

***Cosmarium gauthierae* sp. nov.
(Conjugatophyceae, Desmidiaceae)
from an ephemeral pool in South-West Macedonia**

Jan ŠTASTNÝ* & Jiří NEUSTUPA

Department of Botany, Charles University of Prague,
Benátská 2, Prague, CZ-128 01, Czech Republic

(Received 5 December 2007, accepted 6 June 2008)

Abstract – A new desmid species with slightly twisted cells and asymmetrical ornamentation, *Cosmarium gauthierae* Štastný & Neustupa, is described from an ephemeral pool in south-western mountains of the Republic of Macedonia. It is morphologically close to asymmetrical forms of *C. dimaziforme*, *C. onychonema* and *C. pseudotaxichondrium* to which it has been compared.

Cosmarium / Desmidiaceae / Republic of Macedonia / ephemeral habitats / phytobenthos

Résumé – *Cosmarium gauthierae* sp. nov. (Conjugatophyceae, Desmidiaceae) d'une mare temporaire du sud-ouest de la Macédoine. Une nouvelle espèce de desmidiées à cellules un peu tordues et à ornamentation asymétrique, *Cosmarium gauthierae* Štastný & Neustupa, est décrite d'une mare temporaire des montagnes du sud-ouest de la Macédoine. Cette nouvelle espèce est morphologiquement voisine de formes de *C. dimaziforme*, *C. onychonema* et *C. pseudotaxichondrium* auxquelles elle est comparée.

Cosmarium / Desmidiaceae / République de Macédoine / habitats éphémères / phytobenthos

INTRODUCTION

Ephemeral pools are one of the least studied desmid habitats. However, these localities often contain interesting and little known desmid species (see e.g. Růžicka, 1964, 1967; Kowets, 1997; Williamson, 1999, 2000; Coesel *et al.*, 2006). In April 2007 the second author visited the Ohrid lake region, including the Galičica Mountains, in the south-western part of the Republic of Macedonia. In an ephemeral pool on humic soil formed on a karstic field basement we found a very interesting benthic desmid community that included a taxon that we now propose for taxonomic description as a new species within the genus *Cosmarium* Ralfs.

* Correspondence and reprints: stastny.jan@centrum.cz
Communicating editor: Pierre Compère

MATERIALS AND METHODS

The investigated karstic field is located in Galičica Mountains, approximately 1500 m from the eastern shores of Ohrid lake, at an altitude of 990 m a.s.l. (40°59'15" N, 20°48'50" E). The investigated pool is located near the St. Spas chapel in the middle of the field. The pool was filled by water from melted snow from the adjacent mountain slopes. The climatic conditions of the locality are influenced by the nearby reservoir of the deep Ohrid lake and involve dry and hot sub-mediterranean summers with temperatures regularly >30°C. However, there is a relatively short winter with freezing temperatures and a permanent snow cover, melting usually in late February and March. The vegetation in the immediate vicinity of the sampling locality involves submediterranean deciduous forests of *Quercus frainetto*, *Q. cerris*, *Q. pubescens*, *Carpinus orientalis* and *Juniperus communis* with common *Anemone blanda* in the undergrowth (Medvecká-Kornaš *et al.*, 1986). The water depth in the pool was up to 10 cm at the time of sampling. The surroundings of the locality and the massif of the Galičica Mountains are not inhabited and the only recent anthropogenic activity consists of limited cattle breeding in the non-forested parts of the area.

The locality was sampled on 12 April 2007. Benthic samples were fixed using 2% formaldehyde and examined using an Olympus BX51 light microscope with Olympus Camedia C – 5050Z digital photomicrographic camera. Line drawings were made using a drawing apparatus.

