

THE OCCURRENCE OF SPINES ON *CORONASTRUM AESTIVALE* (CHLOROPHYTA)

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The study on which this manuscript was based
was well under way when Dr P. Timpano unexpectedly died, 24 April 1987.

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ABSTRACT - SEM observations of *Coronastrum aestivale* reveal the presence of long, tapered spines of exfoliated parent cell wall sections. One and sometimes two spines occur on each wall remnant. This new feature may be taxonomically significant within the family Scenedesmaceae.

RÉSUMÉ - L'examen au MEB de *Coronastrum aestivale* révèle la présence de soies longues et effilées portées par les fragments de paroi desquamée de la cellule parentale. Une et parfois deux soies se rencontrent sur chaque reliquat pariétal. Ce nouveau caractère peut être significatif dans la famille des Scenedesmaceae (traduit par la Rédaction).

INTRODUCTION

The genus *Coronastrum* was described by Thompson (1938) with *C. aestivale* as the designated type. Later Fott (1946) added the species *C. ellipsoideum* and in 1950, Thompson described *C. lunatum* emending the genus to include the latter two species: «Coenobia are composed of four cells arranged in a flat plate at the angles of a square, remote from one another but connected by strands of cell wall substance, each cell contains one parietal chromatophore with a pyrenoid. Reproduction is by autospores.» (Thompson, 1950).

In August 1983, a plankton collection was made from a permanent pond in Lawrence, Kansas. The waters were brown-green with blooms of *Volvox carterii* f. *weismannia* (Powers) Iyengar, *V. spermatozophora* Powers, *Peridiniopsis polonicum* (Wolo.) Bour., and other unidentified gymnodinoids. *Coronastrum aestivale* was present in low numbers and upon SEM examination a new feature, long, tapered spines, was observed.

MATERIALS AND METHODS

Formalin preserved material of *C. estivale* collected by Thompson (1950) was obtained from the Kansas University Herbarium to compare with our field sample

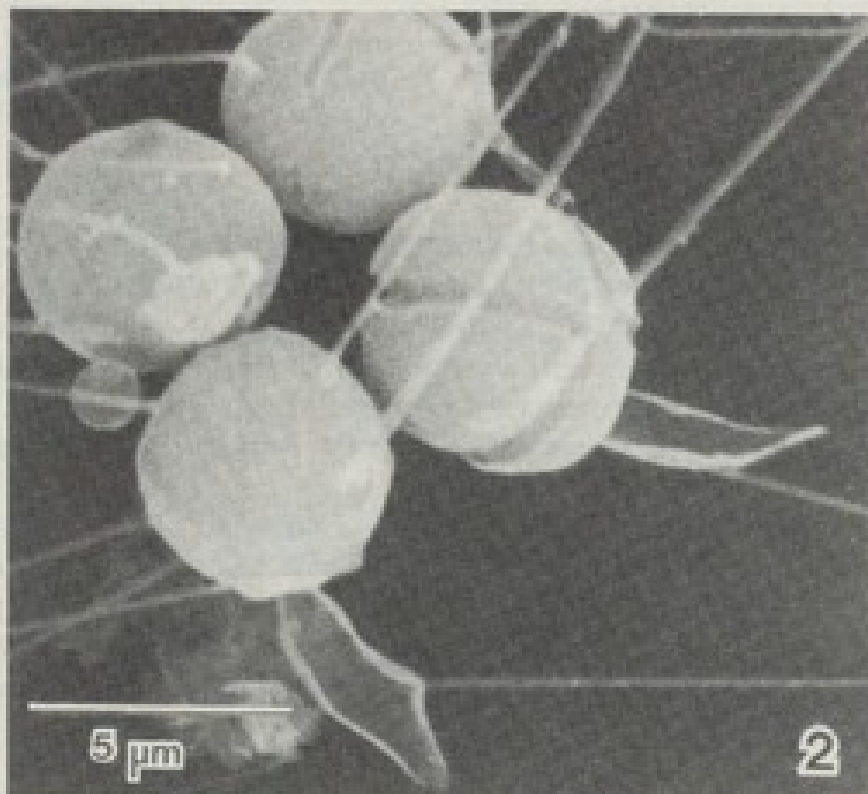
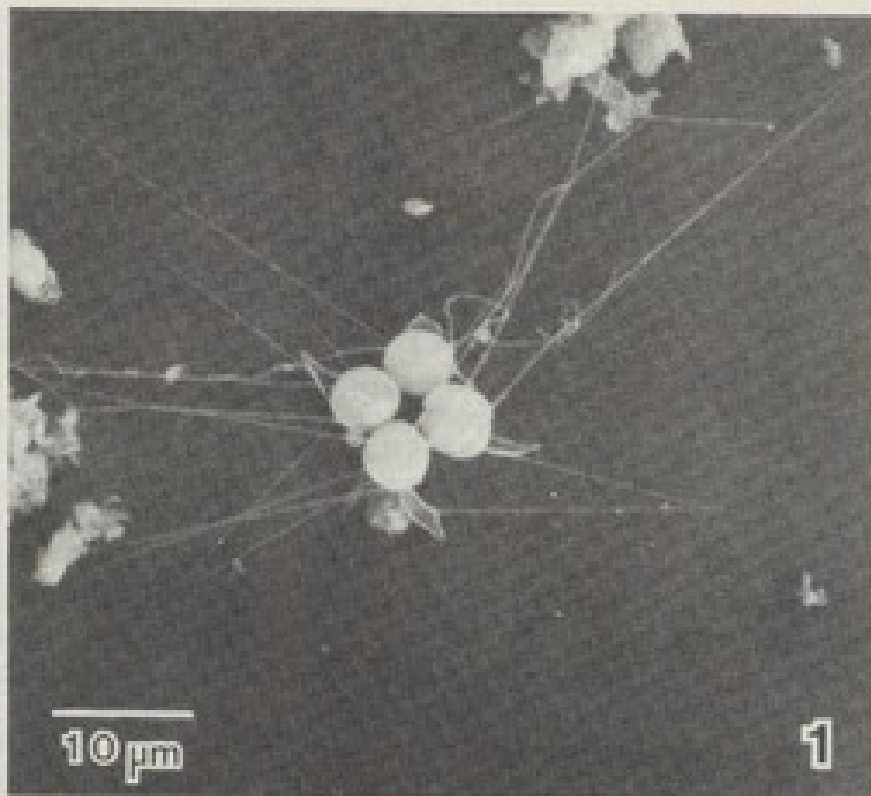


