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Nomenclatural problem on *Conferva armillaris* Müller (BACILLARIOPHYTA)

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Achnanthes longipes had had at least three earlier names, *Conferva armillaris*, *C. stipitata* and *Diatoma vexillum*, and the earliest validly published specific epithet that applies to the taxon in question is 'armillaris'. But the name 'longipes' has been in use for well over 150 years. As for the nomenclatural problem, we must be settled carefully. Here, we show that types of *Conferva armillaris* Müller (1783), *Conferva stipitata* J.E. Smith (1808), *Diatoma vexillum* Jürgens (1818) and *Achnanthes longipes* C. Agardh for find a solution of the nomenclatural problem. As for many early diatom species names, type specimens represented either on slides or as figures were often not designated in the protologues, hence many have been identified and described differently by subsequent authors. The type figure or specimen, as well as the original description, are one of the most effective factors in taxonomic and other studies for the identification of diatom species. In this paper we present some typification made a search for the original material around *Conferva armillaris* Müller.

Key index Words: *Conferva armillaris*, *Achnanthes longipes*, *Diatoma vexillum*, *Conferva stipitata*, *morphology*, *typification*.

Nomenclatural problems

Achnanthes longipes is one of the earliest described species in the genus *Achnanthes*, appearing as it does in the same publication as the generitype, *A. brevipes* C. Agardh (Agardh 1824, Toyoda *et al.* 2005a, Toyoda *et al.* 2006). However, C. Agardh (1824) published the name *A. longipes* as a substitute for *Conferva armillaris* Müller (1783), *C. stipitata* Sm. (1808) and *Diatoma vexillum* (1818) (Müller, 1783; Smith, 1808; Jürgens, 1818; Agardh, 1824; see Figs 1-4 in this paper). *Conferva armillaris* is the oldest described

species epithet that can be positively identified as a species of *Achnanthes*. Although Lyngbye (1819) proposed *C. armillaris* as a synonym of *Echinella stipitata* Lyngbye, which he thought was *Achnanthes brevipes*, comparison of the respective illustrations indicates that Müller was most probably observing specimens of *A. longipes*, with its many chloroplasts when he used the name *Conferva armillaris* (Müller 1783, Lyngbye 1819, Toyoda *et al.* 2005a). In addition, *Conferva stipitata*, a taxon also identified as *A. longipes* as it has a long mucilage stalk, was re-



Figs 1-4. Original descriptions. Fig. 1. Müller, 1783, figs 6-7. Fig. 2. Smith, 1813, *English Bot.* 2nd ed., taf. 2488. Fig. 3. Jürgens 1818, *Alg. Aquat.* Fig. 4. Agardh 1824, *Syst. Alg.*

named *Diatoma vexillum* by Jürgens (Smith 1808, Jürgens 1818, also see Figs 1, 2 of this paper). In summary, the nomenclatural history implies that there are four specific epithets for the same taxon, and the earliest validly published name is *Conferva armillaris*.

