Epitypification of *Humidophila perpusilla* (Grunow) R.L.Lowe & al. (*Diadesmidiaceae, Bacillariophyta*)

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Navicula perpusilla Grunow (1860: 552, pl. II [2]: fig. 7) was described from "*Habitat inter algas in vitreis diu asservatas*" [It lives among algae that have been kept in glass for a long time] without, however, specifying a geographic locality. Grunow highlighted several important features in his description such as the presence of a slight central inflation, the presence of a very fine striation ("*striis transversalibus subtillimis subparallelis, plerumque vix conspicuis ultra 60 in 0.001*" [with very fine, subparallel, transverse striae, hardly visible, more than 60 in 10 µm]) and a small central nodule. He illustrated his new taxon with seven line drawings, one of them at a higher magnification (Fig. 21 herein). The absence of a geographic locality makes it almost impossible to locate original material. In the Grunow collection, part of the herbarium of the Natural History Museum in Vienna (**W**, Austria), both the accession books of Grunow's samples and his original drawings are conserved. Unfortunately, despite a very thorough search, the original drawings for *Navicula perpusilla* could not be found (T.M. Schuster, pers. comm.). In the accession books, several samples listing the name "*N. perpusilla*" could be found, but all of them referred to *N(itzschia) perpusilla*.

The description of *Navicula perpusilla* in Grunow (1860) also referred to a possible synonymy with *Synedra perpusilla* Kützing (1844: 63; pl. 3: fig. XXXI), described from a saline swamp in the Botanical Garden of Venice (now the Giardini Savorgnan, a public park in the Cannaregio district). The addition of a question mark with the name *S. perpusilla* indicated, however, that Grunow was not convinced of these two taxa were synonymous. In his accession books, sample 2524 is reported to contain Kützing's taxon "*Synedra (Navicula) perpusilla*. Moreover, the sample is actually a subsample of Kützing's sample 145, in 1978 indicated as a heterotypic synonym for *Nitzschia frustulum* (Kützing) Grunow, excluding all conspecificity between Kützing's taxon and *Navicula perpusilla* Grunow (Lange-Bertalot & Simonsen 1978: 23).

Van Heurck (1880, pl. XIV [14]: figs 22, 23) illustrated two valves of what Grunow had identified as *Navicula perpusilla* (in fact the drawings were made by Grunow as indicated by the * added to the name in the legend; Fig. 22), but no further information or locality is given. Van Heurck (1885: 106) included *Navicula perpusilla* in the identification key for the "*minutissimées*" section of the genus *Navicula* but did not further treat the species. This was probably an inadvertent omission since the taxon is described in Heurck (1898: 229) referring to the original description of Grunow.

Several localities, from where the species had been observed, were added in Van Heurck (1896) including Rouge Cloître (Delogne) (=Red Monastery, Brussels, Belgium), Scotland and Ireland (O'Meara). O'Meara (1875: 418, pl. 34: fig. 36) had reported the species from the limestone Lough Mask near Tourmakeady (Co. Mayo, Ireland). The record from Rouge Cloître could not be verified despite having checked a large number of samples from this locality as the entire Delogne collection, including more than 30 samples from the Rouge Cloître, has recently been retrieved within the Van Heurck collection (**BR**, Meise Botanic Garden, Belgium). It is highly likely that several populations of *Sellaphora seminulum* (Grunow) D.G.Mann, present in the Rouge Cloître

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samples, were mistaken for *N. perpusilla*, as they have similar valve outlines (Van de Vijver, pers. obs.). The last locality, Scotland, is most likely based on a sample Van Heurck had received through the Walker Arnott collection (now part of the Van Heurck collection in **BR**). In his *Types du Synopsis des Diatomées de Belgique*, Van Heurck (1882–1885), sample Types 212, based on Walker Arnott sample 703, bears a small population of *Navicula perpusilla*. The sample was collected from Tighnabruaich (glen), a small village on the Cowal peninsula (Argyll and Bute, Scotland, UK). Apart from large populations of several *Gomphonema* and *Pinnularia* species, including *G. graciledictum* E.Reichardt and *P. stomatophora* var. *irregularis* Krammer, *Navicula perpusilla* is clearly present in the sample. Cleve (1894: 133) also listed a sample from Scotland as including *N. perpusilla* but the latter is probably based on Cleve & Möller slide 59 in the Cleve & Möller exsiccata set (Cleve & Möller 1878), a sample collected by Dr George Dickie (1812–1883) in the Grampians near Aberdeen (Scotland). Analysis of the slide also showed the presence of a small population of *N. perpusilla* valves (Van de Vijver, pers. obs.).

