

Observations on the type material of several taxa belonging to the *Nitzschia filiformis* (W.Smith) Van Heurck complex (*Bacillariaceae*, *Bacillariophyceae*)

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According to AlgaeBase (Guiry & Guiry 2026), 267 diatom names are listed in the genus *Homoeocladia* C.Agardh, 1827, *nom. rejic.*, which was based upon a single species, *Homoeocladia martiana* C.Agardh (Agardh 1827) from Venice, but was rejected in favour of *Nitzschia* Hassall, 1845 when both genera were considered to be congeneric. Following its recent reinstatement, *Homoeocladia* species are now considered to possess typical conopea extending from the wall of the keel canal over the longitudinal depressions bordering the keel, forming conopeal canals that open at the apices (Lobban & Ashworth 2022). Using this more precise definition of a *Homoeocladia* taxon, at present only 38 species can be recognised as certain *Homoeocladia* species, leaving more than 200 names that currently appear to be synonyms of taxa in other genera and 20 names of uncertain status either taxonomically or nomenclaturally. A large number of *Homoeocladia* names are combinations proposed by Carl Ernst Otto Kuntze (1843–1907) who in 1898, on the basis of genus-name priority, transferred virtually all then-known *Nitzschia* species to the genus *Homoeocladia* (Kuntze 1898), combinations that are mostly currently treated as synonyms.

The Reverend William Smith (1808–1857) described two *Homoeocladia* species in 1856: *H. filiformis* W.Smith (1856: 80, pl. LV [55]: fig. 348) and *H. sigmoidea* W.Smith (1856: 81, pl. LV [55]: fig. 349). The first was originally described from a sample collected in September 1850 near Bexhill, a seaside town in East Sussex (south-east England). Smith also mentioned smaller valves that he reported as the un-named “β”, observed in a sample collected near Lewes (also in East Sussex) in August 1852. *Homoeocladia filiformis* was described as follows: “Fronde linear, simple; fascicles containing three or four frustules; height of frond ·2” to ·3”; F.V. (= front view of frustule) linear-lanceolate, obtuse; V. [=valve] linear-lanceolate, somewhat acute; Length of frustule ·0043”. Breadth of V. ·0003”. v.v. [=living specimen observed]” and illustrated with a figure (fig. 348) composed of several valves and frustules (a, b & d) and a drawing showing how the species lived in tube-shaped colonies. Smith also illustrated his “β” (fig. 348β a–d) showing similar drawings of valves, frustules and a colony but always representing smaller forms.

Van Heurck (1896: 406) referred *H. filiformis* in October 1896 to the genus *Nitzschia* in his *Treatise on the Diatomaceae* with the genus *Homoeocladia* treated as a subgenus of the latter, a few weeks prior to the transfer of the species to the genus *Nitzschia* by Franz Schütt (1859–1921) in Engler & Prantls *Natürliche Pflanzenfamilien* (late December 1896) giving priority to Van Heurck’s name (Schütt, 1896).

The second species, *Homoeocladia sigmoidea*, was later considered by Grunow to be a synonym of *Nitzschia sigma* var. *fasciculata* Grunow, a taxon he described in 1878 from the Caspian Sea (Grunow 1878) that was later raised to species level as *N. fasciculata* (Grunow) Grunow in Van Heurck (1881, pl. 66: figs 11–13). This synonymy was later confirmed by Van Heurck (1896, p. 408: “*N. (H.) sigmoidea*, *W. Sm.*, is nothing else but *N. fasciculata* Grun., which we have previously described.” This presumed synonymy is questionable as *H. sigmoidea* was described more than 20 years before *N. fasciculata* and should therefore have priority. The name *H. sigmoidea*, however,

disappeared in almost all later taxonomic treatments (for instance Hustedt 1930, Krammer & Lange-Bertalot 1988, Lange-Bertalot & al. 2017).

In 1879, the German botanist and phycologist Paul Gerhard Richter (1837–1913)*: described two other *Homoeocladia* species showing some resemblance to *Nitzschia* (*Homoeocladia*) *filiformis*: *H. germanica* P.G.Richter (1879: 65) and *H. conferta* P.G.Richter (1879: 65): “Im August 1874 entdeckte ich am Mühlgerinne zu Köttschau bei Leipzig 2 neue Species des im Binnenlande so selten vorkommenden Genus *Homoeocladia*. Ich beobachtete dieseiben 3 Sommer hindurch, und glaube daher mit gutern Grunde dieseiben nun publiciren zu können [In August 1874, I discovered two new species of the genus *Homoeocladia*, which is so rare in inland areas, at the mill stream near Köttschau, close to Leipzig. I observed these for three summers, and therefore believe I have good reason to publish them now.]” (Richter 1879: 65). Both species were observed in a sample collected from a flume of a watermill (=the so-called “Mühlgerinne” in Richter 1879) in Köttschau near Leipzig (Eastern Germany). Although described in detail in Latin, both species were unfortunately not illustrated, but could be separated based on valve length (70–78 µm in *H. germanica* vs 24–32 µm in *H. conferta*), valve width (3–4 µm in *H. germanica* vs 4–5 µm in *H. conferta*), and the shape of the valve apices (finely attenuated-truncated [*utroque fine attenuato-truncatis*] in *H. germanica* vs finely truncated [*utroque fine truncatis*] in *H. conferta*). Richter (1879: 66) discussed the possible similarities with the species described by Smith (1856) as follows: “Zurückkehrend zu unseren 2 *Homoeocladien* sei noch bemerkt, dass *H. germanica* am nächsten steht *H. filiformis* Sm. b. *parva* Rbh. (Sm. Syn. P. 55 fig. 348 β), von ihr aber verschieden ist durch die schwache Sigmaform der Gürtelseite. *H. conferta* gehört in die Verwandtschaft von *H. sigmoidea* Sm., ist aber um das Doppelte kleiner und gedrungener; die Sigmaform der Schalenseite wird nur dadurch hervorgebracht, dass die Enden einseitig entgegengesetzt sind. [Returning to our two *Homoeocladia*, it should be noted that *H. germanica* is most closely related to *H. filiformis* Sm. b. *parva* Rbh. (Sm. Syn. P. 55 fig. 348 β), but differs from it by the weak sigmoid shape of the girdle side. *H. conferta* belongs to the group of *H. sigmoidea* Sm., but is twice as small and more compact; the sigma shape of the valve side is produced only by the fact that the ends are unilaterally opposed.]”.

