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Taxonomic notes on Dutch desmids VI (Streptophyta, Desmidiales): new species, newly described zygospores

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Abstract

From the Netherlands, three desmid species are newly described to science: *Actinotaenium spinosporum* (with zygospores), *Staurastrum brachiatoides* (with zygospores) and *Staurastrum quadriradiatum*. In addition to that, zygospores of the rather rare species *Staurastrum echinatum* are described for the first time. Differences with similar-looking species are discussed.

Introduction

In the last decade, in the Dutch province of Drenthe quite a series of desmid species were found that up to then were unknown from the Netherlands. Some of those species even appeared to be new to science (Coesel & Van Westen 2013). Recently, the first author, who is investigating and mapping the distribution of desmid species in the above-mentioned province, again encountered some species that could not be identified with help of the existing literature.

Material and Methods

Most of the samples were taken by squeezing (semi)aquatic plants (mainly *Sphagnum* spp.). On the sampling site 'Marsdijk', where such plants were wanting, a plankton net was used. Conductivity and pH were measured with a HANNA HI 98129 Combo pH & EC meter. After collecting, the samples were kept at a temperature of 4 °C in a refrigerator and examined alive within a week. Some of the samples were also fixed with formaldehyde.

As some species were very small it was decided to prepare SEM samples, using the following method: 10 mm glass coverslips were coated with poly-L-lysine solution to ensure better adhesion of the desmid cells. Then a drop of the fixed material was placed on the coverslips after which these were dried at a temperature of 33 °C to remove as much water as possible without damaging the cells. Then they were placed in a 30% acetone solution and in a series of steps (acetone 50%, 70%, 85%, 95%, 100%, 100%) the samples were dehydrated. Subsequently, critical-point drying with liquid CO_2 was applied. Eventually, the coverslips were placed on an aluminium stub with conducting tape and gold-sputtered. The samples were studied with a Phenom Desktop SEM and with a JEOL JSM-6480.

Box plots illustrating differences in cell dimensions and ecology (pH) between *Staurastrum brachiatum* and *Staurastrum brachiatoides* are based on examination of 14 samples with (sporulating) *St. brachiatum* and 14 samples with *St. brachiatoides*. All in total 34 cells of *St. brachiatum* and 34 cells of *St. brachiatoides* were measured. In the box plots the dots represent the outliers i.e. values that are 1.5*IQR larger than Q3 or 1.5*IQR smaller than Q1 (Q1 and Q3 are the 25% and 75% percentiles. IQR= Q3-Q1).

Significance of observed differences in cell length and pH between *Staurastrum brachiatum* and *Staurastrum brachiatoides* was tested by a t-test (McDonald 2009).

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Differential diagnosis:—*Staurastrum quadriradiatum* is a small-sized *Staurastrum* species that can be compared with *St. minimum* Coesel (1996: 23). Both species are very delicate in their morphology and display a corresponding cell shape. Light microscopically, almost no trace of ornamentation is to be seen. The most striking difference is in the number of processes: three in *St. minimum*, four in *St. quadriradiatum* (Figs. 8, 9, 10). As in other 4-radiate *Staurastrum* species, cell morphology is differently expressed depending on the position of the cell observed. Usually cells are seen when resting with one of their processes on the substrate (position 1, see Coesel & Meesters 2013: 42). Their appearance is different when resting on two processes (position 2), compare our Figs. 9 and 10.

Another differentiating feature with respect to *St. minimum* could be in the ornamentation of the processes. While the processes in *St. minimum* are tipped with small but distinct dentations, those in *St. quadriradiatum* are seemingly without ornamentation at the top. Only SEM pictures of *St. quadriradiatum* reveal that the extremities of the processes are not perfectly smooth (Figs. 20, 21).

Finally, but certainly not the least important difference, is in the ecology of the two species. Whereas *St. minimum* is described from acidic, oligotrophic moorland pools (Coesel 1996), *St. quadriradiatum* was abundantly encountered in an artificial, eutrophic pool, the biocenosis of which was dominated by zooplankton and chlorococcalean green algae. Later on, this species was also found on three other localities in Drenthe. One of these was a former, shallow sand pit filled with water. The other locations were shallow, sandy pools at the margin of the built-up area of villages. All locations were used for recreational purposes.

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