As the population in the sample Types 212 sample is fairly large, and the unmounted material used to make that slide is present in **BR**, it allowed us to make detailed morphological observations of the species based on light and scanning electron microscopy. The original drawing 7g (pl. IV) in Grunow (1860) is here designated as the lectotype for *Navicula perpusilla* and the Types 212 sample from the Van Heurck exsiccata set is here designated as epitype for the that lectotype.

Navicula perpusilla was in 1985 considered a variety of *Navicula gallica* (W.Smith) Lagerstedt as *N. gallica* var. *perpusilla* (Grunow) Lange-Bertalot in Krammer & Lange-Bertalot (1985: 71), before being transferred first to the genus *Diadesmis* as *D. perpusilla* (Grunow) D.G.Mann (in Round & al. 1990: 666) and later to the genus *Humidophila* as *H. perpusilla* (Grunow) R.L.Lowe & al. (in Lowe & al. 2014: 358). *Navicula flotowii* Grunow (now *Humidophila flotowii* (Grunow) R.L.Lowe & al.) is by many considered being a synonym of *H. perpusilla* (Hustedt 1961–1966, Krammer & Lange-Bertalot 1986) but an examination of the type material of several *Humidophila* species did not justify this conspecificity based on valve outline, stria density and structure of the valve face surface (Goeyers & Van de Vijver, unpubl. obs.).

Humidophila perpusilla (Grunow) R.L.Lowe, Kociolek, J.R.Johansen, Van de Vijver, Lange-Bertalot & Kopalová, *Diatom Research* 29(4): 358, 2014 (Figs 1–27)

Basionym: *Navicula perpusilla* Grunow, *Verhandlungen der kaiserlich-königlichen zoologisch-botanischen Gesellschaft in Wien* 10: 552, pl. II [2]: fig. 7, 1860.

Lectotype (**here designated**): Original drawing 7g on pl. IV in Grunow (1860).

Epitype (**here designated for the above lectotype for *Humidophila perpusilla***): **BR**-4758 slide prepared from Van Heurck, *Types du Synopsis des Diatomées de Belgique* n° 212 (Scotland), based on original Walker Arnott sample 703 (Tighnabruaich Glen, Argyll & Bute, Scotland). This epitype is illustrated by Fig. 4.

Registration (of typification): https://phycobank.org/103392

Homotypic synonyms: *Schizonema perpusillum* (Grunow) Kuntze 1898, *Navicula gallica* var. *perpusilla* (Grunow) Lange-Bertalot in Krammer & Lange-Bertalot 1985, *Diadesmis perpusilla* (Grunow) D.G.Mann in Round & al. 1990, *Diadesmis gallica* var. *perpusilla* (Grunow) Bukhtiyarova 1995.

Excluded from synonymy: *Navicula flotowii* Grunow, in Van Heurck 1880

Description: Valves elliptic-lanceolate with a clear central inflation in larger valves. Smaller valves with less pronounced inflated central part. Apices not protracted, broadly rounded. Valve dimensions (n=40): valve length 9–16 µm, valve width 3.5–5.0 µm. Axial area broad, clearly widening towards the central area. Central area rounded, bordered by very slightly to not shortened, central striae. Presence of a fascia at present not observed. Raphe short, straight,

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filiform. Central raphe endings simple to very weakly inflated, straight, with often shallow markings on both sides of the central endings. Terminal raphe fissures short, almost absent. composed of one transapically elongated areola, 33–37 in 10 µm, clearly discernible in LM. Striae of the cubiculus-type, located in shallow, occasionally deep grooves, composed of one areola. Areolae in the central area shorter, rounded. Mantle striae in deep grooves, interrupted at the apices by a prolongation of the axial area.