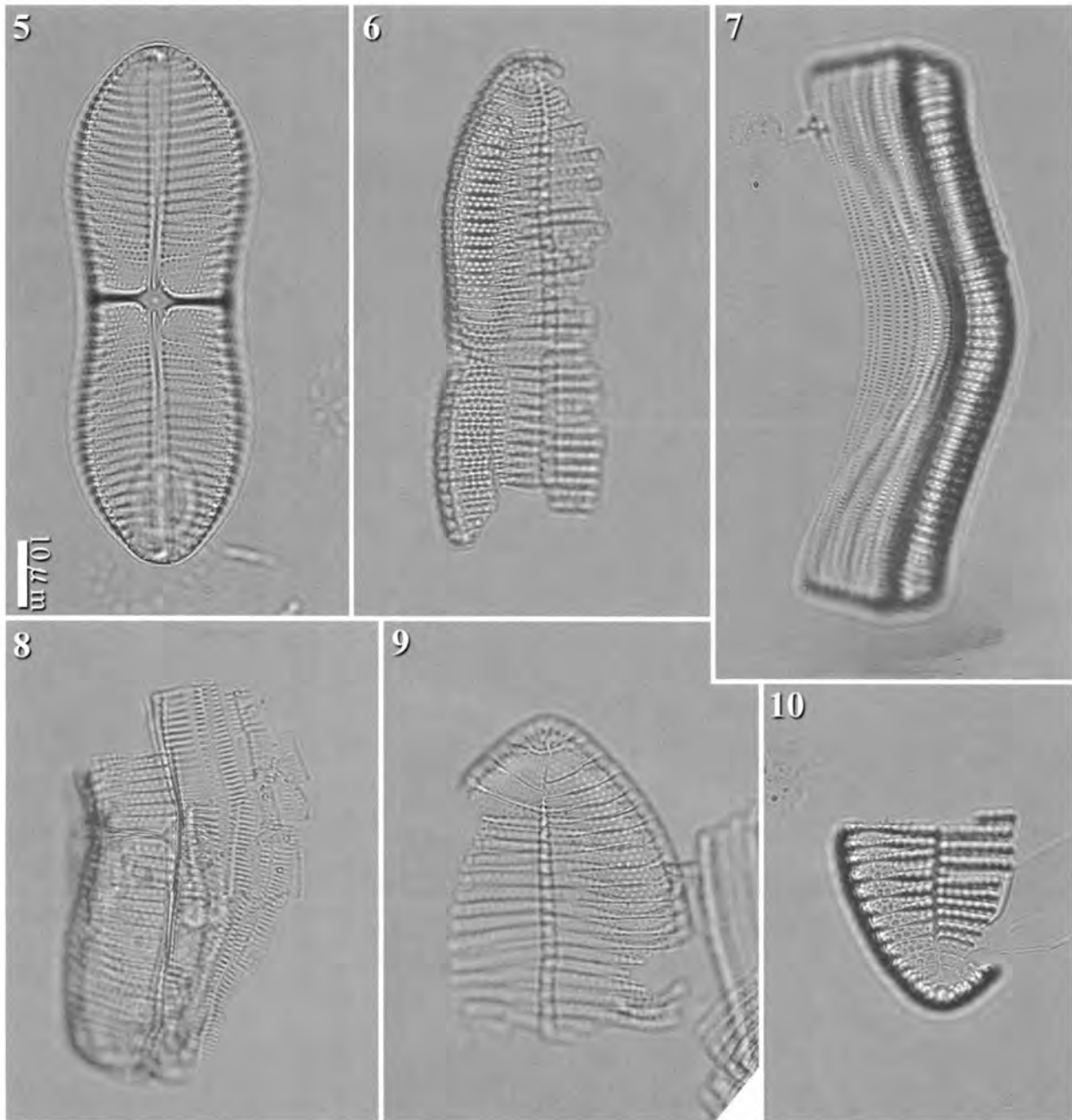
Another problem is the lack of extant material for species, *C. armillaris* and *Achnanthes longipes*; only Jürgens's material of *Diatoma vexillum* has been found in the Natural History Museum, London (Fig. 3). As mentioned above, the between these four species are confirmed here by the typification of each taxa, as for

Conferva armillaris and *C. stipitata* by the illustrations in Müller's and Smith's plate, as for *Diatoma vexillum* by the original materials which was corrected by Jürgens himself and the interpretation of that type determined by designating Jürgens's specimens as *Achnanthes longipes* type.

Diagnosis

Conferva armillaris O.F.Müller. Kungl. Svenska Vetensk. Akad. Nya Handl. 4: 84. pl. 3, f. 6. 7. 1783.

Holotype: [icon in] O.F.Müller. Kungl. Svenska



Figs 5-10. LMs of cleaned material from Jürgens. Scale bar represents 10 μ m. Fig. 5. RV face. Figs 6, 9, 10. ARVs with no terminal orbiculus. Figs 7, 8. Girdle view with RV (fig. 7), and with ARV (fig. 8), showing the convex ARV side and concave RV side.

VetenskAkad. Nya Handl. 4: 84. f. 6. 1783.

= *Conferva stipitata* Sm. in Sowerby, Engl. Bot.

23: 35. pl. 2488. 1813.

Holotype: [icon in] Sm. in Sowerby, Engl. Bot. 23:

35. pl. 2488. 1813.

= *Diatoma vexillum* Jürg. Alg. aquat. Nr. VI: 6. 1818.