Both species were later transferred to the genus *Nitzschia*: *N. germanica* (P.G.Richter) M.Peragallo (1903: 661) and *N. conferta* (P.G.Richter) M.Peragallo (1903: 565). Migula (1906) also transferred *H. filiformis*, *H. conferta* and *H. germanica* to the genus *Nitzschia*, probably unaware of earlier transfers as he reported these taxa as *N. filiformis* (W.Sm.), *N. conferta* (P.G.Richter) and *N. germanica* (P.G.Richter) lacking the name of the second author who proposed the transfer. These transfers were always correctly indicated for other taxa for instance “*N. closterium* (Ehrenb.) W.Sm.” on page 335. Thus the designations *N. germanica* (P.G.Richter) Migula (1906: 338), *N. conferta* (P.G.Richter) Migula (1906: 338), and *N. filiformis* (W.Smith) Migula (1906: 337) are isonyms of no nomenclatural standing.

Hustedt (1930, p. 422) considered both Richter’s taxa as synonyms of *Nitzschia filiformis* (“Zu dieser Art gehören auch, wie ich mich am Originalmaterial überzeugen konnte, *Homoeocladia germanica* P. Richter und *H. conferta* P. Richter. [This species also includes, as I was able to confirm from the original material, *Homoeocladia germanica* P. Richter and *H. conferta* P.

*With Ferdinand Hauck, Richter produced *Phykotecka Universalis* [1885-1896] (“The *Phykotheka* is in fact a continuation of L. Rabenhorst’s *Die Algen Europas*”, TL-2, : 780) an exsiccata with 750 numbers. In a review of numbers 598-600, Pfitzer reported the following: “Hauck und Richter [...] gaben in ihrer Phykotheca auch 598. *Pleurosigma angulatum*, 599. *Campylodiscus tiburicus*, 600. *Berkeleya Dillwynii* aus” (Pfitzer 1894: 44). ‘*Campylodiscus tiburicus*’ has been reported as a new species authored by Hauk & Richter (which may have begun with VanLandingham 1968: 672, as the name is not in Mills), It is, in fact, a misspelling of *Campylodiscus hibernicus* with the ‘600’ referring to the number given for *Berkeleya dillwynii* by Hauck und Richter, the details derived from Pfitzer (1894).

Richter.]". This viewpoint was not shared by Lange-Bertalot in Lange-Bertalot & Krammer (1987, p. 18) who proposed the new combination *N. filiformis* var. *conferta* (P.G.Richter) Lange-Bertalot, stating that *N. filiformis* and the new variety *conferta* are often found sympatrically showing a similar valve structure (even in SEM) but always clearly separable based on valve dimensions. For *Homoeocladia germanica*, however, Hustedt's idea of being a synonym to *N. filiformis* was followed. A year later, Krammer & Lange-Bertalot (1988: 28) confirmed the suggested taxonomic treatment of all these taxa, but, inexplicably, *H. sigmoidea* was omitted and does not appear in any taxonomic treatment in the book.

All original materials for the species discussed above, were retrieved from the Van Heurck collection, part of the herbarium of Meise Botanic Garden (**BR**), allowing a thorough morphological analysis using both light and scanning electron microscopy observations of the populations used for the description of the following 5 taxa: *Nitzschia* (*Homoeocladia*) *filiformis* and the variety β suggested by W. Smith, *N. (H.) conferta*, *N. (H.) germanica* and *Homoeocladia sigmoidea*. (Type material of *H. conferta* and *H. germanica* is also present in the Naturalis Biodiversity Center (**L**), filed under the name *Nitzschia filiformis*: *H. germanica* (L4023066) and *H. conferta* (L4023067). The analysis of the **BR** material also allows to lectotypify all taxa. At present, two syntypes are listed for *N. filiformis*: 'Bexhill, Sussex' and 'near Lewes', whereby the latter is actually only destined for the un-named " β " (Smith 1856: 80). Analysis of both materials showed that the populations differ sufficiently to exclude conspecificity. Thus, a formal lectotype must be designated for *N. filiformis* to exclude taxonomic uncertainty (Turland & al. 2025, Art. 9.3). Krammer & Lange-Bertalot (1988) occasionally mentioned the word 'Typenmaterial' in their figure legends for several of these taxa. These indications cannot be accepted as formal lectotypifications as usually, apart from the word "Typenmaterial", other information regarding the material and where it is conserved, is lacking so that a formal lectotypification was not effected. *Homoeocladia germanica* shows distinct differences in valve outline with *N. filiformis* having clearly narrowing, more acutely rounded apices compared to the broadly rounded in *N. filiformis*, and should be recognised as a separate taxon. As other morphological differences between both taxa are lacking, and given a similar approach was used when *H. conferta* was combined with *N. filiformis* in Lange-Bertalot & Krammer (1987), the taxon is referred to the genus *Nitzschia* as a variety of *N. filiformis*: *N. filiformis* var. *germanica* (P.G.Richter) Van de Vijver, *stat. nov.*, instead of keeping the taxon on species level as proposed by Peragallo (1903: 661).

The un-named " β " that Smith (1856) separated from *H. filiformis* based on valve dimensions and valve shape, should not be included within *N. filiformis*. Analysis of the original population from Lewes (Figs 58–80) showed that this population presents more similarities in valve outline and dimensions with *N. filiformis* var. *conferta* than with *N. filiformis*. Valves are notably shorter (typical for the var. *conferta*) but intermediate valves between " β " and the type population of *N. filiformis* were not observed in the material nor in the lectotype material of *N. filiformis*, despite examination of hundreds of valves. Valves of the " β " have a more lanceolate valve outline with narrower, more acutely rounded apices, a feature at present not observed in the type population of *N. filiformis*, but observed in the type population of the var. *conferta*. However, Smith's " β " and the var. *conferta* also differ markedly. Valves of *N. filiformis* var. *conferta* possess a slight but still distinctly visible sigmoid valve outline, which is confirmed in other European populations (e.g. Bey & Ector 2013: 1035, Ector & al. 2015: 490). Despite being a large population, the Lewes material did not produce any sigmoid valves (see Figs 58–75). As other morphological differences with either *N. filiformis* nor the var. *conferta* could not be observed, it is unclear what the taxonomic status Smith " β " should have. Both taxa are only rarely observed sympatrically (Van de Vijver, unpubl. obs.). Based on the differences in outline and dimensions but also the similarities in ultrastructure with both *N. filiformis* and the varieties *germanica* and *conferta*, I suggest separation

of Smith's "β" as a new variety of *N. filiformis*: *Nitzschia filiformis* var. *minor* Van de Vijver var. *nov.*

A molecular analysis of a broad selection (in terms of valve dimensions and valve outlines) of populations of *N. filiformis*, and the varieties *conferta* and *germanica*, should shed some light on the phylogenetic relations between these populations.