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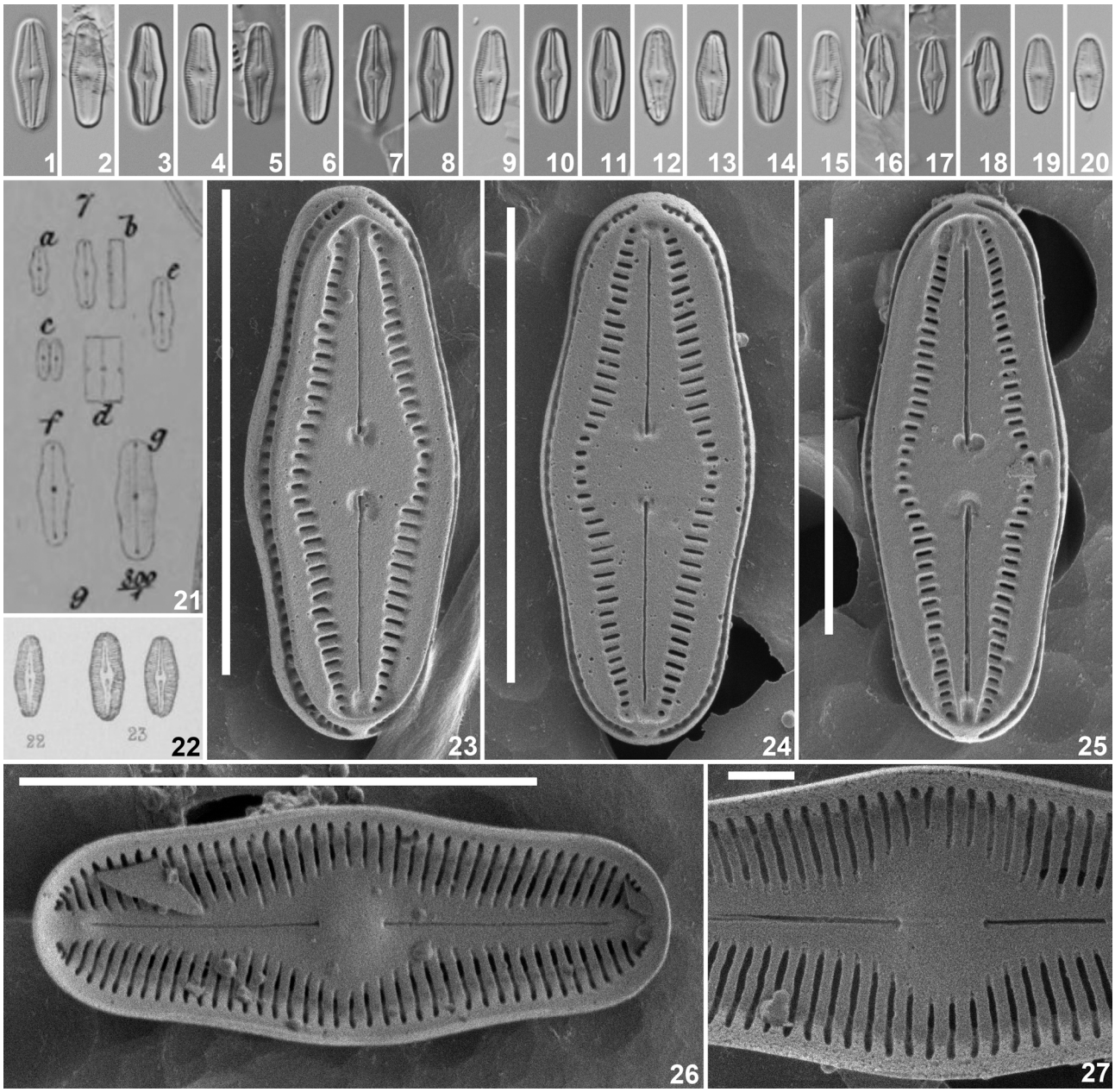

Figs 1–27. *Humidophila perpusilla* (Grunow) R.L.Lowe & al. LM and SEM pictures taken from the epitype material (**BR-4758**, Scotland, sample Types du Synopsis 212, based on Walker Arnott sample 703, Tighnabruaich Glen, Scotland, UK). **Figs 1–21**. LM pictures of valves in decreasing length series. **Fig. 21**. Original drawings for *Navicula perpusilla* Grunow taken from Grunow (1860, plate IV: fig. 7a–g), **fig. 7g designated here as the lectotype**. **Fig. 22.** Original drawings taken from Van Heurck (1880, plate XIV, fig. 22 & 23), representing *Navicula perpusilla*. **Figs 23–25**. SEM external views of three valves showing different degrees of shallowness of the stria grooves. Note also the typical grooves on the mantle where the mantle striae are located. **Fig. 26.** SEM internal view of an entire valve. **Fig. 27.** SEM internal detail of the central area. Scale bars = 10 µm except for Fig. 27 where scale bar = 1 µm.

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