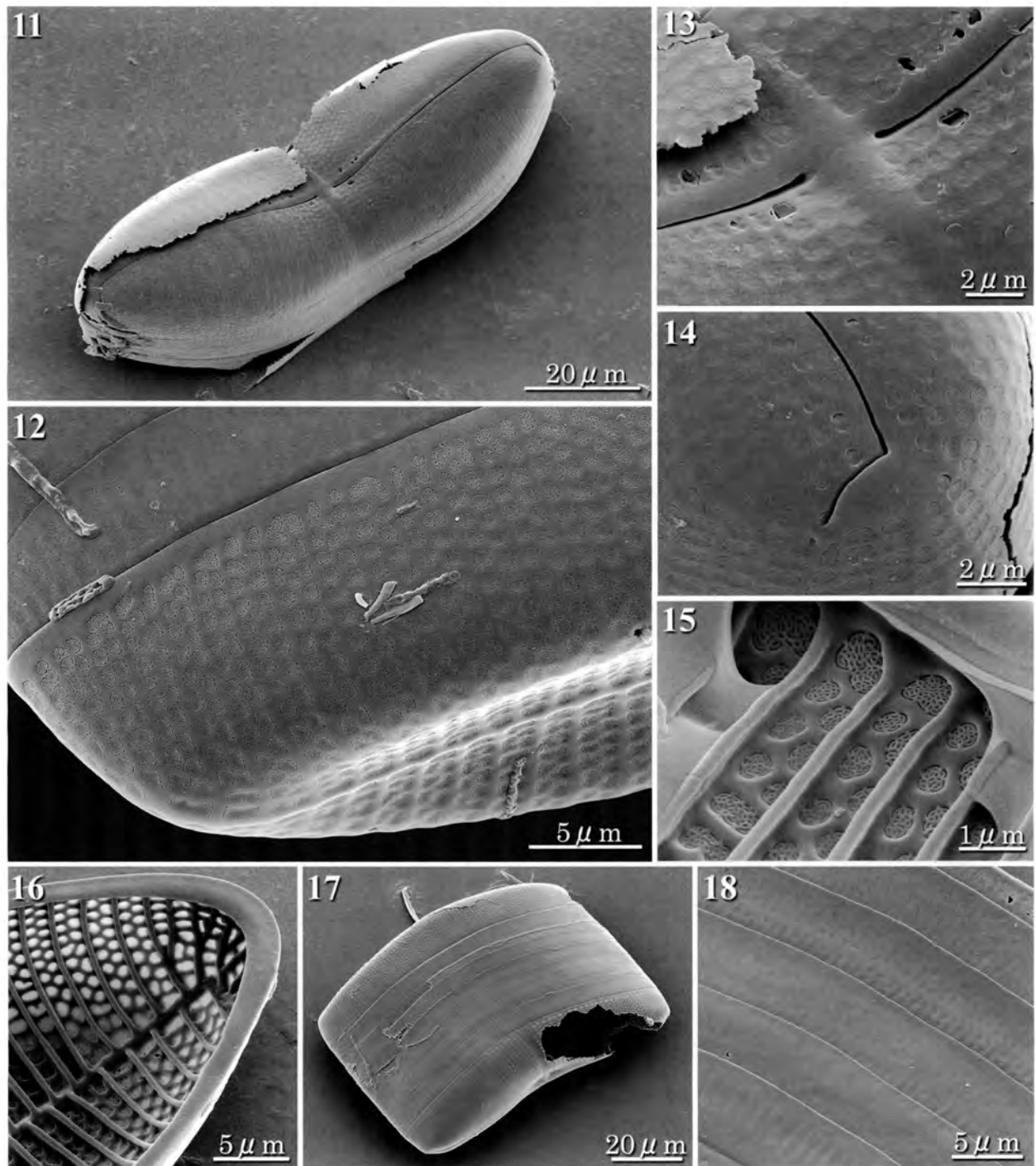
Holotype: no. BM101176 in BM

= *Achnanthes longipes* C.Agardh, Syst. Alg.: 1.
1824.

Synonym: *Achnanthes vexillum* (Jürg.) Bory. Expéd.
Morée 3(2): 336. 1832.

Lectotype: [icon in] O.F.Müller, Kungl. Svenska
Vetensk.-Akad. Nya. Handl. 4: p. 84, pl. 3, f. 6, 1783.

Epitype: Slides of *Diatoma vexillum* Jürg. (no.



