Observations and typification of *Exilaria fulgens* Greville (*Fragilariaceae, Bacillariophyta*) and its transfer to the genus *Ardissonea* De Notaris, 1870

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The diatom genus *Ardissonea* De Notaris (in De Notaris & Baglietto 1870: no. 334) was named for the Italian phycologist Francisco Ardissone (1837–1910) and was often incorrectly rendered as "*Ardissonia*". Introduced on a printed exsiccata label as a combined genus and species description, it initially included a single marine species, *Ardissonea robusta* (Ralfs) De Notaris [≡ *Synedra robusta* Ralfs in Pritchard 1861; type locality: Corsica]. Subsequently, further marine, araphid taxa, mostly described previously in other genera such as *Diatoma* Bory, *Synedra* Ehrenberg or *Exilaria* Greville, *nom. rej.* were added.

Species in the genus *Ardissonea* are characterized by very long, linear valves, uniseriate striae, the absence of rimoportulae and apical porefields, the presence of a bifacial annulus (i.e., two, often marginally placed, longitudinal costae) and the occasional presence of longitudinal, perforated silica plate in the valve interior, giving the valve a chambered structure (Round & al. 1990: 420–421, Kaczmarska & al. 2020). They apparently live epiphytically exclusively on marine macroalgae and sea-grasses (see Round & al. 1990: 420).

The genus was not immediately accepted as being entirely separate from *Synedra* and was mostly employed as a subgenus of the latter. Grunow (in Cleve & Grunow 1880: 108) grouped several *Synedra* species under a common 'group' [Gruppe] named *Superbae* (which later turned to be equivalent to the genus *Ardissonea*) but commented that De Notaris had transferred one of the species (i.e., *S. robusta*) to his new genus *Ardissonea* (incorrectly rendered by Grunow as "*Ardissonia*"). Although Grunow also suggested that some other taxa should be transferred to this genus, he also expressed his doubts about the taxonomic independence of *Ardissonea*, suggesting that it was a possible later synonym of the genus *Toxarium* Bailey [*... und ist nur die Frage, ob nicht vielleicht* Ardissonia *mit* Toxarium *Bailey vereinigt werden muss.*]. According to ICN Art. 36.1 (Turland & al. 2018), a name is not validly published when it is not accepted by its author in the original publication, and hence the new combinations Grunow proposed for *Ardissonea*, are invalid. Van Heurck (1881, plates XLII [42] and XLIII [43] illustrated several of these *Ardissonea* species under *Synedra* as "*Synedra* (*Ardissonia*) *robusa* Ralfs (nec Ehr.) (*Ardissonia robusta* de Notaris)" and "*S.* (*Ardissonia*) *fulgens* (Kütz.) W. Smith (*Licmophora* Kütz.)". Hustedt (1932: 225) considered *"Ardissonia*" as a subgenus of *Synedra* listing eight taxa. Round (1979: 143) treated both *Ardissonea* (as *Ardissonia*) and *Toxarium* as 'good genera', independent from *Synedra*. Poulin & al. (1986) emended the generic description of *Ardissonea* (also as *Ardissonia*) by adding the presence of longitudinal costae on each side of the sternum as a character. In their analysis, two taxa were studied: "*A. crystallina* (C.Agardh) Grunow" and "*A. fulgens* (Greville) Grunow", two combinations invalidly introduced by Grunow in Cleve & Grunow (1880: 108, as "*Ardissonia*"); invalid because he expressed doubt as to the status of "*Ardissonia*". For the latter combination, Grunow even considered Kützing's *Licmophora fulgens* as being the original taxon because he listed his new combination as *Ardissonia fulgens* (Kützing) Grunow.

