On the morphology and taxonomy of *Cyclotella rossii* (Bacillariophyta)

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Abstract. An analysis of published data on *Cyclotella rossii* and *C. chantaica* has shown general morphological similarity and coincidence of the majority of quantitative and qualitative characters. They are valve diameter, frequency of marginal fultoportulae and number of satellite pores in them, number of central fultoportulae and number of their satellite pores, number of rimoportulae and valve relief, presence of externally colliculatelly, position of rimoportula and its fissure orientation respectively. Based on this data and priority the name *C. chantaica*, it is suggested to treat *C. rossii* as a synonym of *C. chantaica* and, considering the latest changes in their systematic position, expand the diagnosis of the species *Pantocsekiella chantaica* (Kuzmina et Genkal) K. T. Kiss, Genkal et Ács emend. Genkal.

Keywords: Bacillariophyta, *Cyclotella rossii*, *Cyclotella chantaica*, frustules morphology, taxonomy.

К морфологии и таксономии *Cyclotella rossii* (Bacillariophyta)

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Резюме. Анализ литературных данных показал общее морфологическое сходство и совпадение большинства количественных (диаметр створки, частота расположения краевых выростов и число опор у последних, число центральных выростов и число опор у них, число двугубых выростов) и качественных (рельеф створки, наличие бугорчатости с наружной стороны,, расположение двугубого выроста и ориентация его щели) признаков *Cyclotella rossii* и *C. chantaica*. На основе этих данных и приоритета последнего названия предлагается свести *C. rossii* в синонимику к *C. chantaica* и, с учетом последних изменений в их систематическом положении, расширить диагноз вида *Pantocsekiella chantaica* (Kuzmina et Genkal) K. T. Kiss, Genkal et Ács emend. Genkal.

Ключевые слова: Bacillariophyta, *Cyclotella rossii, Cyclotella chantaica*, морфология панциря, таксономия.

The species *Cyclotella rossii* Håkansson was described using materials from a Swedish lake Laxa (Håkansson, 1990). The species belongs to small-sized forms (valve diameter 5–18 μm) and is characterized by 2–5 (rarely more) radial rows of puncta (Håkansson, 1990). Krammer, Lange-Bertalot (1991) gave a similar short diagnosis of this species. A detailed description of *C. rossii* with many light and electron microscopy micrographs was presented in a monograph by Houk *et al.* (2010). Other quantitative

(number of striae in 10 μm, frequency of marginal fultoportulae and number of satellite pores in them, number of central fultoportulae and number of their satellite pores, number of rimoportulae) and qualitative (structure of alveoli, copula and central area) features were added to the diagnosis (Houk *et al*., 2010). Later, based on the study of numerous materials from lakes and rivers in the Republic of Karelia, the species diagnosis was refined (Genkal, Chekryzheva, 2016). Over the last few years, the systematic position of *C. rossii* has been repeatedly changed — at first, this species was transferred to the genus *Lindavia* (Schütt) De Toni et Forti as *L. rossii* (Håkansson) Nakov, Gullory, Julius, Theriot et Alverson (Nakov *et al*., 2015), then — to the genus *Pantocsekiella* K. T. Kiss et E. Ács as *P. rossii* (Håkansson) K. T. Kiss et Ács (Ács *et al*., 2016). In 1989, based on materials from the Khantaika River, a new species was described — *Cyclotella chantaica* Kuzmina et Genkal. Morphologically this species is very similar to *C. rossii* (Genkal, Kuzmina, 1989). Later it was also transferred at first to the genus *Lindavia* (Nakov *et al*., 2015), and then — to *Pantocsekiella* (Ács *et al*., 2016).

The aim of this publication is a comparative analysis of morphology of two above mention species with taxonomical resolutions.

