

***Nitzschia saprobionta*, a new name and status for *Nitzschia palea* var. *tenuirostris* Grunow
(Bacillariaceae, Bacillariophyceae)**

Bart Van de Vijver^{1,2} & Xander de Zwart¹

¹Meise Botanic Garden, Research Department, Nieuwelaan 38, 1860 Meise, Belgium
(correspondence: bart.vandevijver@plantentuinmeise.be)

²University of Antwerp, Department of Biology – ECOSPHERE, Universiteitsplein 1, B-2610 Wilrijk, Belgium

Nitzschia capitellata Hustedt (1930: 414) is a commonly reported species from polluted, polysaprobic waters (Lange-Bertalot & al. 2017). The name was first introduced by Hustedt in 1922 in Schmidt's *Atlas der Diatomaceen-kunde* (Schmidt 1922, pl. 348: figs 57–59) but lacked a description. After 1 January 1908 an illustration without a written description or diagnosis is invalid (Art. 38.9 and 38.10, Turland & al. 2018). Hustedt (1930: 414) validated the name, describing it as follows: “*Schalen linear mit parallelen Rändern und lang keilförmig vorgezogenen, an den Polen sehr schmalen, aber kopfig gerundeten Enden, 45-65 µm lang, 4 bis 5 µm breit. Kielpunkte klein, etwa 12 in 10 µm. Transapikalstreifen zart, etwa 30 in 10 µm*” illustrating it with one line drawing (Hustedt 1930, fig. 792). The specimens illustrated by Hustedt in Schmidt (1922, pl. 348: figs 57–59) originated from Kiathane Bach (Bosporus, Turkey, fig. 59) and Bremen (Germany, figs 57, 58). Hustedt (1930) added that the species was most likely halophilous but could also be found in both fresh and brackish waters, and that the species was reported from Bremen, Hessen, Gandersheim (reported by Krasske) and Gdansk (reported by Schulz). Krasske (1927: 255) reported *N. capitellata* as a rare species in the Gande river near Gandersheim (Hessen, Germany) whereas Schulz (1928) identified the species in the region of Gdansk (reported as Danzig, Germany, now in Poland) basing his identification on Hustedt's drawing in Schmidt's *Atlas*. Curiously, the population from the Bosporus sample (Kiathane Bach) was no longer included in this list.

In 1976, Lange-Bertalot revised the taxa in the *Nitzschiae lanceolatae*-complex and included *N. capitellata*, as illustrated in Schmidt's *Atlas*, as a synonym within *Nitzschia intermedia* Hantzsch together with a whole plethora of *Nitzschia* taxa (Lange-Bertalot 1976: 267). In 1978, Lange-Bertalot changed his mind (Lange-Bertalot & Simonsen 1978: 30). As the material from Bremen could not be found (confirmed by Simonsen 1987: 78), Lange-Bertalot based his analysis on the Kiathane Bach material in which he observed two similar forms, one with distant central fibulae and one lacking this feature. The latter remained included within *N. intermedia* rejecting the name *N. capitellata* as a later synonym. The other form bearing the gap in the fibulae, was described earlier by Hustedt as *N. subcapitellata* Hustedt (1939: 663), a name that Lange-Bertalot & Simonsen (1978) considered a synonym of *Nitzschia gandersheimensis* Krasske (1927: 272).

Simonsen (1987) lectotypified *N. capitellata* based on several specimens he observed in the Kiathane Bach sample as he could not find any *Nitzschia* valves that could be identified as *N. capitellata* in any of the Hustedt samples from Bremen he examined. This prompted Krammer & Lange-Bertalot (1988: 89) to separate *N. capitellata* once again as an independent species, dividing it into two distinct groups: *tenuirostris/subcapitellata*-Sippen and *subarcuata/frequens*-Sippen, both based on the original *N. capitellata* drawings in Schmidt (1922: pl. 347: figs 57–59).

Many *Nitzschia* taxa were subsequently added as synonyms to each of the two groups, considerably broadening the original species concept of *N. capitellata* as Hustedt had described it in 1930. This grouping seemed quite remarkable given the highly variable outlook some of the grouped taxa showed. Part of this lumping of taxa into *N. capitellata* was corrected later by further splitting off of some of the taxa. The *subarcuata/frequens* group was taken split off from *N. capitellata* with *Nitzschia frequens* Hustedt (Krammer & Lange-Bertalot 1997) now considered to be a separate species (Lange-Bertalot & al. 2017).

