

CHRYSOSTEPHANOSPHAERA HYALOCYTOBIA SPEC. NOV. (CHRYSOPHYCEAE)

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SUMMARY

Description of *Chrysostephanosphaera hyalocytobia* n.sp. from the Netherlands living solitarily inside the hyalocytes of submerged *Sphagnum* species.

1. INTRODUCTION

The first species of the genus *Chrysostephanosphaera* was depicted by STEIN without recognising it as a new taxon, since he considered it to represent a resting stage of what is nowadays called *Chromulina flavicans* (STEIN 1878, Taf. XIII fig. 19a-g, as *Chrysomonas flavicans* [sic!]). He did not mention the globules in the mucilaginous matter surrounding the cells, nor did he report their occurrence in the *Spongomonas* and *Phalansterium* species described in the same work. SCHERFFEL (1911, pg. 307 sqq.) recognised this organism as a new taxon, *Chrysostephanosphaera globulifera* and assumed that the globular bodies are excretion products of the kind found in the two species of *Lepochromulina* he described in the same paper.

C. globulifera was recorded several times (DOFLEIN 1923; BEIJERINCK 1926, 1932; HUZEL 1936; SKUJA 1939) but it was not studied in detail until 1949, by GEITLER. He pointed out that each cell bears a single chromatophore (instead of two as mentioned previously) and that the globular bodies were living organisms, of as yet uncertain taxonomic position, which he took for symbionts. In 1956 MARGALEF (fide BOURRELLY 1957, pg. 375) described a second species, *C. splendens* which has four chloroplasts per cell.

In the course of drawing up an inventory of benthic Chrysophyceans in a locality near Staverden (Gelderland) an undescribed taxon was met that most likely also belongs to this genus.

2. MATERIAL AND METHODS

Spirit material is preserved in the sample collection of the Hugo de Vries-laboratorium under no. 81.46, but as details cannot be sufficiently observed in this material, it seems preferable to designate an iconotype.

Photographs were taken on Agfa Ortho 25 with a Zeiss Photomikroskop III using a Planapo 63/1.4 oil objective and a light grey filter. Observations and drawing were made with a Zeiss RA microscope with a Neofluar 100/103 oil

objective. Measurement of the symbionts was performed by repeatedly marking the diameters of about 10 sufficiently discernible individuals in sequence on a previously drawn line by means of a drawing tube adjusted to a known magnification (1:2000) and by subsequently measuring each total with a calliper so as to obtain the most reliable mean value. The drawing was made with the help of a drawing tube.

3. DESCRIPTION

***Chrysostephanosphaera hyalocytobia* Ellis-Adam, spec. nov.**

Chrysostephanosphaera cellulis solitariis aut paucis sine ordine conglobatis intra hyalocytos foliorum sphagnorum immersorum habitantibus.

Cellulae globosae vel subellipsoideae (dimensionibus $4,0-6,0 \times 3,5-5,5 \mu\text{m}$) chromatophoro singulo subviridescente ac duabus vacuolis invicem pulsantibus instructae stigmatē destitutae, consociatae cum globosis corpusculis minutis (diametro $0,8-1,1 \mu\text{m}$) incoloratis circumcludentibus aut adjacentibus ad unam partem. Intra sphagna immersa in lacuna turfosa habitat.

Typus: figurae lae specimen sinistrum.

A *Chrysostephanosphaera* with cells living solitarily or in small numbers without any special arrangement within the hyalocytes of submerged *Sphagnum* plants.

Cells globular or somewhat ellipsoid (their dimensions ranging from $4,0-6,0 \times 3,5-5,5 \mu\text{m}$) containing one rather greenish chromatophore and two alternatively pulsating vacuoles (*fig. 1*), without a stigma, and associated with minute, colourless globular bodies (with diameters ranging from $0,8$ to $1,1 \mu\text{m}$) completely or partly surrounding the cell.

Type: the left specimen of *fig. 1*.

