Observations of original William Smith material of *Cymatopleura apiculata* and its transfer to the genus *Surirella* (*Surirellaceae, Bacillariophyceae*)

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William Smith (1808–1857) separated in 1851 the genus *Cymatopleura* W.Smith from the genus *Surirella* Turpin based on "the undulated valves with margins not produced into alae" (Smith 1851: 12). Subsequently, he placed several species into the new genus: *Cymatopleura solea* (Brébisson) W.Smith (1851: 12) to replace the name of a species Ehrenberg had described as *Navicula librile* Ehrenberg (1832: 81) and Brébisson as *Cymbella solea* Brébisson (1835: 51); *Cymatopleura elliptica* (Kützing) W.Smith (1851: 13), a species actually described several years previously as *Navicula undulata* Ehrenberg (1838: 187); and *Cymatopleura hibernica* W.Smith (1851: 13). Two years later, Smith added two other species to his genus: *Cymatopleura apiculata* W.Smith (1853: 37), and *C. parallela* W.Smith (1853: 37). The latter was later treated by Cleve-Euler in 1952 as a variety of *C. solea*, *Cymatopleura solea* var. *parallela* (W.Smith) Cleve-Euler 1952: 96) whereas the former had already been transferred in 1861 by Ralfs in Pritchard as *C. solea* var. *apiculata* (W.Smith) Ralfs (in Pritchard 1861: 793). Lectotypes for the different *Cymatopleura* species, including the variety *apiculata*, were designated by Krammer in Lange-Bertalot & Krammer (1987: 87-90) and lectotype slides, made from original Smith material, were deposited in the Van Heurck collection, now part of the Meise Botanic Garden herbarium (**BR**, Belgium).

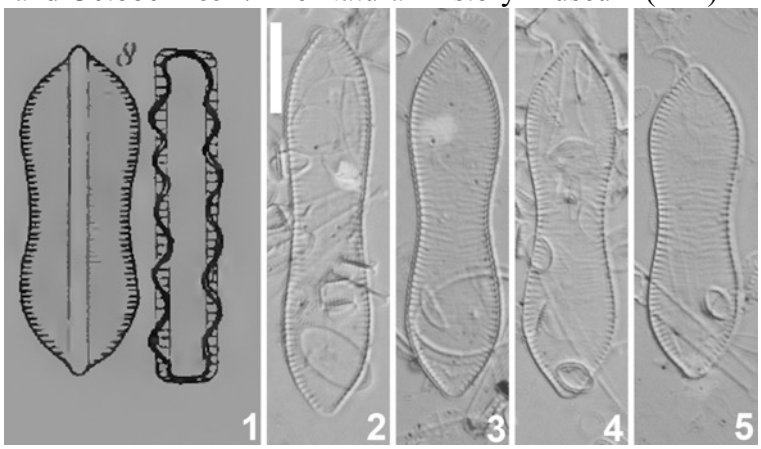
In 2016, Ruck & al. published a detailed phylogenetic analysis of the orders Surirellales and Rhopalodiales and concluded that the genus *Cymatopleura* should be included within the genus *Surirella*, the latter composed of the *Surirella pinnatae* group (whereas the robustoid *Surirella* species were included together with part of *Campylodiscus* and *Stenopterobia* within the genus *Iconella* Jurilj). As a result of this analysis, Jahn & al. (2017) transferred several *Cymatopleura* species to the genus *Surirella*, re-installing, following analysis of several Ehrenberg type samples, the species the latter described. *Cymatopleura solea* became thus *Surirella librile* (Ehrenberg) Ehrenberg (1845: 139) and *Cymatopleura elliptica* is now *Surirella undulata* (Ehrenberg) Ehrenberg (1845: 307). Later, *Cymatopleura hibernica* was transferred to *Surirella* as *Surirella hibernica* (W.Smith) D.Kapustin & O.Kryvosheia (2019: 313) leaving *C. apiculata* and *C. parallela* in the genus *Cymatopleura*, most likely because they are generally seen as simple outline variations of *C. solea*; even William Smith doubted whether *C. apiculata* should be separated as a distinct species, writing "I am not certain that the present is entitled to rank as a distinct species ; it is usually much smaller than the former and of a more rounded outline, but intermediate specimens sometimes occur, and in Ehr. Inf. xiii. 22. fig. 2, copied in Prit. Anim. pi. iii. fig. 155, we have a form as large as Solea with distinct apicula as in the present species". Smith (1853: 37) separated both species because *C. apiculata* has more 'apiculated' valves. Krammer & Lange-Bertalot (1987: 90) added that the var. *apiculata* is always smaller.

