Epitypification of *Achnanthes boyei* Østrup and its transfer to the genus *Planothidium* (*Achnanthidiaceae, Bacillariophyceae*)

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Achnanthes boyei Østrup (1918: 41, pl. 4: fig. 60) was described based on a sample collected from Iceland in 1914. Van de Vijver & al. (2019) analysed the original slide that Ernst Vilhelm Østrup (1845–1917) used to describe the species and proposed, based on morphometric analysis, that *Achnanthes boyei* was a heterotypic synonym of *Achnanthes lanceolatum* Brébisson ex Kützing [≡ *Planothidium lanceolatum* (Brébisson ex Kützing) Lange-Bertalot]. Unfortunately, unmounted material of *Achnanthes boyei* is no longer available, making detailed scanning electron microscopy (SEM) observations impossible. Following the publications by Jahn & al. (2017) and Cantonati & al. (2021), it became clear that SEM analysis might add crucial information to separate sinus-bearing taxa in the genus *Planothidium*.

During a survey of the freshwater and moss-inhabiting diatom flora of Westfjords Region in northwestern Iceland, a *Planothidium* population was observed in a wet *Bryum pseudotriquetrum* (Hedwig) J.R.Spence & H.P.Ramsay ex Holyoak & N.Pedersen moss sample collected in June 2023 along a small brook on the Vestfjarðavegur (65.938103°N, -23.438869°W, alt. 232 m) that showed considerable similarity in outline to the type population of *Achnanthes boyei* as described by Østrup (1918). A second *Planothidium* taxon in the sample had a different outline and axial area and was identified as *P. lanceolatum sensu stricto*. Analysis of both taxa using SEM observations indicated several morphological differences only visible in SEM such as the number of areola rows per stria and the shape of the axial and central area due to the shortening of some central striae on the sternum (= rapheless) valve.

These new observations made it necessary to revise the conclusion in Van de Vijver & al. (2019) that *Achnanthes lanceolatum* and *A. boyei* are conspecific. Here we proposed to recognise both taxa and transfer *A. boyei* to the genus *Planothidium* as *P. boyei* (Østrup) Van de Vijver, Coomans, Pottiez & C.E.Wetzel, *comb. nov*. and epitypify *P. boyei* based on a lectotype specimen from a moss sample collected in 2023. Epitypification is necessary in this instance as valuable information enabling the unambiguous separation of *P. boyei* from *P. lanceolatum* is now available. According to Art. 9.9 in the Code for Botanical Nomenclature, “an epitype is a specimen or illustration selected to serve as an interpretative type when the holotype, lectotype, or previously designated neotype, or all original material associated with a validly published name, is demonstrably ambiguous and cannot be critically identified for purposes of the precise application of the name to a taxon. Designation of an epitype is not effective unless the holotype, lectotype, or neotype that the epitype supports is explicitly cited (see Art. 9.20)” (Turland & al. 2025).

Based on the new observations, the description provided in Van de Vijver & al. (2019) is here updated to incorporate our new information.

Planothidium boyei (Østrup) Van de Vijver, Coomans, Pottiez & C.E.Wetzel, *comb. nov.* (Figs 1–41)

Basionym: *Achnanthes boyei* Østrup 1918: *Botany of Iceland*, Vol. II, Part I. No. 5.: 41, pl. 4: fig. 60.

Lectotype (**designated here**): slide K.B. 6557 (**C**, Botanical Museum in Copenhagen) made from sample 9.213.1 (Hallormsstaðaskógur National Forest, Iceland, leg. J. Boye Petersen)

Epitype (**designated here for the above lectotype** of *Achnanthes boyei* Østrup): slide **BR**-4917, (**BR**, Meise Botanic Garden); sample ICE23-M012 (Vestfjarðavegur Westfjords, Iceland, coll. date 08.vi.2023, (65.938103°N/ -23.438869°W, alt. 232 m, leg. B. Van de Vijver); a representative specimen for the epitype is shown in Fig. 5.

