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A new species of *Gomphonema* (Bacillariophyta) from Xingkai Lake, China

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Abstract

During an extensive survey of diatoms from Xingkai Lake, China, one unusual species of the genus *Gomphonema* was discovered. Detailed morphology of this species is presented using light (LM) and scanning electron microscopy (SEM). These specimens are described as new and named *Gomphonema subinsigniforme* sp. nov. It is distinguished from other known species of *Gomphonema* by its shape, being tumid at the centre of valves, with acute headpole, and narrow rounded footpole. Morphological features and ecological parameters of this species are compared to others in the genus.

Key words: new species, Bacillariophyceae, diatom, taxonomy, SEM

Introduction

The diatom genus *Gomphonema* Ehrenberg (1832:87) is large, including over 500 taxa worldwide (Fourtanier & Kociolek 2009). Almost all taxa are freshwater, although a few marine species have been reported (see Medlin & Round 1986) and all could perhaps be separated from *Gomphonema* as defined here (e.g. see *Gomphonemopsis* Medlin & Round 1986: 207, *Gomphoseptatum* Medlin & Round 1986: 212). Recent work by Passy *et al*. (1997), Kociolek & Stoermer (1991a, 1991b, 1993), Kociolek *et al*. (2004), Kociolek & Kingston (1999), Reichardt (2001, 2005, 2007) and Karthick & Kociolek (2012), among others, have shown variation in striae construction, stigma position, size and shape, raphe organization and apical pore field composition and position within the genus, suggesting the genus is much more diverse morphologically than previously thought. While new species of gomphonemoid diatoms (You *et al*. 2013), and specifically of the genus *Gomphonema* (Fan *et al*. 2004; Gong *et al*. 2012; Liu *et al.* 2012), have been documented from China, and a general treatment of the genus has been offered by Shi (2004) for the country, many areas of China have not been surveyed and further research on the biodiversity of this genus is required.

Xingkai Lake (45°01′–45°34′N - 131°58′–133°07′E), is located in the eastern margin of Heilongjiang Province in China and is a transboundary lake shared by the People's Republic of China (China) and the Russian Federation (Russia). This lake is the largest freshwater lake in Northeast Asia; it is referred to as Xingkai Lake in China and Khanka Lake in Russia. It is actually made up of two lakes: the small, northern Chinese Xiaoxingkai (small Xingkai) and the main Xingkai/Khanka Lake. Our samples were collected from both.

The first report of diatoms from Xingkai Lake was offered by Skvortzow (1929). He reported 139 taxa belonging to 29 genera, including 9 taxa belonging to *Gomphonema*; no new species were described.

In this paper, a new *Gomphonema* species is described, based on detailed morphological investigations using both LM and SEM.

Material and Methods

Material was collected in June 2011 from Xingkai Lake (see Table 1 for details). Water temperature and pH were measured at the time of sampling by using a portable tester (HI 98127, Suzhou, China). Samples were fixed in the field with 4% formalin. Samples were prepared according to standard techniques by boiling in sulphuric acid and oxidation with nitric acid. Frustules were then washed seven times using distilled water, each time being spun for 5 minutes at 3000rpm (Liu *et al*. 2010). Cleaned diatom valves were mounted onto permanent slides with Naphrax.

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Gomphonema subinsigniforme is similar to *Gomphonema butantanum* in outline, apical pore field placement and striae shape. But *G. butantanum* has a broader axial area and more sharply attenuated headpole (Lange-Bertalot *et al*. 1996: plate 38, figs 1–3(4, 5)).

A diatom named "*Gomphonema* spec 2" (Metzeltin *et al*. 2009) also resembles *G. subinsigniforme* in some features, but no description was provided by Metzeltin *et al*. (2009). "*Gomphonema* spec 2" was found in various localities from Khentii Province (Mongolia). According to Metzeltin *et al*. (2009), "*Gomphonema* spec 2" has a lanceolate-clavate outline, acute headpole, rounded footpole. *G. subinsigniforme* differs from this species by being tumid at the centre of the valves.

According to Patrick & Reimer (1975), *G. insigne* and *G. insigniforme* seem to prefer medium hard, circumneutral mesotrophic to eutrophic waters. Our new species occurs in low conductivity, pH slightly acidic to neutral water, prefer to live in marsh and ponds; epiphyte to moss, grass, leaves, filament etc.

In addition to *Gomphonema subinsigniforme*, an additional 33 other species of *Gomphonema* were found in Xingkai Lake. Shi (2004) recorded only 10 species. The most common species encountered by us was *G. acuminatum* Ehrenberg (1832: 88) and *G. parvulum* (Kützing) Kützing. Studies on diatoms in Northeast of China are meager and, hence, further investigations are needed to understand the diversity of diatoms in this region.

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