

# Lectotypification of *Achnantheidium exile* (Kützing) Heiberg (*Achnantheidiaceae*, *Bacillariophyta*)

Wolf-Henning Kusber, *Botanischer Garten und Botanisches Museum Berlin, Freie Universität Berlin, Königin-Luise-Str. 6-8, 14195 Berlin, Germany* (correspondence: [w.h.kusber@bo.berlin](mailto:w.h.kusber@bo.berlin))

Bart Van de Vijver, *Meise Botanic Garden, Research Department, Nieuwelaan 38, 1860 Meise, Belgium & University of Antwerp, Department of Biology – ECOSPHERE, Universiteitsplein 1, B-2610 Wilrijk, Belgium*

*Achnantheidium exile* (Kützing) Heiberg (1863: 119) is one of the larger *Achnantheidium* species in Europe with a maximum length of almost 35 µm. The species is characteristic of carbonate-enriched, somewhat meso-eutrophic lakes and is rarely found in rivers; its main distribution is in Central Europe (Lange-Bertalot & al. 2017). Originally, the species was described as *Achnanthes exilis* Kützing (1833: no. 12).

Kützing mentioned the species in two publications. Initially, Kützing (1833) introduced the species in his exsiccata set *Algarum aquae dulcis Germanicarum, Decas II* as n° 12 with the following description “*Corpusculis quadratis minutissimis lutescentibus, angulis acutis, e frustulis 2–6 compositis, filo demum elongato tenuissimo*” [with very small, yellowish bodies, at sharp angles, composed of 2–6 frustules, at length of a long, very thin thread]. Sampling locality for the exsiccata is ‘*Conferven bei Tennstädt*’ (Bad Tennstedt, Thuringia, Germany). A few months later, in his *Synopsis Diatomearum* (Kützing 1834: 577, pl. 16: fig. 53), he described the new species in more detail with the following words: “*Stipite plus minusve elongato tenuissimo; corpusculis quadratis minutis lutescentibus, fasciis binis notatis, subcurvatis, e frustulis 2–6 (et ultra) constitutis*” [with a more or less elongated, very thin stalk; with very small, squared yellowish bodies, with paired marked valve faces, not entirely curved, composed of 2–6 (and even more) frustules]. Kützing observed the species in large abundances on *Conferva floccosa* (Vaucher) De Candolle [currently *Microspora floccosa* (Vaucher) Thuret] and *Conferva globulina* Kützing [currently *Cladophora globulina* (Kützing) Kützing] in a pool near Tennstädt. The species was illustrated by a very small drawing showing band-like frustules connected to each other on small stalks growing on filamentous algae. He also raised serious doubts whether the species was similar to *Achnanthes leibleinii* C.Agardh (1832: 59), a species based on a poorly described and illustrated, unnamed *Achnanthes* species, published by Valerius Leiblein (Leiblein 1830) by adding this species name but with a question mark. Kützing (1844: 76) further discussed the species in his *Kieselschaligen Bacillarien* referring to both publications of 1833 and by adding, once again, the questionable conspecificity with *A. leibleinii*. Apart from the locality by Tennstädt, Kützing also mentioned with certainty (!) a locality near Falaise (Normandy, France) in a sample from René Lenormand (1796–1871), and a questionable locality near Würzburg, Germany, the locality given by Leiblein (1830) and C. Agardh (1832), stating that the species was rather rare (*Im ganzen selten*). Finally, Kützing (1849: 54) described the species as observed on *Confervae* in Germany, France, Switzerland and England.

Smith (1856: 29) was the first to confirm the presence of the species in Britain, reporting the species from various localities in England and Scotland. In some samples, he observed the species as being ‘parasitic [i.e., epiphytic] on the stipes’ of various *Gomphonema* species. Heiberg (1863: 119) transferred the species to the genus *Achnantheidium* as *Achnantheidium exile*, based on some observations he made of the species in Denmark. Subsequently, Meister (1912: 97) introduced the combination *Microneis exilis* (Kützing) F.Meister.