The *tenuirostris/subcapitellata* group, however, remained included within *N. capitellata*. The name of the group is based on *Nitzschia palea* var. *tenuirostris* Grunow in Van Heurck (1881: pl. 69: fig. 13), a taxon described from a sample collected by Charles-Henri Delogne (1834–1901) from ‘Grand Etang à St. Josse’, a large lake in the former Maelbeek valley in the small community of Saint-Josse-en-Noode, now one of the communities included in the city of Brussels (Belgium). This taxon has rather complicated taxonomic history. Lange-Bertalot (1980: 47) transferred it to *N. gandersheimiensis* as *N. gandersheimiensis* var. *tenuirostris* (Grunow) Lange-Bertalot. The latter combination was omitted, however, in further taxonomic treatments of *N. gandersheimiensis*, currently considered a synonym of *N. tubicola* Grunow.

To complicate things further, Lange-Bertalot (1976, pl. 3: figs 23–25) illustrated three valves naming them ‘*Übergangsformen zur Varietas tenuirostris*’ [intermediate forms to the variety *tenuirostris*] and Krammer & Lange-Bertalot (1988) included these valves within *Nitzschia palea* (Kützinger) W. Smith as “*tenuirostris*-Sippen”, clearly stating that the Grunow taxon *N. palea* var. *tenuirostris* as described in 1881, should be excluded from synonymy, as they (Krammer & Lange-Bertalot, 1988) considered the latter as a synonym of *N. capitellata*. This conclusion was confirmed in Lange-Bertalot & al. (2017: 452).

Almost all samples collected by Delogne in 1876–1878 in the surroundings of Brussels are conserved in the Van Heurck collection, part of the **BR** collection in Meise Botanic Garden (Belgium). During a survey of the diatom communities in the framework of a historical biomonitoring study, the sample from Saint-Josse containing the original population of *N. palea* var. *tenuirostris* was retrieved and studied using LM and SEM observations. The results of this analysis revealed several differences with the valves of *N. capitellata* shown in Simonsen (1987, pl. 103: figs 6–13) and with the valves identified as *N. palea* var. *tenuirostris sensu* Krammer & Lange-Bertalot (1988, pl. 59: figs 19–23). *Nitzschia capitellata sensu stricto* has a stria density of around 30 in 10 µm, allowing them to be easily discerned in LM, as was also clearly indicated and illustrated by Hustedt (1930, p. 414: “Transapikalstreifen zart, etwa 30 in 10 µm”). In Simonsen (1987, pl. 103: fig. 9) the striae are visible and countable. The observed stria density in *N. palea* var. *tenuirostris* always exceeds 35 in 10 µm, usually reaching more than 40 striae, making them impossible to discern in LM, even with oblique lighting. Another difference is the typical constriction in the centre of *N. palea* var. *tenuirostris*, combined with almost parallel margins in the entire cell cycle, a feature not observed in *N. capitellata sensu stricto* that lacks the constriction. Finally, most valves of *N. palea* var. *tenuirostris* have strongly protracted, very elongated apices, in contrast to *N. capitellata* that possesses protracted, but rather short apices. Similarities between both taxa can be found in the more distant fibulae in the centre and the fibula density that ranging from 10–12 in 10 µm. *Nitzschia palea* var. *tenuirostris sensu* Lange-Bertalot (1976) is a more delicate, slender, shorter taxon that clearly differs from the Grunow taxon. Desianti & al. (2015) discussed several species described by Matthew Hohn and Joan Hellerman including *Nitzschia cryptostriata* M.H. Hohn & Hellerman, which they suggest is *N. capitellata*. As the former has a stria density of 44–47 striae in 10 µm, conspecificity between both should be excluded. A possible conspecificity between *N. cryptostriata* and *N. palea* var. *tenuirostris* Grunow, can also be excluded, given the higher, not overlapping, stria density of the former (44–47 versus 35–40 in 10 µm). Striae are very weakly discernible, though not countable as in *N. palea* var. *tenuirostris* Grunow.

Therefore, the taxon described by Grunow, and often reported in biomonitoring surveys as *N. capitellata*, should no longer be identified under that name but needs to be kept separate from *N. capitellata*. As the taxon also should be separated from the nominate *Nitzschia palea* based on the morphological results of the *N. palea* (Kützinger) W. Smith var. *palea* type material in Trobajo & Cox (2006), a new name is necessary at species level to avoid homonymy with *Nitzschia tenuirostris* Manguin, described in 1952 from Guadeloupe (Bourrelly & Manguin 1952).

