Cosmarium *druimnahimrichense* C.D.N. Johnson spec. nov.

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Abstract

Cosmarium druimnahimrichense is currently only known from Loch Druim na h-Imrich, near Loch a' Charnain, South Uist, Outer Hebrides (also known as the Western Isles; see figure 1 for geographical position west of the Scottish mainland). In size and morphology, there are some similarities with *C. subspeciosum* Nordstedt 1875, however that species only has one pyrenoid per semicell and other differences noted below. Other taxa with some similarities are discussed but no taxa were found to suggest a close relationship. Therefore, a new name has been chosen to avoid further taxonomic confusion.

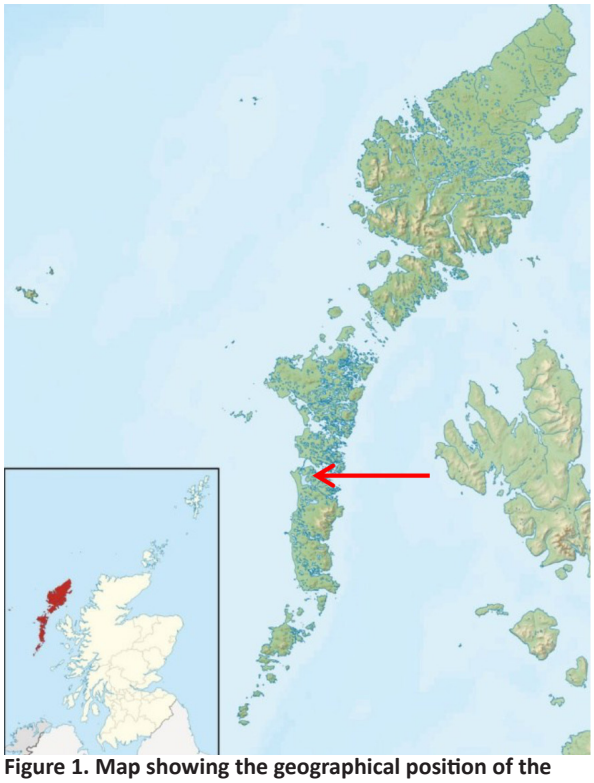

Figure 1. Map showing the geographical position of the Outer Hebrides (inset) and the sample site. Ordnance Survey data © Crown copyright.

Introduction

It was a cold March morning and still early in the season for collecting desmids. The vegetation had died down leaving nothing identifiable. The area I chose to sample was a shallow, silty, branch of a larger loch complex. The whole area is part of the scattered settlement of Loch a' Charnain, South Uist, Outer Hebrides (figs. 2–4). It comprises lowland moor and peat bog. Much peat has been extracted over previous decades and is now abandoned leaving many shallow depressions. This has proved a productive collecting area. With a high rainfall, the pH is usually just slightly acidic. The dominant taxon in the March collection was *C. polymazum* (C.F.O. Nordstedt) F. Wolle 1884 and numerous cells of a desmid I didn't recognise. This is the subject of this paper.

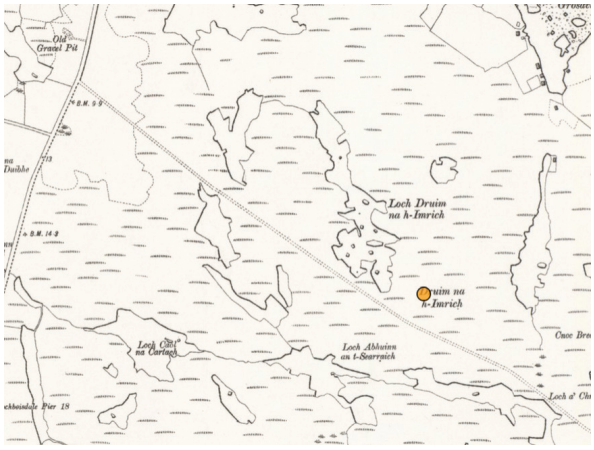

Figure 2. 1888-1913 map of Druim na h-Imrich. Reproduced with the permission of the National Library of Scotland.