RESULTS AND DISCUSSION

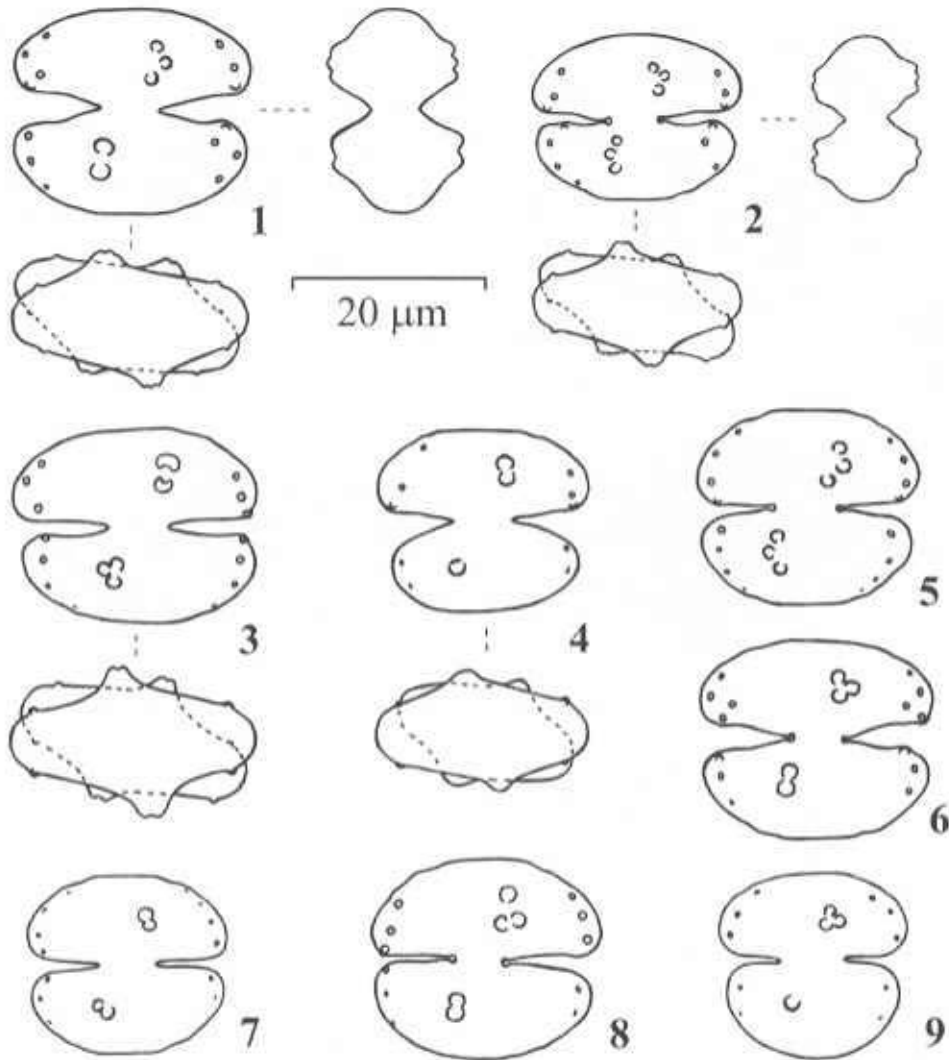
Cosmarium gauthierae Štastný et Neustupa, species nova

Cellulae paulo latiores quam longiores, aspectu frontali fere ellipticae, profunde constrictae, sinu plus minusve aperto; semicellulae a fronte visae late trapeziformes vel ellipticae apice truncato vel obtuso, lateribus saepe undulatis 3-4 granulis parvis intramarginalibus ornatis, pariete frontale 2-3 granulis ornato, leviter asymmetricae a centro dispositis sinistrorsum, a vertice visae ellipticae, mutue tortae fere 20°, a latere visae fere circulares. Cellularum longitudo 18.5-24 µm, latitudo 21-27.5 µm, crassitudo 13-16.5 µm, longitudo latitudine ratio 0.8-1.0, latitudo isthmi 5.5-7.5 µm.