The original material of *Homoeocladia sigmoidea* is lectotypified but will be given the name *Nitzschia nana* Grunow (in Van Heurck 1881, plate LXVII [67]: fig. 3). Following a comparison of the original drawing of *N. nana* in Van Heurck (1881) and original material of *N. (obtusula v.?) nana*, being *Types du Synopsis* no. 399 (Haverfordwest, Pembrokeshire, Wales, =Walker Arnott sample 464 as *N. fasciculata*), identified in Krammer & Lange-Bertalot (1988, expl. pl.17: figs 4–6) as 'Typenmaterial' for this species, with the original material of *H. sigmoidea*, it is clear that both taxa are conspecific, and hence according to Art. 11.4, the earliest legitimate species name of the epithet would be *sigmoidea*, but it should be transferred to the genus *Nitzschia*. This would, however, create an illegitimate name as a later homonym of *Nitzschia sigmoidea* (Nitzsch) W.Smith (1853: 38) described in 1817 as *Bacillaria sigmoidea* Nitzsch (1817: 104) [Art. 11.4(c)]. A replacement name should thus be proposed following Art. 53 of the Code. However, when a new combination would be illegitimate according to Art. 53, then the final epithet of the next earliest legitimate name at the same rank may be used instead or, if there is no final epithet available, a replacement name [...] may be published. This means that *Nitzschia nana* Grunow in Van Heurck should be employed as the correct name under *Nitzschia* for *Homoeocladia sigmoidea* W.Smith, with the original material of *H. sigmoidea* designated as lectotype.

Nitzschia filiformis (W.Smith) Van Heurck, *A treatise on the Diatomaceae*, 406. Oct. 1896 (Figs 1–16).

Basionym: *Homoeocladia filiformis* W.Smith, *Synopsis of the British Diatomaceae*, p. 80, pl. LV[55]: fig. 348, 1856.

Lectotype (here designated): BR-4950 (Fig. 5), slide prepared from original W. Smith material, Bexhill, East Sussex, England, Sept. 2, 1850, Van Heurck collection (**BR**).

Duplicates of the here designated lectotype: BM-collection: **BM** 001220457 (unmounted material), **BM** 0024415, **BM** 0024416 (original slides prepared from **BM** 001220457).

Registration (of lectotype): <http://phycobank.org/107567>

Homotypic synonym: *Nitzschia filiformis* var. *genuina* A.Cleve, *nom. inval.* 1952: 78.

Description: Frustules aggregated in tube-like colonies. Valves linear to extremely narrow linear (=filiform), with straight, almost parallel margins throughout most of their length, very slightly gradually tapering towards obtusely rounded, rather broad apices. Valve dimensions (n=50); length 85–180 µm, width 4.5–5.0 µm. Raphe keel eccentric, not positioned on the margin, but slightly off (Fig. 13). Raphe branches curved, with central raphe endings distinctly curving inwards onto valve face, converging with central striae (Figs 13,14). Distinct longitudinal grooves running alongside the keel, interrupting the striae (Fig. 14), becoming shallower towards the apices where grooves are replaced by series of large, transapically elliptical areolae (Fig. 15). Striae uniseriate, composed of small, transapically elliptical (not rounded) areolae (Figs 13–15), 31–35 in 10 µm, discernible in LM. Areolae becoming larger towards the margin opposite the keel (Figs 14–15). Areolae internally closed by perforated hymenes (Fig. 16). Fibulae distinct, relatively broad, irregular in size and distribution, 7–9 in 10 µm. Prominent central nodule present, central fibulae more spaced than others (Fig. 16). On valve mantle near the valve center, 3(4) longitudinal rows of areolae present, composed of areolae of different size and shapes (Fig. 14).

Nitzschia filiformis* var. *conferta (P.G.Richter) Lange-Bertalot in Lange-Bertalot & Krammer, 1987: 18 (Figs 17–34 (LM), 50–53 (SEM)).

Basionym: *Homoeocladia conferta* P.G.Richter, *Hedwigia* 18(5): 65, 1879.

Lectotype (here designated): BR-4851 (Fig. 21), slide prepared of original P.G. Richter material from Köttschau bei Leipzig, Germany (coll. date July 1877), present in the Van Heurck collection (**BR**).

Registration: <http://phycobank.org/107571>

Homotypic synonym: *Nitzschia conferta* (P.G.Richter) Migula, 1906: 338.

Description: Morphology and ultrastructure largely similar to *N. filiformis* including presence of longitudinal grooves, raphe structure, and central nodule. Differences include valve shape being lanceolate, weakly sigmoid with convex margins and acutely narrowing apices. Valve dimensions (n=30): length 25–38 µm, width ca 4 µm, striae 35–38 in 10 µm, very weakly discernible in LM. Fibulae, 8–10 in 10 µm, with central fibulae more spaced. Striae composed of very small, rounded areolae, equal in size and shape. Valve mantle with 2 rows of very small areolae flanking a row of larger areolae (Fig. 51).

Nitzschia filiformis* var. *germanica (P.G.Richter) Van de Vijver & D.M.Williams, *comb. & stat. nov.* (Figs 35–49 (LM), 54–57 (SEM)).

Basionym: *Homoeocladia germanica* P.G.Richter, *Hedwigia* 18(5): 65, 1879.

Lectotype (here designated): BR-4951 (Fig. 39), slide prepared of original P.G. Richter material from Köttschau bei Leipzig, Germany (coll. date July 1877), present in the Van Heurck collection (**BR**).

Registration (new combination): <http://phycobank.org/107576>

Registration (lectotype): <http://phycobank.org/107572>

Homotypic synonym: *Nitzschia germanica* (P.G.Richter) M.Peragallo 1903: 661.