Recently, we examined the original material of *Exilaria fulgens* Greville (1827: pl. 291, figs 1, 2); this was originally described the species based on a marine sample collected by Capt. [Dr Dugald]

Carmichael (1772–1827) near Appin (Scotland). According to Williams (1988) no original material was present in **BM** (Natural History Museum, London, UK). However, during a survey of the *Synedra* taxa present in the William Smith collection (Hoover 1976), part of the Van Heurck collection (**BR**, Meise Botanic Garden, Belgium), original Carmichael Appin material from "herb. Greville" containing a nice population of *Exilaria fulgens* was discovered (Fig. 1). In 1844, Kützing transferred *Exilaria fulgens* to the genus *Licmophora* as *L. fulgens* (Greville) Kützing (Kützing 1844: 123, pl. 13: fig. 5) clearly indicating *Exilaria fulgens* Greville as basionym for the species. William Smith (1853) subsequently transferred the species to the genus *Synedra* as *Synedra fulgens* (Greville) W.Smith (1853: 74, pl. 12: fig. 103) followed a couple of years later by the invalid transfer Grunow made in Cleve & Grunow (1880: 123) to the genus "*Ardissonia*". Based on the analysis of the genus *Synedra sensu stricto* in Williams & Balasubramanian (2021), it is unlikely that *Exilaria fulgens* should remain in the genus *Synedra* due to the absence of apical pore fields and rimoportulae, the presence of the bifacial annulus, and the presence of open, chambered striae, features characteristic of the genus *Ardissonea* (Poulin & al. 1986, Round & al. 1990, Kaczmarska & al. 2020). The species differs, however, slightly from the *typus generis*, *Ardissonea robusta*, in lacking the large longitudinal, internal plate spanning the entire valve length (see Round et al. 1990; 420–421).

Here, we document on the morphology of *Exilaria fulgens* using light and scanning electron microscopy and effect a transfer the species to the genus *Ardissonea*. The original Greville material of *Exilaria fulgens* from the W.Smith collection (**BR**) is designated as the lectotype.

Ardissonea fulgens (Greville) Kanjer, Kusber & Van de Vijver, *comb. nov.* (Figs 1–16)
Basionym: *Exilaria fulgens* Greville, *Scottish cryptogamic flora, ...* Vol. 5: pl. 291, 1827.
Synonyms: *Diatoma fulgens* (Greville) Greville, *Hooker's British flora:* 407, 1833, *Licmophora fulgens* (Greville) Kützing, *Die Kieselschaligen Bacillarien oder Diatomeen:* 123. 1844, *Synedra fulgens* (Greville) W.Smith *A synopsis of the British Diatomaceae* 74, pl. 12: fig. 103, 1853, "*Ardissonia fulgens*" Grunow in Cleve & Grunow 1880, *nom. inval.*
Lectotype (here designated): **BR-**4678, slide prepared from sample *Exilaria fulgens*, Appin, Scotland; original Greville material collected by Carmichael and found in the William Smith collection, part of the Van Heurck collection (**BR**).
Registration: http://phycobank.org/102895
Description: Frustules in girdle view rectangular, solitary. Valves linear with weakly inflated central part and broadly rounded, weakly subcapitate apices. Marginal spines absent. Valve dimensions (n=20): valve length 330–346 µm, width 9.5–11.5 µm. Sternum absent at the apices, present in the rest of the valve, very narrow, linear (Figs 5–8). Central area absent. Internal chambered structure absent. Longitudinal costae [= bifacial annulus] entirely positioned at the margins. Striae uniseriate, parallel, spanning the entire valve width at the apices, 15–16 in 10 µm. At the valve face/mantle junction, striae interrupted by thick hyaline line entirely surrounding the valve margin (Figs 11, 12). Near the middle of the valve, hyaline zone undulating towards the sternum (Figs 9–10, 12–13, arrows). At the apices, striae more irregular, radiate following the rounded apices (Figs 11, 14). Internally, striae clearly chambered bordered by narrow, costa-like structures, irregularly bifurcating (Fig. 14). Small pseudosepta present (Fig. 14). Rimoportulae and apical pore fields absent (Figs 11, 14). Girdle bands closed, rather broad, perforated with fimbriate pars interior (Figs 15–16).
Nomenclatural note: Greville (1827) used material Carmichael provided under the unpublished designation "*Echinella fulgens* Car." (Fig. 1, also noted in the original published description). Greville (1827) combined the epithet with the generic name *Exilaria* when publishing the species validly (ICN Art. 38.7). *Exilaria* is a genus name later rejected in favour of *Licmophora* C.Agardh, *nom. cons*. Although the genus name *Exilaria* is not available for use, the species name is as a basionym according to ICN (Art. 56.1 Note 1).