Our own observations of samples in which both *C. apiculata* and *C. solea* were present (for instance **BM** 23303, sample Lewes, 5th May 1850), show that *C. apiculata* is distinctly narrower and smaller (valve length 55–63 µm, valve width ca. 15 µm) than *C. solea* (valve width never

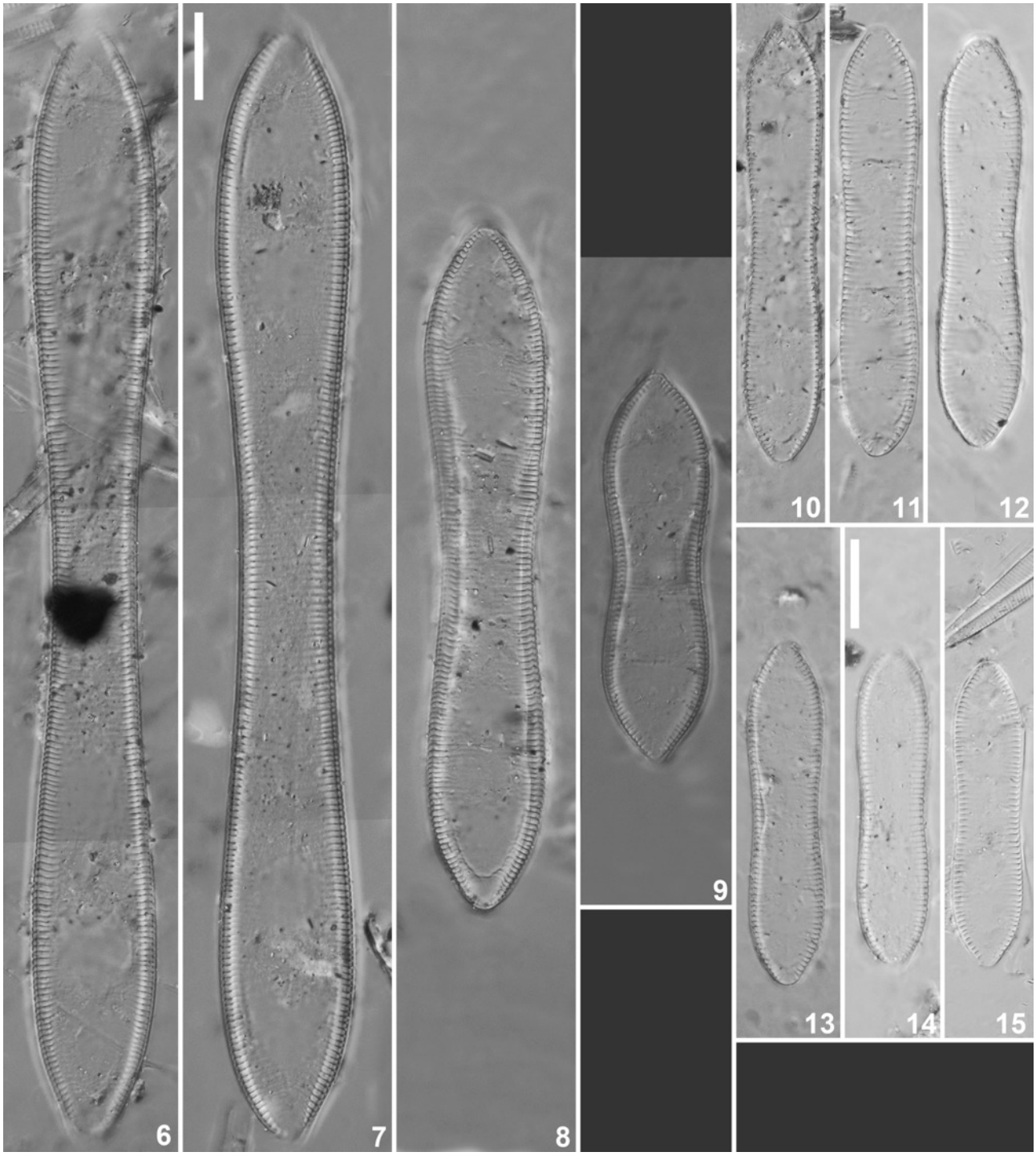
below 20 µm), and even short specimens of *C. solea* are typically much wider, justifying a separation of both taxa (Fig. 9). Lange-Bertalot & al. (2017, p. 154) kept both under the name *C. solea* but added that they most likely should be separated although they seem not to differ in ecological preferences.