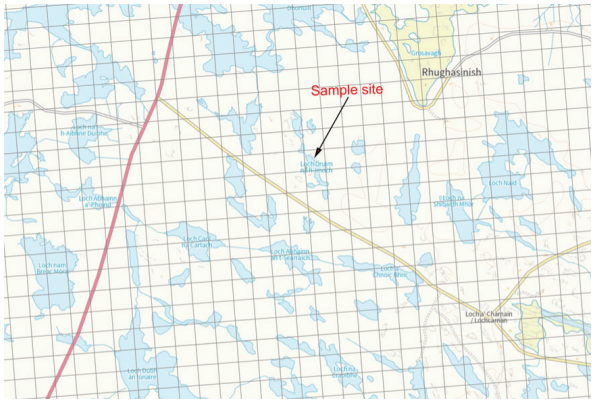

Figure 3. Map of the Loch a' Charnain area. © Ordnance Survey.

Figure 4. Sample site: part of Loch Druim na h-Imrich. Sample area outlined. © Christine Johnson.

Taxonomic account

Cells medium-sized, about 1.35 times as long as broad, broadly elliptic in outline, sinus linear and slightly dilate at the apex. Semicells broadly semicircular, basal angles tightly rounded, sides slightly convex and crenate converging upwards and blending easily into the small truncate apex. The semicell's margin has 20–22 crenae;

the cell-wall is ornamented with five concentric radiating series of granules, crossing the sides, the outer two in face view are geminate. There are two noticeable supraisthmial granules, above these is a circular group of granules in five vertical rows, the middle three comprise 6 granules that become adjacent farther away from the isthmus. The outer rows comprise 3 or 4 granules. Between these granules and the concentric series is an unsculptured zone. Side view of the semicell is subcircular with the basal half protruding (resembling an eggcup), apical view elliptic with a pronounced central protuberance. Chloroplast axile with two pyrenoids.
Cell dimensions: L: 47.1–52.6 µm; B: 36.2–39.0 µm; Is: 12.6–13.8 µm; Th: 26.0–26.9 µm; L/B: 1.28–1.39 (figs. 5-6).

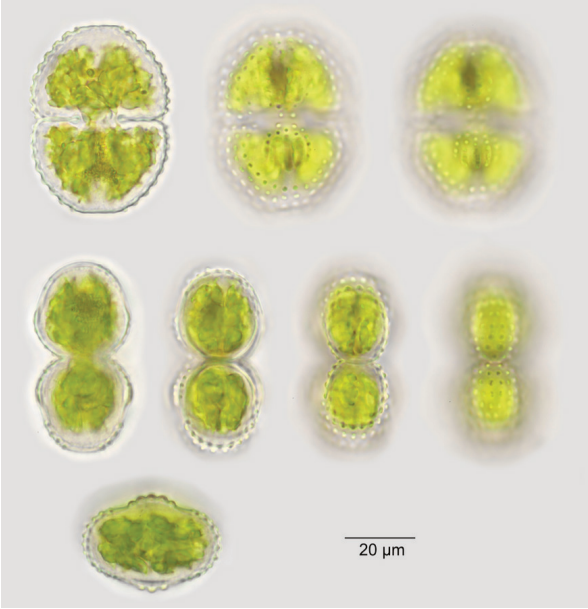

Figure 5. A montage of a live cell of *C. druimnahimrichense*. © Chris Johnson.

Type
Fixed natural sample (plankton net through the shallow, silty, end of the loch), collected by C.D.N. Johnson, 8 March 2024, deposited at the Natural History Museum, London, Accession No. BM015671241 (Holotype represented by figure 6).

Type locality
UNITED KINGDOM. Loch Druim na h-Imrich, near Loch a' Charnain, South Uist, Outer Hebrides. Lat: 57.379830N Long: 7.328386W.

