

The Identity of *Cyclotella glomerata* Bachmann and *Discostella nipponica* (Skvortzov) Tuji et Williams comb. et stat. nov. (Bacillariophyceae) from Lake Kizaki, Japan

Akihiro Tuji¹ and David M. Williams²

¹Department of Botany, National Science Museum,
Amakubo 4-1-1, Tsukuba, 305-0005 Japan
E-mail: tuji@kahaku.go.jp

²Department of Botany, The Natural History Museum,
Cromwell Road, London SW7 5BD, U.K.

Abstract Type material of *Cyclotella glomerata* Bachmann and seven recently collected samples were examined to establish the identity of this species. *C. glomerata* has a central rimoportula at the central area of the valve face and forms colonies; several marginal fultoportulae occur on the ribs. Thus, this taxon is not a member of the new genus *Discostella*, which includes the *Cyclotella stelligera* group, but is similar to other species in *Cyclotella*.

In addition, isotype material of *C. glomerata* f. *nipponica* Skvortzov was examined. It does not share significant characters with *C. glomerata* but has characters that place it in *Discostella*. Thus, we propose the new combination *Discostella nipponica* (Skvortzov) Tuji et D. M. Williams.

Key words: *Cyclotella glomerata* f. *nipponica* Skvortzov, *Discostella nipponica* (Skvortzov) Tuji et D. M. Williams, *Cyclotella glomerata* Bachmann, *Discostella glomerata* (Bachmann) Houk, Wolfgangsee

Introduction

Cyclotella glomerata Bachmann was first described by Bachmann (1911) from Zugersee (The Lake of Zug), Switzerland. This taxon has been reported worldwide as a planktonic species (e.g. Krammer & Lange-Bertalot 1991, Tuji & Houki 2001, Houk & Klee 2004). Krammer & Lange-Bertalot (1991) described this taxon as part of the “*Cyclotella stelligera* sippen complex”. Tuji & Houki (2001) reported this taxon from Lake Biwa, illustrated with an SEM, suggesting that it was a member of the “*Cyclotella pseudostelligera* group”. Recently, Houk & Klee (2004) transferred this taxon to the new genus *Discostella* Houk et Klee, which included the *Cyclotella stelligera* group. All previous reports of *Cyclotella glomerata* have included it in the *Cyclotella stelligera* / *pseudostelligera* group.

Bachmann's original figures (1911: Figs 106–108) and the illustrations offered by Krammer & Lange-Bertalot (1991: Taf. 49), depict

specimens in colonies of many cells. Since the descriptions of species placed in the genus *Discostella* have no central rimoportulae nor do they form colonies, this leaves problems with the inclusion of *C. glomerata* in *Discostella*.

In addition, Skvortzov (1936) described the form *C. glomerata* f. *nipponica* Skvortzov from Lake Kizaki, Japan. Skvortzov's original illustration is too simple to be certain of its identity and his name has not been used in any floral reports from Japan.

In this study, we have examined specimens from Bachmann's type slide of *C. glomerata*, Hustedt's slides, and several recently collected samples, from Wolfgangsee, Austria, and isotype material of *C. glomerata* f. *nipponica*, in an attempt to clarify the taxonomy of *C. glomerata*.

Materials and Methods

A slide prepared by Bachmann from Zugersee, the type locality of *Cyclotella glomerata*, and la-

belled AC2/57 in BRM was examined. Another slide from Zugersee labelled 136/07 as well as raw material (E1305, Meister 589, from BRM; material collected by Meister on 3rd May 1906) were examined. The slides in BRM with specimens of *Cyclotella glomerata*, numbered AC1/20 and AC1/21 and prepared by Hustedt from Wolfgangsee material, were also examined. Further, six samples (TNS-AL-55781–55784, 55789–55790 in TNS) collected from Wolfgangsee by A. Tuji on 15th–18th August 2005, were used for SEM and LM observation of *C. glomerata*.

Raw material from Lake Kizaki (TNS-AL-55512 in TNS), thought to be isotype material of Skvortzov's (1936) earlier collection (Tuji 2002, Ohtsuka & Tuji 2002), was used to examine specimens of *C. glomerata* f. *nipponica* Skvortzov.

