Cosmarium tasiussaqense R. Lenzenweger – rediscovered in the Outer Hebrides

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Abstract

During the repeated sampling of an area of flooded machair (South Uist, Outer Hebrides) an unfamiliar *Cosmarium* was discovered which was superficially similar to *C. lapponicum* O, Borge 1913. Further research revealed that it was *C. tasiussaqense* R. Lenzenweger. This species was described from Tasiusaq Island within Upernavik Archipelago, Greenland from a site with a similar ecology to that on South Uist.

Introduction

In 2020 I sampled an area of flooded machair in the Outer Hebrides and found a *Cosmarium* that was unknown to me.

> *Machair is a Gaelic word meaning fertile, low-lying grassy plain, formed over centuries by wind-blown, calcareous, shell-sand forming stable fixed dune systems. A rare and unique habitat occurring on the exposed west-facing shores of Scotland and Ireland. It supports a rich and colourful flora in summer, which is grazed down in the autumn. Being low-lying, it readily floods in late autumn through to early spring, with ample rainfall.*

To gather more data, I resampled the area over the following 3 years. The pH and conductivity range over seven collections is: pH 7.9–8.6; conductivity: 424–505 µS/cm. (fig. 1).

In consultation with Frans Kouwets, it was decided to regard it as an undescribed species. While making comparisons with the superficially similar

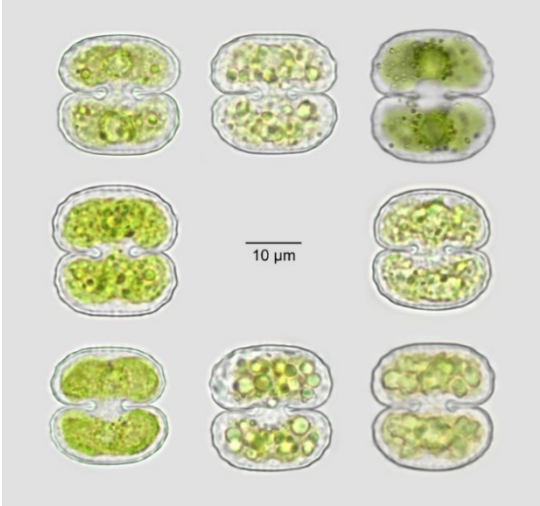

Figure 2. A montage of *C. tasiussaqense* in face view. Photo © Chris Johnson.

Cosmarium lapponicum O. Borge 1913, I came across *C. tasiussaqense* and was struck by its similarity to my taxon. I consulted Frans again and he agreed that it was indeed the same.

Description (figs. 2-5)

Cells small, about as long as broad, the sinus linear with a slightly dilated apex then closed for 60 percent of its length before opening widely. Semicells are trapeziform with broadly rounded basal angles. Each upper lateral angle is punctuated with four widely-spaced intramarginal granules, starting at the apical angle and finishing below the

Figure 1. Flooded machair at Range 2, South Uist. Photo © Christine Johnson.

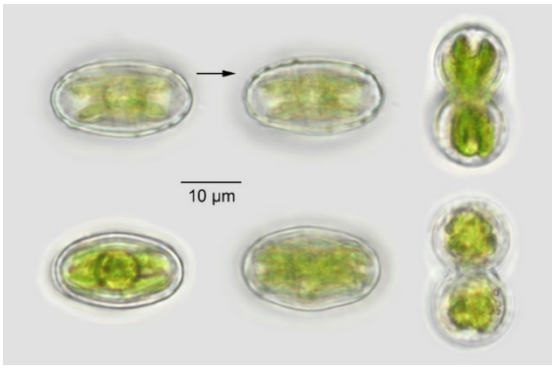

Figure 3. A montage of *C. tasiussaqense* in side and apical view. Photo © Chris Johnson.

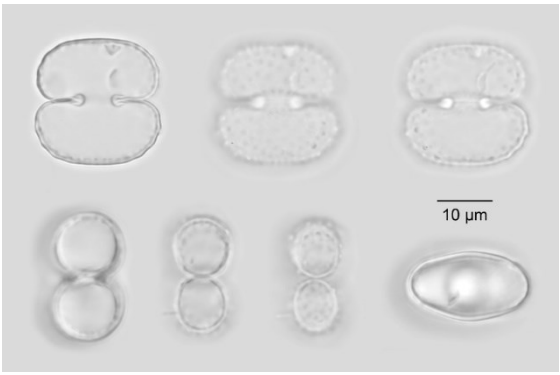

Figure 4. A dead cell of *C. tasiussaqense* in three views, showing secondary granules and mucus pores. Photo © Chris Johnson.

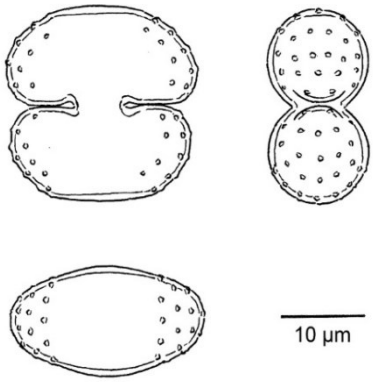

Figure 5. Drawing showing frontal, lateral and apical views of a single vegetative cell of *C. tasiussaqense*. © Frans Kouwets.

median line, giving an undulate outline. There is a secondary series of granules running parallel (seen best in empty cells). The apex is smooth and slightly convex. Empty cells in face view show a series of fairly random pores. The broadest point of the semicells is close to the median line. Semicells in side view are orbicular showing a series of granules in three loose lines. Apical view is elliptic with slight timidity with the sides showing a series of granules in loose lines. Chloroplast axile with one central pyrenoid. Zygospore unknown. Cell dimensions: L. 21.6-24.3 µm; B. 21.2-23.1 µm; Is. 6.2-7.5 µm; Th. 12.3-14.3µm; L./B. 0.96-1.11.

