



Examination and comparison of *Fragilaria candidagilae* sp. nov. with type material of *Fragilaria recapitellata*, *F. capucina*, *F. perminuta*, *F. intermedia* and *F. neointermedia* (Fragilariales, Bacillariophyceae)

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Abstract

Fragilaria candidagilae Almeida, C. Delgado, Novais & S. Blanco is a new araphid diatom species, described from samples collected in central and southern Portugal (SW Europe). *Fragilaria candidagilae* has linear-lanceolate valves with strongly capitate apices, without spines, and alternate punctate striae. This taxon presents siliceous plaques on the valve mantle edge, two apical pore fields in the poles and siliceous depositions on the outer areolar openings in the form of rounded floating disks. The morphology of the new diatom species is documented by light and scanning electron micrographs and discussed in detail, including a morphological comparison with the type material of similar taxa such as *Fragilaria recapitellata*, *F. capucina*, *F. intermedia*, *F. neointermedia* and *F. perminuta* to confirm it as a new species. Statistical comparison of morphometric characters and valve shape analysis were based on at least 20 valves. Ecological notes were also included. Considering morphology and morphometry, together *F. candidagilae* is clearly different from other species.

Key words: Diatoms, Araphids, epilithon, new species, Geometric morphometry, ecology

Introduction

The genus *Fragilaria* was described by Lyngbye (1819) for eight species that included *F. pectinalis* (O.F. Müller) Lyngbye and it was originally conceived for species that form linear colonies in which each individual frustule is attached to another one rather than to a particular substratum (Lyngbye 1819). The definition of the genus *Fragilaria* was modified in Williams & Round (1987, 1988) using morphological, cytological and ecological characters. They recognized a narrower circumscription of this genus and assigned the remaining taxa formerly included in *Fragilaria* to five other genera. According to these authors, *Fragilaria* genus included taxa with apical pore fields situated at the poles, one apical rimoportula and single rows of areolae (Williams & Round 1987). The description of this genus in Round *et al.* (1990) included linear, linear-lanceolate, elliptical, capitate valves, sometimes with a slight central swelling and a linear or lanceolate sternum, often expanded on one side at the centre with simple areolae, arranged in transapical uniseriate rows. Tuji & Williams (2006) proposed that the description of the genus *Fragilaria* required expansion and suggested including two rimoportulae in species such as *Fragilaria capucina* Desmazières (1830: no. 453) The finding of suitable diagnostic characters to separate *Fragilaria* from closely related genera such as *Ulnaria* and *Synedra* is still under discussion (see, e.g., Williams 2011, Morales *et al.* 2014, Kociolek & Williams 2015). These genera are characterized by a high variability in shape, size, and ultrastructure (e.g. Krammer & Lange-Bertalot, 1986–1991, Williams & Round 1987, Schmidt *et al.* 2004).

The *Fragilaria capucina* Desmazières (1830, fasc. 10, no. 453) emend. Lange-Bertalot (1980: 747)/*vaucheriae* complex *sensu* Lange-Bertalot in Krammer & Lange-Bertalot (2000) is known to include cosmopolitan species, appearing in many freshwater diatom floras (e.g. Patrick & Reimer 1966; Krammer & Lange-Bertalot 1991, 2004), but their actual diversity may be underestimated due to force-fitting of European and North American names to taxa found