

## "BIOGEOGRAPHY OF MARINE BENTHIC ALGAE"\*

### PREFACE

Over the past six years, the biogeography of benthic marine algae has developed from a predominantly descriptive activity, involving speculative ecological and historical explanations for the observed distribution patterns found, into a dynamic experimental science involving field and laboratory studies that use both physiological and molecular biological approaches.

The recent progress made in seaweed biogeography is illustrated by three special volumes dedicated to this topic and which appeared in the period 1984–1987. Two of these, *Helgoländer Meeresuntersuchungen* 38 (3–4) 1984 and 41 (3) 1987, comprise contributions to the Second and Third Seaweed Biogeography Workshops, organized by the International Working Group on Seaweed Biogeography. The third volume, *Botanica Marina* 29 (3) 1986, contains papers presented at the symposium "Modern Aspects of algal biogeography" held during the Second International Phycological Congress at Copenhagen in 1985. The present volume is a natural continuation of this series, and we expect that others will continue to appear in the future.

The papers in the previous three volumes and in the present volume represent roughly three different approaches:

The first major approach involves world-wide to ocean-wide patterns analysis in which clustering, ordination and other multivariate statistical methods are utilized, as well as methods of phylogenetic systematics ("cladistics"). This approach is basic to all other investigations; it generates the overall hypotheses which can be translated into more specific hypotheses that can be tested by experimental methods. Reliable floristic and distributional data are instrumental to this approach; these are still dearly lacking for many shores. Hanisak & Blair's paper is therefore a very welcome addition to our knowledge, as it provides these basic data for a so far phycologically terra incognita, namely deep water substrates off Florida's W coast. This paper is instrumental to understanding the seaweed biogeography in the Caribbean and NE America. An equally important addition to our basic knowledge is presented in Prud'homme van Reine's paper on the biogeography of the Azorean seaweed flora which is particularly interesting as this flora must have been constituted by long-range dispersal from donor continents (namely the Atlantic E coast). A particularly stimulating paper is contributed by Rosen. By comparing present and past distributions of marine organisms having a rich fossil record (e.g. reef corals), he presents an overview of the hypotheses explaining these distributions. Finally, Lawson's contribution to the "pattern approach" is a useful critical evaluation of the various ordination and classification techniques as applied to seaweed biogeography.

The second major approach investigates ecological factors affecting

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distribution patterns whereby temperature, irradiation, photoperiod, and salinity are studied under field and laboratory conditions. Breeman summarizes in her paper the experimentally determined ranges of thermal tolerance and requirements for the completion of the life history of ca 60 seaweed species from the N Atlantic Ocean. These thermal responses account for the location of geographic boundaries in all but a few species. Optimum thermal ranges never explain geographic ranges, and this in contrast to often expressed opinions. Probably for no other group of organisms is it at present possible to explain in this way the causation of ecologically determined boundaries. The work reviewed and evaluated by Breeman is partly the result of cooperative investigations by members of the International Working Group on Seaweed Biogeography. An interesting topic is tackled by Russell, namely the question whether or not incipient seaweed speciation takes place in the brackish Baltic. The available evidence suggests that this might be the case.

The third major approach utilizes macromolecular techniques, specifically single-copy nuclear DNA-DNA hybridization kinetics and 18 S rRNA sequencing. These techniques provide a measure of genetic distance, i.e. a sampling of the genomic "archives" in absence of the fossil "archives", from which phylogeny and relative divergence times can be investigated according to the molecular clock. On the basis of DNA-DNA hybridization data, Stam et al. suggest, in their contribution, that N Atlantic *Laminaria* species diverged 15–19 million years ago and they present arguments that this divergence took place in a N Pacific ancestral group.

The success of the symposium was due of course in the first place to the efforts of the speakers-and-authors in presenting not only fascinating lectures fitting into the strict time schedule but also publishable manuscripts, although the finalization of some manuscripts took more time than anticipated. Therefore, we gratefully acknowledge the patience and expert support of the editors of the "Helgoländer Meeresuntersuchungen".

Finally, we would like to express our profound admiration for the excellent organization of the XIV Botanical Congress. This was certainly also essential to the success of the symposium "Biogeography of marine benthic algae".

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