Here, we detail observations on specimens of *Nitzschia palea* var. *tenuirostris* from the Delogne sample from Saint-Josse using light and scanning electron microscopy. The taxon is raised to species level and the name *Nitzschia saprobionta* nom. nov. stat. nov. is chosen to indicate the preference of the species for polysaprobic conditions. Lange-Bertalot (1980: 47) had designated the Delogne slide in the Van Heurck collection (formerly in AWH, Antwerp, Belgium), as type slide for the species. We designate now the Delogne sample ‘Gde. Etang St Josse’ kept in **BR** formally as isolectotype for this species in accordance with ICN Art. 9.3 (Turland & al. 2018). Both lectotype and isolectotype are from the same material and are now kept in the Van Heurck collection, part of **BR**, since the transfer of the entire Van Heurck collection to Meise Botanic Garden in 2006 (Van de Vijver, pers. comm.).

Nitzschia saprobionta Van de Vijver & de Zwart, *nom. nov. stat. nov.* (Figs 1–25)

Replaced name: *Nitzschia palea* var. *tenuirostris* Grunow in Van Heurck 1881, pl. 69: fig. 13

Lectotype (designated by Lange-Bertalot (1980: 47): “Van Heurck collection in Antwerp, under *Nitzschia palea* var. *tenuirostris*, 20.ii.1877.”

Isolectotype (here designated): BR-4813! (Meise Botanic Garden, Belgium)

Registration (of new name): <http://phycobank.org/104044>

Registration (of isolectotypification): <http://phycobank.org/104048>

Type locality: Gde. [Grand] Etang Saint-Josse [ten-Noode], Belgium, coll. 20.ii.1877, leg. Delogne, sample kept at **BR**.

Description: LM: Valves elongated, with parallel margins, usually asymmetrically constricted near the valve centre (for instance Figs 4 and 19). Smallest valves with more convex margins Valve apices distinctly protracted, elongated, occasionally terminating into an inflated, capitate end. Valve dimensions (n=40): length 30–75 µm, width 4.0–4.5 µm. Raphe filiform, eccentrically placed on one side to the valve, with separated straight central raphe endings (Fig. 22) and long, hooked terminal raphe fissures (Fig. 23). Internally central nodule distinct with central raphe endings separated (Fig. 25). Fibulae small but distinct, 10–12 in 10 µm, connected internally to 1–2 (occasionally 3) striae (Figs 21, 24). Striae uniseriate, 39–40 in 10 µm, situated between weakly raised virgae, composed of fairly large, rounded areolae, each covered externally with individual hymenes, located in the areolar channel (Figs 22, 23). Clear hyaline groove separating 2 areolae per striae, running from apex to apex (Fig. 20, 22).

Bourrelly, P. & Manguin, É. (1952). *Algues d'eau douce de la Guadeloupe et dépendances: recueillies par la Mission P. Allorge en 1936*. pp. 1–282, 31 pls. Paris: Société d'Édition d'Enseignement Supérieur.

Desianti, N., Potapova, M. & Beals, J. (2015). Examination of the type materials of diatoms described by Hohn and Hellerman from the Atlantic Coast of the USA. *Diatom Research* 30(2): 93–116.