As shown in Table, ranges of variability of quantitative features in *P. rossii* and *P. chantaica* coincide, except for the number of striae in 10 μm. Higher values of this characteristic can be associated with interpopulation variability — as the valve diameter decreases, the number of striae in 10 μm increases (Genkal, Popovskaya, 2004; Genkal, 2014; Genkal, Chekryzheva, 2016). *C. chantaica* valves are flat, externally colliculate, mainly with several radial rows of punctae of unequal size ± shallow furrows or chaotically arranged, (Genlal, Kuzmina, 1989, figs 6–9), which is characteristic of *C. rossii* (Håkansson, 1990, figs 47–49; Houk *et al*., 2010, pl. 207, figs 1–6, pl. 208, figs 1–6, pl. 209, figs 1, 2; Genkal, Chekryzheva, 2016, Figs 1–26). The rimoportula position and orientation in *C. rossii* varies to a large extent (Genkal, Chekryzheva, 2016, Figs 29–38). In *C. chantaica* the process occurs near alveoli and its fissure is oriented either at an angle or perpendicular to them (Genlal, Kuzmina, 1989, figs 11, 12), like in *C. rossii*. Auxospores are found in *C. chantaica* (Genlal, Kuzmina, 1989, figs 13, 14). In the first description of *C. rossii* (Håkansson, 1990) and works by some researchers (Houk *et al*., 2010; Genkal, Chekryzheva, 2016), there is no information on coloniality of this species. According to the diagnosis (Genkal, Kuzmina, 1989), *C. chantaica* may occur as solitary cells as well as in colonies.

The stated above makes it possible to consider *C. rossii* to be conspecific with *C. chantaica* and, consequently, a synonym of the latter, as well as refine its diagnosis. Considering the latest taxonomic changes, an extended diagnosis of this species is presented.

Pantocsekiella chantaica (Kuzmina et Genkal) K. T. Kiss, Genkal et Acs emend. Genkal ≡ *Cyclotella chantaica* Kuzmina et Genkal, 1989, Biologia vnutrennikh vod. Informatsionnyy byulleten 4: 9. ≡ *Lindavia chantaica* (Kuzmina et Genkal) Nakov, Gullory, Julius, Theriot et Alverson, 2015, Phytotaxa 217(3): 254. ≡ *Pantocsekiella chantaica* (Kuzmina et Genkal) K. T. Kiss, Genkal et Acs, 2016, Fottea, Olomouc 16(1): 65.

Table

The variability of morphological features in *Cyclotella rossii* and *C. chantaica* according to published data

Features								Reference
Valve diameter, μm	Number of striae in 10 μm	Number of central fultoportulae	Number of satellite pores in central furtoportulae	Marginal fultoportulae arrangement	Number of satellite pores in marginal fultoportulae	Number of rimoportulae	Number of radial rows of pucta in the central area	
Cyclotella rossii								
5–18							2–5, rarely more	Håkansso, 1990
5–18								Krammer, Lange-Bertalot, 1991
9.5–16	14–16	2		On every 3–5 costae				Genkal *et al.*, 1997; Genkal, Yeshko, 1998
5–18							2–5, rarely more	Håkansson, 2002
5–18	16–18	2–3(5)	2	On every 2–3(5) costae	2	1	2–8	Houk *et al.*, 2010
5–31	12–25	1–13	2 (rarely 1 or 3)	On every 2–8 costae	2	1 (rarely 2)	2–8	Genkal, Chekryzheva, 2016
Cyclotella chantaica								
3.4–21.8	18–35	1–5	2	On every 3–8 costae	2	1		Genkal, Kuzmina, 1989

= *Cyclotella kuetzingiana* var. radiosa Fricke in Schmidt 1900, Atlas der diatomaceenkunde 56: pl. 222, fig.8.

= *Cyclotella rossii* Håkansson, 1990, Diatom Research 5(2): 267. ≡ *Lindavia rossii* (Håkansson) Nakov, Gullory, Julius, Theriot et Alverson, 2015, Phytotaxa 217(3): 258. ≡ *Pantocsekiella rossii* (Håkansson) K. T. Kiss et Acs, 2016, Fottea, Olomouc 16(1): 68.

= *Cyclotella palustris* Genkal et Kulikovskiy, 2008, Botanicheskii Zhurnal 93(5): 773.

Cells cylindrical, 3.4–31 μm in diam., solitary or in colonies (4–41 cells). Striae of nearly equal lengths 12–35 in 10 μm. Marginal fultoportulae are situated on every, slighty depressed, 2–8 costae, Externally with a simple opening, internally with a short central tube surrounded laterally by two satellite pores. A single rimoportula (sometimes two) situated in the marginal area, external with a small opening on a shortened costa, internally with a sessile labium having a relatively wide radial, oblique or circumferentially oriented slit. The central area in nearly flat, externally colliculate, more often with several radial rows of puncta of unequal size ± shallow furrows or chaotically, 1–13 fultoportulae situated eccentrically near the center or in the shape of ring, with a small, simple external opening, internally with short central tube surrounded by 2 (rarely 1–3) satellite pores. The girdle band is smooth, composed of several copulae. There are auxospores.

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