

Revision of the Coccoid myxophyceae

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Edited by

J. E. Potzger

The *Butler University Botanical Studies* journal was published by the Botany Department of Butler University, Indianapolis, Indiana, from 1929 to 1964. The scientific journal featured original papers primarily on plant ecology, taxonomy, and microbiology. The papers contain valuable historical studies, especially floristic surveys that document Indiana's vegetation in past decades. Authors were Butler faculty, current and former master's degree students and undergraduates, and other Indiana botanists. The journal was started by Stanley Cain, noted conservation biologist, and edited through most of its years of production by Ray C. Friesner, Butler's first botanist and founder of the department in 1919. The journal was distributed to learned societies and libraries through exchange.

During the years of the journal's publication, the Butler University Botany Department had an active program of research and student training. 201 bachelor's degrees and 75 master's degrees in Botany were conferred during this period. Thirty-five of these graduates went on to earn doctorates at other institutions.

The Botany Department attracted many notable faculty members and students. Distinguished faculty, in addition to Cain and Friesner, included John E. Potzger, a forest ecologist and palynologist, Willard Nelson Clute, co-founder of the American Fern Society, Marion T. Hall, former director of the Morton Arboretum, C. Mervin Palmer, Rex Webster, and John Pelton. Some of the former undergraduate and master's students who made active contributions to the fields of botany and ecology include Dwight W. Billings, Fay Kenoyer Daily, William A. Daily, Rexford Daudenmire, Francis Hueber, Frank McCormick, Scott McCoy, Robert Petty, Potzger, Helene Starcs, and Theodore Sperry. Cain, Daudenmire, Potzger, and Billings served as Presidents of the Ecological Society of America.

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REVISION OF THE COCCOID MYXOPHYCEAE

Francis Drouet and William A. Daily

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This study originated as an inquiry, some twenty years ago, into what names should be employed for species of coccoid Myxophyceae found in general collections of algae from various parts of the world. Gradually we accumulated and examined many thousands of specimens. Equally gradually it became apparent to us that only a carefully executed revision of the group, with sufficient attention paid to the morphological variation and life history of each species and with strict adherence to the stern discipline of the science of historical taxonomy, would produce a classification and a nomenclature which would satisfy our desire.

Our method consisted essentially of studying and re-studying every specimen which we could collect, borrow, purchase, or otherwise secure. Among these specimens were included the original material of many species described by various authors. During the latter years we made an ambitious attempt to find the original specimens of as many previously described species as possible. With funds provided by Mr. E. J. Richards of Chicago, a search was made in the larger European herbaria for such historical specimens. The nomenclature, synonymy, descriptions, notes, *nomina excludenda*, and photographs in the treatment of genera and species below record the results of this work.

It early became apparent that the various species are of very broad distribution in appropriate habitats over most of the earth. Our interpretations of their morphology and life histories were (and perhaps still are to a certain extent) often qualified by prejudices learned from previous classifications, and it has required considerable audacity to recognize such now readily apparent phenomena as the properties of the sheath material to be-

come hydrolyzed and to develop pigments which change color easily. It was a difficult admission finally to note hyelloid filaments at the bases of the cushions of *Entophysalis*, although it had been wholly natural to see entophysaloid cushions at the surface of plants of *Hyella*. We came to realize the fact that big plants grow from little plants and that (in our time) all plants come from other plants. In this group where the cells differentiate no hard parts, it became reasonable to expect that no two plants, each with a separate history of growth in separate environments, could look exactly alike; the same had to be admitted for each cell of each plant. In every microenvironment there occur at times catastrophic events (freezing, thawing, inundation, drying, heating, intense insolation, shading, parasitization, depredation by animals, changes in chemical nature of the substratum or medium, etc.) peculiar to its small area; it finally became apparent that these events often cause radical changes in the appearance and mode of growth of both plants and cells. The classification outlined here attempts to take these matters into consideration.

