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Gomphonema svalbardense sp. nov., a new freshwater diatom species (Bacillariophyta) from the Arctic Region

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Abstract

During a survey of freshwater diatoms from lakes in the region of Petuniabukta on Spitsbergen (Svalbard Archipelago) a new *Gomphonema* species, *G. svalbardense* sp. nov., has been recorded. The new taxon was previously cited in the literature as *G. angustatum* var. *undulatum* but this identification proved to be erroneous. Detailed morphology description of *G. svalbardense* based on light and scanning electron microscopy is presented in this paper and the morphological features of the taxon have been compared with similar species. *Gomphonema svalbardense* is characterized by its typical linear, almost naviculoid outline with undulating margins, with clearly inflated central part, asymmetric central area, lateral raphe with simple straight proximal endings and the weakly radiate striae. History, ecology and biogeography of the species, mainly based on literature data, have been included.

Key words: Svalbard, Arctic Region, *Gomphonema*, diatoms, taxonomy, morphology, new species

Introduction

In the middle of the twentieth century, the diatom flora of the Arctic Svalbard Archipelago (74°–81°N, 10°–35°E) was the focus of several large morphological and taxonomic studies, published by among others Hustedt (1937), Krasske (1938) and Foged (1964), the latter listing more than 572 taxa in 207 samples. During more recent years, diatom studies on Svalbard were restricted to a few sparse floristic and (paleo-)ecological accounts (e.g., Picińska-Fałtynowicz 1988, Beyens 1989, Van de Vijver *et al.* 1999, Guilizzoni *et al.* 2006, Luoto *et al.* 2011) and only a few new taxa were described from the archipelago. Van de Vijver *et al.* (2004) described three new *Stauroneis* taxa from Svalbard in their revision of this genus in the Arctic and Antarctic Regions.

Since 2011 the interest in diatom research on Svalbard has revived with the Czech education program of polar ecology undertaken by the Centrum for Polar Ecology (University of South Bohemia). During the regular field expeditions, several lakes in the surroundings of the Petuniabukta fjord area have been studied (Reports of Czech research activities in Petuniabukta, http://polar.prf.jcu.cz/docs_cz.htm). The Petuniabukta fjord area is located in the northern part of Billefjorden, the inner branch of Isfjorden in the central part of Spitsbergen, the main island of the Svalbard Archipelago. The area is situated in the maritime High Arctic climate zone, with a mean annual temperature of about -7.5 °C and low precipitation rates of about 200 mm a year, mainly in the form of snow (Rachlewicz *et al.* 2007, Komárek *et al.* 2012, Láska *et al.* 2012). The geology of the study area is strongly correlated to the north-south facing Billefjorden Fault zone which resulted in a complex of different rock formations belonging to four structural entities differing in age and origin (Dallmann *et al.* 1999, Szczuciński & Rachlewicz 2007). The entire fjord is surrounded by steep mountains ranging between 265 and 935 m a. s. l. (Komárek *et al.* 2012). During the early Holocene, the entire area rose due to glacioisostatical uplift which resulted in the development of several good-preserved marine terraces (Szczuciński & Rachlewicz 2007). About ten glaciers, of which the tide-water glacier Nordenskiöld is the biggest, are located in the area. Since the beginning of the 20th century, the glaciers are retreating with speeds ranging from a few meters to 50 meters a year (Szczuciński

or s-shaped with or without central flaps [e.g., *G. acuminatum* Ehrenberg (1832: 88)-complex and the *G. truncatum* Ehrenberg (1832:88)-complex] (Reichardt 1999, 2001). Occasionally species show depressed areolae such as in *G. vibrioides* (Reichardt 1991: 524) or *G. latipes* Reichardt (2001: 196), but never as deep as in *G. svalbardense* where the areolae are small rounded poroids each positioned eccentrically at the bottom of a deep, irregularly shaped depression. Reichardt (1999) showed one picture of *G. lapponicum* (Plate 46, fig. 10) where rounded areolae are visible at the bottom of shallow, rounded depressions but this structure is entirely different from the areolae in *G. svalbardense*. The internal opening of the isolated pore is hardly separated from the areola series in the central area. In most *Gomphonema* taxa, the internal opening is usually a slit-like, elongated opening, positioned between the internal proximal raphe endings (see for instance *G. acuminatum* in Reichardt 1999, plate 55, Fig. 4) or located at the end of a (shortened) series of areolae (*G. angustatum* in Reichardt 1999, plate 23, Figs 15–16) but then the opening can always be distinguished as an elongated, thin slit contrary to the short slit in *G. svalbardense*.

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