Holotypus hic designatus: Macedonia, Galičica Mountains, periphyton of an ephemeral pool, 990 m a.s.l., leg. J. Neustupa, 12.4. 2007. Holotype is deposited in PRC.

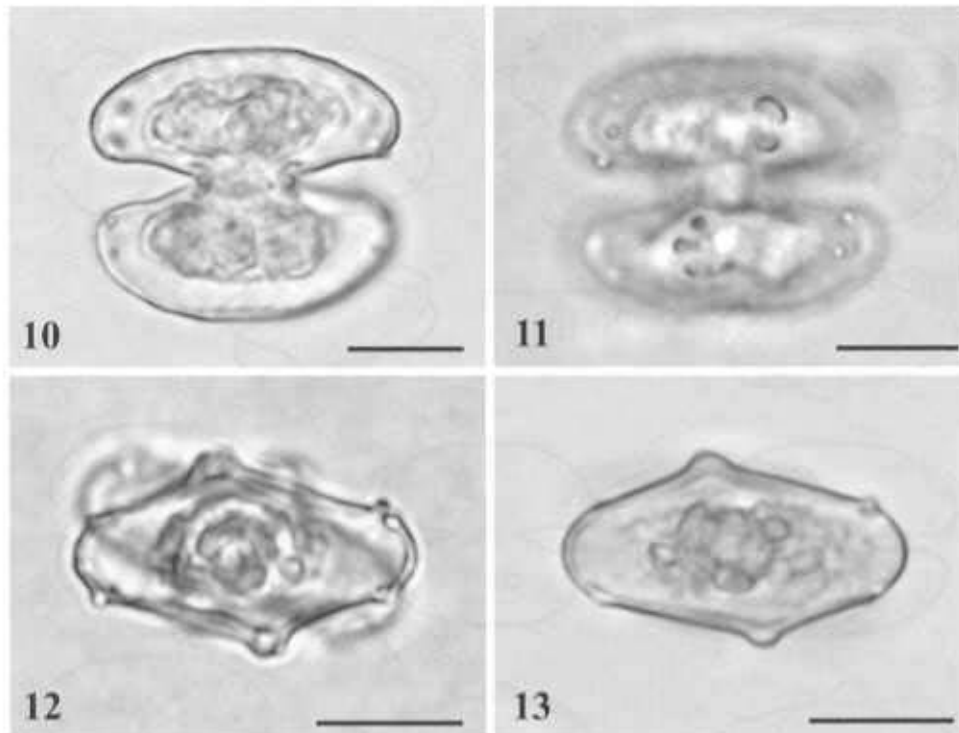
Etymology: Described in honour of Lucienne Gauthier-Lièvre, who conducted extensive investigations of algae in Mediterranean wetlands and mountainous habitats of North Africa, and also contributed to the knowledge of asymmetrical desmids.

The vegetative cells are slightly wider than long; in frontal view they are approximately elliptical, with a deep median constriction and with a more or less open sinus (Figs 1-10). The cells are twisted at the sinus through about 20°, which is best seen in apical views (Figs 1-4, 12). In frontal views, the semicells are broadly trapeziform to nearly elliptical with a truncate or rounded apex and often with some undulations at the lateral margins. A group of two to three papillae is



Figs 1-9. *Cosmarium gauthierae* sp. nov.

regularly visible left of the centre in one semicell and right of the centre in the other semicell. The lateral parts of the semicells bear three or four small intramarginal granules (Figs 1-9, 11). In apical views the semicells are elliptical; in lateral views they are approximately circular, with central tubercles distinctly visible in both apical and lateral view. In apical views the intramarginal granules are also usually visible (Figs 1-4, 12-13). The vegetative cells are 18.5-24 µm long, 21-27.5 µm wide and 13-16.5 µm thick. The isthmus is 5.5-7.5 µm wide. The length:width ratio is 0.8-1.



