Type analysis of *Fragilaria capucina* f. *lanceolata-baikali* and *Fragilaria capucina* f. *sublanceolata-baikali* (*Bacillariophyta, Fragilariaceae*)

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During an analysis of the diatom flora of some shallow-water samples from Lake Baikal (Siberia, Russia), two new forms of *Fragilaria capucina* Desmazières (1830: 453) were described: *Fragilaria capucina* f. *lanceolata-baikali* Flower & D.M.Williams (in Flower & al. 2004: 92) and *F. capucina* f. *sublanceolata-baikali* Flower & D.M.Williams (in Flower & al. (2004: 92). Both forms occurred in the same sample, although Flower & al. (2004) indicated that *Fragilaria capucina* f. *sublanceolata-baikali* was much more abundant than f. *lanceolata-baikali*. The two forms were separated based on differences in valve outline combined with differences in valve length with f. *sublanceolata-baikali* being shorter (12–35 µm) with more elliptic-lanceolate valves and well-developed, rostrate, never capitate apices. The form *lanceolata-baikali*, on the other hand, possessed longer valves (35–57 µm) with a more lanceolate valve outline with straight margins and less-developed, weakly rostrate apices. Both forms possess valves presenting short, conical spines (although valves lacking spines have likewise been observed in both forms), have a similar stria density (19–20 in 10 µm), and a similarly reported valve width (3.5–4.5 µm).

This valve width, however, proved to be an underestimation. The original material from Flower & al. (2004) was retrieved from **BM** (London, UK). The material for sample **BM** 100321 was collected from an *Ulothrix-Cladophora* association in shallow water in Peschsnaya Bay (Lake Baikal) on 26.vi.1997 (Flower & al. 2004, Novais & al. 2019). All measured valves during the re-analysis showed a valve width of 4.0–5.5 µm. Moreover, a thorough analysis of the populations on the type slide showed that the reported differences (see also Novais & al. 2019) are most likely based on insufficient observations of the type material in Flower & al. (2004). Analysis of more than 100 valves showed a continuum in valve outline and dimensions. Shorter valves indeed show a slightly more elliptic-lanceolate valve outline although also strictly lanceolate smaller valves were encountered whereas in longer valves occasionally specimens with protracted, rostrate to even subcapitate apices have been observed. A strict separation between both forms is therefore no longer possible and both forms should be merged into one, relatively distant from *Fragilaria capucina sensu stricto*. *Fragilaria capucina* presents several morphological features that cannot be observed in the Baikal taxa. The species forms long, ribbon-like colonies with the frustules connected to each other using well-developed linking spines (e.g., Tuji & Williams 2006, Heudre & al. 2019). Tuji & Williams (2006) and Van de Vijver & al. (2021) recently published images of the type of *F. capucina*. The valves typically possess two rimoportulae per valve, a rare feature in the genus *Fragilaria* with only a few taxa known to present two rimoportulae. The Baikal taxa never form ribbon-like colonies, do not possess linking spines and only have one rimoportula per valve. Considering the Baikal taxa as forms in the *F. capucina* group can therefore not be maintained. Novais & al. (2019) already transferred both taxa to species level as *F. sublanceolata-baikali* (Flower & D.M.Williams) Novais, C.Delgado & S.Blanco and *F. lanceolata-baikali* (Flower &

D.M.Williams) Novais, C.Delgado & S.Blanco. Even though they cited both basionyms fully and directly in accordance with ICN Art. 41.8 (Turland & al. 2018), an error in the citation of *F. lanceolata-baikali* occurred. Unfortunately, the epithet of the basionym itself was misprinted (*F. capucina* f. *sublanceolata-baikali*) for *F. lanceolata-baikali*. If this misprint is treated as correctable error, taking into account that the intention of Novais & al. (2019) was clearly stated by citation of the correct figures, both combinations can be considered valid.

Given the unique combination of morphological features in both forms, we agree that a transfer to species rank of one of the former forms (*F. capucina* f. *sublanceolata-baikali*, published as first name in bold font) was justified. The other form should be considered as a synonym to *F. sublanceolata-baikali* (Flower & D.M.Williams) Novais, C.Delgado & S.Blanco.

