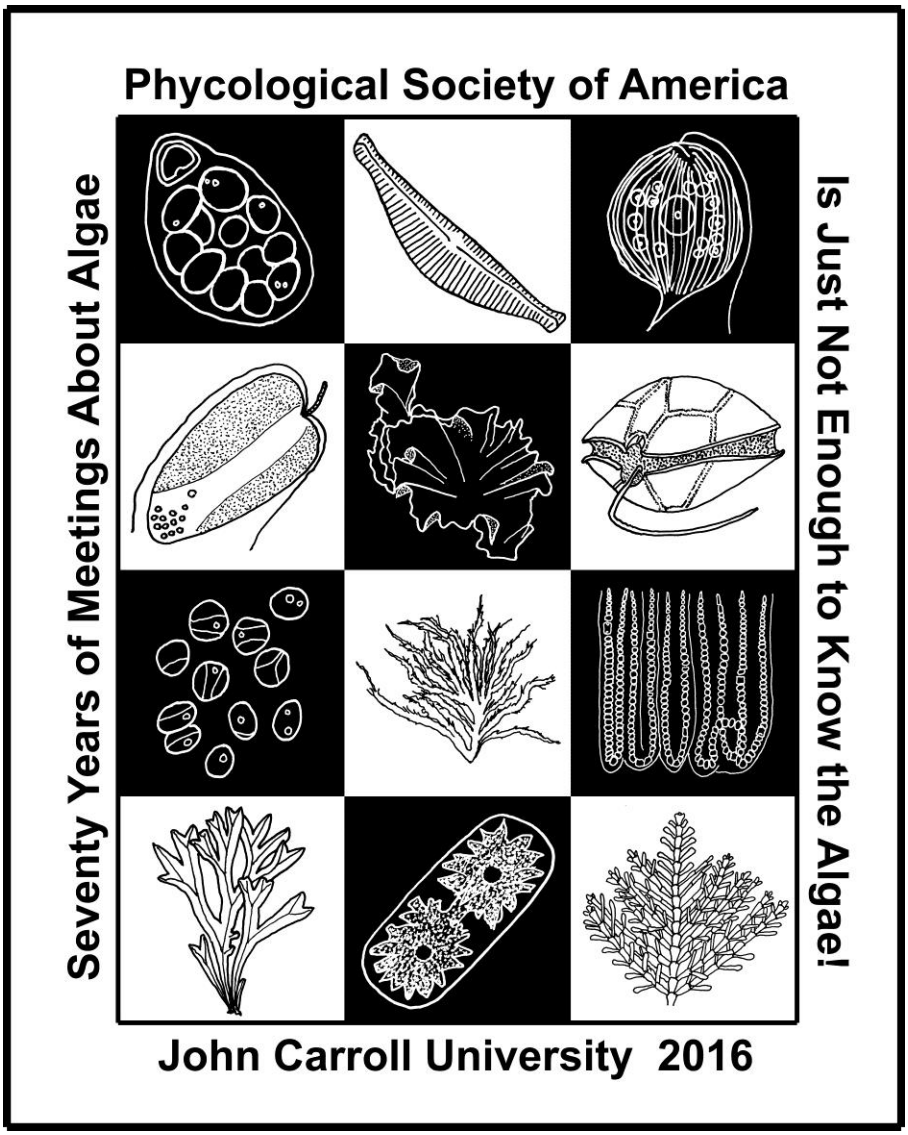
51st Annual Meeting of the Phycological Society of America



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Rhodoliths collected offshore the NW Gulf of Mexico at ~65m have been maintained in closed microcosms. Non-flagellated unicells were captured from the rhodoliths' interior with a micromanipulator and microscope and used to establish cultures following their isolation. These endolithic non-flagellated cells subsequently developed into free-living, flagellated *Ochrosphaera verrucosa* haptophytes, but also into amorphous blobs of palmelloid cell colonies. Each cell has a prominent central pyrenoid, parietal chloroplasts, and a thin or thick cell wall; scattered floridean starch granules were visible in older cells. Single cells, or cell clusters (in pairs, tetrads, or up to 12) were embedded inside an extracellular matrix whose boundaries remain closely appressed to neighboring clusters. Cell division by concavo-convex division resulted in hemispherical cells subsequently expanding in size. Plastid tufA sequence analysis confirmed that the colonies are a new sp. of *Rhodosorus* distinct from the generitype *R. marinus* and *R. magnei*. The 3 spp. can be separated on the basis of color, number and degree of chloroplast lobes, and number of cells grouped in a communal gelatinous envelope. The tufA sequence of the NW Gulf of Mexico *Rhodosorus* is a perfect match to that retrieved by tufA metabarcoding from calcareous coral reef substrata from Okinawa, Japan. This is the first report indicating that a *Rhodosorus* sp. spends part of its life history endolithically inside deepwater rhodoliths, co-habiting with *Ochrosphaera*.