Figs 11-18. SEMs from Jürgens material. Almost all individuals were broken. Fig. 11. External view of whole frustule with RV uppermost. Fig. 12. External view at terminal of the ARV; no terminal orbiculi. Fig. 13. Valve centre showing slightly expanded raphe fissures, part of the stauros. Fig. 14. Valve end with terminal fissure, curved at one side. Fig. 15. Internal view of the ARV, with sunken areolae slightly. Fig. 16. Internal view of the ARV showing costae well developing in the internal part of the ARV. Fig. 17. Girdle view, a frustule consists of valves with usually more than three copulae. Fig. 18. Expansion of view of copulae, which are occluded cribrate areolae with volae.

BM101176 & BM101177 in BM)

(lectotype and epitypes are designated here).

(≠ *Echinella stipitata* Lyngb. 1819 = *Achnanthes brevipes* C.Agardh 1824: see Toyoda *et al.* 2006)

Morphology based on Jürgens material

The specimens in Jürgens's (1818) material were examined using scanning electron microscopy (SEM), although unfortunately, almost all the individuals were broken. However, a description was possible.

Cells panduriform to linear-lanceolate (Figs 5, 6), 77 - 88µm long and 20 - 40µm wide, with 6.5 costae in 10µm on raphid valve, 5 - 6 on araphid valve. Frustule has valves often with three or more copulae (Figs 7, 8, 17, 18). Valves with bi- or triseriate striae, between costae on the both valves (Figs 11, 12); conspicuous cribrate areolae with volae present on both valves and copulae (Figs 13, 15, 18). Raphid valve concave, with stauros reaching valve margin (Figs 8, 13). Raphe fissures, filiform, formed at longitudinal centre of valve (Fig. 13); terminal fissure deflected to opposite side over valve apices (Fig. 14); direction differs in internal view. Araphid valve convex, with rapheless sternum near valve centre (Figs 6, 9, 10); no terminal orbiculous at valve ends (Figs 6, 10, 12, 16). All copulae are open ended at one pole.

A summary to solve the nomenclatural problems

We found type specimens from Jürgens material, which is suitable for the selection of epitypes, the earliest collection of *Achnanthes longipes* in existence. It is possible that this material should be referred to as a neotype, but as *Conferva armillaris*, *C. stipitata*, *Diatoma vexillum* and *A. longipes* were all referred to the same species by Agardh himself (see Fig. 4), lectotype designation seems more appropriate. Reinbold (1893) designated *D. vexillum* as *A. brevipes*, but his classification is rejected as there are biseriate striae on

the valves of *D. vexillum*. *A. brevipes* has uniseriate striae on its valve, thus, these two species are not the same taxon (cf. Toyoda *et al.* 2005a).

Achnanthes longipes have had at least three earlier names, and the earliest validly published specific epithet that applies to the taxon in question is 'armillaris'. If one was to strictly follow the rule of priority by the International code of botanical nomenclature (ICBN; Greuter *et al.* 2000), changing the name of this diatom from *A. longipes* C.Agardh to *A. armillaris* (Müll.). This nomenclatural change indicate that *C. stipitata* and *D. vexillum* would be synonyms of *A. armillaris* (*C. armillaris*), and Agardh's description of *A. longipes* would be invalid. On the other hand, *A. longipes* represents established practice; the name has been in use for well over 150 years. Introducing confusion is contrary to the intention of the ICBN; Article 14.2 states that "Conservation aims at retention of those names which best serve stability of nomenclature". Since the ICBN now allows the conservation of specific epithets (Art. 14.1), we can do that the name *A. longipes* be conserved against *Conferva armillaris*, *C. stipitata* and *Diatoma vexillum* as Agardh's name 'longipes' has been used and accepted by all subsequent authors and has always been the preferred name; 'armillaris', 'stipitata' and 'vexillum' has rarely, if ever, been used subsequently.

In this case, we just submitted the nomenclatural problem, and we still find a solution of this. This must be settled carefully. But, now, in order to fix the identity of these species epithet, our preliminary arrangement for considering the species epithet was set. We hope that our steadfast arrangement of this nomenclatural problem will be submitted as another paper near future.

Such nomenclatural problems occur in many species. Therefore, the investigation of old material, extant in herbarium throughout the world, is one of the most important activities in the study of species names and morphology.

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