

Wojciech W.A. Kowalski

Independent Researcher, Kadetów 14/2 St., 71-227 Szczecin;
Department of Botany and Nature Conservation, West Pomeranian University of Technology in Szczecin,
J. Slowackiego 17 St., 71-434 Szczecin, Poland; e-mail: wojciech.wakowalski@wp.pl

Micrasterias crux-melitensis Ehrenberg var. *multispinosa*
W.W.A.Kow. var. nov. and *Xanthidium fasciculatum* Ehrenberg
ex Ralfs var. *burchardtii* W.W.A.Kow. var. nov. –
new taxa for the desmidia flora from wetland ecosystems
of Western Pomerania, Poland

Abstract

The paper presents the characteristics and description along with the original drawings of two taxa of the order Desmidiales (Chlorophyceae) that have not been recorded in the world so far. They belong to the species *Micrasterias crux-melitensis* Ehrenberg ex Ralfs and the species *Xanthidium fasciculatum* Ehrenberg. The found specimens are characterised by different morphological features, which have not been recorded in the descriptions of forms and typical varieties representing these genera in the world flora. Single cells of those varieties were present in the materials collected during fieldwork carried out as part of the reconnaissance and registration of phycoflora habitats of moss bog ecosystems in Western Pomerania.

Keywords: Chlorophyceae, Desmidiales, moss ecosystems

Received: [2024.05.08]

Accepted: [2024.06.14]

Introduction

Western Polish Pomerania is an area where a large number of typologically different swamp ecosystems are concentrated. They developed as a result of plant succession causing to land primarily in local outflow hollows, less often in river valleys or lake shores.

Swamp peat ecosystems are characterised by high typological diversity and diversity of plant cover, specific genesis, as well as the effect of anthropogenic transformation processes.

This genesis of their formation as well as local trophic conditions and hydrology resulted in the creation of both low peat bog ecosystems and specific moss bogs, dominated by various phytocoenoses shaped primarily under the influence of ombrotrophic

waters. Many of them, despite the increasing anthropogenic negative impacts in nature causing their degradation, have still retained their natural, original character.

The high degree of naturalness is also reflected in the richness of the unique, insufficiently known phycoflora. The most valuable in terms of nature, and at the same time refugia of the unique vascular plants and phycoflora, are not only the moss ecosystems but also spring springs and calcareous water habitats.

Material and methods

The research was conducted to protect the most valuable and unique ecosystems of great natural value. Material for research was collected during fieldwork carried out in order to document the plant cover of peat bog ecosystems and the phycoflora representing them. Samples intended for microscopic examination were collected during the summer months in various phytocenoses, including those characteristic and defining natural habitats subject to legal protection.

These were microhabitats of various phytocenoses, defined not only by botanical composition but also by basic ecological parameters: min. degree of hydration, pH, and ionic conductivity. The chemical parameters of water were not analysed in the habitats. They represented vegetation formations from the class *Scheuchzerio-Caricetea nigrae* (Nordh. 1937) R.Tx. 1937 and *Oxycocco-Sphagnetea* Br.-Bl. et R. Tx. 1943 (Matuszkiewicz, 2017).

The attached illustrations of new varieties are the author's original engravings.

Description of the new taxa of Desmids for science

Micrasterias Agardh ex Ralfs (1848)

Micrasterias crux-melitensis (Ehrenb.) Hassal. ex Ralfs var. *multispinosa* W.W.A.Kow. var. nov.

Description: cells circular in outline, almost as long as they are wide, lg.: br. 0.89–1.07×; lg. 110.0–112.4 μm, br. 102.8–125.3, isth. 19.8 μm wide, deeply narrowed, app. 29.2 μm. Dimensions of spine cells: lg. 69.2–74.1, br. 84.6–86.5 μm. Linear sine, expanding in the outer part. In terms of form, size and shape, the cells have a morphological form characteristic of the taxon, which does not differ from the nominal species and its previously registered varieties and forms.

The top patch and the marginal patches of the first and further orders are shaped in accordance with the diagnostic descriptions presented in the literature (West, West, 1905, 1912; Krieger, 1939; Forster, 1982; Hirano, 1957, 1959; Palmar-Mordvintseva, 1982, 2005; Coesel, 1994; Lenzenweger, 1996, 2003; Kossinskaja, 1952; Roll, 1924, 1925). The dimensions and other features of the cell are consistent with previous diagnoses of the species.

