



Two new species of *Mallomonas* (Chrysophyceae: Synurales): *Mallomonas temonis* and *Mallomonas divida*

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Abstract

This paper describes two new species of *Mallomonas*. *Mallomonas temonis* was identified in the Table Mountain Plateau, South Africa; *Mallomonas divida* was identified in Aquitaine, France. The descriptions are based on silica-scale morphology studied by means of transmission and scanning electron microscopy. *Mallomonas temonis* belongs to the section *Heterospinae*. A scale is surrounded by a submarginal rib connected at lateral parts by a strong, more or less transversal rib. *Mallomonas divida* belongs to the section *Torquatae*. The shield of scales is covered by regularly arranged, delicate papillae and marked by one or several rows of more distinctive papillae.

Introduction

Synurales, including *Synura* Ehrenberg 1834: 314 and *Mallomonas* Perty 1852: 170, are often important components of the phytoplankton community of freshwater lakes and reservoirs. *Mallomonas* represents the most diversified genus of the group (Siver 1991). Currently, it is comprised of approximately 280 taxa; however, only 163 taxa are accepted taxonomically (Guiry & Guiry 2012). The cell body of the flagellates is covered with an armor of imbricated silica scales. The scales represent flat, bilateral, almost symmetrical objects with dimensions of 2.5–6.0 × 1.5–4.0 μm in most species. In *Mallomonas*, some or all scales may harbor a bristle. The oldest record for the genus dates to ~40 million years ago, and is represented by numerous *Mallomonas* scales and bristles discovered in Eocene maar lake sediments (Siver & Wolfe 2005). Siver & Wolfe (2005) reported several extinct species along with scales significantly similar to contemporary taxa, and they concluded that the scale morphology is an old and reliable morphological character. *Mallomonas* also represents the flag ship genus to study biogeography and to evaluate the neutral dispersal model in protists (Řezáčová & Neustupa 2007).

Early classification of *Mallomonas* was based on characteristics like cell size and shape, colonial versus solitary habitat, number of visible flagella, number of chloroplasts, scale outline, and position of bristles visible under a light microscope (Starmach 1985). The introduction of electron microscopy into silica-scaled chrysophyte research was initially performed by Fott (1955) and Asmund (1955), and it revolutionized the *Mallomonas* taxonomy. *Mallomonas* is considered to have one of the best morphological species concepts within Stramenopiles. The taxonomically diagnostic morphology of scales and bristles enables this concept of morphospecies to be applied reproducibly. Intensive investigation resulted in description of numerous new species and several recently published monographs (Siver 1991, Kristiansen 2002, Kristiansen & Preisig 2007). Several analyses using molecular markers were performed to set a baseline for understanding of synurophyte phylogeny (Lavau *et al.* 1997, Andersen 2007); however, the genus *Mallomonas* was shown to be polyphyletic in the *rbcL* phylogenetic tree, and it was not resolved based on nuclear SSU rDNA data (Andersen 2007). The most recent study examined the phylogenetic relationship among *Mallomonas* species isolated from Korean localities using scale morphology combined with nuclear SSU and LSU rDNA and *rbcL* genes (Jo *et al.* 2011).