We here provide detailed observations on and illustrations of specimens of both *Fragilaria capucina* f. *lanceolata-baikali* and f. *sublanceolata-baikali* from a slide prepared from the original material (Peschsnaya Bay, Lake Baikal, **BM** and **BR**) using light and scanning electron microscopy and give a complete morphological description of the species.

Fragilaria sublanceolata-baikali (Flower & D.M.Williams) Novais, C.Delgado & S.Blanco (in Novais & al. 2019: 139) (Figs 1–69)

Basionym: *Fragilaria capucina* f. *sublanceolata-baikali* Flower & D.M.Williams in Flower & al. (2004), *Proceedings of the Seventeenth International Diatom Symposium*, Ottawa, p. 92, figs 13 & 15.

Holotype: **BM** 100321 (**BM**, Natural History Museum, London, UK).

Synonyms: *Fragilaria capucina* f. *lanceolata-baikali* Flower & D.M.Williams (in Flower & al. 2004: 92, figs 14, 16), *Synedra vaucheriae* var. *capitellata* Grunow *sensu* Skvortzov (1937: pl. 4, fig. 1), *Fragilaria lanceolata-baikali* (Flower & D.M.Williams) Novais, C.Delgado & S.Blanco (in Novais & al. 2019: 139)

Description: Frustules in girdle view not observed, perhaps because of preparation technique. Valves strictly lanceolate in larger specimens becoming more elliptic-lanceolate in smaller valves, with gradually tapering margins. Smaller specimens with clearly convex margins. Apices protracted, subcapitate (larger specimens) to rostrate (smaller specimens). Marginal spines usually present (Figs 63, 65, 67, arrows indicating spine vestiges), conical, never in the shape of linking spines. Spines occasionally absent, independent from valve length (Figs 62, 64, 66). Valve dimensions (n=50): valve length 10–45 µm, width 4.0–5.5 µm. Axial area narrow, linear, not widening towards the central area. Central area asymmetrical. One side clearly swollen and depressed, hyaline. Opposite side with several shortened striae. Ghost striae rarely visible, although sometimes present (Fig. 62, arrows: present, Fig. 64: absent). Striae uniseriate, parallel to very weakly radiate throughout, alternating, becoming slightly more radiate near the apices, 17–20 in 10 µm, composed of small, rounded to apically elongated areolae (Figs 65–67). Occasionally, several areolae doubled per stria (Figs 64, 66). Apical pore field well developed, composed of up to six rows of small, squarish pores (Figs 63, 66). Rimoportula large, present at one apex per valve, replacing part of the last stria (Figs 63, 66, 67, arrows), oblique. Internally, depressed central area clearly visible (Fig. 69). Rimoportula transapically elongated, almost straight (Fig. 68).

