

Phylogenetic positions of the colorless, colonial iron-flagellate *Anthophysa vegetans* and *Polykaryon pyrenidosum* gen. et comb. nov. (Heterokontophyta)

J. Craig Bailey and Ian J. Misner

Biological Sciences and Center for Marine Science, University of North Carolina at Wilmington, Wilmington, NC 28403 USA

Abstract

The freshwater heterokont algae *Anthophysa vegetans* and *Botrydiopsis pyrenidosa* (strain SAG 31.83) were reexamined in the light microscope and their phylogenetic positions were investigated using DNA sequence analyses. Although differences in numbers of cells per colony and cell sizes were observed, our morphological data are consistent with previously published information for both species. In particular, the highly multinucleate nature of *B. pyrenidosa* cells was confirmed by fluorescence microscopy using the DNA-binding fluorochrome DAPI. Parsimony and maximum likelihood analyses of nuclear small subunit ribosomal RNA (18S rRNA) gene sequences confirm placement of the colorless, colonial flagellate *A. vegetans* within the Chrysophyceae and imply that *A. vegetans* is most closely related to *Poterioochromonas* spp. and *Ochromonas sphaerocystis*. Evidence is presented for four independent losses of photosynthetic capacity within the Chrysophyceae. *Botrydiopsis pyrenidosa* was first described by Trenkwalder, classified in the Xanthophyceae, and deposited in the Sammlung von Algenkulturen (strain SAG 31.83). Analyses of 18S rRNA gene sequence(s) derived from an authentic isolate indicate that *B. pyrenidosa* is not closely related to *Botrydiopsis intercedens* and may not belong in the Xanthophyceae. The alga cannot be confidently placed in any known class of heterokont algae and a new genus, *Polykaryon*, is erected to include *P. pyrenidosum* (Trenkwalder) Bailey *et* Misner. *Polykaryon* is treated as *incertae sedis* within the heterokont algal lineage.