A. H. S.** On Additional Occurrence of *Bythotrephes* in Victoria. Mem. Nat. Mus. Melbourne No. 7: 157-158. pl. 14. 1927.
- May, V.** A Comparison between Marine Floras. Contrib. N. S. Wales Nat. Herb. 1 (2): 94-98. 1940.
- Setchell, W. A.** The *Scinaia* Assemblage. Univ. Calif. Publ. Bot. 6 (5): 79-152. pl. 10-16. 1914.
- Svedelius, N.** On the Discontinuous Geographical Distribution of Some Tropical and Subtropical Marine Algae. Ark. f. Bot. 19 (3): 70 pp. 1924.
- Weber van Bosse, A. & M. Foslie.** The Corallinaceae of the Siboga-Expedition. Monographie LXI of: Uitkomsten op Zoologisch, Botanisch, Oceanographisch en Geologisch Gehied. 110 pp. 16 pl. Leiden. 1904.



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