Lange-Bertalot & Ruppel (1980: 14) refer to slide **BM18450** made from Kützing sample 832 as a syntype for *A. exilis*, illustrating four valves from this slide (LM) and adding other photographs taken from populations in the Durance (France) and from the Loisach spring (Tyrol, Austria). Lange-Bertalot & Krammer (1989: pl 53: figs 1–7), refer to slide **BM18450** as lectotype for the



species. The sample from which the slide was made was collected near Zürich. Krammer & Lange-Bertalot (1991, pl. 33: figs 23–31) added several illustrations from this slide, although it is unclear what pictures were taken from the Zürich slide and what pictures originate from the population from the Loisach spring, as the caption did not discriminate between the two samples.

In the catalogue of Kützing's collection made by Eulenstein in 1868 [held partly in the Natural History Museum, London (**BM**), and partly in Meise Botanic Garden (**BR**)] several samples are listed to contain *Achnanthes exilis*, among them sample 832, collected from a fountain ('*Brunnen*') in Zürich by Carl Wilhelm von Nägeli (1817–1891). This is, however, not the original material that was used by Kützing to describe the species, therefore it could only serve as a neotype if (and only if) no original material is available. Further analysis of the catalogue revealed that several samples, Kützing 294 and 295, were collected from Tennstädt, one sample (no. 945) originated from "Dolgelley" (Dolgellau, Gwynedd, north-west Wales), one sample from Falaise (France, sample 1381) and one additional sample from a fountain in Zürich (sample 857b). Additionally, **BR** has conserved several copies of the exsiccata set distributed by Kützing in 1833.

According to ICN Art. 9.19 (Turland & al. 2018) a lectotype must be, amongst other things, in conformity with Art. 9.13. Here we explain, why the type mentioned earlier conflicts with Art 9.13. Kützing (1833, 1834, 1844) did not include samples from Zürich as part of the original material and it was only in 1849 that samples from Switzerland (more than likely the Zürich material) were added to the list of localities. Therefore, the chosen lectotype in Lange-Bertalot & Krammer (1989) is not acceptable since original material from Tennstädt (Decas II, n°12), the sole locality listed by Kützing (1833, 1834), was available. Analysis of this material (Figs 1–25) and Kützing sample 832 (Figs 26–46), both conserved at **BR**, based on LM and SEM observations, showed that both populations represent *A. exile*. Therefore, sample Decas II, n°12, "*Conferven bei Tennstädt*" is **here designated** as lectotype for *Achnanthes exilis*, superseding the "lectotypus" selected by Lange-Bertalot & Krammer (1989).

*Achnanthidium exile* (Kützing) Heiberg, 1863 (Figs 1–46)

Basionym: *Achnanthes exilis* Kützing, *Algarum aquae dulcis germanicarum* Decas II, n°. 12. 1833.

**Lectotype (designated here**, taking precedence over the "lectotype" by Lange-Bertalot &

Krammer 1989 in conformity with Art. 9.13): **BR**-4710, slide prepared from Kützing sample Decas II, n° 12, *Conferven bei Tennstädt* in **BR** (Meise Botanic Garden, Belgium).