Description: Morphology and ultrastructure largely similar to *N. filiformis* including presence of longitudinal grooves, raphe structure, and central nodule. Differences include valve shape being elongated lanceolate, with gradually narrowing margins from valve center to the acutely narrowing apices. Valve dimensions (n=30): length 60–80 µm, width 4.0–4.5 µm, striae 32–35 in 10 µm, weakly discernible in LM. Fibulae, 8–9 in 10 µm, with central fibulae more spaced. Striae composed of very small, rounded areolae, equal in size and shape (Figs 54–55). Valve mantle with 2 rows of very small areolae flanking a row of larger areolae (Fig. 55).

Nitzschia filiformis* var. *minor Van de Vijver & D.M.Williams, *var. nov.* (Figs 58–80).

Holotype: BR-4952 (Fig. 62), slide prepared of original W. Smith material collected near Lewes (coll. date Aug. 25, 1852), present in the Van Heurck collection (**BR**).

Isotype: slide-479 (University of Antwerp, Belgium), slide prepared of original W. Smith material collected near Lewes (coll. date Aug. 25, 1852), present in the Van Heurck collection (**BR**).

Registration: <http://phycobank.org/107573>

Homotypic synonym: *Homoeocladia filiformis* “β” in Smith (1856, p. 80, plate LV[55]: fig. 348β, *nom. inval.*

Description: Morphology and ultrastructure largely similar to *N. filiformis* including presence of longitudinal grooves, raphe structure, and central nodule. Differences include valve shape being more linear-lanceolate, with linear margins at valve middle, halfway the valve gradually tapering to the more acutely narrowing apices. Valve dimensions (n=50): length 35–60 µm, width 4.0–5.0 µm, striae 31–35 in 10 µm, weakly discernible in LM. Fibulae, 7–10 in 10 µm, with central fibulae more spaced. Striae composed of very small, rounded areolae, equal in size and shape (Figs 76, 77 & 79). Valve mantle with 2 rows of very small areolae flanking a row of larger areolae (Fig. 77).

Nitzschia nana Grunow (in Van Heurck), *Synopsis des Diatomées de Belgique* 1881: pl. LXVII [67]: fig. 3 (Figs 81–101).

Synonym: *Homoeocladia sigmoidea* W.Smith, *Synopsis of the British Diatomaceae*, p. 81: pl. LV[55]: fig. 349, 1856.

Lectotype (here designated): BR-4953 (Fig. 87), slide prepared of original W. Smith material from Wareham, Dorset, England, January 25, 1850, an Heurck collection (**BR**).

Duplicate of the here designated lectotype: BM 0024419 (unmounted material)..

Registration (of lectotype): <http://phycobank.org/107575>

Synonym (?): *Nitzschia sigma* var. *fasciculata* Grunow 1878: 119, *Nitzschia fasciculata* (Grunow) *sensu* Grunow in Van Heurck 1881: pl. LXVI [66]: figs 11–13.

Description: Valves clearly sigmoid in outline with apices turned into opposite directions. Valves linear with parallel margins, apices very weakly narrowing at the end, acutely rounded. Margins weakly unilaterally constricted at fibular side. Valve dimensions (n=40): length 35–65 µm, width 4.0–4.5 µm. Raphe keel eccentric, positioned on the margin (Fig. 99). Raphe branches curved, with central raphe endings distinctly curving inwards onto valve face, converging with central striae (Fig. 100). Striae uniseriate, composed of fairly large, rounded to, transapically elliptical areolae (Figs 99–100), of irregular size, 32–34 in 10 µm, discernible in LM. One longitudinal row of very large, elliptical areolae positioned at raphe keel, running from apices to valve middle, separating one row of small rounded areolae at the keel from the rest of the striae (Fig. 100). Areolae internally closed by perforated hymenes (Fig. 101). Fibulae distinct, relatively broad, irregular in size and distribution, 10–13 in 10 µm. Prominent central nodule present, central fibulae more spaced than others (Fig. 101). On valve mantle near the valve center, 3 longitudinal rows of areolae present, composed of areolae of different size and shapes (Fig. 100), the middle row presenting the largest areolae (Fig. 100).

Notes: Observations of valves identified as *Nitzschia nana* in Van Heurck Types du Synopsis n°399 shows a larger range in valve length with specimens reaching almost 100 µm (Van de Vijver, pers. obs.), indicating that the range in the lectotype material most likely does not reflect the entire cell cycle. Lange-Bertalot & al. (2017) mention a valve length of up to 120 µm.

Wolf-Henning Kusber is once more thanked for his nomenclatural advice on the treatment of *Homoeocladia sigmoidea* and *Nitzschia nana*.

