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Type Examination of *Fragiaria gracilis* Østrup (Bacillariophyceae)

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Abstract Isotype material of *Fragiaria gracilis* Østrup was examined using SEM. The individuals in this type material, agree with the photograph of the Lectotype for this taxon designated by Lange-Bertalot in Krammer and Lange-Bertalot. The well developed apical pore fields extending across apex and down the mantle are present at each apex. A transapically orientated rimoportula is present at one valve apex and is approximately positioned at the valve restriction forming the sibcapitate apex. A single row of pores exists on open copular bands. These characters of this taxon agree with the current concept of genus *Fragilaria sensu* Williams and Round.
Key words : *Fragilaria gracilis*, isotype, rimoportula, SEM, ultrastructure.

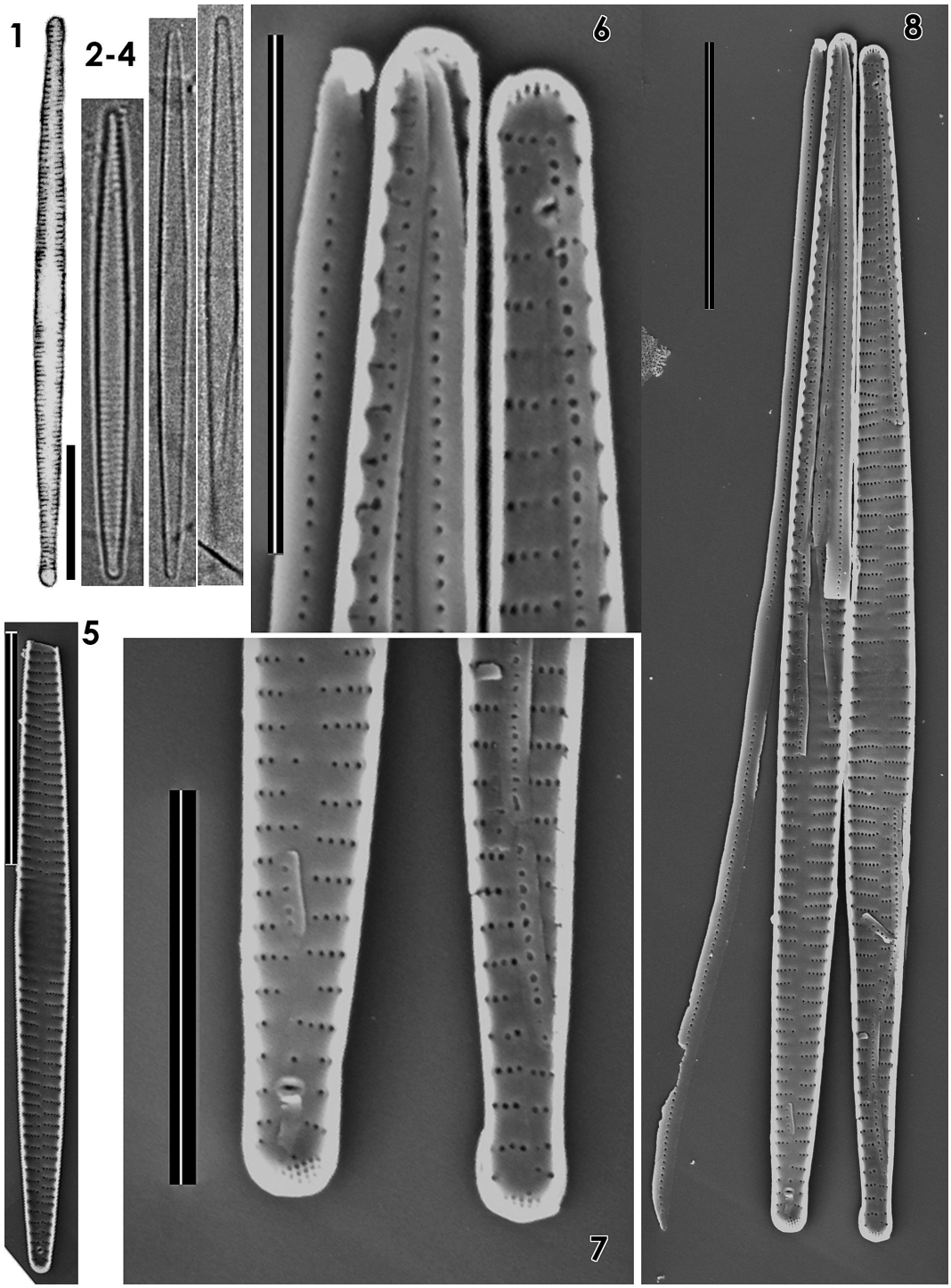
Introduction

The *Fragilaria capucina*/*vaucheriae* species complex *sensu* Lange-Bertalot in Krammer and Lange-Bertalot (1991) are understood to be cosmopolitan (and common) species, appearing in many freshwater diatom floras (e. g., Patrick and Reimer 1966; Krammer and Lange-Bertalot 1991, 2004). In spite of frequency of occurrence, taxa identifications within these complexes remain problematic. In an attempt to clarify these taxonomic problems, we have over the last few years attempted to re-examine original slides and material and when possible made amendments to selected taxa (Tuji, 2004; Tuji and Williams, 2006a; Tuji and Williams, 2006b).