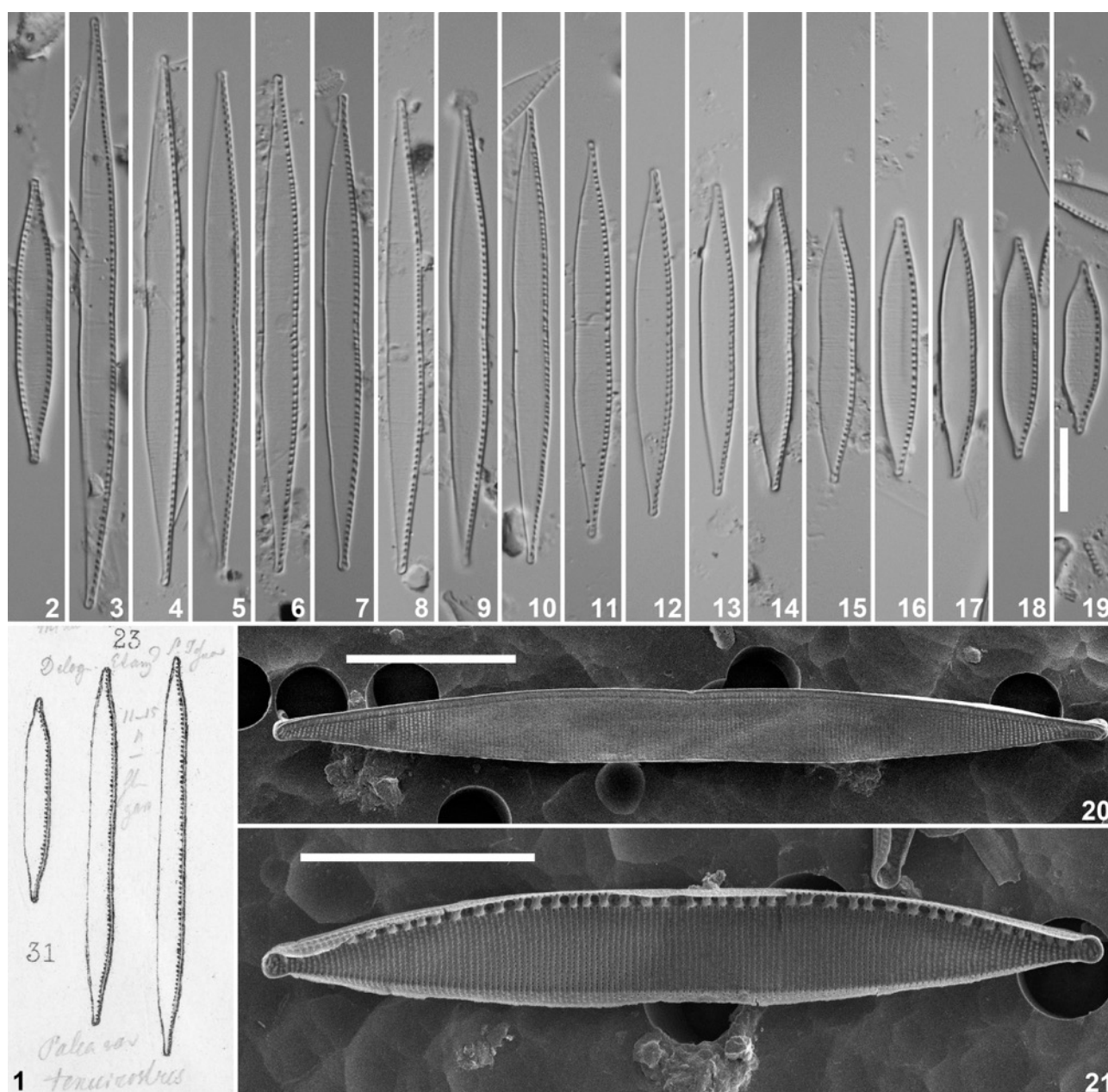
Hustedt, F. (1930). Bacillariophyta (Diatomeae) Zweite Auflage. In: *Die Süßwasser-Flora Mitteleuropas. Heft 10*. (Pascher, A. Eds), pp. [i]–vii, [1]–466. Jena: Verlag von Gustav Fischer.

Hustedt, F. (1939). Die Diatomeenflora des Küstengebietes der Nordsee vom Dollart bis zur Elbemündung. I. Die Diatomeenflora in den Sedimenten der unteren Ems sowie auf den Watten in der Leybucht, des Memmert und bei der Insel Juist. *Abhandlungen des Naturwissenschaftlichen Verein zu Bremen* 31(2/3): 571–677.