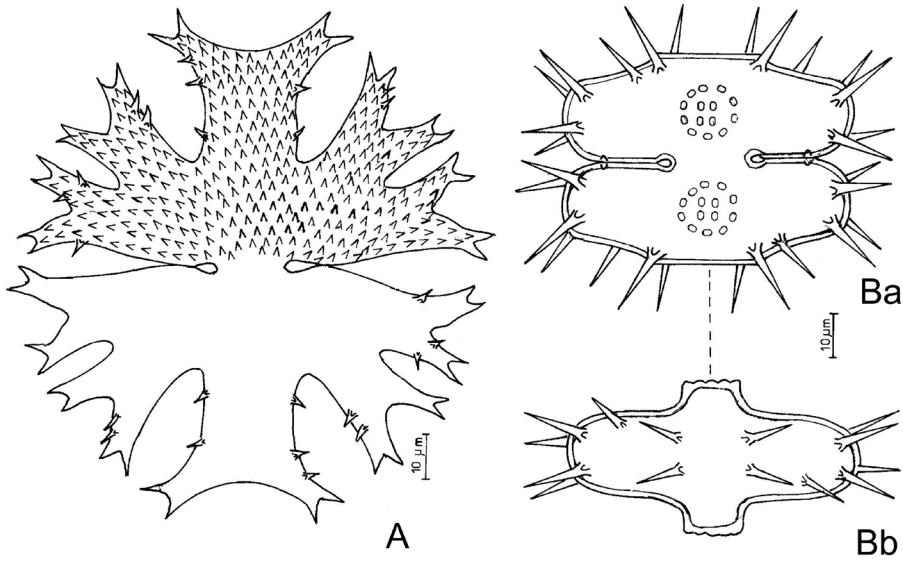


Fig. 1. *Micrasterias crux-melitensis* Ehrenberg var. *multispinosa* W.W.A.Kow. var. nov. – A; *Xanthidium fasciculatum* Ehrenberg ex Ralfs var. *burchardtii* W.W.A.Kow. var. nov.: cell morphology and ornamentation – Ba, view of the top side of the cell – Bb

Habitat: water-reservoir interdune depression dominated by *Sphagnum* mosses with some mosses pH rank – 6.3–6.4.

Distribution in Poland: not recorded.

Occurrence: Benthic, oligotrophic and mesotrophic lakes, in soft water habitats and *Sphagnum* bogs, intermingled with other desmids.

General distribution: this form of cells has not been previously reported in the algal literature.

Type: Fig. 1A.

Remarks: Analysis and review of documented descriptions of the species *Micrasterias crux-melitensis* and its varieties and forms in taxonomic studies (Krieger, 1939; Forster, 1982; Růžička, 1981; West, West, 1912; Coesel, 1985; Palmar-Mordvintseva, 1982, 2005; Prescott, et al., 1975; Roll, 1924, 1925; Coesel, Meesters, 2007) showed the walls of the cells which have not yet been recorded in the recognised algal literature, on the entire surface and in the marginal parts of the gable patch and the patches of further rows are equipped with spikes. Typically, the morphological features and ornamentation of cell walls are arranged in a very regular manner. Deviations in the arrangement and symmetrical arrangement of its elements on the cell wall suggest that the observed cell specimen of *Micrasterias crux-melitensis* is probably a morphological form of the species resulting from the influence of environmental factors. The habitat in which this particular form of the taxon was recorded is distinguished by a very natural phytocenosis and the lack of impacts resulting from anthropogenic processes.

Xanthidium Ehrenb. 1837

Xanthidium fasciculatum var. *burchardtii* W.W.A.K. var. nov.