4. LOCALITY AND HABITAT

The locality, called "De Leemputten", is situated in the vicinity of the Castle of Staverden (Municipality of Ermelo, Prov. Gelderland) on the slope of a push moraine, overlain by a layer of sand deposited by the retreating ice cover. A number of shallow pools originated in and after this period by the action of ice and wind. In addition several pits of diverse size and depth occur as the result of loam quarrying in the past. The lower part of the field is marshy and covered by vegetation consisting of *Calluna vulgaris* (L.) Hull and *Narthecium ossifragum* (L.) Huds. interspersed with *Phragmites australis* (Cav.) Trin. ex Steud. and *Sphagnum* spp. The new alga was collected in a small pit of about 1 m^2 and with a water depth of about 0.25 m , sparsely overgrown with *Carex rostrata* Stokes and completely filled with submerged *Sphagnum crassicaudum* Warnst. var. *obesum* (Wils.) Schimp. and some plants of *S. cuspidatum* Ehrh. This vegetation is covered by a slushy iron hydroxide deposit throughout the year.

Simultaneously with the periodical collection of samples to study the algal

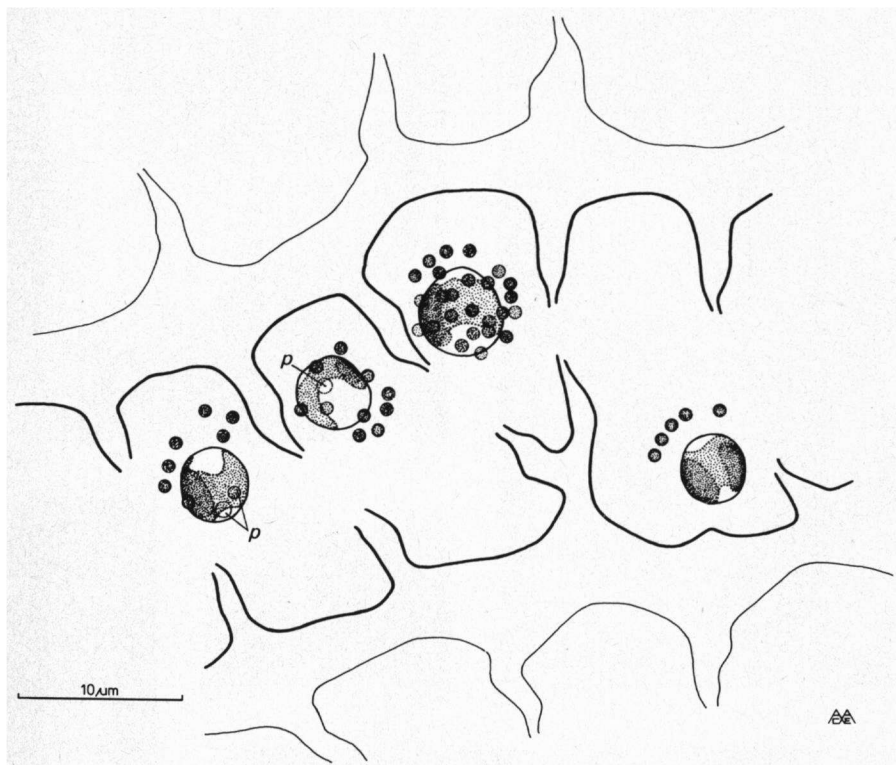