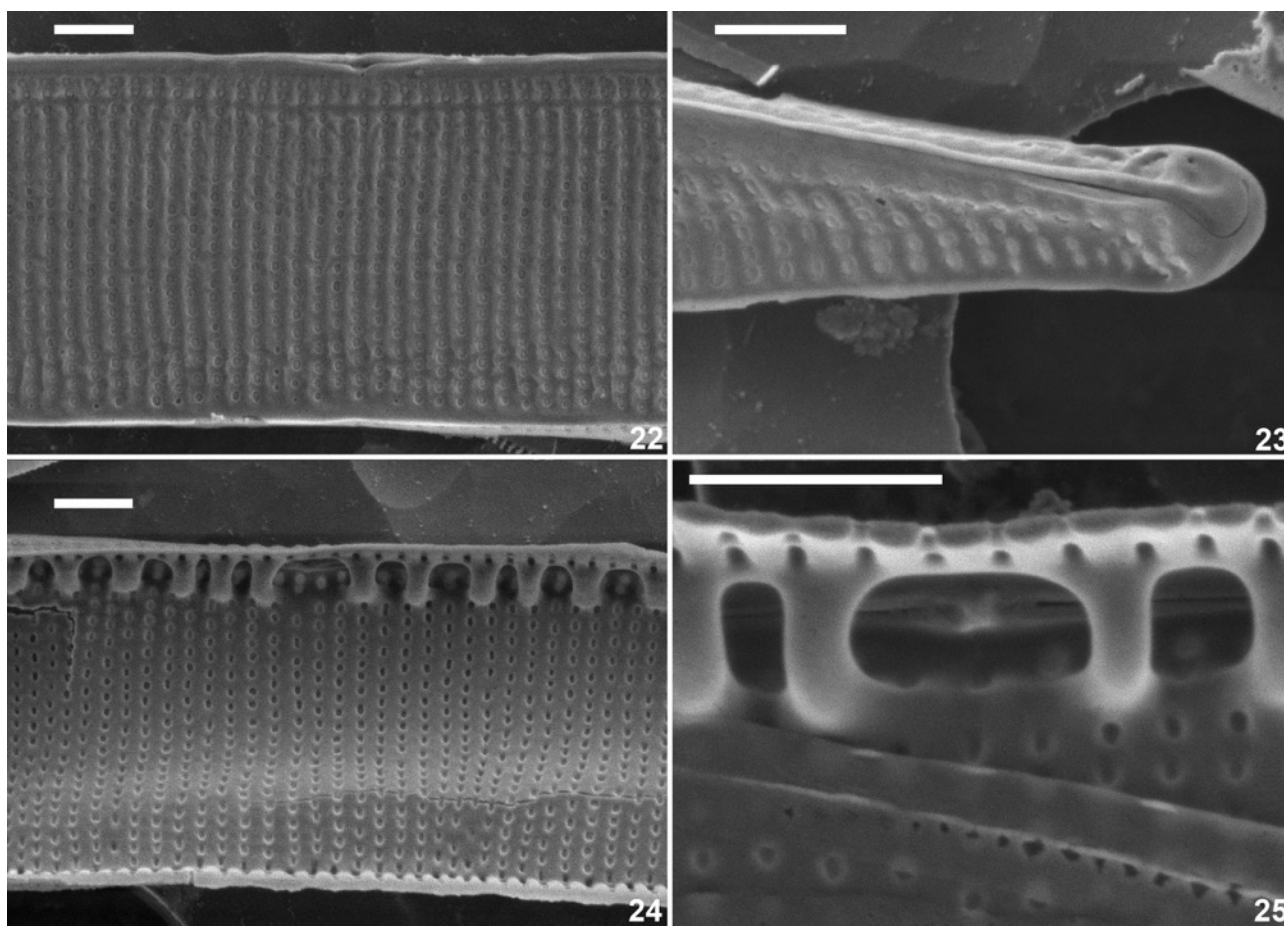
Krammer, K. & Lange-Bertalot, H. (1988). Bacillariophyceae. 2 Teil: Bacillariaceae, Epithemiaceae, Surirellaceae. Süßwasserflora von Mitteleuropa 2/2, Begründet von A. Pascher. Herausgegeben von H. Ettl, J. Gerloff, H. Heynig, D. Mollenhauer. Band 2/2. pp. [i]–x, [1]–596, Jena: Gustav Fischer.

Krammer, K. & Lange-Bertalot, H. (1997). Bacillariophyceae. 2 Teil: Bacillariaceae, Epithemiaceae, Surirellaceae. Süßwasserflora von Mitteleuropa 2/2, Begründet von A. Pascher.