Description: cells elliptical in outline, much wider than long, lg.: br. 0.81–0.86×; dimensions without spikes lg. 54.3–55.2 µm, br. 66.7 µm, isth. 19.8 µm wide, deeply narrowed, app. 29.2 µm. Dimensions of spine cells: lg. 69.2–74.1, br. 84.6–86.5 µm. Linear sine, expanding in the outer part. Elliptical semi-cells, strongly flattened at the top of the apical part, with angularly rounded sides. Each half-cell is equipped with 6 pairs of straight, long 13.0–14.6 µm spines at the corners, mounted on the edges of the rounded corners. The central part of the half-cells with circular ornamentation in the form of a clear uplift, 13.0 µm in diameter in the apical part, about 7.6–7.0 µm high, made of distinct, regularly embedded granules; 4 in the central part, surrounded by 10 granules on the outer circle. On the outer edges of the central ornamentation of the half-cells, on the top side there is a clearly marked wavy presence of 5 granules. At the base of the half-cells, closer to their outer part, there are short extensions about 2 µm long directed towards the sinus. Viewed from the top, the cells are elliptical, with almost flat and parallel sides and rounded ends. In the central part there are half-cells with a clear ornamental circular uplift. In this part, the cells are 33.0–34.0 µm thick, with almost parallel wall sections 20.0 µm thick. There are visible spines on the apical surface, placed in 4 semi-cells at the rounded ends and 2 pairs symmetrically in the central part. Additionally, at the ends of the half-cells, single spines are placed alternately. The cell wall is very delicately dotted.

Habitat: in the benthos among other species of desmidia in open aquatic depressions in the *Carici limosae-Sphagnetum cuspidati* Hueck 1925 (= *Drepanoclado fluitantis-Caricetum limosae* (Kästner et Flössner, 1933) Krisai, 1972) phytocoenosis complex (Jasnowski, Jasnowska, 1982) dominated by *Sphagnum cuspidatum* Ehrh. ex Hoffm. with a large share of *Batrachospermum turfosum* Bory, pH range 5.7–6.1. Oligotrophic habitat of moss bogs, in benthos together with other desmidia.

Distribution in Poland: Taxon not yet recorded in phycoflora.

General distribution: The distribution and occurrence of the taxon unknown.

Type: Fig. 1Ba and Bb.

Remarks: In a review of the primary algological literature (West, West, 1912; West, Carter, 1923; Krieger, 1939; Forster, 1982; Hirano, 1957, 1959; Palmar-Mordvintseva, 1982, 2005; Coesel, 1994; Crosdale, Flint, 1988; Lenzenweger, 1997, 2003; Kossinskaja, 1952), no cells with such morphological features were recorded. No such variation was recorded in the study by Kanetsuna, Yamagishi (2018) regarding Desmidia from Southeast Asia.

Some of the cells characteristics refer to *Xanthidium fasciculatum* Ralfs var. *oronnense* West & West. A common feature of this variety is the presence at the base of the half-cells, closer to their outer part, of rounded outgrowths about 2 µm long, directed

towards the inner side of the half-cells. They differ from the cells of this variety and the nominal species in slightly larger dimensions, both in length and width, and in shape. Important features that distinguish the taxon are the form of central ornamentation and the presence of single alternating spines, clearly visible from the top of the half-cells. They are located very symmetrically in the central part between the pairs of apical and marginal spines. The central ornamentation of the half-cells consists of 14 oval granules, arranged in two circles, 10 of which regularly surround the 4 in the centre. The shape of the half-cells is also different, they are elliptical in outline and much wider than the long ones, lg.: br. 0.81–0.86 \times . The nature of the accompanying phycoflora indicates a taxon associated with a mesotrophic habitat.

To present the morphological differences between both described varieties, the original documentation for the species is provided below (Fig. 2A–C).

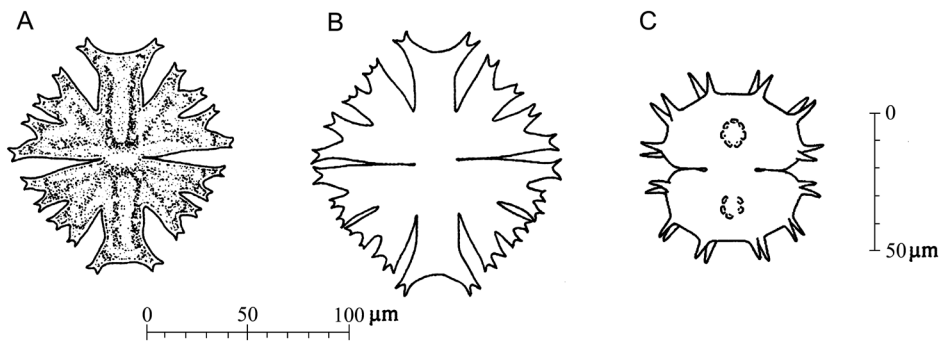


Fig. 2. Typical forms of *Micrasterias crux-melitensis* Ralfs (Source: Růžička, 1981) – A, B, and *Xanthidium fasciculatum* Ehr. (Source: West, Carter, 1923) – C

Conflict of interest

The author declares no conflict of interest related to this article.