GENOME BASED PHYLOGENY OF RED ALGAE PROVIDES A ROBUST FRAMEWORK FOR INFERRING EVOLUTION OF KEY CELLULAR TRAITS

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Red algae comprise an anciently diverged, species-rich phylum with forms that span unicells to large seaweeds. Here, leveraging a rich red algal genome and transcriptome dataset, we used 298 single-copy orthologous nuclear genes from 15 red algal species to erect a robust multi-gene phylogeny of Rhodophyta. This tree places red seaweeds (Bangiophyceae and Florideophyceae) at the base of the mesophilic red algae with the remaining non-seaweed mesophilic lineages forming a well-supported sister group. The early divergence of seaweeds contrasts with the evolution of multicellular land plants and brown algae that are nested among multiple, unicellular or filamentous sister lineages. Using this novel perspective on red algal evolution, we studied the evolution of the pathways for isoprenoid biosynthesis. This analysis revealed losses of the mevalonate pathway on at least three separate occasions in lineages that contain *Cyanidioschyzon*, *Porphyridium*, and *Chondrus*. Our results establish a framework for in-depth studies of the origin and evolution of metabolic pathways in Rhodophyta.

TO BE OR NOT TO BE: WILL THE REAL *CHRYSYMENIA* (RHODYMENIACEAE, RHODOPHYTA) PLEASE STAND UP?

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The genera in the Rhodymeniaceae that have a hollow thallus lacking diaphragms comprise *Chrysymenia* J. Agardh (including *Gloiosaccion* Harvey), *Botryocladia* (Agardh) Kylin and *Irvinea* Guiry. *Chrysymenia* has traditionally been defined by a lack of internal rhizoids and with the only solid portion of the thallus limited to the stipe, and *Botryocladia* is characterized by the presence of larger, solid axes. Our new revision of *Chrysymenia* indicates that on the basis of vegetative characters alone, the true *Chrysymenia* clade contains taxa that exclusively produce gland cells directly on unmodified medullary cells, and that *Botryocladia* species may or may not cut off gland cells from modified glandiferous medullary cells. Based on phylogenetic sequence analysis (*rbc*L, UPA, LSU sequences) and morphological data, the hollow, gelatinous species *Chrysymenia enteromorpha* Harvey from the Gulf of Mexico and the Caribbean Sea, and *C. wrightii* Harvey from the Northeast Pacific, are newly transferred to the genus *Botryocladia*. Two new species of *Chrysymenia* are reported for the Gulf of Mexico from 60-68 m depth: a broad, foliose species growing attached to rhodoliths offshore Louisiana and the vicinity of the Dry Tortugas, FL, and a slender branched species from the vicinity of the Florida Middle Grounds, Florida. A revised concept of a monophyletic *Chrysymenia* will be discussed in the context of the Rhodymeniaceae.

HAVE MARINE ANIMAL CONSERVATION LAWS CAUSED THE DECLINE OR EXTIRPATION OF MACROALGAL POPULATIONS OVER THE PAST CENTURY IN BERMUDA?

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Unlike the difficulties associated with estimating the diminution of animal size over time in marine megafauna, early seaweed collectors left an extensive archival record of herbarium specimens from locations throughout the world useful for comparative purposes with recent populations of the same species collected today. Using collections in the 1912-1917 Bermuda fascicles of the algal exsiccata *Phycotheca-Boreali Americana*, as well as the extensive Bermuda collections compiled by W.R. Taylor and his students in the University of Michigan Herbarium, we are able to compare the presence and absence of macroalgae from a century ago and today in locations around the islands. Several marine herbivorous fishes, especially parrotfish (*Scarus* spp., *Sparisoma* spp.), have seen increased population sizes since Bermuda enacted the 1978 Protected Species Order. By 1990, when the Bermuda fish trap ban was put into effect, several species of grouper (*Mycteroperca* spp., *Epinephelus* spp.) and Mutton hamlet (*Alphestes*), the main predators of parrotfish and other herbivorous fish, were rarely seen in surrounding waters. Furthermore, in 1982, intertidal grazing West Indian top shells (*Cittarium pica*) were reintroduced to the islands, and since then, along with the rise in parrotfish populations, inshore populations of many algal species have declined or disappeared. We will discuss several large and abundant Bermuda macroalgal species of the early 20th century that today are diminished in size and abundance, and how increased parrotfish and top shell populations over the past 40 years may have caused these changes.

CYANOMARGARITA GEN. NOV.: CONVERGENT EVOLUTION RESULTING IN A CRYPTIC GENUS IN CYANOBACTERIA