



Observations on the type material of *Synedra vaucheriae* var. *septentrionalis* Østrup (*Fragilariaceae*, *Bacillariophyta*) and its transfer to the genus *Fragilaria*.

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In the nineteenth century, a large number of *Synedra* Ehrenberg and *Fragilaria* Lyngbye taxa were described by scientists such as Albert Grunow (1826–1914), Friedrich T. Kützing (1807–1893) and William Smith (1808–1857). Both genera used to be separated based on the type of colonies their taxa formed, with *Fragilaria* grouping taxa forming ribbon-shaped colonies whereas *Synedra* grouped mostly solitary taxa. Nowadays, this division has been shown to be inaccurate and many *Synedra* taxa have been transferred to the genus *Fragilaria* and several other araphid genera such as *Ulnaria* (Kützing) Compère, *Ctenophora* (Frenguelli) D.M. Williams & Round or *Tabularia* (Kützing) D.M. Williams & Round (Williams & Round 1986, Tuji & Williams 2006, Williams 2011). Since these taxonomic insights only developed relatively recently, it is clear that a lot of former *Synedra* taxa require reassessment, often hindered by a lack of appropriate type material. Some *Synedra* names have almost been forgotten such as *Synedra deformis* W. Smith [type from Sussex, England] or *S. fontinalis* W. Smith, [type from the Pyrenees] although, occasionally, recent populations of such taxa are regularly reported in European rivers (Van de Vijver & al. in press). In many cases, these populations get “force-fitted” into more generally accepted taxa such as *Fragilaria capucina* Desmazières, *F. rumpens* (Kützing) G.W.F. Carlson or *F. vaucheriae* (Kützing) J.B. Petersen, leading perhaps to an underestimation of the *Fragilaria* biodiversity in Europe.

In the early twentieth century, several *Synedra* and *Fragilaria* taxa were described from northern Europe and Greenland by Ernst V. Østrup (1845–1917). One of these is *Synedra vaucheriae* var. *septentrionalis* Østrup (1910: 250, pl. 14: fig. 19), originally described from north-east Greenland (Syntype localities: Vester Elv and Lille Snenæs). Østrup (1910) added a brief Latin description and a line drawing (Fig. 2): “*Valva lineari apicibus capitatis subcapitatisve. Striis parallelis, altera in parte media valva deficientibus ibique areolam unilateralem relinqventibus*” [Valve linear with capitate to subcapitate apices. Striae parallel, lacking on one side in the middle of the valve and on the other side with areolae]. Valve dimensions: length of 23–30 µm, width of 3.6 µm and 16 striae in 10 µm. Østrup (1910) added “As this small species occurs in the samples both free and also attached to the narrow branches of algae, but never in the form of long bands, I think it may be a *Synedra*, not a *Fragilaria*. A. Cleve (*Beitr. z. Fl. d. Bär. Ins.*, 17, fig. 10) describes and figures a *Synedra Vaucheria* Kütz. var. *perminuta* Grun., which may be a smaller and non-capitate form of the present species.”

This taxon remained in the genus *Synedra* for a long time and was only rarely reported. Hustedt (1932: 194) considered it a synonym of *Synedra vaucheriae* Kützing but Cleve-Euler (1953: 59) recombined the species to *Synedra amphicephala* var. *septentrionalis* (Østrup) A. Cleve based on its more coarse striation and the absence of striae in the central area, features she attributed to the



complex of species around *S. amphicephala* Kützing. In 1991, Krammer & Lange-Bertalot (1991, pl. 109: fig. 6) referred the species to the genus *Fragilaria* as “*Fragilaria capucina* var. *septentrionalis*” and designated sample 4735 from the Østrup collection as the lectotype for this name. The transfer, however, cannot be considered as valid since a full and direct reference to the basionym is lacking according to Art. 41.1 of the International Code for Botanical Nomenclature (Turland & al. 2018).

Material from sample 4735 (Lille Snenæs, Greenland, coll. date 29.VI.1908) was retrieved from the Østrup collection in Copenhagen (C) and investigated. The original Østrup slide (C-A-99330) (Fig. 1) was used to analyse the size diminution series of the type population and unmounted material (Fig. 1) was prepared for SEM analysis. Based on light and scanning electron microscopy observations, we present morphological details of specimens from the type population and transfer the species to the genus *Fragilaria*.

