

Muelleria pseudogibbula, a new species from a newly recorded genus (Bacillariophyceae) in China*

LIU Qi (刘琪)^{1,2}, LI Bo (李博)², WANG Quanxi (王全喜)^{2,**}

¹ School of Life Science, Shanxi University, Taiyuan 030006, China

² College of Life and Environment Science, Shanghai Normal University, Shanghai 200234, China

Received Jul. 21, 2016; accepted in principle Oct. 25, 2016; accepted for publication Jan. 17, 2017

© Chinese Society for Oceanology and Limnology, Science Press and Springer-Verlag GmbH Germany, part of Springer Nature 2018

Abstract The genus *Muelleria* is reported for the first time from China in this paper. The new diatom species *Muelleria pseudogibbula* sp. nov. was observed during a survey of diatoms from Zoigê Wetland, Sichuan Province, China. The morphological characters of this new species were documented by light and scanning electron microscope and compared with similar species. *M. pseudogibbula* is characterized by its lanceolate to linear-lanceolate valve outline with rounded apices, two longitudinal canals running parallel to each side of the raphe, proximal ends of the raphe deflected to the same directions and finishing before the first row of areolae, and curved distal raphe ends, forming two divergent branches.

Keyword: *Muelleria*; new species; new record genus; Qinghai-Tibet; wetland

1 INTRODUCTION

Zoigê Wetland covers Maqu County, Hongyuan County and Aba County, and is located at the eastern edge of the Qinghai-Tibet Plateau (Zhou et al., 2002; Chen and Lü, 2010). As typical alpine peat wetland ecosystem, Zoigê Wetland has an important role in biodiversity and the conservation of water and soil. From the mountain regions numerous watercourses flow down towards the wetland, as a consequence forming a complete physiographic region (Mu, 1982).

The diatom genus *Muelleria* (Frenguelli) Frenguelli was established in 1945 (Frenguelli, 1945), and *M. gibbula* (O. Müller) Frenguelli is the type species. It comprises a small number of biraphid diatoms, with less than 40 species reported so far. The genus *Muelleria* is characterized by two apparently longitudinal ribs, the proximal raphe ends deflected to the same direction in external valve (Spaulding and Stoermer, 1997). Most species are restricted to high latitudes of either the southern or northern hemisphere, most are narrowly endemic in fresh water and brackish water (Spaulding et al., 1999).

We encountered a new species of *Muelleria* from the Zoigê Wetland, and the present report includes light (LM) and scanning electron microscope (SEM)

observations on Chinese specimens of the new species and comparisons with similar species in the genus

2 MATERIA AND METHOD

The diatom samples in this study were obtained from Zoigê Wetland in May, 2012. Most of the samples were benthic from freshwater and were fixed in situ with 4% formaldehyde.

Samples were digested with hydrochloric acid and concentrated H₂O₂ (30%) to remove organic matter. After treatment, cleaned material was washed 5–7 times with distilled water, then dried on cover glasses and mounted in Naphrax.

For LM, the slides were observed with an Olympus BX51 microscope at the University of Colorado, Boulder. For SEM observation, the material was air dried on copper stubs to copper stubs, sputter coated with gold-palladium and viewed with a JEOL JSM-6380LV SEM at Shanghai Normal University.

Type slides and material are stored at the Freshwater Algal Herbarium of Shanghai Normal University

* Supported by the National Natural Science Foundation of China (Nos. 31270249, 31600166)

** Corresponding author: wangqx@shnu.edu.cn

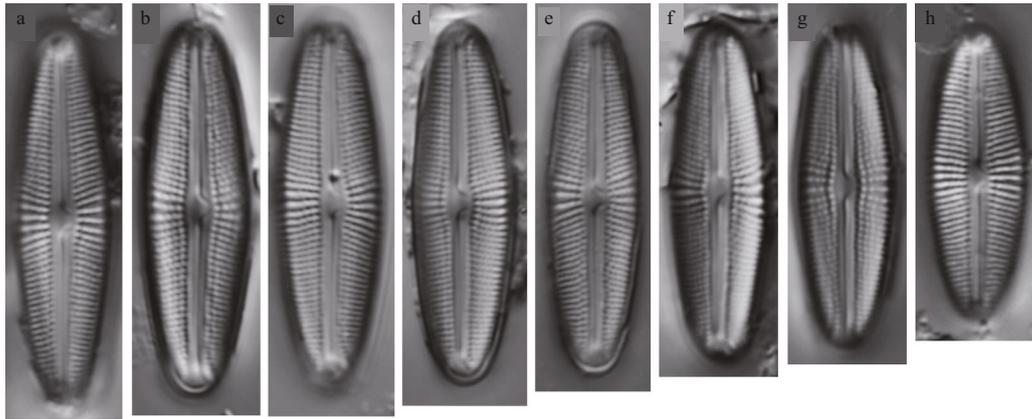


Fig.1 LM micrographs of *Muelleria pseudogibbula* (a–h); holotype specimen (b)

Scale bar=10 μ m.

(SNU). Terminology for valve features follows Hendey (1964), Round et al. (1990), Spaulding and Stoermer (1997), Spaulding et al. (1999).

3 RESULT

Muelleria pseudogibbula Q. Liu & Q.X. Wang sp. nov.

Fig.1a–h; Fig.1b is the holotype.