Over a thousand species, varieties and forms have been described within, or at one time or another transferred into, this group of plants. Authors of these taxa published before 1935, when the type method was incorporated into the International Rules of Nomenclature, did not, except in rare instances, indicate type specimens; and almost as seldom since 1935 have authors of novelties in microscopic algae designated types. It has therefore been a major task of this project for us to select type specimens for all specific and subspecific taxa previously untypified. In making such selections, we have wherever possible chosen the material originally studied by the authors; if such material were not found, then a specimen named later or reasonably assumed to have been seen by the author has been designated as the type.

There are perhaps numerous species for which no original specimens were preserved. The number of these is probably far less than this paper indicates, since we have been somewhat restricted in time, in patience, in assistance, and in financial, political, and psychological means to search out and examine the historical bases for all such species. For the purpose of completeness, we are designating the original descriptions of these species as temporary types (to serve until original specimens may be found); and these descriptions have been interpreted by us with some sense of responsibility in special lists of synonymy under the appropriate taxa. Descriptions (even with illustrations) are of course only ink and paper, not algae; the application of iodine to them will not indicate what to the taxonomist will be of primary concern: whether or not the cells of the new taxon contain starch. Especially of the algae are descriptions and illustrations matters of personal interpretation. It would be eminently unscientific of us and unfair

to the author if we presumed to comprehend fully a description without seeing the original specimen also. We have concluded that names of species with only descriptions and illustrations for types cannot be employed as names for taxa of algae in nature.

HISTORY OF CLASSIFICATION

If botanists prior to 1777 encountered species of coccoid Myxophyceae, they probably referred them to the Linnaean genera *Byssus*, *Tremella*, or *Ulva*. J. Lightfoot in his *Flora Scotica* (1777) named a conspicuous gelatinous alga from wet places on the Isle of Skye *Ulva montana* [*Anacystis montana* of this paper]. K. Sprengel in *Flora Halensis, Mantissa* (1807) described green globules floating in a lake near Halle as *Coccochloris stagnina*. During the period 1790—1850, numerous genera and species were published by J. B. Bory de St. Vincent, C. A. Agardh, H. C. Lyngbye, J. P. Vaucher, C. Sommerfelt, S. F. Gray, H. F. Link, C. G. Ehrenberg, A. J. C. Corda, R. K. Greville, E. Fries, P. J. Turpin, B. Biasoletto, F. G. F. Meyen, B. Gaillon, M. J. Berkeley, A. de Brébisson, A. Braun, V. Trevisan, A. H. Hassall, J. J. Roemer, F. C. Mertens, A. G. Roth, and others to accommodate species of coccoid algae. In the 1830's, G. Meneghini and G. Zanardini in Italy, F. T. Kützing and L. Rabenhorst in Germany, W. H. Harvey in England, J. G. Agardh in Sweden, and C. Montagne in France began the careful description and classification of all algae, revising at the same time the work done by colleagues and by past authors. Without separating the Myxophycean forms as a group, they created classifications which would account for a large proportion of the unornamented coccoid algae which we know today.

Carl Nägeli, studying collections of microscopic algae principally from Switzerland, wrote a short paper in 1849 entitled *Gattungen Einzelliger Algen*. He separated the family *Chroococcaceae* from the more obviously green and red algae and divided the species in it among genera characterized by planes of cell division and the resultant distribution of the cells within the gelatinous matrix. The limitations which he set to the variability of the gelatinous matrix have remained with us as an incontrovertible orthodoxy. His classification, an expression of philosophical commitment to his theory of the cell as the unit of structure and function in plants, his descriptions, and his illustrations were so logically and mechanically executed that their material bases have remained almost completely unquestioned until now.

In his *Flora Europaea Algarum* (1864—68), L. Rabenhorst attempted to resolve the classifications of coccoid algae by Kützing, Meneghini, Nägeli, and others, chiefly along Nägelian lines. With this publication as