Results

Specimens of two taxa from *Cyclotella* (or *Discostella*) were observed in slide AC2/57 (pl. 1 figs. 1, 3–6), collected from Zugersee (the type locality of *C. glomerata*) and Hustedt's slide AC1/20 and AC1/21 (pl. 1 fig. 2) from Wolfgangsee. Specimens of one taxon have a circular central pattern with a central fuloportula (pl. 1 fig. 3), the other has a ring and stelligoid central pattern with no central fuloportulae (pl. 1 fig. 4). Both taxa are easily distinguished using the central pattern and the existence of central fuloportula(e). The taxon with the central fuloportula agrees with the original description of *C. glomerata* and can be identified as such.

The individuals in the slides, AC2/57 (pl. 1 figs. 1, 3–6), AC1/20, AC1/21 (pl. 1 fig. 2), 136/07 (pl. 1, figs. 7–9) and TNS-AL-55790sa (pl. 1 figs. 10–17), all share the similar dimensions of cell size, density of striae, the form of central area, the possession of one to several small central fuloportula and the character of colony formation characteristics (pl. 1, figs. 1, 2, 17) that can be observed on the micrograph in Krammer & Lange-Bertalot (1991: Taf. 49, fig. 11), except for two points. The figure in Kram-

mer & Lange-Bertalot (1991) were from Wolfgangsee (AC1/20 in BRM). The individuals in slide 136/07 do not appear to form colonies—although it is possible that they could be destroyed during the cleaning process. Colonies were not observed in recently collected material after they were subjected to the cleaning process. The cell size of individuals in the slide 136/07 and TNS-AL-55790sa are larger than others, but the dimensions overlap. The ultra-structure of the individuals in TNS-AL-55790 from Wolfgangsee also agree in their main features with the structure of specimens from a slide 136/07 and a material E1305 from Zugersee.

A description is as follows: cells 3–10 μm in diameter, 2.5–4.5 μm in depth, attached at the valve face, forming colonies with few to many cells (pl. 1 figs. 1, 2, 17). In SEM, one small central fuloportula with two pore covers and cowlings, are present in each valve (pl. 2 figs. 1–6). Marginal fuloportulae, also with two pore covers and cowlings, exist close to the valve ends and at the end of every three to four ribs (pl. 2 figs. 2, 3, 6). The ribs on the marginal fuloportulae are more depressed than the other ribs (pl. 2 figs. 2–4). Rimoportulae occur on the valve face, close to valve face/mantle junction (pl. 2 fig. 4).

C. glomerata f. *nipponica* is rare in the isotype material from Lake Kizaki. The specimens that were found had cells of 3–4 μm in diameter, with striae 18 in 10 μm (pl. 3 figs. 1–7). The specimens occur only as unicells, not in colonies. No central fuloportula was observed in the SEM, although marginal fuloportulae, with long tubes and two cowlings, occur at the valve face/mantle junction (pl. 3 figs. 6–7). The ribs branch on the valve face, while they strongly branch on the mantle. A small sessile rimoportula occurs on the valve/mantle junction (pl. 3 figs. 1–7).

Discussion

It seems appropriate to designate BRM slide AC2/57 from Zugersee as lectotype for *Cyclotella glomerata* Bachmann.

Our observations show that *C. glomerata*

forms colonies, has one to three central fultoportulae with marginal fultoportulae occurring on the ribs, observations supported by the original figures presented by Bachmann (1911). These characters are not part of the genus *Discostella* as described by Houk & Lee (2004). The SEM image of *C. glomerata* presented by Houk & Lee (2004: fig. 114) is not of *C. glomerata*.

We designate as lectotype for *C. glomerata* f. *nipponica* Skvortzov an individual on the slide TNS-AL-55512sl in TNS, made from isotype material; TNS-AL-55512. The designated lectotype agrees with the characters of a taxon identified as *C. glomerata* by Japanese diatomists (e.g. Tuji & Houki, 2001). Since its characters are of the genus *Discostella* and that it differs considerably from *C. glomerata* f. *glomerata*, we propose the new combination *Discostella nipponica*.

Taxonomic Conclusions

Cyclotella glomerata Bachmann Mitt. Naturfor. Ges. Luzern 6: 131. f. 106–108, 1911.

(pl. 1 figs. 1–3, 5–17, pl. 2 figs. 1–5)

Lectotype (designated here): An individual in AC2/57 in BRM. (pl. 1 fig. 1 (arrow), fig. 2).

Synonym: *Discostella glomerata* (Bachmann) Houk et Klee, Diatom Res. **19**: 220. 2004.

non: *Discostella glomerata* sensu Houk et Klee, Diatom Res. **19**. f. 114. 2004.

Cyclotella glomerata sensu Tuji & Houki 2002.