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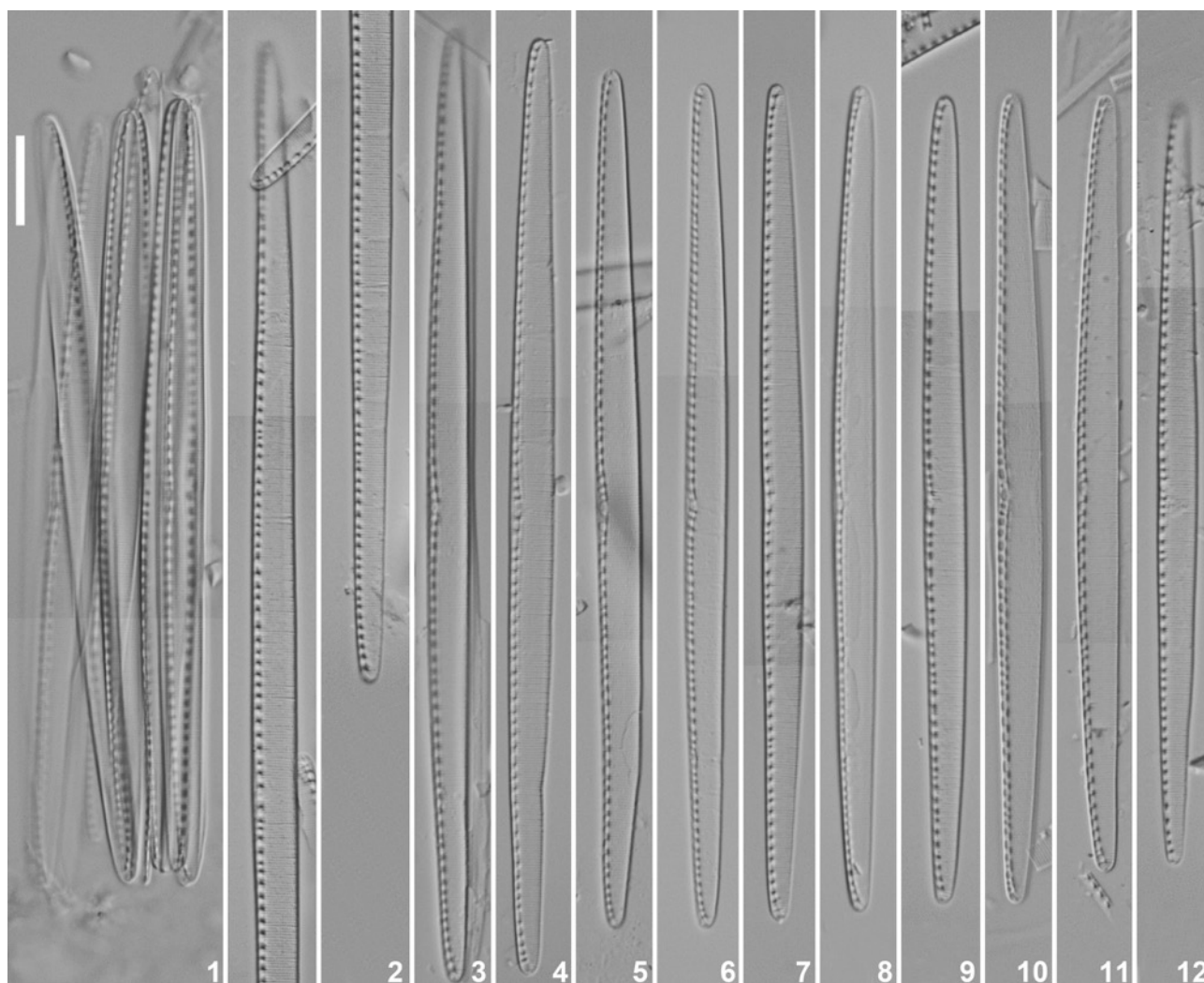
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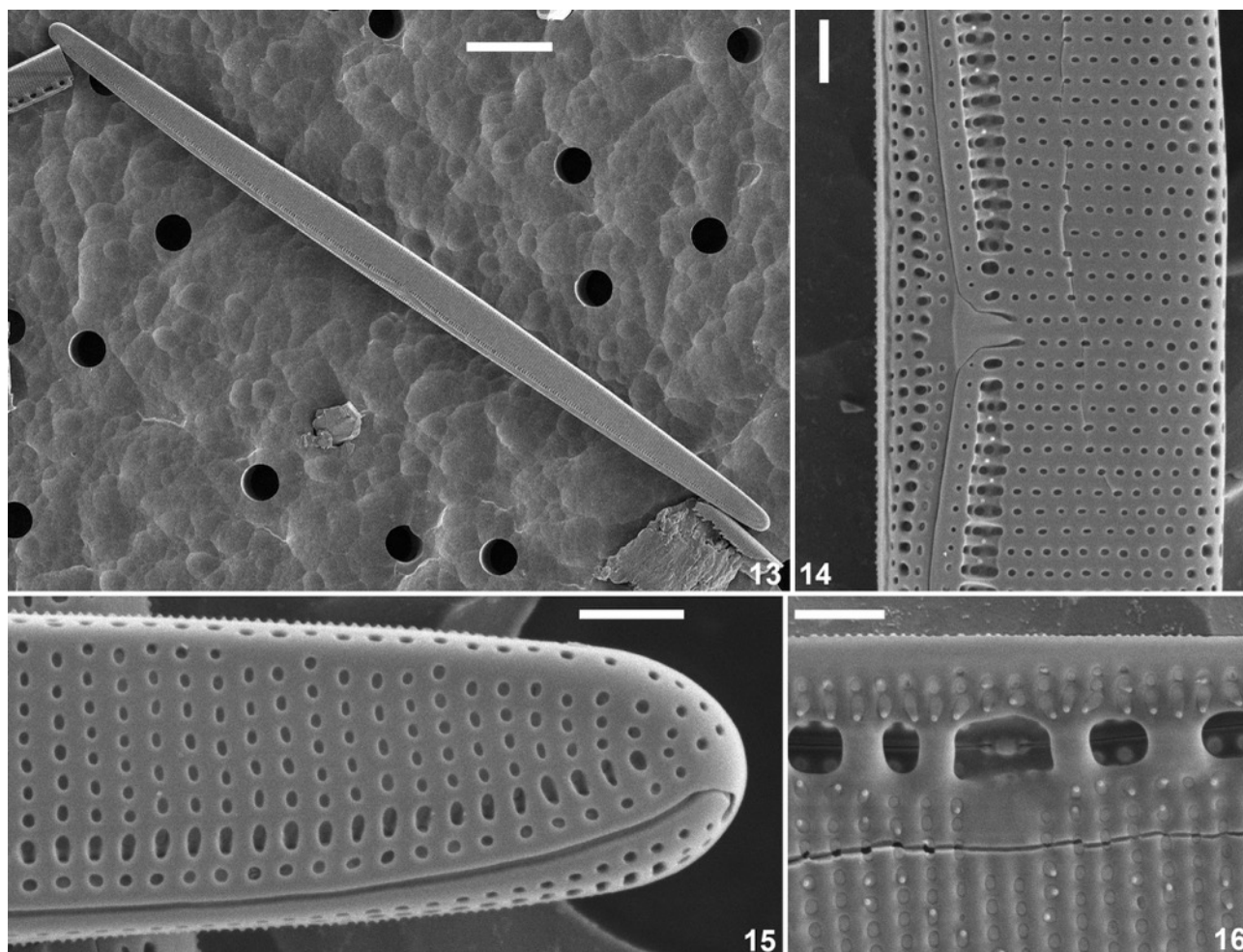
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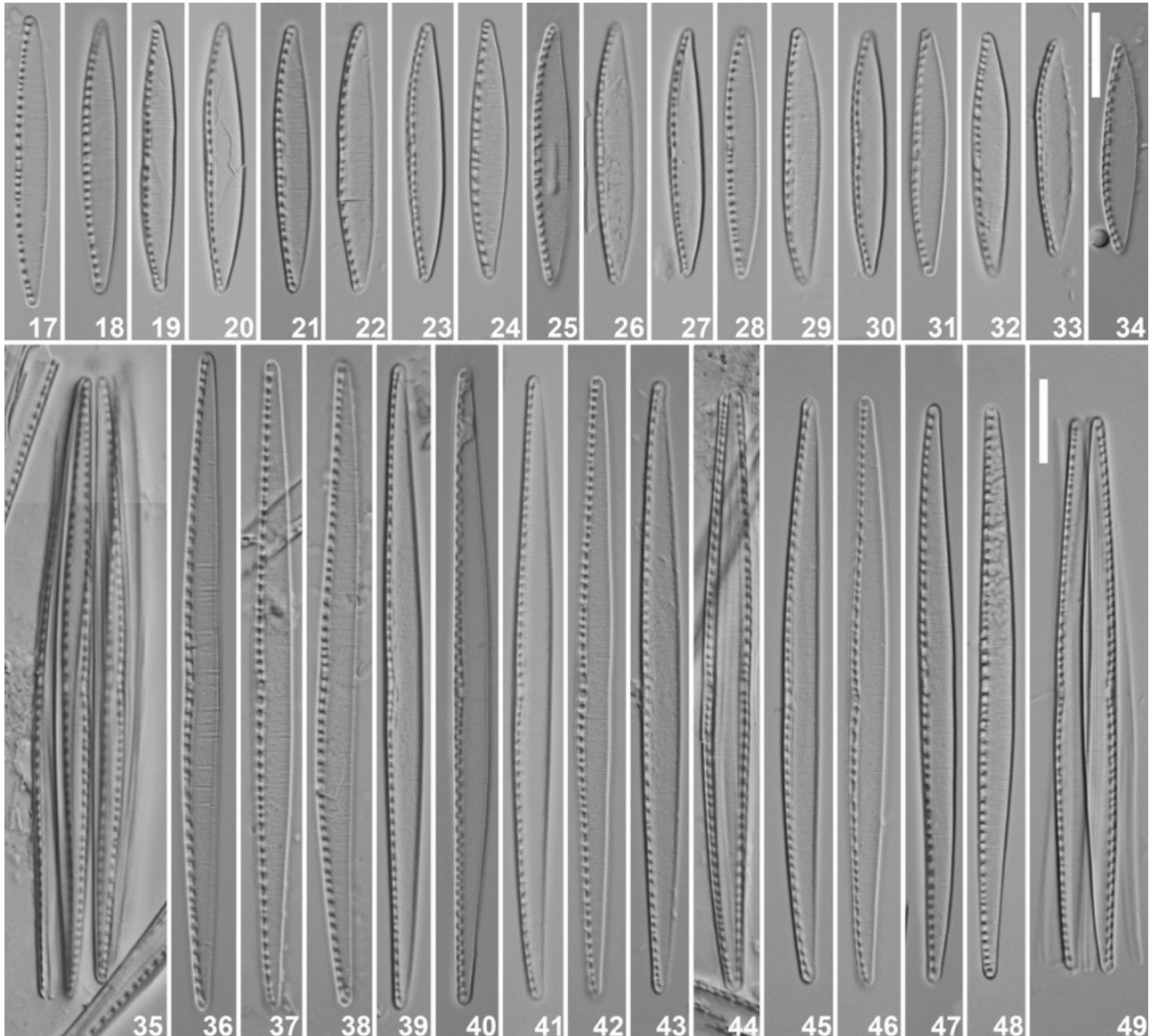
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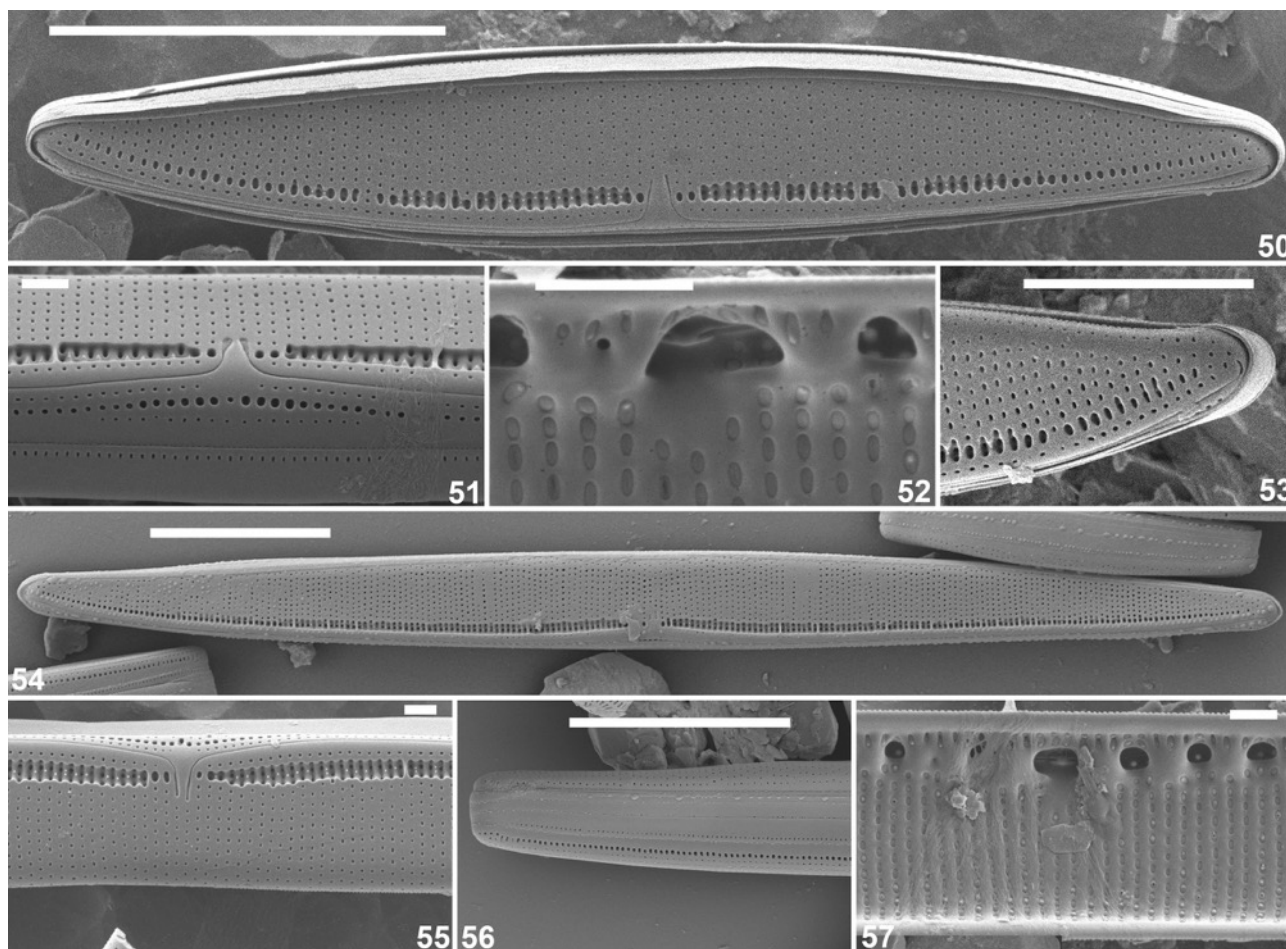
Figs 1–12. *Nitzschia filiformis* (W.Smith) Van Heurck. LM pictures taken from lectotype sample (BR-4950, Bexhill, East Sussex, England). Fig. 1. Aggregate of frustules. Figs 2–12. LM pictures showing valves in decreasing length. Fig. 2 consists of two parts given the length of the valve. Scale bar = 10 μ m.