Etymology
Named after Loch Druim na h-Imrich and the tiny hamlet of the same name, as they appear on the 1888-1913 Ordnance Survey Map (fig. 2). It translates as a 'byway for travellers' and relates to the track that appears alongside the Loch on the same map. On a modern map (fig. 3) this track has become a single-lane road that goes to the nearby scattered settlement of Loch a' Charnain, South Uist, Outer Hebrides.

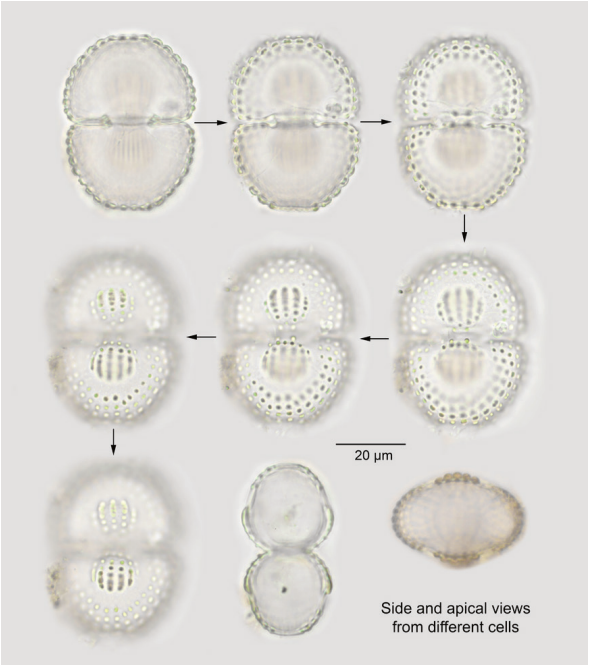

Figure 6. A montage of a dead cell of *C. druimnahimrichense*. © Chris Johnson.

Occurrence
Only known from a shallow, silty, oligotrophic loch. Samples were taken using a plankton net along the margins. No identifiable vegetation was noted in March. The pH: 6.7, conductivity: 197 µS/cm.

Discussion
C. druimnahimrichense mostly resembles the *C. subspeciosum* Nordstedt 1875 complex in its outline shape and size (fig. 7) and possibly its habitat requirements. However, there are some significant differences tabulated below.

C. subspeciosum	*C. druimnahimrichense*
One pyrenoid per semicell	Two pyrenoids per semicell
Smaller size	Larger with virtually no overlap
Sinus with no dilate apex	Sinus with a dilate apex
16 crenae per semicell visible in face-view	20–22 crenae per semicell
Central protuberance of small random granules	Central protuberance of pronounced organised granules
No supraisthmial granules	Two supraisthmial granules

As part of the *C. subspeciosum* complex, Nordstedt (1870: 213, pl. 3: 24) described and illustrated *C. pulcherrimum* from Brazil. The drawing is rather sketchy and has a remarkably narrow isthmus. It bears little comparison with the South Uist desmid. Another cell, also from Brazil, is *C. binum* Nordstedt 1880. His original description (1880: 121) was of a large cell with two pyrenoids per semicell and cell dimensions: L: 86–90 µm; B: 70–72 µm; Is: 20–21 µm; Th: 42–46 µm; much larger

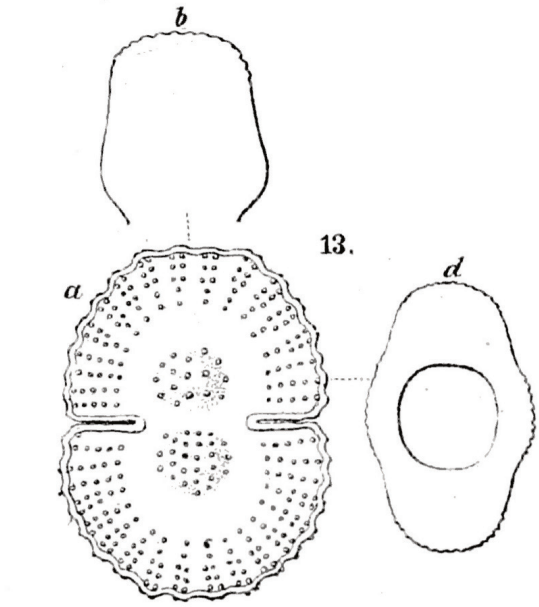

Figure 7. Drawing of *C. subspeciosum* from Nordstedt 1875.