Fragilaria gracilis Østrup was first described in 1910 from material collected by Østrup and listed as "Sj: Et Bassin I Botanisk Have, Kjøbenhavn". In the original description one valve measurement was given (length 63 μm, width 3.6 μm with 20 striae in 10 μm). The species description states valves nearly linear, apices subcapitate to gradually attenuated, with shortened striae clearly evident at margin and punctuate close to the axial area. No comparisons with other taxa were given in the original description. Hustedt (1950) proposed the transfer of this taxon to a variety of *F. capucina* although no justification for this proposed transfer was given and as illustrated by Lange-Bertalot in Krammer and Lange-Bertalot (1991) and Tuji (2004), this taxon is not a varietal form of *F. capucina*. Type examination of *Fragiaria gracilis* Østrup using LM was already done by Lange-Bertalot in Krammer and Lange-Bertalot (1991), and he designated a lectotype slide and presented photomicrographs of the lectotype (Coll. Oestrup 1342: Krammer and Lange-Bertalot, 1991, Taf. 110: 9–11). However, morphological characters such as narrow valve, the form of central area and form of apex, are not enough to separate this taxon from other related taxa. In this study, I examined specimens from the type material of *Fragiaria gracilis* Østrup using SEM and described ultra structure of this taxon.

Materials and Methods

I examined a slide numbered 1342 and a raw material 352.1 from the Østrup collection housed in the Botanical Museum and Library, University of Copenhagen (C). The slide 1342 is the same slide which was examined and designated as a lectotype by Lange-Bertalot in Krammer and



Figs. 1–8. *Fragiaria gracilis* Østrup. Fig. 1. Original Iconograph figure taken from Østrup (1910). Figs. 2–4. Individuals from lectotype slide 1342 in the Østrup collection housed in C. Scale Bar=10 μm. Figs. 5–8. Individuals from type material 352.1 in the Østrup collection housed in C. Figs. 5, 8. Inner view of valves showing one transapically positioned rimoportula at the apex and well developed apical pore fields. Scale Bar=10 μm. Figs. 6, 7. Apex with and without rimoportula. Bar=5 μm.

Lange-Bertalot (1991). The raw material was preserved and stored in a small bottle. The valves designated as the Lectotype specimen by Lange-Bertalot are not maked. Østrup wrote these numbers for type slide and raw material ("5. Tab. V, fig 117. 352.1. 1342. 16.3/7") in his book (Østrup 1910), which is now housed in C.

Subsamples for SEM study were prepared following Tuji (2004).

Results and Discussion

Fragiaria gracilis Østrup, Danske Diat.: 190. pl. V. f. 117. 1910.

Lectotype: slide 1342 housed in the Østrup collection in the Botanical Museum and Library, University of Copenhagen (C), designated with photomicrographs by Lange-Bertalot in Krammer and Lange-Bertalot (1991: Taf 110: 9–11). [Figs. 2–4]

Isotype (raw material): 352.1 in the Østrup collection housed in C. [Figs. 5–8]

Type locality: A basin in the Botanical garden, Kopenhaben.

The individuals found in the slide 1342 (Figs. 2–4), agree with the original description (Length: 63 μm, Breadth 3.6 μm. Str. 20 per 10 μm) and Østrup's original figure (Fig. 1), and the photomicrographs in Krammer and Lange-Bertalot (1991). In his amended description of this taxon, Lange-Bertalot presents a narrow range in valve width (2–3 μm), and indicates that the axial area is present but in LM may or may not be distinct. In SEM (no pictures presented), Lange-Bertalot further indicates that spines are absent along the valve margins. The form of apex from my LM observations of the lectotype slide can vary from acute to subcapitate. Unfortunately, as indicated by Østrup in the original description, indicates that this taxon is present in low relative abundance on the type slide and I cannot examine enough individuals for the study of morphological variation within the *F. gracilis* population. Striae are parallel throughout. Central are is present (Figs. 5–8), but very week in LM (Figs. 2–4). Axial area is narrow (<0.3–0.5 μm wide) and linear. Internally, areolae are small round pores opening into a depressed strial area between the interstriae. Areolae separated from other areolae on the striae, are scattered but consistently present next to the axial area. Spines are absent. Well developed apical pore fields extending across apex and down the mantle are present at each apex. (Figs. 6, 7). A transapically orientated rimoportula is present at one valve apex and is approximately positioned at the valve restriction forming the sibcapitate apex (Fig. 8). A single row of pores exists on open copular bands (Fig. 8). The SEM characters observed in this type material study of *F. gracilis* are in agreement with the original description by Østrup and consistent with the current concept of genus *Fragilaria* (*sensu* Williams and Round 1988). This taxon is distinctly separated from *F. capucina* sensu stricto and should be considered a distinct species. *Fragilaria gracilis* should be compared with *Fragilaria famelica* (Kütz.) Lange-B. which has more coarse striae.

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