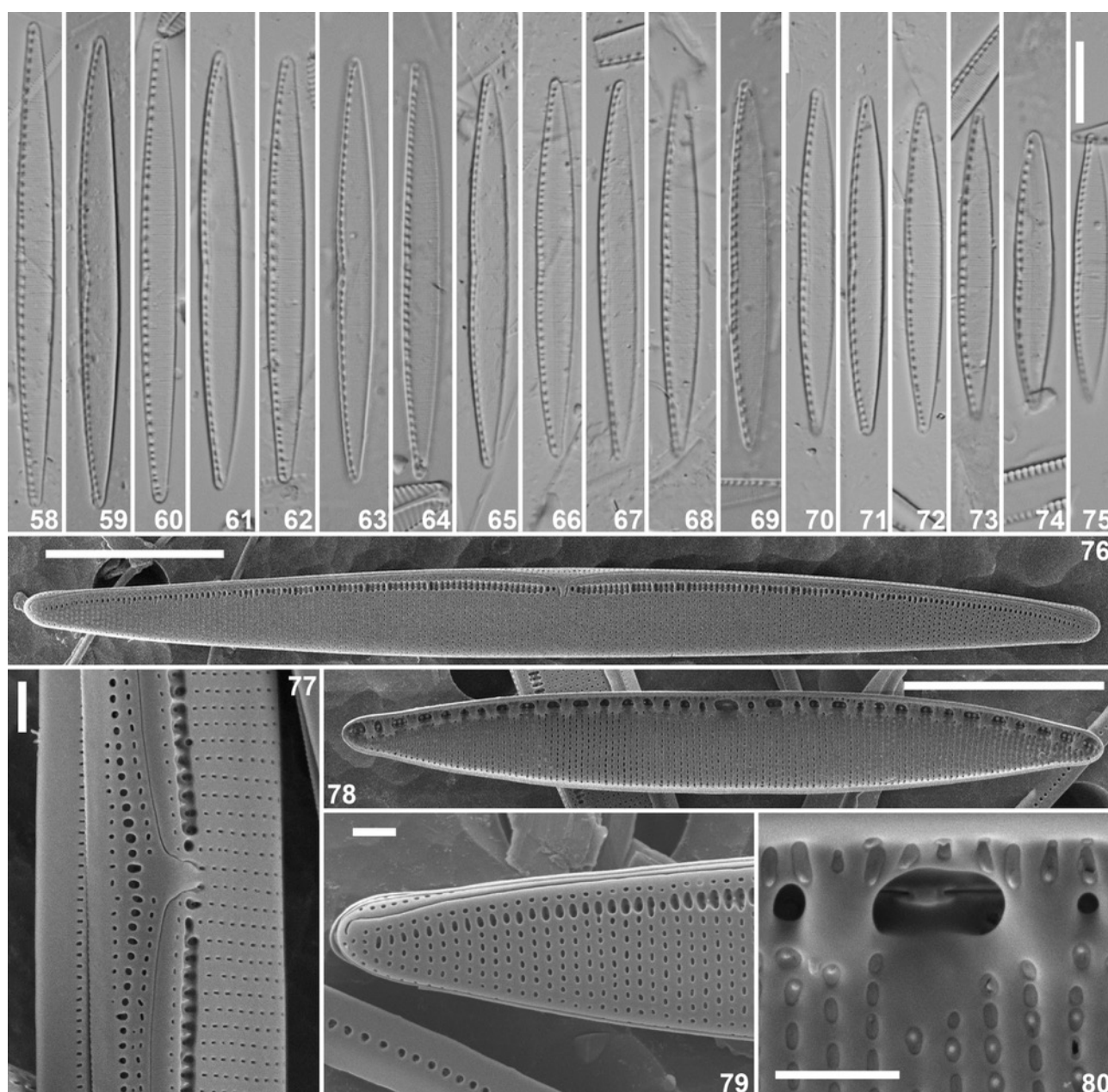
Figs 13–16. *Nitzschia filiformis* (W.Smith) Van Heurck. SEM pictures taken from lectotype sample (BR-4950, Bexhill, East Sussex, England). Fig. 13. SEM external view of an entire valve showing the longitudinal grooves. Fig. 14. SEM external detail in slight oblique view showing the central raphe endings, the longitudinal grooves and the series of areolae on the valve mantle. Fig. 15. SEM external detail of a valve apex showing the continuation of the groove as a series of transapically elongated areolae. Fig. 16. SEM internal detail of the central raphe endings and the central nodule. Note the fibulae and the internal areola hymenes. Scale bar = 1 μm , except for Fig. 13 where scale bar = 10 μm .