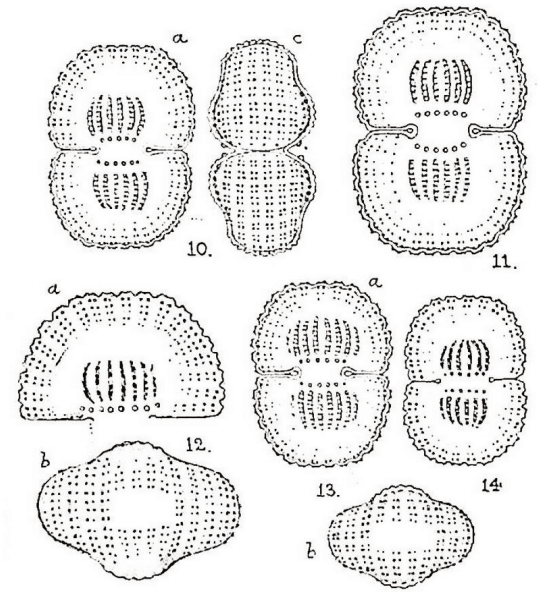

Figure 8. Drawings of *C. binum* from West & West 1908.

than the South Uist desmid. These Brazilian taxa may prove to be exclusively tropical.

From Poland Raciborski (1889: 93, pl. 5: 25) described and illustrated a much smaller (unnamed) form of *C. binum*. It has a more pronounced central group of vertical granules and a horizontal row of 8 supraisthmial smaller granules. This is most likely not related to *C. binum*. West & West (1908: 246) stretched the taxonomic boundaries of *C. binum* further with cell dimensions: L: 41–90 µm; B: 30–59 µm. (fig. 8). They include a modified image of Raciborski's form. Their drawings are consistent in presenting 6-8 vertical rows of granules plus a supraisthmial horizontal row of granules that almost certainly represent more than one species. None displays the two supraisthmial granules that are a consistent feature of the South Uist taxon.

A little-known taxon, remarkably briefly described by West (1892: 729) as *C. supraspeciosum* var. *emarginatum,* measuring 61×52 µm, bears superficial resemblance to the South Uist cell. From West's drawing (l.c., pl. 9: 24) of a semicell it shows 28 crenae in face view and a vague central area of random granules; it has two pyrenoids and the sinus is open at the apex. In their later flora, West & West (l.c.: 144) have synonymised it with their *C. quadrifarium* f. *polystichum* (as *polysticha*). In comparison with *C. druimnahimrichense* it has too many crenae, is larger and lacks the structured protuberance and the two distinctive supraisthmial granules to warrant further consideration.

Conclusion

The South Uist taxon has been initially compared with the superficially similar *C. subspeciosum* but there are too many differences (tabulated above) to warrant further consideration. *C. binum* was considered based on the central protuberance, which had some similarity with the taxon in question. Nordstedt's original concept (1880: l.c.) is of a large cell, almost twice the size of the South Uist cell, which immediately excludes comparison. By 1908 West & West (l.c.) included a much broader range of sizes, which suggests more than one taxon is involved. Looking at their plate (l.c., pl. 88: 10–14, our fig. 8) there is consistency in 6–8 vertical rows of granules and a horizontal row of smaller granules above the isthmus. *C. druimnahimrichense* has 5 vertical rows of granules and lacks the horizontal row. Instead, it has two prominent granules close the isthmus. The author sees no reason to associate the South Uist taxon with the foregoing taxa and has chosen a name to avoid any subsequent confusion.

Acknowledgements

My thanks to Frans Kouwets for drawing my attention to the little-known taxon *C. supraspeciosum* var. *emarginatum*, and to the editorial panel for helpful comments and suggestions, which has added more clarity to the paper.

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