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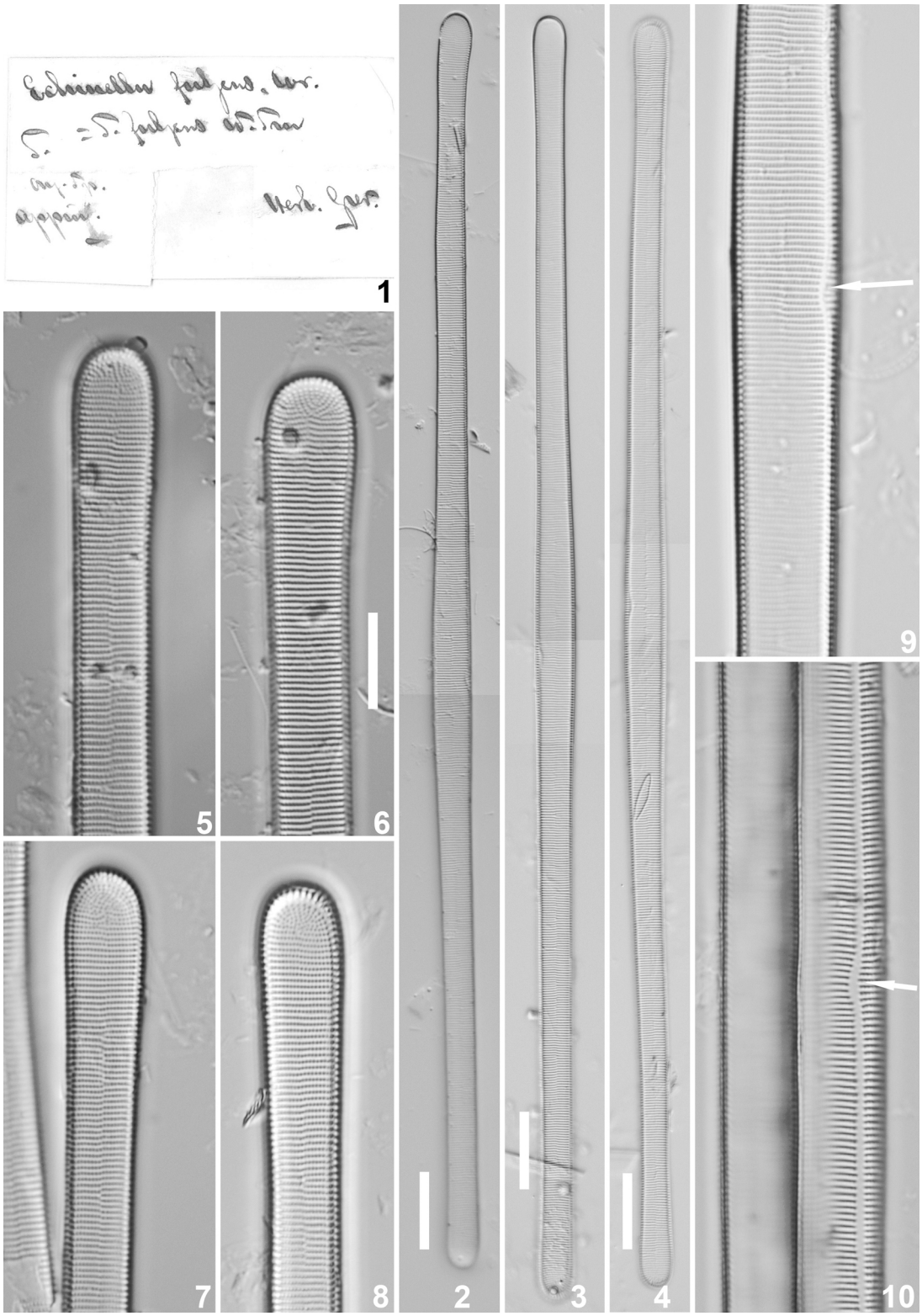
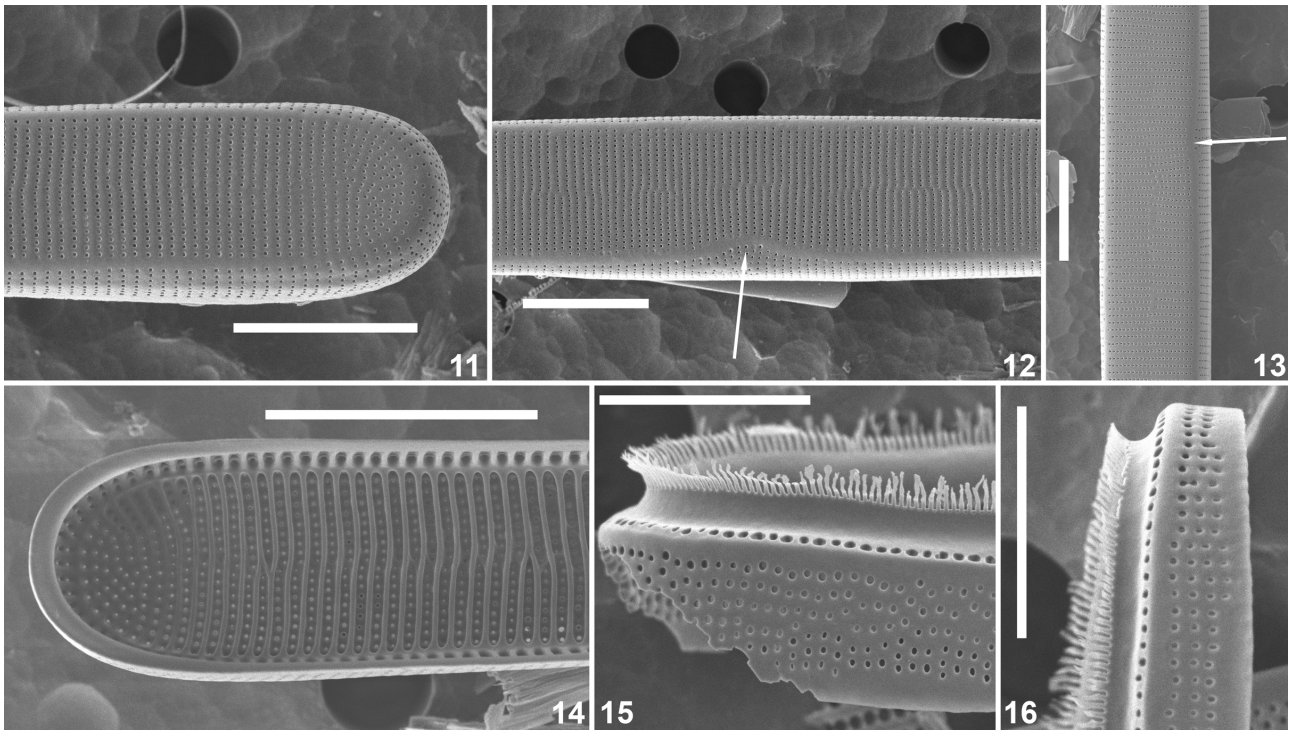