Figs 10-13. *Cosmarium gauthierae* sp. nov., LM photographs. 10, Cell in frontal view. 11, The same cell focussed on the cell wall ornamentation. 12, Cell in apical view showing the characteristic twisting of cells. 13, Semicell in apical view. Scale bar = 10 μ m.

Cosmarium gauthierae is relatively well delimited from other members of its genus. Its morphological features are somewhat similar to *Cosmarium onychonema* Raciborski. The cell shape and size of this species, described from Guyana by Raciborski (1895), are similar to *C. gauthierae*. In addition, *C. onychonema* also possesses excentrically located papillae. However, it clearly differs from *C. gauthierae* in several morphological features. *Cosmarium onychonema* lacks the intramarginal granules and regularly has only a single central papilla (Raciborski, 1895; Prescott *et al.*, 1981). In addition, *C. onychonema* lacks the twisting of cells, which is one of the prominent discriminating features of *C. gauthierae*. Krieger & Gerloff (1969) described *Cosmarium onychonema* var. *africanum* based on the drawings of Schmidle (1898) and Borge (1928). This variety differs from *C. gauthierae* in all the above mentioned discriminative characters of a type variety of *C. onychonema*. In addition, it has more elliptical semicells that do not conform to the morphological features of *C. gauthierae*.

Gauthier-Lièvre (1931) found a desmid population in an ephemeral wetland in the Mediterranean region of Algeria that she determined as *C. onychonema*. However, Krieger & Gerloff (1969) suggested that her material probably does not fit into *C. onychonema* and could represent an undescribed

Cosmarium species. Material studied by Gauthier-Lièvre (1931) had twisted cells and the shape of the cells was very similar to our investigated population, with the sinus being more widely open and slightly concave in its central part. She did not detect any intramarginal granules which are, however, present in our species, but this could be actually explained by the fact that she only examined a limited number of cells and had no possibility to investigate the empty cell wall with discernible cell wall features. Thus, we believe that the species reported by Gauthier-Lièvre (1931) was probably identical to ours. This hypothesis is further supported by the similar ecological conditions of both localities, which is supported also by their similar desmid species composition (characterized by species such as *Cosmarium commissurale*, *C. blytii*, *C. corbula*, *C. botrytis*, *C. impressulum* and *Staurastrum punctulatum*). In addition, Gauthier-Lièvre (1958) reported an unidentified *Cosmarium* species from Congo, whose morphological characteristics were similar to both *C. gauthierae* and *C. onychonema*. However, this probably undescribed *Cosmarium* species differs from *C. gauthierae* by the regular granulation of the cell wall and the regularly elliptical semicell shape.

Other taxa that are similar to *C. gauthierae* include *Cosmarium dimaziforme* (Grönbl.) Scott & Grönblad, described from Brazil (Scott & Grönblad, 1957; for the original figure see Grönblad, 1945) and some varieties of *C. pseudotaxichondrum* Nordstedt, in particular *C. pseudotaxichondrum* var. *asymmetricum* Bourrelly & Couté, described from French Guyana (Bourrelly & Couté, 1982). However, these taxa differ from *C. gauthierae* particularly by the straight semicells and the presence of two very prominent papillae on either side of the basal angles of the semicells. In addition, *C. dimaziforme* lacks excentric papillae, while in *C. pseudotaxichondrum* var. *asymmetricum* the intramarginal granules and the central papillae are located subapically.

C. gauthierae and all the above mentioned taxa are all rather similar morphotypes. We feel that the unique combination of typical morphological features together with the unusual ecological characteristics of our population justify the description of *C. gauthierae* as a separate species.

Cosmarium gauthierae is now known from two Mediterranean and sub-Mediterranean localities of North Africa and South-East Europe. We hypothesize that this species, being probably limited to little-studied ephemeral habitats, is more widely distributed across the Mediterranean region and perhaps even further. Ephemeral pools still harbour many little known or undescribed desmid species, and therefore they should not be ignored by investigators interested in desmid diversity.