Krammer (in Lange-Bertalot & Krammer 1987: 90) designated as lectotype for *Cymatopleura apiculata*.a sample from the William Smith collection (part of the Van Heurck collection in **BR**). He chose the sample 'near S. Wales, April 28, 1854, Mr. Okeden' as lectotype, confusingly also the type of *Surirella apiculata* (see Smith 1856: 88), although Lange-Bertalot & Krammer (1987: 94) erroneously indicated 1855 as collection date. There are several inconsistencies in this choice of lectotype. The first is the incorrect labelling. The sample labelled 'near S. Wales, April 28, 1854, Mr. Okeden' refers to a slide made from the type material for *Surirella apiculata*, as there is only sample present in the Smith collection in **BR** for the latter species, collected in Haverfordwest, south Wales (Hoover, 1976). This sample was collected in 1854, but inspection of a slide prepared from this Haverfordwest material revealed the presence of a large population of *S. apiculata* but *C. apiculata* could not be observed. Instead, the material from which the intended lectotype was made, was listed in the Smith collection as 'Blarney, April 23 1855' (although Hoover (1976) reported it incorrectly in his catalogue as 'Ap. 15, 55'). Blarney is a small town north of Cork city in Ireland. Secondly, the lectotype should only be considered an 'intended lectotype' as the chosen material was collected two years after the description of the species in Smith (1853) and therefore, could not represent the original material used to describe the species (Turland & al. 2018, Art. 9.3).

Smith (1853) did not specify an exact locality from where he described the species, stating simply "*In numerous localities with the former* [i.e. with *C. solea*]." *Cymatopleura apiculata* had already been mentioned and illustrated and considered to be a "*young (?) frustule*" of *C. solea* as Smith (1851, p. 13, fig. 8, our Fig. 1) stated. *Cymatopleura solea* was reported by Smith (1853: 36) from samples collected at Lewes in May 1850 and October 1852. The Natural History Museum (**BM**) in London has several original Smith slides in its collection dated May 6th 1850 from Lewes. One of the slides (**BM** 23309) is labelled "*Cymatopleura apiculata* – Lewes May 6 1850" whereas a second slide (**BM** 23303) is labelled "*Cymatopleura solea* – Lewes May 6 1850". Analysis of both slides revealed a different diatom flora in the two slides. In **BM** 23309, a small population of *C. apiculata* was observed (Figs 2–5) whereas in BM 23303, a large population of *C. solea* (Figs 6–9) and a somewhat smaller population of *C. apiculata* was found (Figs 10–15). Unfortunately, the coverslip of slide **BM** 23309 was too thick to allow observations at 600x or 1000x and could solely be observed at 400x magnification. The observations on slide **BM** 23303 were made at 600x magnification to facilitate the comparison between both taxa at the same magnification. The observations show that both taxa differ in valve dimensions,



Figs 1–5. *Cymatopleura apiculata* W.Smith. **Fig. 1.** Original drawing of & 'young (?) frustule of *C. solea* (W. Smith 1851, p. 13, fig. 8). **Figs 2–5.** LM pictures taken from W. Smith slide BM 23309 (Lewes, May 6 1850) of several specimens. Scale bar = 20 µm.



Figs 6–15. *Cymatopleura solea* (Brébisson) W.Smith and *C. apiculata*. LM pictures taken from W. Smith slide **BM** 23303 (Lewes, May 6th, 1850). **Figs 6–9.** LM Valve views of *C. solea*. **Figs 10–15.** LM valve views of C. apiculata. Scale bar = 20 µm.

especially in valve width. For each taxon, 20 specimens were measured. *Cymatopleura solea* had a valve length of 90–250 µm with a width of 19.5–22.5 µm, whereas *C. apiculata* had a length of 69.5–102.0 µm and a width of 14–16 µm. Given Smith's statement that both taxa co-occur, **we here designate slide BM** 23303, labelled *C. solea* as lectotype for *C. apiculata* superseding Krammer's lectotypification in Lange-Bertalot & Krammer (1987). Following Art. 9.19, a lectotype "may only be superseded by a nonconflicting element of the original material" if it "is in serious conflict with the protologue" (Turland & al. 2018: 25). As *C. apiculata* was described by William Smith at least

two years prior to the sampling date of the chosen lectotype, the latter could never have been part of the original material as determined by Art. 9.4: "…original material comprises the following elements: *(a)* those specimens and illustrations (both unpublished and published prior to publication of the protologue) that the author associated with the taxon, and that were available to the author prior to, or at the time of, preparation of the description, diagnosis, or illustration with analysis. " (Turland & al. 2018).