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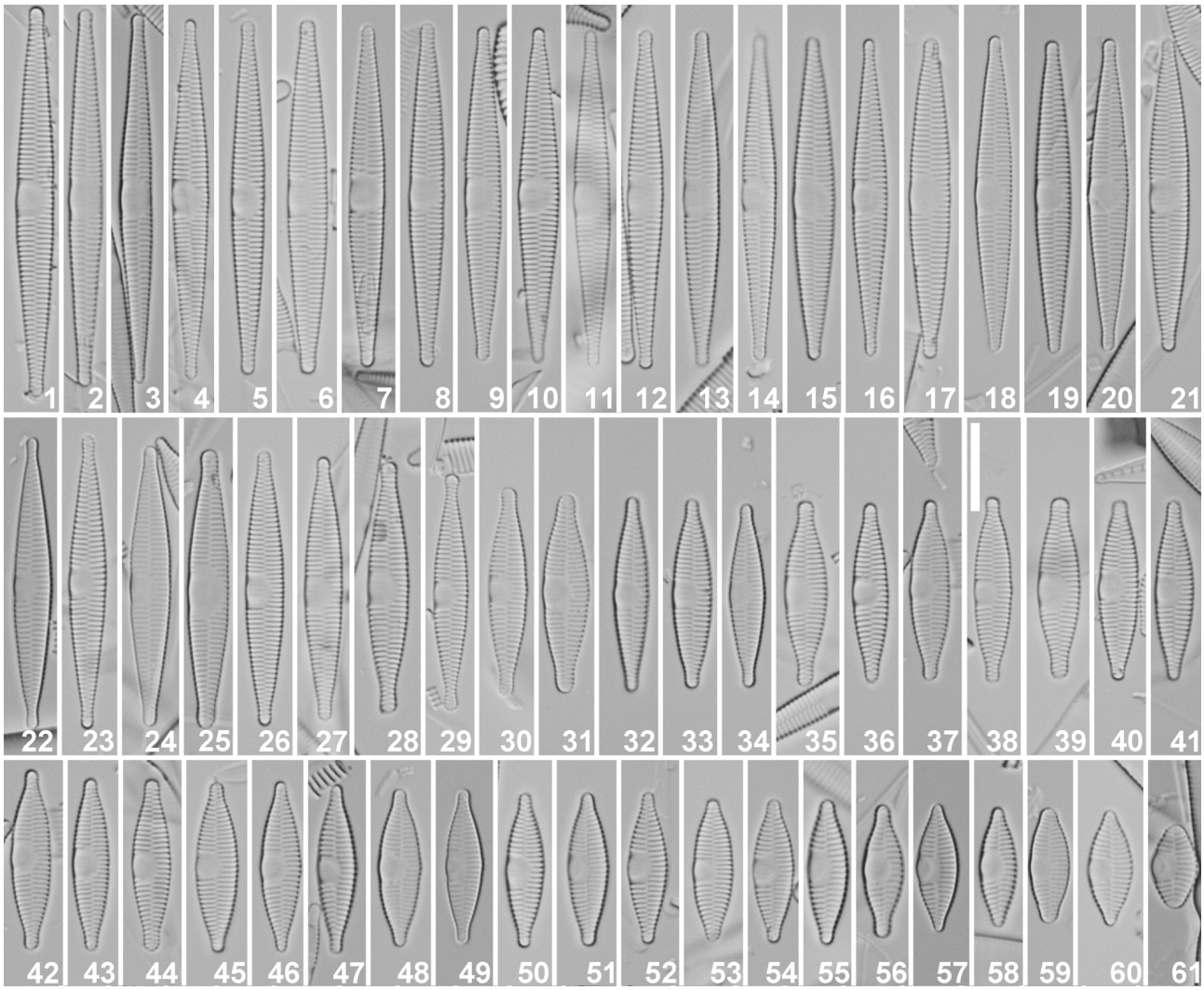
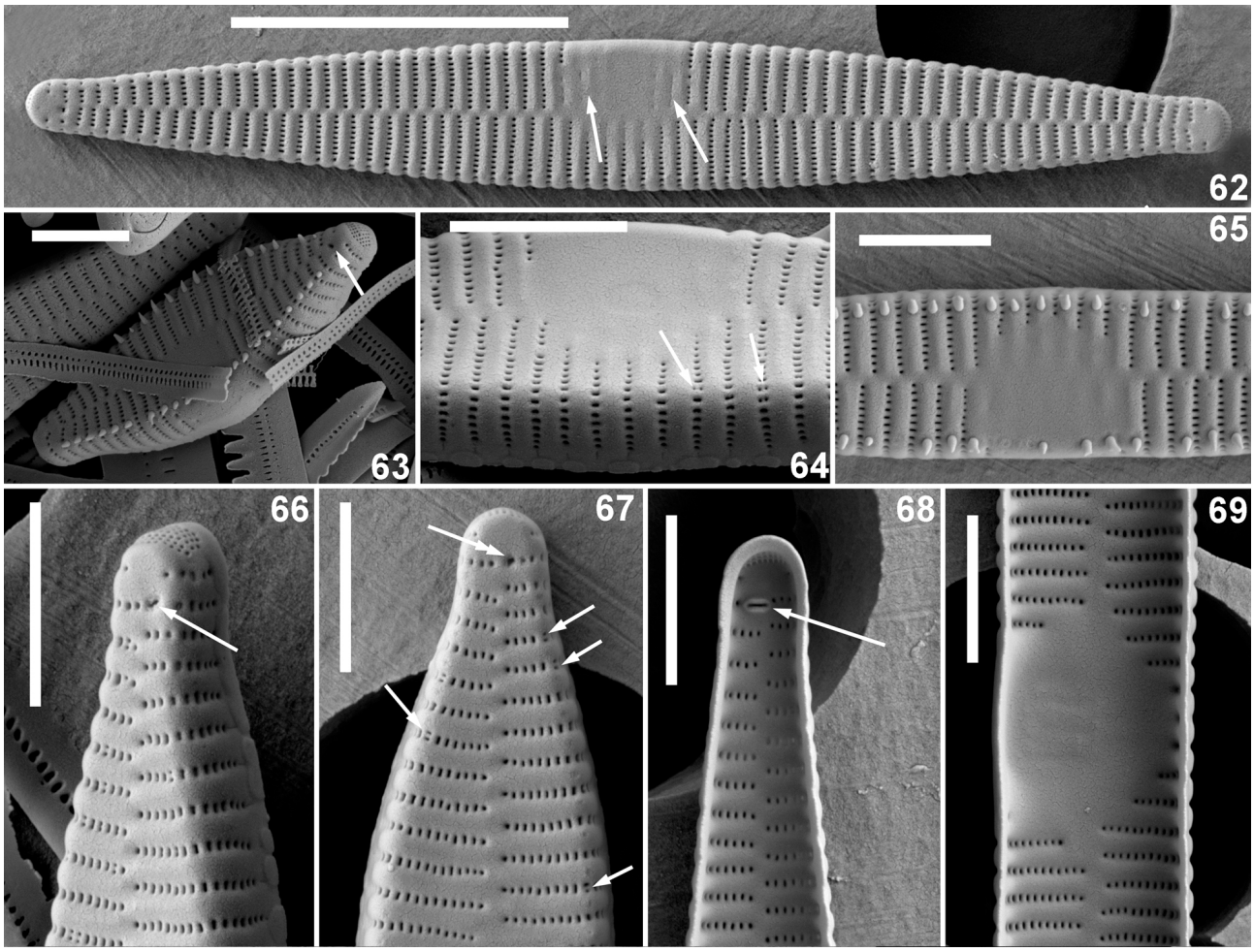