Fragilaria septentrionalis (Østrup) Van de Vijver, C.E. Wetzel & Ector *comb. nov. et stat. nov.*
Basionym: *Synedra vaucheriae* var. *septentrionalis* Østrup, 1910, *Meddelelser om Grønland* 43: p. 250, pl. 14: fig. 19.

Homotypic designations: “*Synedra amphicephala* var. *septentrionalis*” A. Cleve (Cleve-Euler 1953: 59), *nom. inval.* “*Fragilaria capucina* var. *septentrionalis*” Lange-Bertalot (in Krammer & Lange-Bertalot 1991: pl. 109, fig. 6), *nom. inval.*

Lectotype: Coll. Østrup 4735 designated and depicted by Krammer & Lange-Bertalot (1991, pl. 109: fig. 6).

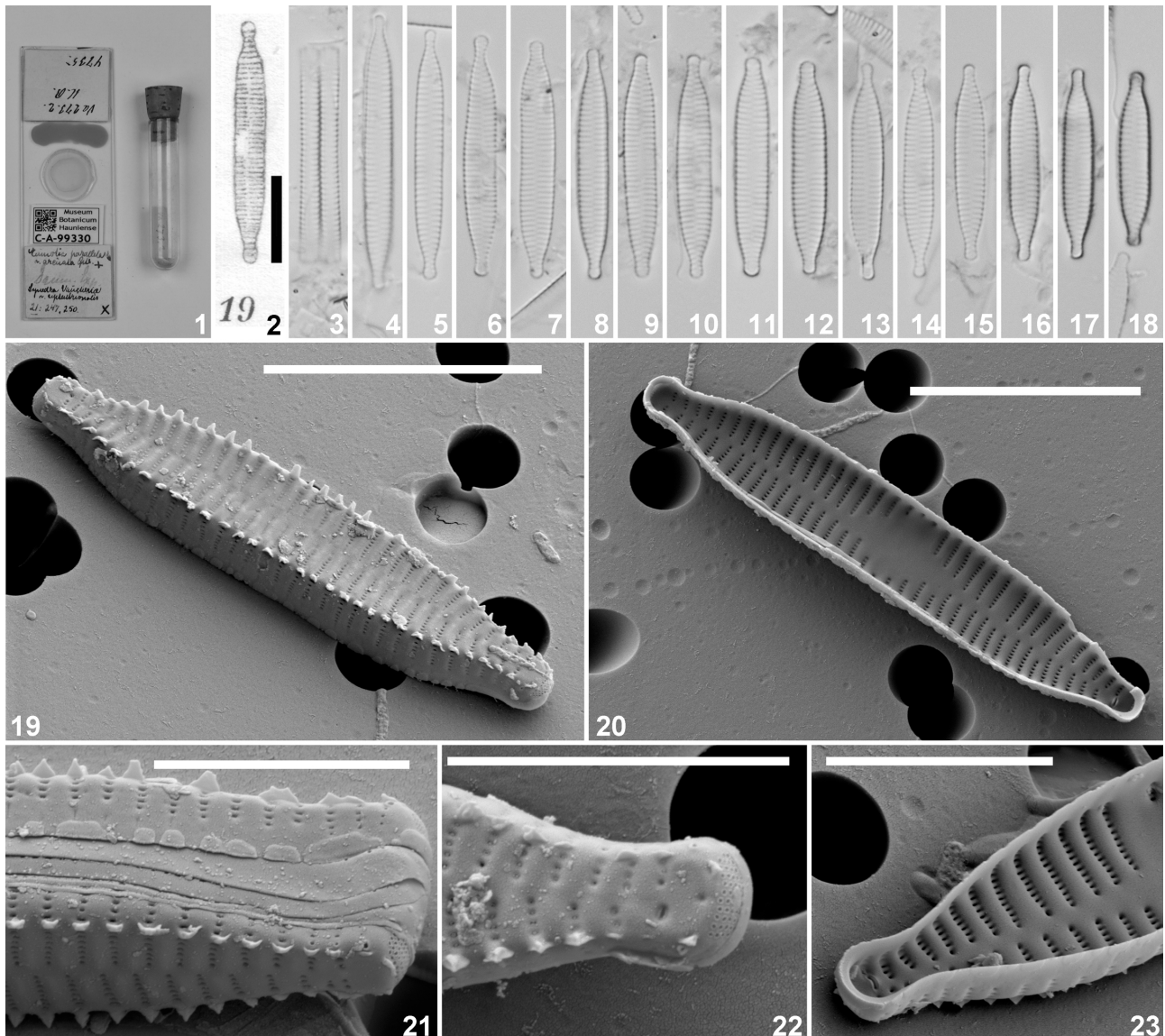
Description: Frustules in girdle view rectangular, solitary or two cells attached, never forming band-like colonies. Valves narrow, linear with almost parallel margins, only narrowing close to the apices. Apices protracted, capitate to occasionally rostrate, throughout the entire valve diminution series. Valve dimensions (n=25): length 21–33 µm, width 3.0–4.5 µm. Axial sternum narrow, weakly widening towards the central area. Central area asymmetrical due to the absence of striae or shortened striae on one side. Ghost striae occasionally present. Striae parallel throughout the entire valve, always alternating along the entire valve length, 15–16 in 10 µm, becoming slightly radiate at the apices. Striae, uniseriate, composed of small, rounded areolae, externally covered by individual hymenes. Valve face rather flat with virgae between striae almost not raised. Striae continuing onto the mantle, interrupted by a continuous series of large, triangular spines. Linking spines never present. Large siliceous mantle plaques present at the mantle edge. Rimoportula present at one apex, replacing the last stria before the apex. Apical pore field rather small, composed of up to 4 parallel rows of small, rimmed poroids. Internally, virgae weakly raised. Central area bordered by several shortened striae. Rimoportula large, oblique with clearly raised lips. Cingulum composed of several open copulae bearing one row of rounded perforations.