Since the morphological structure of *C. apiculata* (e.g. raphe structure, striae) does not differ from *C. solea*, and the latter was transferred to the genus *Surirella*, we also transfer *C. apiculata* to the latter genus. Because the name *Surirella apiculata* was already used for a species described by Smith (1856: 88) based on specimens from Haverfordwest in South Wales, a new name is required for *C. apiculata* when transferred to *Surirella*. We propose the name *Surirella microlibrile* Van de Vijver, Pottiez & Jüttner *nom. nov.* to indicate the close resemblance to *S. librile* but the much smaller valve dimensions. In the present contribution we document the morphology and variability of *S. microlibrile* as seen in slide BM 23303 which is designated as lectotype superseding Krammer's lectotype.

Unfortunately, unmounted material for the Lewes sample, collected on May 6th 1850, was no longer available in **BM** and **BR**. There are, however, two samples listed for *C. apiculata* in the Smith collection (Hoover 1976, p. 16), one from Falaise (Normandy, France) collected by A. de Brébisson on 20.i.1853, and a sample collected on April 22nd, 1855 from Blarney. The latter sample, as stated hereabove, was used as Krammer's (intended) lectotype. As it contained a large population of *C. apiculata*, the material was prepared to be studied in SEM and added as reference material to better illustrate and document the morphology of *S. microlibrile*.

***Surirella microlibrile* Van de Vijver, Pottiez & Jüttner, *nom. nov.* (Figs 16–29)**

Replaced name: *Cymatopleura apiculata* W.Smith, p. 37, pl. X [10]: fig. 79, 1853.

Lectotype (here designated, superseding the intended lectotype designated by Krammer in Lange-Bertalot & Krammer (1987) being not from original material): **BM** 23303 (Natural History Museum, London), original Smith slide labelled *Cymatopleura solea* – May 6th 1850, Lewes, East Sussex, England.

Reference material: slide V-30-C1 (intended lectotype designated by Krammer in Krammer & Lange-Bertalot (1987: 90), and **BR**-4837 (Meise Botanic Garden, Belgium), slide made from original material from Blarney, Co. Cork, Ireland in the W. Smith collection, April 22, 1855, both slides and materials kept in **BR**!

Registration: http://phycobank.org/104481 (name)

Registration: http://phycobank.org/104483 (lectotype)

Homotypic synonyms: *Cymatopleura solea* var. *apiculata* (W.Smith) Ralfs (in Pritchard 1861: 793), *Cymatopleura librile* var. *apiculata* (W.Smith) Descy (1983: 7)

Description : Frustules in girdle view rectangular with clear undulations (Figs 1, 16). Valves linear with parallel margins, often weakly concave in the middle. Apices short, wedge-shaped, rarely weakly protracted, cuneately rounded (Figs 1–5, 10–15, 17–21). Valve dimensions (n=25): length 55–105 µm, width 14–16 µm. Axial area very narrow, linear. Fibulae c. 8 in 10 µm, very short, marginal (Figs 26–28). Striae weakly visible in LM, parallel, 30–35 in 10 µm, uniseriate, grouped in series of 4–5 (Fig. 28). In SEM, valve face undulations distinct, the largest undulation in the middle of the valve. Valve face covered with a reticulate pattern of small cross bars and small silica granules. Raphe simple with straight, drop-like enlarged, closely spaced, terminal endings (Fig. 25).

Note: The epithet originally applied by Ehrenberg, "*librile*", is clearly treated by him as a noun. Lewis & Short's *Latin Dictionary* (1890) give the noun as a scale-beam, and Ehrenberg probably saw a resemblance to the beam of a balance in the outline. The epithet "*microlibrile*" is also treated here as a noun.