Herbarium

A fixed natural sample (plankton net through shallow flood-water), collected by C.D.N. Johnson, 17 October 2023, has been deposited at the Natural History Museum, London, Accession No. BM001243474.

Locality

Ministry of Defence (MOD) South Uist Missile Range 2, Geirinis, South Uist, Outer Hebrides, Scotland, UK. Lat: 57.360624N; Long: 7.400865W.

Etymology and occurrence

C. tasiussaqense is named after the discovery site: Tasiusaq (modern spelling), located on Tasiusaq Island within Upernavik Archipelago, a vast collection of small islands on the west coast of Greenland facing Baffin Bay. This original find occurred in the realm of the Nearctic. The South Uist find is the second record worldwide and the first for the western Palearctic.

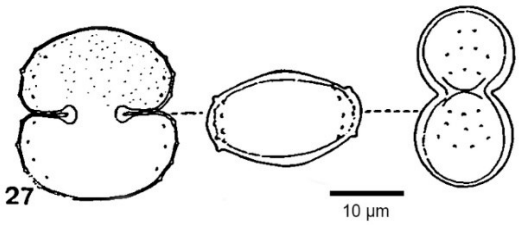

Figure 6. *C. tasiussaqense* from Lenzenweger (1989).

Discussion

Lenzenweger (1989: 105) doesn't make reference to other taxa for comparison, and for the habitat he records: *zona ripae lacus*. Unfortunately, there is no mention of the flora (aquatics) or the pH. Lenzenweger's drawing (l.c., pl. 2: 27) clearly shows the four intramarginal granules and a parallel series within, also the convex apex (fig. 6).
A similar cell in outline profile is *Cosmarium tetrachondrum* Lundell 1871 (Lundell l.c.: 38, pl. 3: 2). He describes and illustrates the cell with prominent supra-isthmial granules and a smooth cell-wall, but failed to mention the characteristic intramarginal granules. His dimensions: L. 20.5 µm; B. 2 3-26.3 µm; Is. 6-7 µm; Th. 10.7 µm. Nordstedt (1873: 17), commenting on Lundell's nominate form, notes that at the edges, you notice hints of small elevations on the cell membranes. From Sweden Borge (1895: 18) also described a form with slightly wavy sides to the semicells. Neither author provided a drawing. Eichler (1896: 126) described a forma *verrucosum* from Poland, which is truncate in face-view, with exaggerated wavy sides and the two characteristic supra-isthmial granules in an atypical position some way from the isthmus. Dimensions: L.

21 µm; B. 24 µm; Is. 5 µm; Th. 12 µm. (l.c., fig. 19). Since Eichler, many others have described and illustrated unnamed forms including: Borge (1906: 38, pl. 2: 25); Grönblad (1921: 34, pl. 7: 4-6); Huzel (1937: 96, pl. 10: 20-22); Coesel (1991: 56, pl. 9: 29). (See composite fig. 7).

Finally, a taxon showing some similarity is *C. lapponicum* O. Borge (1913: 19, pl. 1: 14). This is smaller than *C. tasiussaqense* with virtually no overlap in size. It has a truncate apex and minute intramarginal granules: these granules are variable in number and position. Indeed, Borge (l.c., pl. 1: 15) describes *C. lapponicum* var. *undulatum* with slightly more undulate sides, but later finds showed intermediates between the two; therefore, it is generally regarded as synonymous (fig. 8). This is another rare species with a seemingly Arctic-alpine distribution.

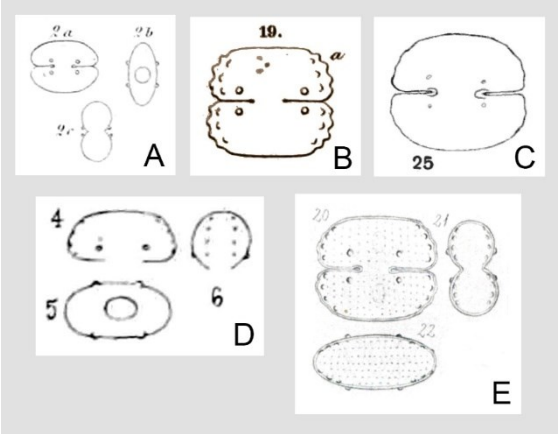

Figure 7. A montage of *C. tetrachondrum* formae. (A) from Lundell (1871); (B) from Eichler (1896); (C) from Borge (1906); (D) from Grönblad (1921); (E) from Huzel (1937).

Conclusion

C. tetrachondrum and its various forms present a similar outline to *C. tasiussaqense* with undulate lateral sides but also support characteristic supra-isthmial granules, which are not a feature of *C. tasiussaqense.* C. *lapponicum,* as noted above, has more distinct differences. It is also worth noting that the above-mentioned taxa occupy mesotrophic habitats that are on the acidic side of neutral. From the little we know about *C. tasiussaqense*, it favours atmophytic habitats that experience periods of desiccations and a pH that has a slight to pronounce alkalinity. This suggests a different ecology. *C. tasiussaqense* is a well described species with no known taxa to cause confusion with. Although *C. tasiussaqense* seems to be a very rare Arctic-alpine species, it is still worthwhile to keep this species in mind. The species may also be found elsewhere in north-western Europe, for example, along the coast in more or less calcareous dune valleys that are flooded in winter.

Acknowledgement

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