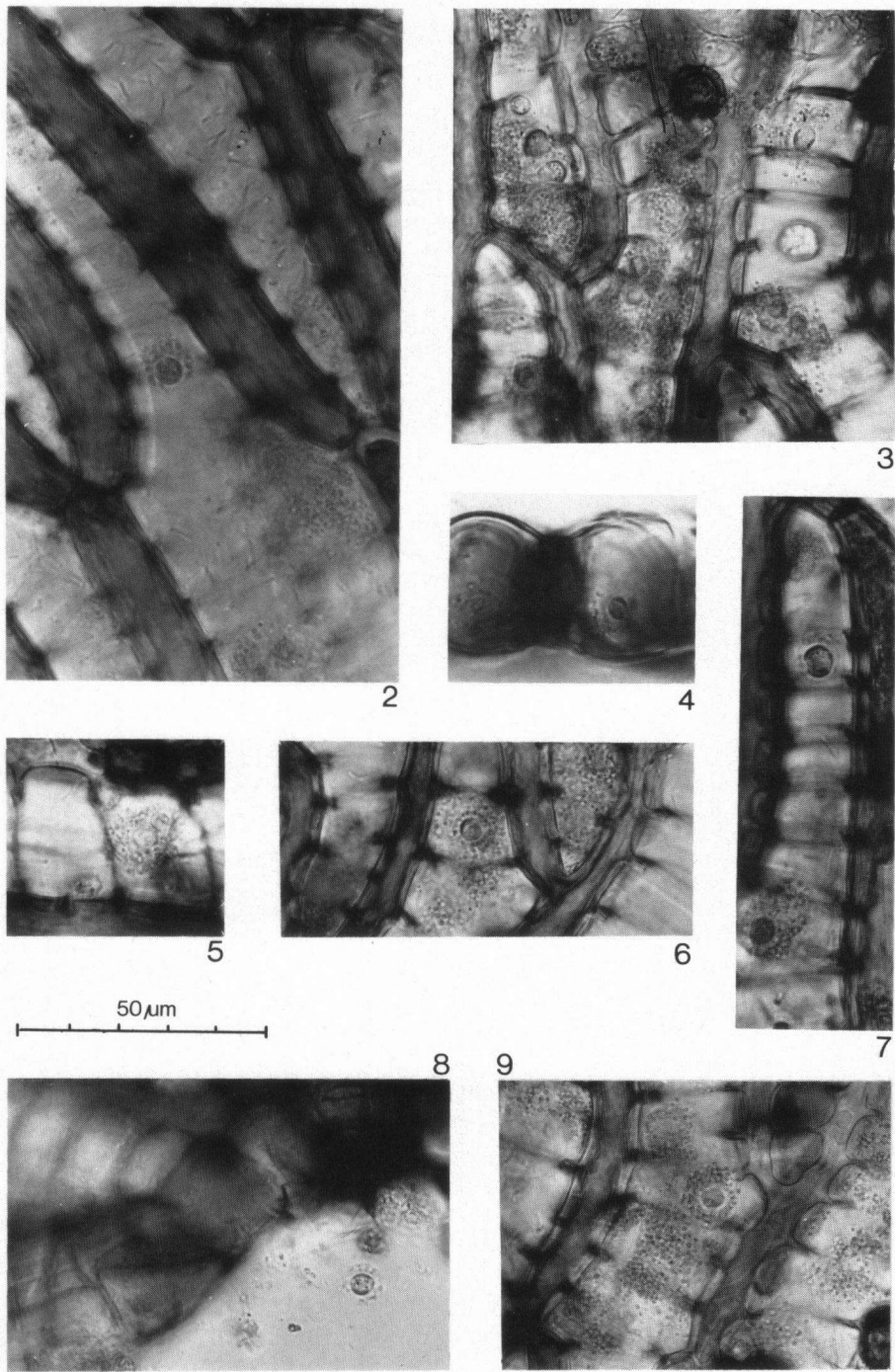
Fig. 1. *Chrysostephanosphaera hyalocytobia* Ellis-Adam, n.sp. Four specimens in a hyalocyte of *Sphagnum crassycladum* var. *obesum* (optical section indicated schematically), drawn at a scale of 1: 2000, and enlarged twice with a pantograph ($10\ \mu\text{m} \sim 40\ \text{mm}$). The symbionts are all drawn to the same (mean) size, as it was virtually impossible to show the differences in dimensions on the drawing.

TYPE: left specimen; the two pulsating vacuoles are depicted at their maximum size simultaneously to show their relative position. In the two specimens on the right hand side they could not be observed well enough to be adequately drawn.

flora, pH and conductivity were measured electrometrically, and also the water temperature was recorded in the field. The values observed ranged from pH 4.1 to 5.3 and from 41 to 83 $\mu\text{S}/\text{cm}$ and from 1.5 to 24.0°C respectively in the period from 11/8-'80 to 3/8-'81. The organism under discussion was found for the first time at 29/6-'81 the corresponding values being pH 4.6, 46 $\mu\text{S}/\text{cm}$ and 13.0°C.