References

- Coesel, P.F.M. (1985). De Desmidiaceeën van Nederland. Deel 3, Fam. Desmidiaceae (I). *Wetenschappelijke Mededelingen van de Koninklijke Nederlandse Natuurhistorische Vereniging*, 170, pp. 70. Utrecht.
- Coesel, P.F.M. (1994). De Desmidiaceeën van Nederland. Deel 5, Fam. Desmidiaceae (III). *Wetenschappelijke Mededelingen van de Koninklijke Nederlandse Natuurhistorische Vereniging*, 210, pp. 88. Utrecht.
- Coesel, P.F.M., Meesters, K.J. (2007). *Desmids of the Lowlands. Mesotaeniaceae and Desmidiaceae of the European Lowlands*. Koninklijke Nederlandse Natuurhistorische Vereniging Publishing. Zeist, the Netherlands. p. 352.
- Crosdale, H., Flint, E.A. (1988). *Flora of New Zealand. Freshwater algae, Chlorophyta, Desmids with ecological comments on their habitats*. Vol. II., Wellington: V.R. Ward, Government Printer, p. 133, Table 27.
- Forster, K. (1982). Conjugatophyceae: Zygnemales und Desmidiales (excl. Zygnemataceae). In: G. Huber-Pestalozzi (Ed.), *Das Phytoplankton des Süßwasser*, 8(1), Stuttgart: E. Schweizerbart'sche Verlagsbuchhandlung, pp. 543.

- Hirano, M. (1957). Flora desmidiarum japonicarum. IV. *Contributions from the Biological Laboratory, Kyoto University*, 5, 166–225.
- Hirano, M. (1959). Flora desmidiarum japonicarum. V. *Contributions from the Biological Laboratory, Kyoto University*, 7, 226–301.
- Jasnowski, M., Jasnowska, J. (1982). Szata roślinna torfowisk mszarnych na Pojezierzu Bytowskim. Cz. 4. Zbiorowiska roślinne ze związku *Rhynchosporion albae* Koch 1926. *Zeszyty Naukowe AR Szczecin 99, Rolnictwo Ser. Przyroda*, 30, 59–67.
- Kanetsuna, Y., Yamagishi, T. (2018). *Desmids of Southeast Asia*. Published by Bishen Singh Mahendra Pal Singh, New Donnaught Place, Dehra Dun – 248 001 (India).
- Kossinskaja, E.K. (1960). *Flora spor. Rast. SSSR. Konyugaty ili Stseplyaki 5(1) – Desmidievyje vodorosli. Moskva-Leningrad*. p. 511.
- Krieger, W. (1939). *Die Desmidiaceen Europas mit Berücksichtigung der außereuropäischen Arten. Dr. L. Rabenhorst's Kryptogamen – Flora von Deutschland, Österreich und der Schweiz. B. XIII Conjugatae, Section I, Part II, No.1. Leipzig: Akademische Verlagsgesellschaft*, pp. 712.
- Lenzenweger, R. (1996). *Desmidiaceenflora von Österreich. Bibliotheca Phycologica. Band 101, Tel. 1. Berlin-Stuttgart: J. Cramer in der Gebrüdern Borntraeger Vorlangsbuchhandlung*.
- Lenzenweger, R. (1997). *Desmidiaceenflora von Österreich. Bibliotheca Phycologica. Band 102, Tel. 2. J. Berlin-Stuttgart: J. Cramer in der Gebrüdern Borntraeger Vorlangsbuchhandlung*.
- Lenzenweger, R. (2003). *Desmidiaceenflora von Österreich. Bibliotheca Phycologica. Band 111, Tel. 4. Berlin-Stuttgart: J. Cramer in der Gebrüdern Borntraeger Vorlangsbuchhandlung*.
- Matuszkiewicz, W. (2017). *Przewodnik do oznaczania zbiorowisk roślinnych Polski*. Warszawa: PWN. ss. 537. [In Polish]
- Palamar-Mordvintseva, G.M. (1982). *Opredelitel' presnovodnykh vodorosley SSSR. Zelenyye vodorosli. Klass Kon'yugaty. Poryadok. Desmidievyje (Manual for identification of the freshwater algae of the USSR. Desmidiales)*. Vol. 11(2). Leningrad: Nauka Leningradskoe Otdelenie.
- Palmar-Mordvintseva, G.M. (2005). *Flora vodoroslej kontyentalnich vodoim Ukraini. Desmidievyje vodorosli, I, II*, pp. 572.
- Prescott, G.W., Croasdale, H.T., Vinyard, W.C. (1975). *A synopsis of North American Desmids, Part II. Desmidiaceae: Placodermatae, Section 2*. University of Nebraska Press Lincoln and London, pp. 7+413.
- Roll, J.V. (1924). Nekotorye novye i redkie desmidievyje vodorosli. II. Desmidiaceae nova necnon minus cognitae. II. *Bot. Mater. Inst. spor. Rast. glavn. bot. Sada RSFSR, Leningrad*, 3, 121–128.
- Roll, J.V. (1925). Materialy k flore vodoroslej SSSR. Rod Micrasterias AG. *Russ. Arch. Protistol.*, 4, 235–253.
- Růžička, J. (1981). *Die Desmidiaceen Mitteleuropas*. Band 1, Lief. 2. Stuttgart: E. Scheizerbart'sche Verlagsbuchhandlung, pp. 543.
- Siemińska, J., Wołowski, K. (2003). *Katalog glonów prokariotycznych i eukariotycznych Polski (Catalogue of Polish prokaryotic and eukaryotic Algae). Różnorodność biologiczna Polski (Biodiversity of Poland)*. Kraków: W. Szafer Institute of Botany, Polish Academy of Sciences. Vol. 5. ss. 251. [In Polish].
- West, W., West, G.S. (1905). *A monograph of the British Desmidiaceae*. Vol. 2. Ray Society, London. Johnson Reprint Corporation (1971), New York-London 1971, pp. 204.
- West, W., West, G.S. (1912). *A monograph of the British Desmidiaceae*. Vol. 4. Ray Society, London. Johnson Reprint Corporation (1971), New York-London 1971, pp. 191.
- West, G.S., Carter, N. (1923). *A monograph of the British Desmidiaceae*. Vol. 5. Ray Society, London, pp. 300.