Registration (for the new combination): http://phycobank.org/105992

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Description: Frustules rectangular, only weakly bent in the middle, producing a concave raphe valve (Fig. 1). Valves narrowly rhombic to lanceolate, usually with inflated central part. Apices are weakly protracted, broadly rounded in smaller specimens becoming clearly protracted, rostrate in longer specimens. Smallest specimens elliptic to linear-elliptic with non-protracted, broadly rounded apices (Figs 17 & 18). Valve dimensions (n=60): length 9–29 µm, width 4–6.5 µm. Sternum (=rapheless) valve (Figs 1–18, 38, 39, 41): axial area narrow, gradually widening almost from the apices towards the central area. Central area with a large horseshoe–shaped hyaline sinus on one side showing a very distinct circular depression bordered by at least one distinctly shortened stria. The other side of the central area with several shortened striae forming a semi-lunate hyaline area. Both central and axial area with typical pattern of irregular, shallow depressions (Figs 38, 39). Striae clearly radiate in the centre, becoming even more distinctly radiate towards the apices, 13–15 in 10 µm. Striae composed of 4 rows of small areolae, the outer rows markedly larger than the inner rows. At the apices, striae only composed of 2–3 rows of areolae. Raphe valve (Figs 19–37, 40): Axial area very narrow, linear, almost not widening near the central area. Central area forming a rectangular to bow–tie shaped hyaline area, bordered on one side by 1–3 very short striae. Raphe branches straight with expanded, drop–like central raphe endings. Terminal raphe fissures unilaterally deflected. Striae radiate in the middle, becoming distinctly radiate towards the apices, 13–16 in 10 µm. Striae composed of 4 rows of equally sized areolae.

Planothidium boyei differs from *P. lanceolatum* in the number of areolae per stria on the sternum valve with *P. boyei* having four rows and *P. lanceolatum* only three. According to Van de Vijver & al. (2013) the type of *P. lanceolatum* is devoid of shallow depressions in the axial area but this could be an effect of erosion of the type material. The shape of the central and axial area differs in each species. In *P. boyei*, due to the distinct shortening of the striae adjacent to the sinus, the central area develops a distinctive shape not observed in *P. lanceolatum*. The semi-lunate hyaline zone on the other side of the central area in *P. boyei* is also not observed in *P. lanceolatum*. Although subtle, these differences proved in the past sufficient to separate other *Planothidium* species, separations confirmed by molecular data (cf. Jahn & al. 2017).

The *Planothidium boyei* population collected in 2023 was observed in a diatom community entirely dominated by *Meridion circulare* (Greville) C.Agardh, *Meridion constrictum* Ralfs, and *Odontidium mesodon* (Kützing) Kützing, like the community in which the type population of *Achnanthes boyei* was observed (Van de Vijver & al. 2019).

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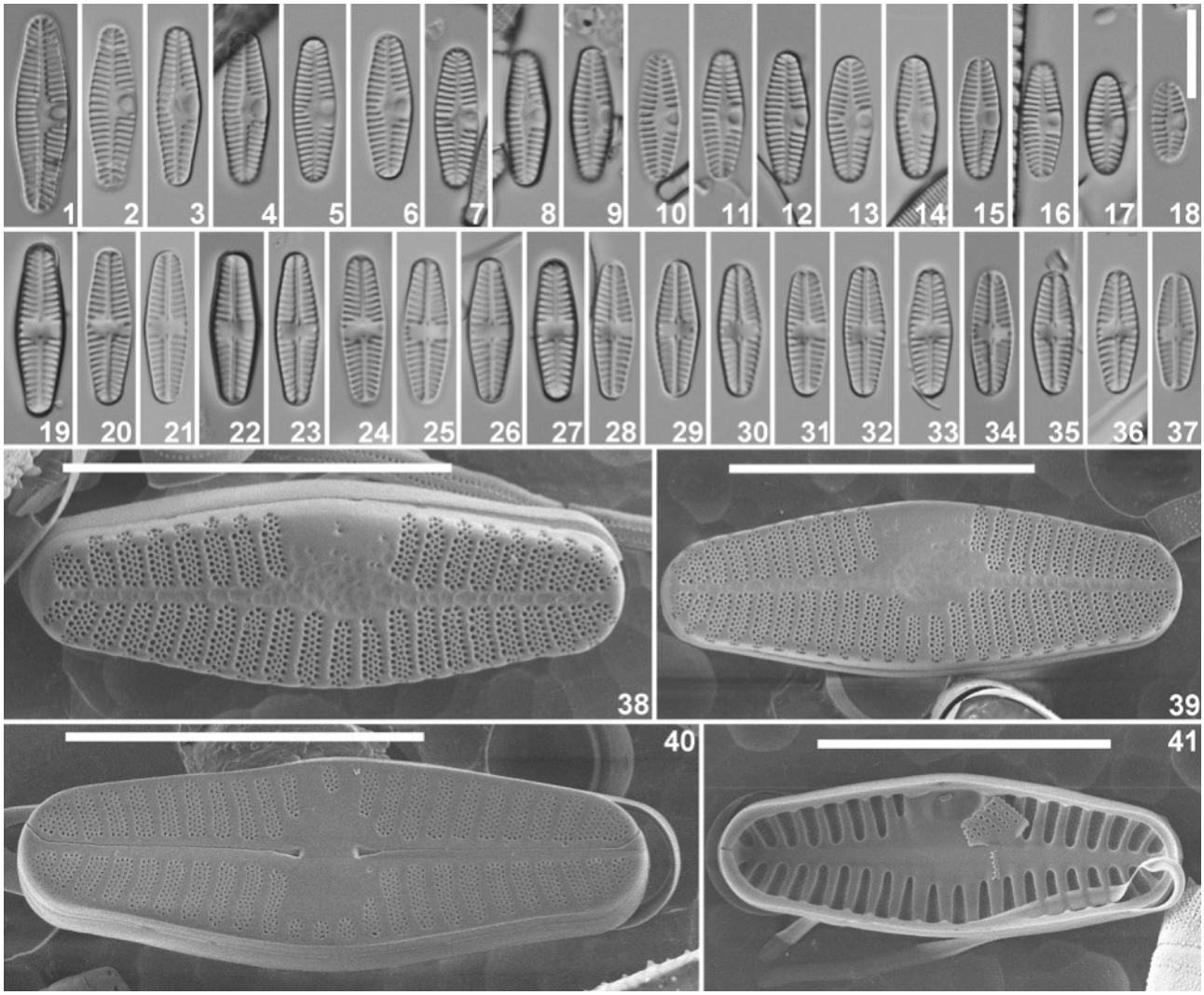
Cantonati, M., Bilous, O. Angeli, N. van Wensen, L. & Lange-Bertalot, H. (2021). Three new diatom species from spring habitats in the northern Apennines (Emilia-Romagna, Italy). *Diversity* 13(549): 1–20.