Discostella nipponica (Skvortzov) Tuji et D. M. Williams, comb. et stat. nov. (pl. 3 figs. 1–7)

Basionym: *Cyclotella glomerata* Bachmann f. *nipponica* Skvortzov, *Philippine J. Sc.* **61**: 13. pl. 1. f. 12, 1936.

Lectotype (designated here): An individual in TNS-AL-

55512sl in TNS (pl. 3. f. 1–3). England finder: L19.

Isotype (type material): TNS-AL-55512 in TNS.

Type locality: Lake Kizaki, Nagano Pref., Japan.

Synonym: *Cyclotella glomerata* sensu Tuji & Houki 2002.

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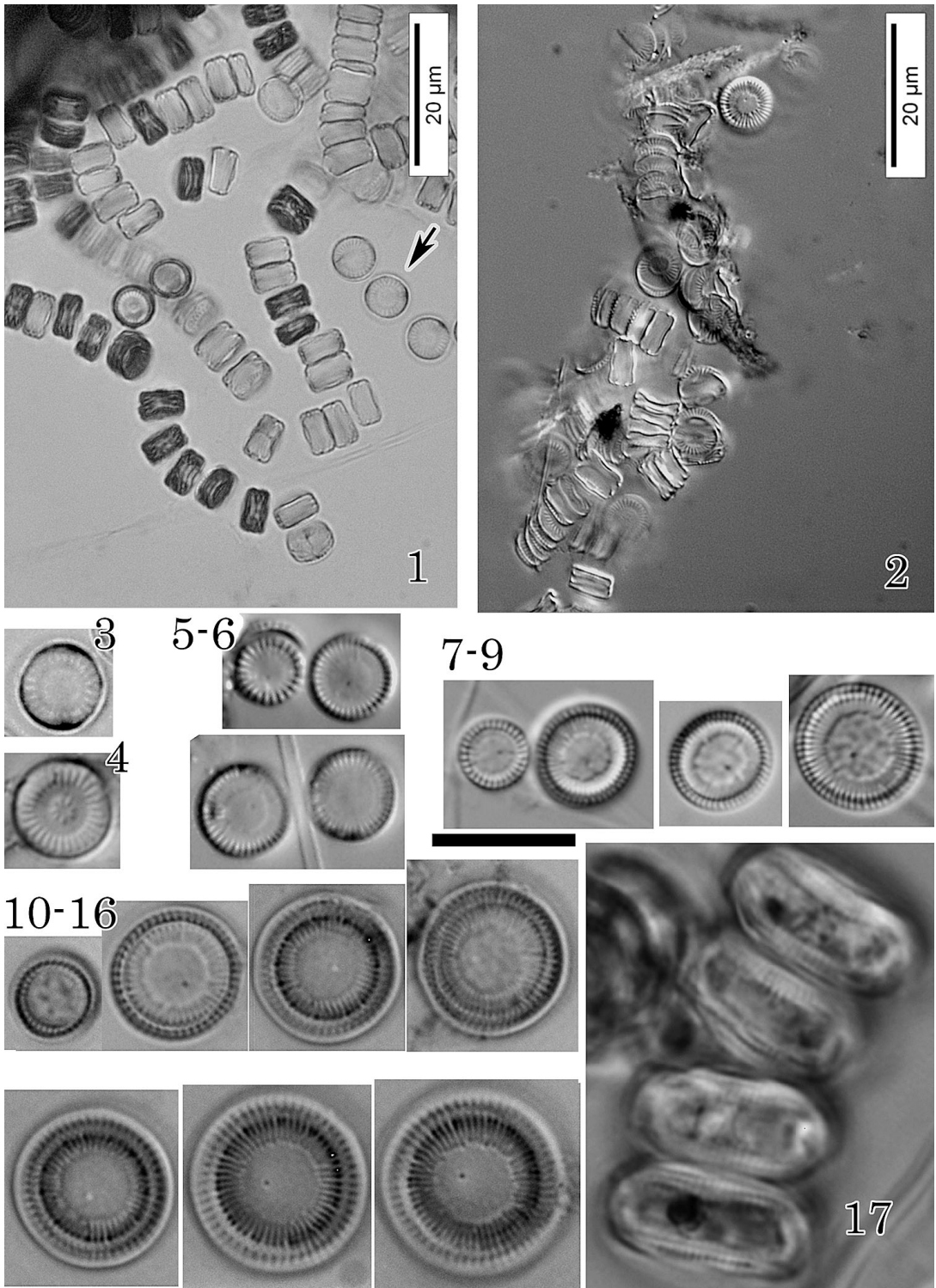


