



The diatom genus *Hantzschia* (Bacillariophyta) in Xinjiang Province, China

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Abstract

Hantzschia species are uncommon in Xinjiang Province, usually found in small populations and found only in a few samples. However, the diversity in the region is relatively high, with 13 species and 1 variety being identified. Except for the cosmopolitan species *H. amphioxys*, *H. abundans*, *H. virgata* and *H. distinctepunctata*, most of the taxa in *Hantzschia* observed in this region have limited distributions, including *H. vivacior*, *H. nitzschioides*, *H. compacta*, *H. barckhausenii*, *H. longa* and *H. vivax*, as well as the species described herein as new. Four new species of *Hantzschia* are described: *H. pseudobardii*, *H. sinensis*, *H. yili* and *H. subrobusta*, a further two interesting species, *H. vivacior* and *H. nitzschioides* are documented with light and scanning electron microscopy. All species described are compared with other similar *Hantzschia* taxa from other localities or compared to holotype specimens. These data show a higher diversity of diatoms in Xinjiang Province than previously understood and provide additional information for understanding their biogeography.

Key words: *Hantzschia*, Xinjiang Province, China, ultrastructure

Introduction

The diatom genus *Hantzschia* Grunow (1877: 174) belongs to the family Bacillariaceae Ehrenberg (1832: 32); it is a relative small genus, but species-level taxonomy is problematic. There are 252 items found for *Hantzschia* in the *Catalogue of Diatom Names* (Fourtanier & Kociolek 2011), of which there appear to be less than a dozen nomenclatural duplicates, suggesting there are ca. 240 distinct named taxa in the genus; 106 are sub-specific taxa of *H. amphioxys* (Ehrenberg) Grunow in Cleve & Grunow (1880: 103). In Algaebase (Guiry & Guiry 2014), there are 122 taxa listed for this genus, of which 76 are suggested to be accepted names (valid species); of these 22 are in the *H. amphioxys* complex. Obviously, a large species complex such as *H. amphioxys* poses many taxonomic questions relative to other species in the genus.

Hantzschia is difficult to diagnose, although some consider it to be a natural group (Round *et al.* 1990). Here we adopt the diagnosis given in Kociolek *et al.* (2015), recognizing *Hantzschia* as being weakly or strongly asymmetric about the apical axis, with frustules having the canal raphe of each valve on the same side (the ventral margin). Mann (1978) examined the genus *Hantzschia* in detail, especially *H. amphioxys*, *H. marina* (Donkin) Grunow in Cleve & Grunow (1880: 105; basionym: *Epithemia marina* Donkin 1858: 29) and *H. virgata* (Roper) Grunow in Cleve & Grunow (1880: 104 basionym: *Nitzschia virgata* Roper 1858: 23). These taxa were studied in order to determine the extent of infra-specific variation. Krammer & Lange-Bertalot (1997) described almost all the *Hantzschia* species (11 species, 3 varieties) found in middle Europe. Recently, the number of *Hantzschia* species has increased rapidly, due to the application of a narrower species concept and infraspecific taxa of *H. amphioxys* being recognized at a different taxonomic rank (usually as species) (Lange-Bertalot 1993, Lange-Bertalot *et al.* 2003). Another reason there has been an increase in the number of *Hantzschia* species described is there has been study of freshwater diatoms with modern tools from more remote areas, such as Mongolia (Metzeltin *et al.* 2009), South Shetland Islands (Zidarova *et al.* 2010) and Sardinia (Lange-Bertalot *et al.* 2003). More explicit species definitions and criteria are needed, and for our work we subscribe to a morphological species concept (Mallet 2007).

The species of *Hantzschia* from Xinjiang Province have not been studied in any detail. You *et al.* (2005) recorded four *Hantzschia* taxa, including *H. amphioxys* and its varieties; You *et al.* (2011a) reported six newly recorded *Hantzschia* species from Xinjiang and other regions. Regarding other genera from the region, work has been published

reported some rare and new *Hantzschia* species in her doctoral dissertation, but these were documented with the LM. In this study, we examined in greater detail samples from Xinjiang and produced the detailed characters of these rare and new species in both LM and SEM. In the SEM the feature most difficult to observe was whether the internal central raphe endings exist or if the raphe is continuous. Most species described from the northern hemisphere, such as *H. amphioxys* or *H. abundans*, possess central raphe endings well separated from each other (Lange-Bertalot 1993). Some *Hantzschia* species from the southern hemisphere lack central pores, but this feature is not easily seen nor reported in all described species (Metzeltin *et al.* 2005). In two of these new species, *H. sinensis* and *H. yili*, internal central raphe endings were clearly observed. These results provide more data to support the hypothesis of Lange-Bertalot (1993) regarding the relationship between structural features and biogeographic distribution, that most species in the northern hemisphere possess central raphe endings, while the southern species lack them.

Zhu & Chen (2000) reported 3 species and 11 varieties of *Hantzschia* from Tibet, a region south of Xinjiang. While these two areas are near to each other, the climate, altitude, water pH are very different between the two (Wang & Zuo 2010). The similarity of *Hantzschia* taxa between these two areas is very low and they share only cosmopolitan species, such as *H. amphioxys* and some of its varieties. About 20 *Hantzschia* species were recorded from Mongolia by Metzeltin *et al.* (2009), but like Tibet, the similarity of the *Hantzschia* flora to that of to Xinjiang is quite low. Thus, there may be broader (northern hemisphere versus southern hemisphere) and local (across areas of Asia) differences in the distribution of *Hantzschia* taxa. Within-genus differences demonstrated by *Hantzschia* taxa suggest they might be good proxies for understanding the biogeography of microbes more generally. Souffreau *et al.* (2013) showed that even what were considered cosmopolitan species of *Hantzschia* may differ genetically.

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