Valves are lanceolate to linear-lanceolate with rounded apices. Valve length 20.5–25.0 μ m, breadth 6.0–6.5 μ m. The raphe is almost straight with two longitudinal canals alongside the axial area running parallel to each side of the raphe. Proximal raphe ends are deflected to the same directions and finish before the first row of areolae. Axial area is narrow and linear. Central area is small and elliptical. Striae are radiate near the center, becoming parallel near the apices. Central striae are more widely spaced, 19–21 in 10 μ m, increasing to 25–26 in 10 μ m distally.

In SEM, striae are composed of individual, circular, small areolae that are variable in size and becoming abruptly and distinctly expanded on each side of distal raphe (Fig.2a, b). The raphe is straight, barely undulate and filiform (Fig.2a). External distal raphe ends form two divergent branches in a “Y” shape (Fig.2a, b). Proximal raphe ends are deflected to the same side of the valve and finish before the first row of areolae (Fig.2a, c). Distal raphe ends curve slightly in the same direction as the proximal raphe ends, clearly bifurcating, finish onto the valve face/mantle junction (Fig.2a, c). The axial area is narrow and linear, enlarging slightly in the middle of the valve to form an elliptical central area, and at the apices (Fig.2a, b).

Type: CHINA. Zoigê Wetland, Sichuan province (SHTU, holotype SC20120505401, holotype illustrated in Fig.1b, isotype SC20120505402).

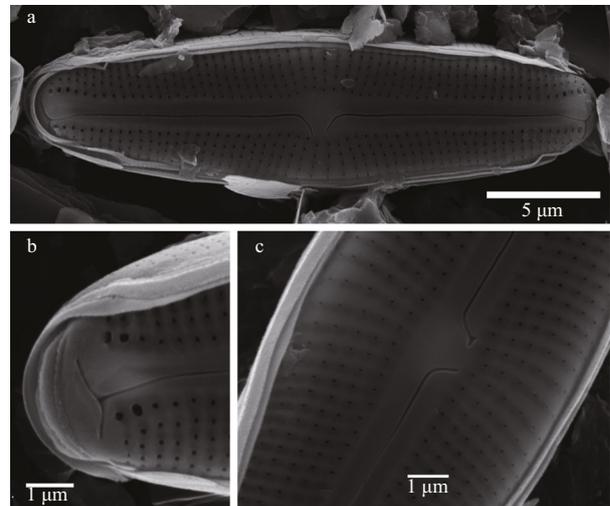


Fig.2 SEM micrographs of *Muelleria pseudogibbula*

a. external view of the valve showing the external raphe structure and uniseriate striae; b. valve exterior showing distal raphe ends are curved, forming two divergent branches; c. detail of proximal raphe ends, showing they are clearly bifurcated. Scale bars: a: 5 μ m; b and c: 1 μ m.

Etymology: The specific epithet of the new species refers to its resemblance to *M. gibbula*.

Type locality: Zoigê Wetland, Sichuan province, China; altitude 3594 m, epiphytic on aquatic vascular plants, water pH 8.2.

4 DISCUSSION

The new species is similar to *Muelleria gibbula*, *M. regigeorgiensis* and *M. linearis*. In its valve outline, *Muelleria pseudogibbula* is similar to *M. gibbula*, which has a linear to elliptical valve outline with broadly rounded apices (Spaulding and Stoermer, 1997; Spaulding et al., 1999). However, *M. pseudogibbula* has expanded areolae on each side of the distal raphe ends, these appear as lacking in *M. gibbula* and *M. linearis*. *M. pseudogibbula* has

rounded areolae and *M. regigeorgiensis* Van de Vijver & Spaulding has C-shaped to reniform areolae (van de Vijver et al., 2010).

5 ACKNOWLEDGEMENT

We are grateful to the collector of PANG Wanting, NI Yichen and FANG Yong for their help with collection samples in the field.

References

- Chen Z K, Lü X G. 2010. Comparison between the marsh wetland landscape Patterns in the Zoigê Plateau for two periods. *Wetland Science*, **8**(1): 8-14. (in Chinese with English abstract)
- Frenguelli J. 1945. El platense y sus diatomeas, Las diatomeas del platense. *Revista del Museo de La Plata (Nueva serie)*, (sección Paleontología), **3**: 77-221.
- Hendey N I. 1964. An Introductory Account of the Smaller Algae of British Coastal Waters. Part V: Bacillariophyceae (diatoms). Her Majesty's Stationery Office, London. 317p.
- Mu G C. 1982. The natural situation and physiognomy growth of the Zoigê Plateau. *Journal of Southwest China Normal University*, **4**: 42-46.
- Round F E, Crawford R M, Mann D G. 1990. The Diatoms: Biology and Morphology of the genera. Cambridge University Press, Cambridge. 747p.
- Spaulding S A, Kociolek J P, Wong D. 1999. A taxonomic and systematic revision of the genus *Muelleria* (Bacillariophyta). *Phycologia*, **38**(4): 314-341.
- Spaulding S A, Stoermer E F. 1997. Taxonomy and distribution of the genus *Muelleria* Frenguelli. *Diatom Research*, **12**(1): 95-113.
- van de Vijver B, Mataloni G, Stanish L, Spaulding S A. 2010. New and interesting species of the genus *Muelleria* (Bacillariophyta) from the Antarctic region and South Africa. *Phycologia*, **49**(1): 22-41.
- Zhou W J, Lu X F, Wu Z K, Deng L, Jull A J T, Donahue D, Beck W. 2002. Peat record reflecting Holocene climatic change in the Zoigê Plateau and AMS radiocarbon dating. *Chinese Science Bulletin*, **47**(1): 66-70.