Plate 1. 1–3, 5–17. *Cyclotella glomerata* Bachmann. LM. 4. *Discostella* sp. 3–17. Bar=10 µm. 1, 3–6. AC2/57 in BRM, specimens collected from Zugersee. 1. arrow and 3: lectotype, designated here. 2. AC1/21 in BRM, specimens collected Wolfgangsee. 7–9. 136/07 in BRM, specimens collected from Zugersee. 10–17. TNS-AL-55790sa in TNS, specimens collected from Wolfgangsee.

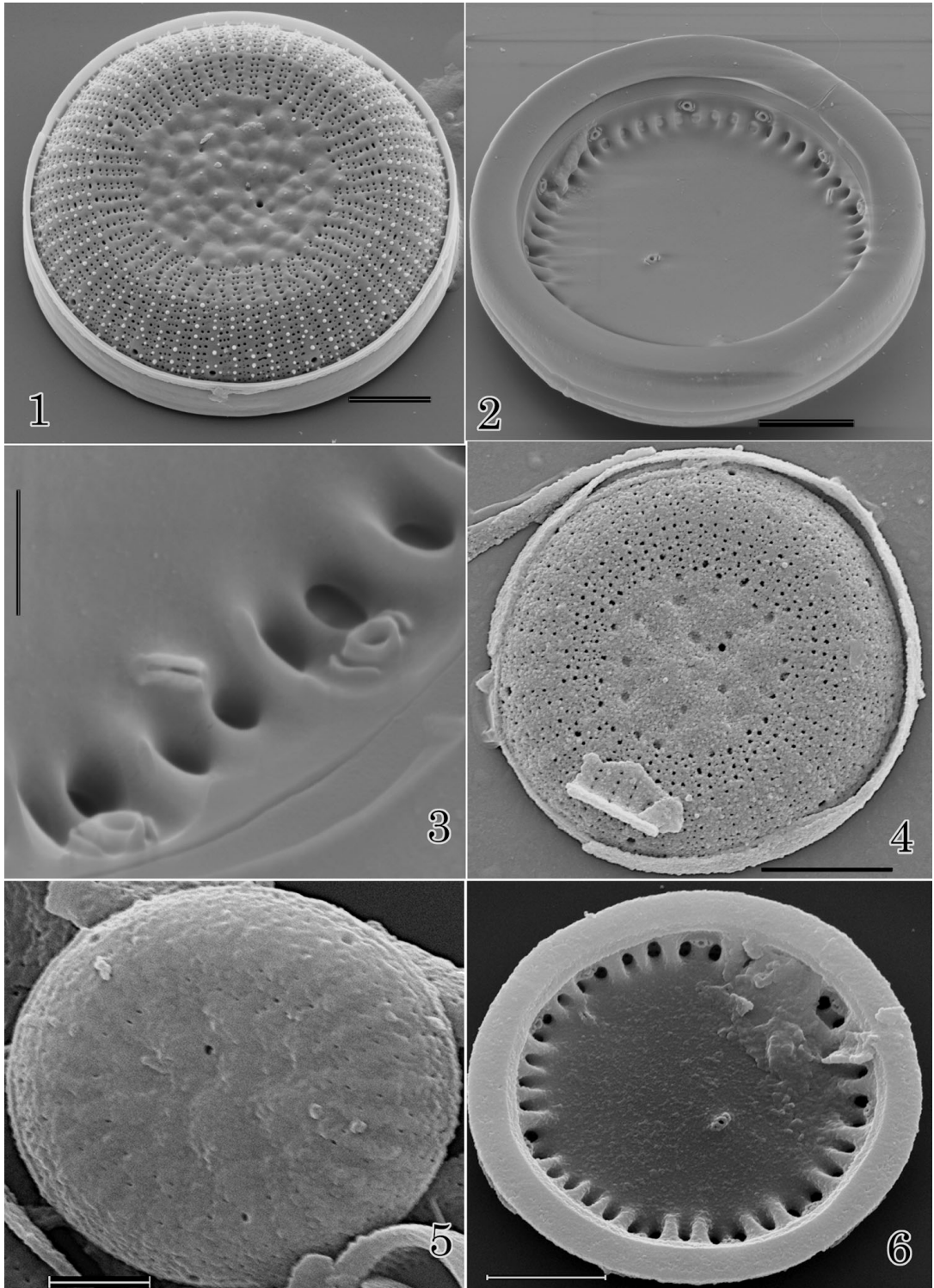


Plate 2. 1–6. *Cyclotella glomerata* Bachmann. SEM. 1–3. TNS-AL-55790 in TNS, specimens collected from Wolfgangsee. 1–2. Bar=2 μm . 3. Bar=0.5 μm . 4–6. E1305 in BRM, specimens collected from Zugersee. 4. Bar=2 μm . 5, 6. Bar=1 μm . 