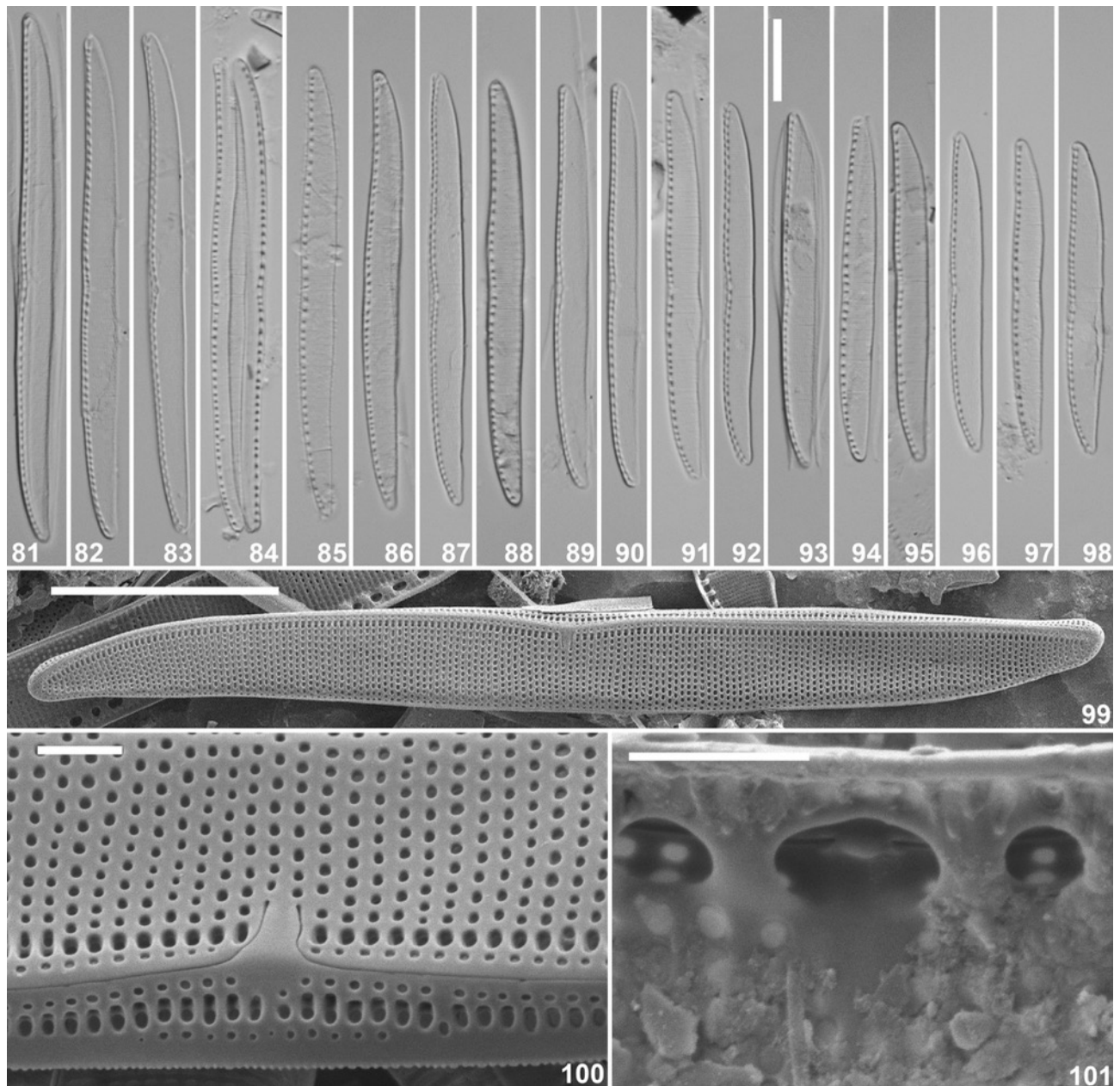
Figs 17–49. *Nitzschia filiformis* var. *conferta* (P.G.Richter) Lange-Bertalot (Figs 17–34) & var. *germanica* (P.G.Richter) Van de Vijver & D.M.Williams, *stat. nov.* (Figs 35–49). All LM pictures taken from the lectotype sample (BR-4951, Kötzschau bei Leipzig, Germany). Figs 17–34. LM pictures showing valves in decreasing length of *Nitzschia filiformis* var. *conferta*. Figs 35–49. LM pictures showing valves in decreasing length of *Nitzschia filiformis* var. *germanica*. Scale bar = 10 μ m.