Jahn, R., Abarca, N., Gemeinholzer, B., Mora, D., Skibbe, O., Kulikovskiy, M., Gusev, E., Kusber, W.-H. & Zimmermann, J. (2017). *Planothidium lanceolatum* and *Planothidium frequentissimum* reinvestigated with molecular methods and morphology: four new species and the taxonomic importance of the sinus and cavum. *Diatom Research* 32(1): 75–107.

Østrup, E. (1918). Freshwater diatoms from Iceland. Part I. In: *The Botany of Iceland, Vol. II, part I* (Rosenvinge, L.K. & Warming, E. Eds), pp. 1-98, 5 pls, Copenhagen & London: J. Frimodt; Humphrey Milford, Oxford University Press.

Turland, N.J., Wiersema, J.H., Barrie, F.R., Gandhi, K.N., Gravendyck, J., Greuter, W., Hawksworth, D.L., Herendeen, P.S., Klopper, R.R., Knapp, S., Kusber, W.-H., Li, D.-Z., May, T.W., Monro, A.M., Prado, J., Price, M.J., Smith, G.F. & Zamora Señoret, J.C. editors (2025). International code of nomenclature for algae, fungi, and plants (2025 Edition Madrid Code) Regnum Vegetabile Volume 162. pp. [i]–xlvii, 1-303. Chicago & London: The University of Chicago Press.

Van de Vijver, B., Wetzel, C.E., Levkov, Z. & Ector, L. (2019). Analysis of the type slide of *Achnanthes boyei* Østrup (Achnanthidiaceae, Bacillariophyta). *Notulae Algarum* 96: 1–6.



Figs 1–41. ***Planothidium boyei*** (Østrup) Van de Vijver, Coomans, Pottiez & C.E.Wetzel, *comb. nov*. LM and pictures taken from the epitype slide (**BR**-4917, Vestfjarðavegur Westfjords, Iceland). **Figs 1–18.** Rapheless valves. **Figs 19–37**. Raphe valves. **Fig. 38.** SEM external view of a sternum valve in slight oblique view showing the short mantle striae. **Fig. 39.** SEM external view of the sternum valve showing the 4 rows of areolae per stria and the shallow markings in the central and axial area. Note also the shortening of the striae adjacent the sinus. **Fig. 40.** SEM external view of a raphe valve. Each stria is composed of 4 rows of areolae of equal size. **Fig. 41.** SEM internal view of a sternum valve showing the typical sinus. Scale bars = 10 µm.