Acknowledgements. The authors are much obliged to Dr Frans Kouwets for writing the Latin diagnosis. This study was supported by research project no. 21620828 of the Czech Ministry of Education, and by Charles University Science Foundation B BIO 164/2006 grant.

REFERENCES

- BORGE O., 1928 — Süßwasseralgen. In: Schröder B., Zellpflanzen Ostafrikas, gesammelt auf der akademischen Studienfahrt 1910, *Hedwigia* 68: 93-114.
- BOURRELLY P. & COUTÉ A., 1982 — Quelques Algues d'eau douce de la Guyane Française. *Amazoniana* 7: 221-292.
- COESEL P.F.M., MEESTERS K. & SCHULP H., 2006 — Subatmofytische sieraalgssoorten, nieuw voor de Nederlandse flora. *Gorteria* 31: 137-141.

- GAUTHIER-LIÉVRE L., 1931 — Recherches sur la flore des eaux continentales de l'Algérie et de la Tunisie. Alger, 299 p.
- GAUTHIER-LIÉVRE L., 1958 — Desmidiacées asymétriques. Le genre *Allorgeia* gen. nov. *Bulletin de la société d'histoire naturelle de l'Afrique du Nord* 49: 93-101.
- GRONBLAD R., 1945 — De algis Bresiliensibus, praecipuis Desmidiaceis in regione inferiore fluminis Amazona a Professore August Ginzberger (Wien) anno 1927 collectis. *Acta societatis scientiarum fennicae, Series B*, 2(6): 1-43.
- KOUWETS F.A.C., 1997 — Contributions to the Knowledge of the French Desmid Flora I. New and Noteworthy Taxa from Central and Eastern Pyrenees. *Archiv für Protistenkunde* 148: 33-51.
- KRIEGER W. & GERLOFF J., 1969 — Die Gattung *Cosmarium*. Lieferung 3/4. J. Cramer Verlag, Weinheim, pp. 241-410.
- MEDVECKA-KORNAŠ A., DRENKOVSKI R., GRUPCE L. & MULEV M., 1986 — The oak forest Quercetum frainetto-cerris on the foothills of the mountain range Galičica (Macedonia). *Acta societatis botanicorum poloniae* 55: 325-342.
- PRESCOTT G.W., CROASADALE H.T., VINYARD W.C. & BICUDO C.E. de M., 1981 — *A synopsis of North American desmids*. Part II. Desmidiaceae: Placodermae Section 3. Lincoln and London, University of Nebraska Press, 720 p.
- RACIBORSKI M., 1895 — Die Desmidieen des Tapakoomasees. *Flora* 81 (1): 30-35.
- RŮŽICKA J., 1964 — Desmidiaceen der feuchten Felsen in der Hohen Tatra. *Fragmenta floristica et geobotanica* 10: 103-119.
- RŮŽICKA J., 1967 — Interessante Zieralgen aus der Hohen Tatra I. *Přehled* 39: 244-259.
- SCHMIDLE W., 1898 — Die von Professor Dr. Volkens und Dr. Stuhlmann in Ost-Afrika gesammelten Desmidiaceen, bearbeitet unter Benützung der Vorarbeiten von Prof. G. Hieronymus. In: Engler A., Beiträge zur Flora von Afrika. XVI. *Engler's Botanische Jahrbücher* 26 (1): 1-59.
- SCOTT A.M. & GRONBLAD R., 1957 — New and interesting desmids from the southeastern United States. *Acta societatis scientiarum fennicae, Series B*, 2(8): 1-62.
- WILLIAMSON D.B., 1999 — A proposed new desmid genus *Cructangulum* and descriptions of three new desmid species from rock pools in the Western Cape, South Africa. *Algological Studies* 93: 55-62.
- WILLIAMSON D.B., 2000 — Some Desmid Floras of Wet Rock Surfaces. *Algological Studies* 97: 11-27.