From the same pit a new desmid, *Spirotaenia diplohelica*, has been described by COESEL (1981), who provides some more details concerning the habitat.

The new alga was found in the hyalocytes of *S. crassycladum* var. *obesum* in abundance (also, but more rarely, in *S. cuspidatum*); it occurs in mature hyalocytes of fully developed leaves, i.e. in the lower two thirds of the leaves attached to the lower two thirds of a branch. It may already be present in the



uppermost two whorls of branches but it is always more abundant in lower ones. Apparently this phenomenon has to be ascribed to the time available for settlement, because *Chrysostephanosphaera hyalocytobia* seems to prefer leaves already occupied by other organisms. The presence of such organisms forms an indication that the leaf in question is worth examining, although they hamper the observation, sometimes so much that they even render it impossible.

The cells of the new alga can be found both along the lateral walls of the hyalocytes and in their central part. A slight preference for places beneath the marginal pores can be observed.

5. DISCUSSION

Thus far two species of *Chrysostephanosphaera* had been described, viz. *C. globulifera* Scherffel (1911) and *C. splendens* Margalef (1956), which both have the cells regularly arranged in a symbiont bearing gelatinous matrix. Within this matrix each cell lies in a symbiont-free space of their own. In *C. hyalocytobia* the cells are mostly single, surrounded by a group of symbionts of their own (figs. 2, 4, 7, 8, 9), adjacent groups sometimes being confluent (figs. 3, 6). Sometimes a few cells shared the same space (fig. 5), but this may be the result of a recent division. The fact that in such specimens the symbiont group is larger than in single-celled ones can be interpreted as an argument pleading in favour of this vision or against it. The symbiont group can be either compact (fig. 9), rather sparse (fig. 8) or cup-shaped as in *C. globulifera* (GEITLER, 1949, fig. 3c) (fig. 1, 2, 7 top). The shape of the chromatophore (fig. 1) is also of the same type as that of *C. globulifera*, but its colour tends more towards a greenish tinge, while in the other species its bright, golden colour contributes to its striking appearance. Leucosine can be present in the form of minute droplets (fig. 7 top).

Fig. 2-9. *Chrysostephanosphaera hyalocytobia* Ellis-Adam n.sp. in hyalocytes of *Sphagnum crassiusculum* var. *obesum*.

Fig. 2. A solitary cell with asymmetrical symbiont cloud. The rod-like bodies are bacteria growing on the outer surface of the leaf, and a specimen of *Stephanoporus epiphyticus* (Scherf.) Pasch. is also recognisable.

Fig. 3. A number of cells with confluent symbiont clouds; both globular and ellipsoid cells are present. The dark spots are out of focus surface dwelling Chrysophyceans.

Fig. 4. T.s. of leaf containing one specimen.

Fig. 5. Two cells sharing one space.

Fig. 6. Cell with a distinct, symbiont-free space, its symbiont cloud confluent with the adjacent one which is without a cell. In the neighbouring cell also confluent symbiont clouds without *Chrysostephanosphaera* cells.

Fig. 7. Two cells, the topmost with cup-shaped symbiont cloud and distinct leucosine droplets.

Fig. 8. Single cell, dropped out of a torn hyalocyte. Note the deceptive appearance of the chromatophore suggesting the presence of two separate ones.

Fig. 9. Individual symbiont clouds in distinct spaces, only one of which contains a cell.

It goes without saying that the observation of this life-form is a very cumbersome procedure, so that it is not surprising that I did not succeed in establishing the presence or constant absence of rhizopodia. On account of the similarity of other features I place this organism in the genus *Chrysostephanosphaera*, considering that it would be more prudent to take the risk of having my name transferred to the parentheses later than to refrain from publication of this taxon.

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