



## Four new *Pinnularia* Ehrenberg (Bacillariophyta, Pinnulariaceae) species from Amazonian black water (Tupé Lake, Amazonas State, Brazil)

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### Abstract

Tupé Lake belongs to one of the Sustainable Development Reserves in the Negro River Basin, Amazonas State, Brazil. It connects to the Negro river by a channel, so its level varies according to the floods of the river. The water has low pH (< 5), low conductivity (< 7.60  $\mu\text{S}\cdot\text{cm}^{-1}$ ) and high temperature (> 28.5°C). During a taxonomic study of the genus *Pinnularia*, four new species are described: *P. manausensis* Pereira & Torgan, *P. nelsonii* Pereira & Torgan, *P. tupensis* Pereira, Melo & Torgan and *P. walkerae* Pereira & Torgan. The study was based on samples taken during October and December 2003 (low waters) and September 2008 (falling), including samples of plankton and sediment. The morphology of the species is compared to closely related (similar) taxa. Detailed valve structures of some species are documented with scanning electron microscopy.

**Key words:** diatoms, freshwater, *Pinnularia*, new species, taxonomy

### Introduction

*Pinnularia* Ehrenberg (1843: 45) is a typical freshwater, raphid, pennate diatom genus, species-rich and distributed worldwide. According to Algaebase, there are over 2500 names of which c. 500 are considered to be accepted (Guiry & Guiry 2013).

The *Pinnularia* flora of the Amazonian region has been poorly studied. Currently, a total of 127 taxa in *Pinnularia* are recorded from the lakes, rivers and ‘igarapés’ in the Amazonian region (Table 1). The first records were published in taxon lists and were eventually illustrated by Uherkovich (1976, 1981), Uherkovich & Rai (1979), Uherkovich & Franken (1980), Melo *et al.* (2004, 2005), Aprile & Mera (2007) and Raupp *et al.* (2009); few studies presented descriptions and comments (Hustedt 1965, Fukushima & Xavier 1988, Díaz-Castro *et al.* 2003, Metzeltin & Lange-Bertalot 1998, 2007, and Pereira *et al.* 2012, 2013).

The great Amazonian rivers are classified as white, clear and black waters, the colors based on their physical and chemical aspects (Sioli 1984). The Amazonian black waters are characterized by low concentration of dissolved salts, absence of suspended matter, low pH, and high concentrations of humic and fluvic acids (Sioli 1984, Kùchler *et al.* 2000, Franzinelli & Igreja 2002). These conditions are favorable for species in *Pinnularia* (Uherkovich 1984, Metzeltin & Lange-Bertalot 1998, Round *et al.* 1990, Krammer 2000).

Tupé Lake is a black water system located in a Sustainable Development Reserve on the left bank of the Negro River, about 30Km west of Manaus, Amazonas State, Brazil. In this lake Melo *et al.* (2005) found five species of *Pinnularia* during their study on phytoplankton. A detailed taxonomic investigation of 23 species and seven varieties was undertaken by Pereira *et al.* (2013). During our own studies in Tupé Lake we observed several

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