Registration (of lectotypification): <http://phycobank.org/103131>

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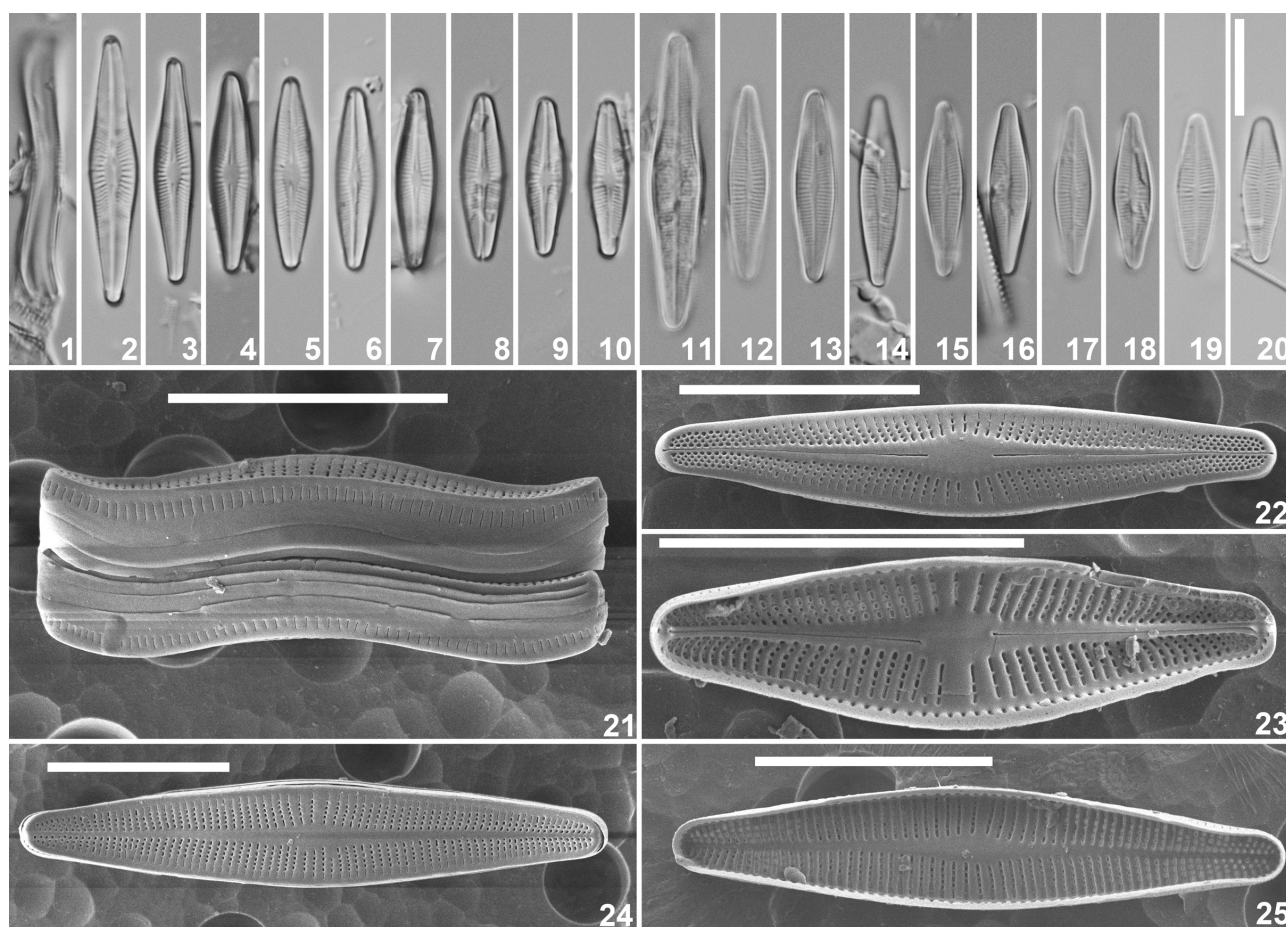
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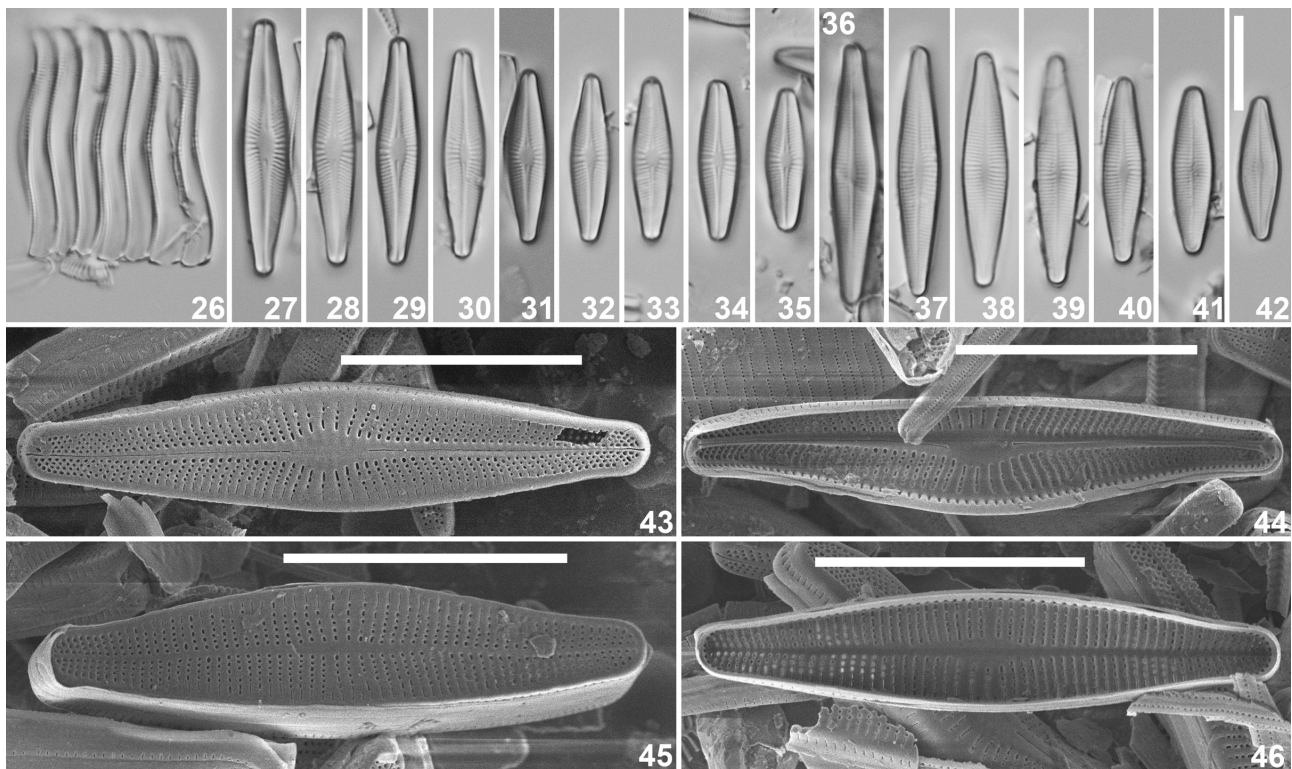
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**Figs 1–25. *Achnantheidium exile* (Kützinger) Heiberg.** LM and SEM pictures taken from the lectotype material (BR-4710, *Confervae bei Tennstädt*). **Fig. 1.** LM frustule in girdle view. **Figs 2–10.** LM valve face views showing raphe-bearing valves. **Figs 11–20.** LM valve face views showing rapheless valves. **Fig. 21.** SEM view of two entire frustules in girdle view. **Fig. 22.** SEM external view of a raphe-bearing valve. **Fig. 23.** SEM internal view of a raphe-bearing valve. **Fig. 24.** SEM external view of a rapheless valve. **Fig. 25.** SEM internal view of a rapheless valve. Scale bars = 10 µm.





**Figs 26–46. *Achnantheidium exile* (Kützing) Heiberg.** LM and SEM pictures taken from Kützing sample 832 (*Brunnen in Zürich*, leg. Nägeli). **Fig. 26.** LM several frustules connected to each other in girdle view. **Figs 27–35.** LM valve face views showing raphe-bearing valves. **Figs 36–42.** LM valve face views showing rapheless valves. **Fig. 43.** SEM external view of a raphe-bearing valve. **Fig. 44.** SEM internal view of a raphe-bearing valve. **Fig. 45.** SEM external view of a rapheless valve. **Fig. 46.** SEM internal view of a rapheless valve. Scale bars = 10 µm.