- Herausgegeben von H. Ettl, J. Gerloff, H. Heynig, D. Mollenhauer. Band 2/2. pp. [i]–x, [1]–611, Jena: Gustav Fischer.
- Krasske, G. (1927). Diatomeen deutscher Solquellen und Gradierwerke. *Archiv für Hydrobiologie* 18: 252–272.
- Lange-Bertalot, H. (1976). Eine Revision zur Taxonomie der *Nitzschia lanceolatae* Grunow. Die "klassischen" bis 1930 beschriebenen Süßwasserarten Europas. *Nova Hedwigia* 28: 253–307.
- Lange-Bertalot, H. (1980). New species, combinations and synonyms in the genus *Nitzschia*. *Bacillaria* 3: 41–77.
- Lange-Bertalot, H. & Krammer, K. (1987). Bacillariaceae, Epithemiaceae, Surirellaceae. Neue und wenig bekannte Taxa, neue Kombinationen und Synonyme sowie Bemerkungen und Ergänzungen zu den Naviculaceae. *Bibliotheca Diatomologica* 15: [2], 1–289.
- Lange-Bertalot, H. & Simonsen, R. (1978). A taxonomic revision of the *Nitzschia lanceolatae* Grunow. 2. European and related extraEuropean freshwater and brackish water taxa. *Bacillaria* 1: 11–111.
- Lange-Bertalot, H., Hofmann, G., Werum, M. & Cantonati, M. (2017). *Freshwater benthic diatoms of Central Europe: over 800 common species used in ecological assessments*. English edition with updated taxonomy and added species (Cantonati, M. & al. eds). pp. 1–942, 135 pls. Schmitt-Oberreifenberg: Koeltz Botanical Books.
- Schmidt, A.[W.F.] (1922). *Atlas der Diatomaceen-kunde*, series VIII: Heft [87]. pp. pls 345–348. Leipzig: O.R. Reisland.
- Schulz, P. (1928). Süß- und Brackwasser-Diatomeen aus dem Gebiete der Freien Stadt Danzig und dem benachbarten Pomerellen. *Bericht der Westpreussischen Botanisch-Zoologischen Verein* 50: 85–195.
- Simonsen, R. (1987). *Atlas and catalogue of the diatom types of Friedrich Hustedt*. Vol. 1. Catalogue. Vol. 2. pls 1–395. Vol. 3. pls. 396–772. pp. 1–525, 772 pls. Berlin & Stuttgart: J. Cramer in der Gebrüder Borntraeger Velagsbuchhandlung
- Trobajo, R. & Cox, E.J. (2006). Examination of the type material of *Nitzschia frustulum*, *N. palea* and *N. palea* var. *debilis*. Pp. 431–445. In: Witkowski A. (editor) *Proceedings of the Eighteenth International Diatom Symposium*. Miedzydroje, Poland.
- Turland, N.J., Wiersema, J.H., Barrie, F.R., Greuter, W., Hawksworth, D.L., Herendeen, P.S., Knapp, S., Kusber, W.-H., Li, D.-Z., Marhold, K., May, T.W., McNeill, J., Monro, A.M., Prado, J., Price, M.J. & Smith, G.F., editors (2018). International Code of Nomenclature for algae, fungi, and plants (Shenzhen Code) adopted by the Nineteenth International Botanical Congress Shenzhen, China, July 2017. *Regnum Vegetabile*, Vol. 159. pp. [i]–xxxviii, 1–253. Glashütten: Koeltz Botanical Books.
- Van Heurck, H. (1881). *Synopsis des Diatomées de Belgique*, Atlas. pp. pls XXXI–LXXVII [31–77]. Anvers: Ducaju et Cie.



Figs 1–21. *Nitzschia saprobionta* Van de Vijver & de Zwart, *nom. nov.*, *stat. nov.* LM and SEM pictures taken from the isolectotype material (**BR**-4813, St Josse, Belgium, leg. Delogne, 20.ii.1877, sample housed at **BR**). **Fig. 1.** Original drawing taken from Van Heurck (1881, plate 69, fig. 31) with the annotations Grunow added indicating their origin. **Fig. 2.** Frustule showing both valves. **Figs 3–19.** LM valve face views showing the cell diminution series. **Fig. 20.** SEM external view of an entire valve. **Fig. 21.** SEM internal view of an entire valve. Note the fibulae usually connected to 1–2 striae. Scale bar represents 10 μm .



Figs 22–25. *Nitzschia saprobionta* Van de Vijver & de Zwart, *nom. nov.*, *stat. nov.* LM and SEM pictures taken from the isoelectotype material (**BR**-4813, St Josse, Belgium, leg. Delogne, 20.ii.1877, sample housed at **BR**). **Fig. 22.** SEM external view of the valve centre showing the central raphe endings. **Fig. 23.** SEM external detail of the valve apex with the terminal raphe fissure. **Fig. 24.** SEM internal view of the valve centre showing the fibulae and the central nodule. **Fig. 25.** SEM internal detail of the central nodule and the central raphe endings. Scale bars = 1 μm .