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### **Classification of freshwater raphidophyceans based on ultrastructure and phylogenetic relationships**

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Freshwater species of Raphidophyceae (Heterokontophyta) are clearly distinguished from marine species by the composition of photosynthetic pigments, and the presence or absence of a pyrenoid and contractile vacuole. Classification to genus level has been traditionally carried out based on the cell morphology, the constituents of contractile vacuoles, and the presence or absence of mucocysts, as well as their distribution, which can be easily recognized only in the light microscope. Since it is very hard to establish culture strains of freshwater species, up to now their ultrastructural features could not be determined at the species or generic level, and molecular phylogenetic analysis could not be performed. In this study, the ultrastructure and molecular phylogeny of culture strains of *Gonyostomum semen*, *G. depressum*, *G. latum*, *Merotricha bacillata* and *Vacuolaria virescens*, originally established from Japanese ponds and lakes, were investigated using 18S rDNA and *rbcl* gene sequences. The following new findings were obtained; 1) *Gonyostomum* was polyphyletic, 2) *G. latum* and *G. depressum* formed a clade, 3) *M. bacillata* appeared between the latter clade and *G. semen*, 4) The pyrenoids were found for the first time in *G. latum* and *G. depressum*, 5) Their ultrastructure was very similar to each other. These findings require the generic emendation of *Gonyostomum* and *Merotricha*, and the establishment of a new genus for *G. latum* and *G. depressum*.