The combination of all morphological features (including apical pore field, a single rimoportula per valve, mantle plaques, open copulae and uniseriate striae) justify the placement of this taxon within the genus *Fragilaria* making a transfer into this genus necessary. Comparison of the species with the type of *F. vaucheriae* (Wetzel & Ector 2015) and *F. amphicephaloides* Lange-Bertalot (new name for *Synedra amphicephala* Kützing within *Fragilaria*; priority for *Fragilaria amphicephala* Ehrenberg) (Van de Vijver, unpubl.) also shows that a further combination of this taxon with any of these two species is not recommended based on the absence of spines in the latter two and differences in valve outline and valve dimensions. Both *Fragilaria vaucheriae* and *F. amphicephaloides* have more linear-lanceolate valves, in contrast to the typical linear outline in *F. septentrionalis* marked by the parallel margins. Accordingly, *Synedra vaucheriae* var. *septentrionalis* is raised to species level.



Published records of *F. septentrionalis* are scarce and mostly restricted to non-illustrated records (e.g., Bertrand & al. 2004, Serieyssel & al. 2011). These records should all be revised to allow a more precise determination of its biogeographical distribution. Only Lange-Bertalot & Genkal (1999, pl. 1: figs 7–9) show three valves from Siberia that differ clearly from the type of *F. septentrionalis*, excluding conspecificity based on morphological differences. The valve outline in the Siberian valves is lanceolate with clearly convex margins. The TEM illustration (Lange-Bertalot & Genkal (1999, pl. 1: fig. 7) also lacks the presence of spines. The Siberian taxon shows more affinity to the *F. recapitellata* Lange-Bertalot & Metzeltin complex of species but should be reanalysed to know its exact taxonomic position.

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Figs 1–23. *Fragilaria septentrionalis* (Østrup) Van de Vijver, C.E. Wetzel & Ector comb. nov. stat. nov. **Fig. 1.** Lectotype slide and original unmounted material from the Østrup collection (C). **Fig. 2.** Line drawing from Østrup (1910, pl. 14, fig. 19) representing *Synedra vaucheriae* var. *septentrionalis* Østrup. Figs 3–23. LM and SEM observations of the lectotype population of *F. septentrionalis* from Lille Snenæs, Greenland (sample 4735). **Fig. 2.** LM view of two valves connected in girdle view. **Figs 4–18.** Several valves showing the valve diminution series. **Fig. 19.** SEM view of an entire frustule showing the spines and the asymmetrical central area. **Fig. 20.** SEM internal view of an entire valve. **Fig. 21.** SEM external detail of the valve apex in girdle view with the marginal spines, the mantle plaques and the apical pore field. **Fig. 22.** External SEM detail of the valve apex with the rimoportula and the apical pore field. **Fig. 23.** Internal SEM detail of the valve apex with the large rimoportula. Scale bars represent 10 μm except for Figs 21–23 where scale bar represents 5 μm .