Figs 1–10. ***Ardissonea fulgens*** (Greville) Kanjer, Kusber & Van de Vijver, *comb. nov.* LM pictures taken from the lectotype material (Appin, Greville original material, **BR**-4678). **Fig. 1.** Original Greville sample of *Exilaria fulgens* conserved in the William Smith collection. **Figs 2–4.** Three complete valves photographed at lower magnification. **Figs 5–8.** Four LM photographs of apices showing the continuous striation and the irregular, radiating striae at the apices. Figs 9–10. Two LM photographs showing the middle part of the valves with the undulating hyaline line (arrows). Scale bar = 10 µm for figs 5–10, 20 µm for figs 2–4.



Figs 11–16. ***Ardissonea fulgens*** (Greville) Kanjer, Kusber & Van de Vijver, *comb. nov.* SEM pictures taken from the lectotype material (Appin, Greville original material, **BR**-4678). Fig. 11. SEM external view of a valve apex showing the radiating striae at the apex and the absence of a sternum. **Figs 12–13.** SEM external view of the middle part of the valve with the sternum and the undulating hyaline zone (arrows). **Fig. 14.** SEM internal view of a valve apex showing the chambered striae with the bifurcating costae, the small pseudoseptum and the irregularly radiating striae at the apex. **Figs 15–16.** Two ends of the same copula showing its closed nature, the fimbriate pars interior and the broad, perforated pars exterior. Scale bar = 10 µm except for figs 15 & 16 where scale bar = 5 µm.