1, 4, 5. External view of valve face. 2–3, 6. Inner view of valve face showing valve face fultoportulae, marginal fultoportulae on the ribs and the rimoportula on valve face close to valve face/marginal junction.

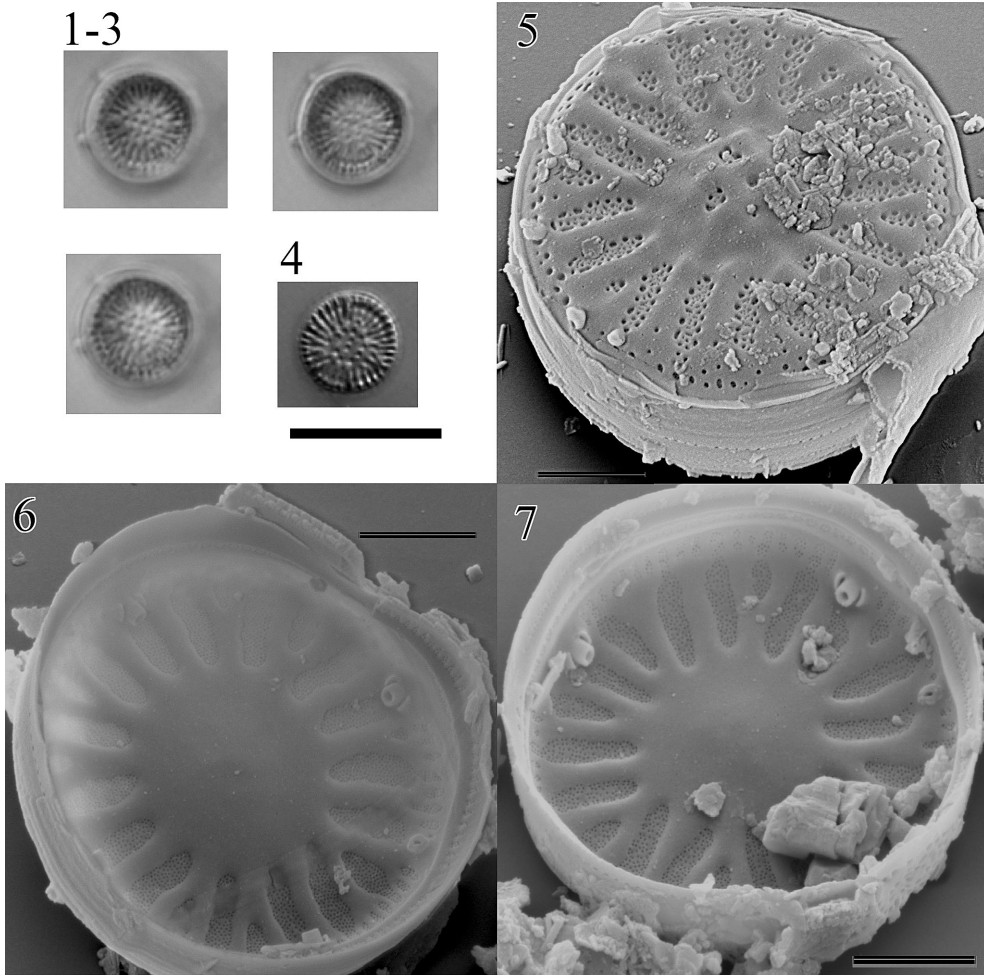


Plate 3 1–7. *Discostella nipponica* (Skvortzov) Tuji et D. M. Williams, comb. et stat. nov. 1–4. TNS-AL-55512sl in TNS. Bar=10 μ m. LM. 1–3. Lectotype. 5–7. TNS-AL-55512 in TNS. SEM. Bar=1 μ m. 5. External view of valve face. 6–7. Inner view of valve face showing marginal fultoportulae on the rib and a rimoportula on valve face close to valve face/marginal junction; no valve face fultoportulae are evident.