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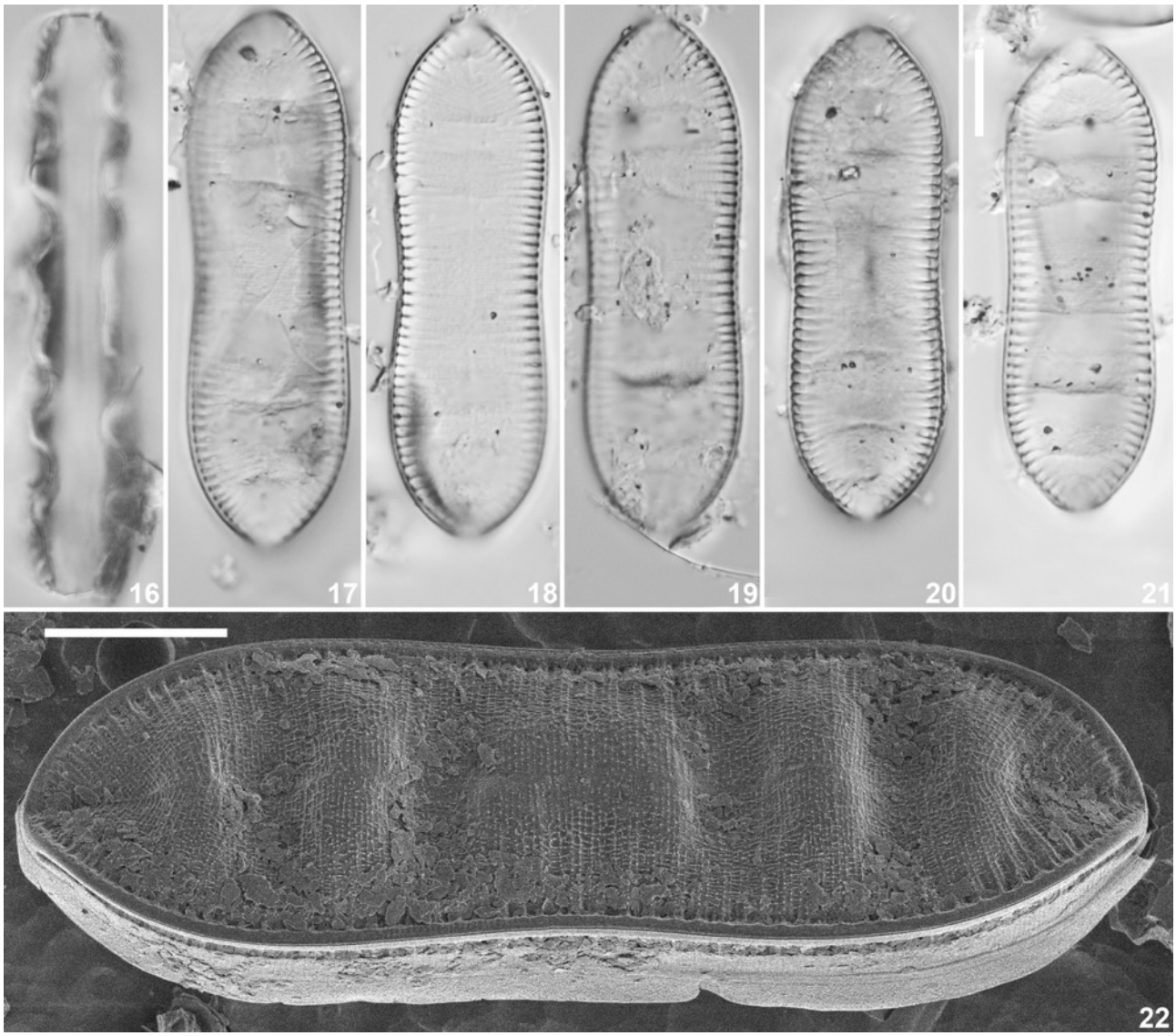
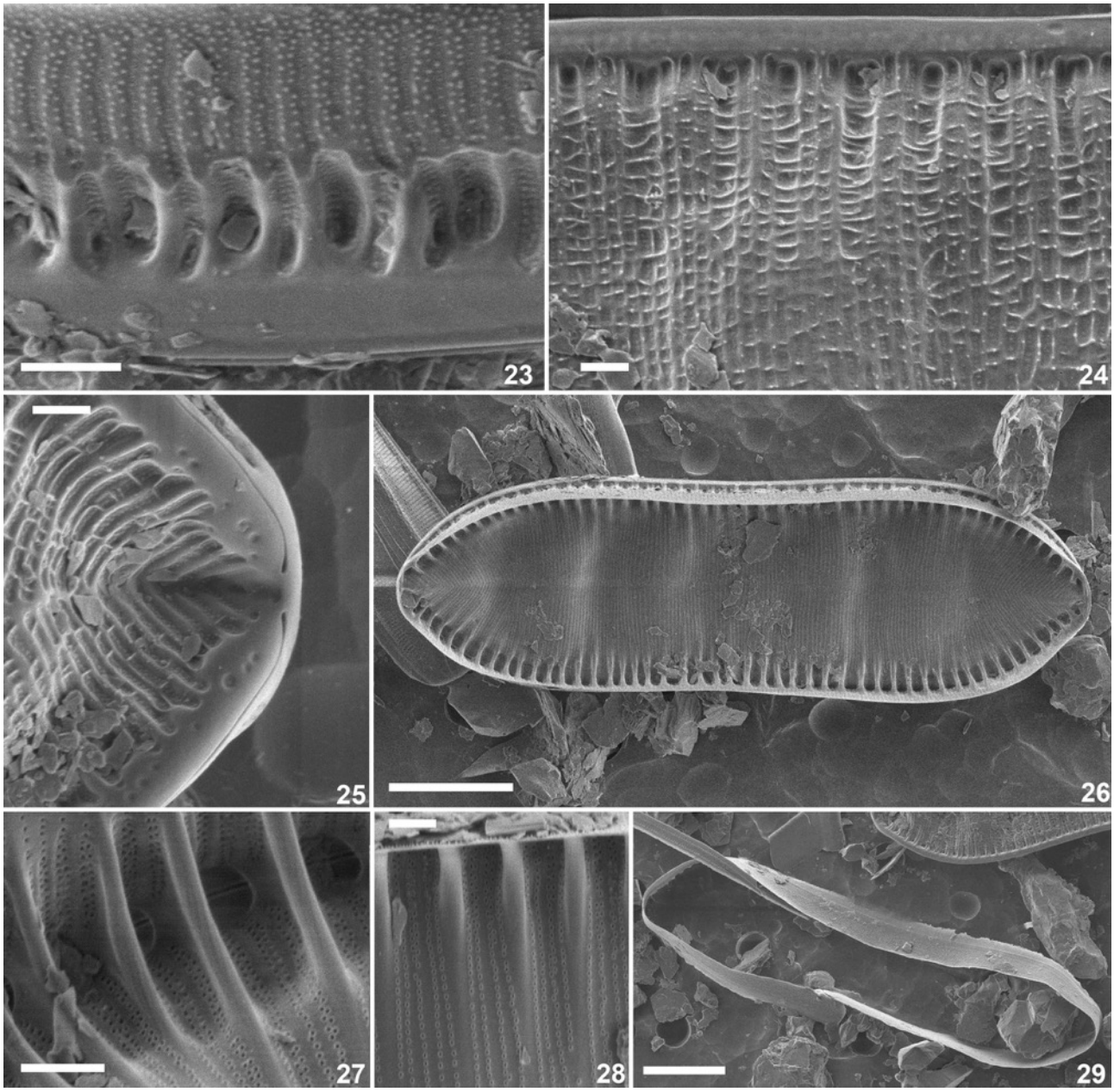


Figs 16–22. *Surirella microlibrile* Van de Vijver, Pottiez & Jüttner, *nom. nov.* LM and SEM pictures taken from the reference material (BR-4837, Blarney, Co. Cork, Ireland; April 22, 1855). **Fig. 16.** LM view of a frustule in girdle view. **Figs 17–21.** LM views of a size diminution series. **Fig. 22.** SEM external view of a complete valve. Scale bars = 10 µm.



Figs 23–29. *Surirella microlibrile* Van de Vijver, Pottiez & Jüttner, *nom. nov*. SEM pictures taken from the reference material (**BR**-4837, Blarney, April 22, 1855). **Fig. 23.** SEM external detail of the valve margin. Note the many granules. **Fig. 24.** SEM external detail of the valve surface with the typical pattern of small ridges. Fig. 25. SEM external detail of the valve apex with the terminal raphe endings. **Fig. 26.** SEM internal view of an entire valve. **Fig. 27.** SEM internal detail of the fibulae and the raphe. **Fig. 28.** SEM internal view of the striae and the areolae. Note the striae grouped in small series of 4–5 striae. **Fig. 29.** SEM view of a girdle band. Scale bar = 10 µm (Figs 26 & 29), = 1 µm (Figs 23–25, 27–28).