Fig. 1, 2: *Coronastrum aestivale*. Fig. 1: Four-celled colony with numerous spines. Note the four quarter sections of the original parent cell wall. Fig. 2: Spines occur on exfoliated wall remnants and on the cell walls of dividing cells.

which was preserved in 2% final concentration glutaraldehyde buffered with pond water. Both samples were rinsed in Carefoot medium (Carefoot, 1968), adhered to pre-treated cover slips (Timpano & Pfiester, 1985), post-fixed with 1% buffered OsO_4 , washed with water, dehydrated in ethanol, critical point dried in liquid CO_2 , mounted on stubs, coated with gold using a sputter coater, and examined with an ETEC Auto Scan or JEOL 840A.

RESULTS AND DISCUSSION

In the preserved field sample, only 4-celled coenobia of *C. aestivale* were observed (Fig. 1). Each coenobium is planar with equidistant cells circumscribing a large, open central area. Each cell is connected but not appressed to its immediate neighbor by cellular material (Thompson, 1938, 1950) and every cell retains a portion of mother cell wall. The cells average 5 μm in diameter. No gelatinous matrix is present. Autosporic reproduction results in 4 daughter cells. As a cell cleaves, the parental wall splits into 4 equal sections (Fig. 2). Each wall section becomes free at the apex, exfoliates and enrolls along its longitudinal edges. When daughter cells separate from one another, each inherits one of the quarter sections. Now these broadly lanceolate wall remnants are attached only at the base of each autospore. One or two spines are observed attached in a row along the central longitudinal line of the wall remnant. Each spine is widest at its base, 0.2-25 μm and slightly tapers along its 30-50 μm length ending in an acute point (Figs. 1, 2). Newly divided cells already possess spines before the cells separate. Development of spines is not known, although they must mature before exfoliation begins. The presence of spines was not noted on the three described species (Thompson, 1938, 1950; Fott, 1946). This feature may not resolve with LM bright-field optics without special treatment.

Formalin preserved type material (Thompson, 1950) was examined with the SEM. *Coronastrum* coenobia were present, but covered with debris. Attached spines were not observed, but it is difficult to know the effect the 35 years in formalin has had on these fine structures.

Coronastrum is placed in the family Scenedesmaceae near *Crucigenia*, *Tetrastrum* and *Hofmannia* which it resembles in gross morphology and reproduction (Thompson, 1938, 1950). *Crucigenia* and *Tetrastrum* are coenobia of 4 appressed cells with no obvious attached parental wall remnants and are generally delimited by the presence of spines (*Tetrastrum*) or their absence (*Crucigenia*) (Ahlstrom & Tiffany, 1934). Coenobia of *Hofmannia* differ from *Coronastrum* by the presence of a copious gelatinous matrix which surrounds the cells. Another family member, *Scenedesmus*, has spines and fine structures called bristles. The ultrastructure observations of the *Scenedesmus* terminal spine shows a complex structure of closely aggregated spikelets (Staehelin & Pickett-Heaps, 1975). Its bristles, up to 20 at a time, issue from specialized pores on the wall. These bristles can be extremely long (ca. 100 μm) and are directly comparable to either the aggregate spikelet structure of *Scenedesmus* or its bristles. Spines of *Coronastrum* are simple with no compound structure and they do not issue from a specialized pore region. These spines do not dissolve in ethanol.

In summary, the presence of fine tapering spines attached to the exfoliated parent cell wall of *C. aestivale* is a feature new to the genus. While their presence may be of taxonomic importance, critical observations of the two remaining species are necessary before emending the generic description.

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