Micrasterias crux-melitensis Ehrenberg var. *multispinosa* W.W.A.Kow. var. nov.
oraz *Xanthidium fasciculatum* Ehrenberg ex Ralfs var. *burchardtii* W.W.A.Kow. var. nov. –
nowe taksony flory desmidiów z ekosystemów podmokłych
Pomorza Zachodniego, Polska

Streszczenie

W pracy przedstawiono opisy dwóch nowych dla nauki taksonów desmidiów (Desmiales/Chlorophyceae) wraz z oryginalną dokumentacją ikonograficzną oraz charakterystykę środowiska ich występowania. Pierwszy opisany takson należy do rodzaju *Micrasterias* i jest odmianą gatunku *Micrasterias crux-melitensis* Ehrenberg ex Ralfs, a drugi należy do rodzaju *Xanthidium* i jest odmianą dla *Xanthidium fasciculatum* Ehrenberg. Opisane taksony charakteryzują się cechami morfologicznymi, które nie zostały do tej pory odnotowane i opisane dla form oraz typowych odmian, reprezentujących te taksony we florze świata. W materiale pobranym podczas prac terenowych prowadzonych w ramach identyfikacji i rejestracji siedlisk fikoflory ekosystemów mszystych na Pomorzu Zachodnim obecne były tylko pojedyncze okazy tych odmian.

Słowa kluczowe: Chlorophyceae, Desmiales, ekosystemy mszarów

Information on the author

Wojciech W.A. Kowalski

The author is a specialist in the field of algology. His research interests concern both single species of algae and whole groups of marine and freshwater algae, with particular emphasis on rare and endangered taxa. A special taxonomic group of interest are the taxa associated with the ecosystems of peat bogs, as well as freshwater red algae. Now, he is retired researcher from the Department of Botany and Nature Conservation, West Pomeranian University of Technology in Szczecin.