Figs 50–57. *Nitzschia filiformis* var. *conferta* (P.G.Richter) Lange-Bertalot (Figs 50–53) & var. *germanica* (P.G.Richter) Van de Vijver & D.M.Williams, *stat. nov.* (Figs 54–57). All SEM pictures taken from the lectotype sample (BR-4951, Kötzschau bei Leipzig, Germany). Fig. 50. SEM external view of an entire valve showing all determining features of the taxon (central raphe endings, longitudinal groove, finely areolated striae). Fig. 51. SEM external detail of the central area. Note the rows of areolae on the mantle. Fig. 52. SEM internal view of the central raphe endings and the central nodule. Fig. 53. SEM external view of a valve apex. Fig. 54. SEM external view of entire valve showing all determining features of the taxon (central raphe endings, longitudinal groove, finely areolated striae). Fig. 55. SEM external detail of the central area. Note the rows of areolae on the mantle. Fig. 56. SEM external view of the girdle structure at one apex. Fig. 57. SEM internal view of the central raphe endings and the central nodule. Scale bar = 1 µm, except for Figs 50, 54 & 56 where scale bar = 10 µm and Fig. 53 where scale bar = 5 µm.



Figs 58–80. *Nitzschia filiformis* var. *minor* Van de Vijver a D.M.Williams, *comb. nov. & stat. nov.* All pictures taken from the holotype sample (BR-4952, near Lewes, UK). Figs 58–75. LM pictures showing valves in decreasing length. Fig. 76. SEM external view of an entire valve showing all determining features of the taxon (central raphe endings, longitudinal groove, finely areolated striae). Fig. 77. SEM external detail of the central area. Note the rows of areolae on the mantle. Fig. 78. SEM internal view of an entire valve. Fig. 79. SEM external view of a valve apex. Fig. 80. SEM internal view of the central raphe endings and the central nodule. Scale bar = 10 µm, except for Figs 77, 79 & 80 where scale bar = 1.



Figs 81–101. *Nitzschia nana* Grunow All pictures taken from the lectotype sample of *Homoeocladia sigmoidea* W.Smith. (BR-4953, Wareham, UK). Figs 81–98. LM pictures showing valves in decreasing length. Fig. 99. SEM external view of an entire valve showing all determining features of the taxon (central raphe endings, row of elongated areolae bordering the keel, striae with larger areolae). Fig. 100. SEM external detail of the central area. Note the rows of areolae on the mantle. Fig. 101. SEM internal view of the central raphe endings and the central nodule. Scale bar = 10 μ m, except for Figs 100 & 101 where scale bar = 1.