Figs 1–61. *Fragilaria sublanceolata-baikali* (Flower & D.M.Williams) Novais, C.Delgado & S.Blanco. LM pictures taken from the original type material (**BM** 100321, Peschsnaya Bay, Lake Baikal). Cell diminution series cycle of *Fragilaria lanceolata-baikali*. Scale bar = 10 µm.



Figs 62–69. *Fragilaria sublanceolata-baikali* (Flower & D.M.Williams) Novais, C.Delgado & S.Blanco. SEM pictures taken from the type population (**BM** 100321, Peschsnaya Bay, Lake Baikal). **Fig. 62**. External view of an entire valve lacking spines showing several ghost striae (arrows). **Fig. 63**. External view of an entire valve with spines showing the position of the rimoportula (arrow). **Fig. 64**. External detail of the swollen central area lacking ghost striae and spines. The arrows indicate the mantle plaques on the abvalvar edge of the mantle. **Fig. 65**. External detail of the swollen central area showing marginal, conical spines. **Fig. 66**. External detail of the valve apex showing the rimoportula (arrow) and the apical pore field. **Fig. 67**. External detail of the valve apex showing the rimoportula (double arrow) and several doubled areolae in the striae (arrows). **Fig. 68**. Internal detail of the valve apex with a rimoportula (arrow). Fig. 69. Internal detail of the depressed central area. Scale bars represent 10 µm except for figs 64–69 where scale bars = 2 µm.