



## A new *Shivaphis* species (Hemiptera: Aphididae) on the Chinese endemic plant, *Pteroceltis tatarinowii*

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### Abstract

A new species of aphid in subfamily Calaphidinae, *Shivaphis pteroceltis* sp. n., is described from China. This aphid feeds on *Pteroceltis tatarinowii*, an endemic tree commonly planted as an ornamental in China and used in the production of Xuan paper. The life cycle is described, and the descriptions of fundatrices, apterous and alate viviparae, oviparae and males are provided. COI sequences have been deposited in Genbank, and the type specimens are deposited in the National Zoological Museum of China, Institute of Zoology, Chinese Academy of Sciences, Beijing and Forestry Bureau of Central District, Zaozhuang City, Shandong Province, China.

**Key words:** *Shivaphis pteroceltis*, *Pteroceltis*, Calaphidinae, new species, COI

### Introduction

*Pteroceltis tatarinowii*, a Chinese endemic plant listed in the 3<sup>rd</sup> grade of the national protection, is one of the dominant species in the limestone mountainous regions, and is a popular ornamental tree in the grounds of ancient temples, parks and gardens. Its bark is used in the production of the famous Xuan paper, used in Chinese calligraphy and painting since the Tang Dynasty.

Recently, when surveying the germplasm resources of *Pteroceltis tatarinowii* in Shandong limestone mountainous regions, we found large aphid populations feeding on the leaves and young branches of *P. tatarinowii* and secreting thick wax powder or filaments. The aphid was identified as a new species belonging to *Shivaphis* subgenus *Sinishivaphis*, in subfamily Calaphidinae. This genus has six known species, five in China (Qiao *et al.*, 2005) and one in India and Central Asia (Remaudière & Remaudière, 1997, Quednau, 2003).

### Materials and methods

**Morphological description.** Aphid terminology and the measurements in this paper generally follow Quednau (2003) and Qiao *et al.* (2005). The unit of measurement in this paper is millimetres (mm).

**COI sequencing.** COI genes from 2 paratype apterous viviparous females and 1 paratype male were sequenced. Aphids specimens preserved in 100% ethanol were used for molecular analysis. Total genomic DNA was extracted from a single aphid using the method of Sambrook *et al.* (1989). The COI sequences were amplified using primers LepF (ATTCAACCAATCATAAAGATATTGG) and LepR (TAAACTTCTGGATGTCCAAAAAATCA) (Footitt *et al.*, 2008). Sequences were assembled by Seqman II (DNASTAR, Inc., WI, USA) and then aligned using Clustal W (Thompson *et al.*, 1994).

Sequences were deposited in GenBank under the accession numbers KF772792, KF772793 and KF772794. Sequence divergences based on K2P distances were calculated by MEGA v5 (Tamura *et al.*, 2011). There is no distance among the sequences of the three samples.

**Distribution.** China: Shandong Province (Zaozhuang City), Anhui Province (Chuzhou City).

**Biology.** The species forms large colonies on *Pteroceltis tatarinowii*. Colonies that are visited by ants bear thick wax powder (Figs 30, 34), but colonies not visited by ants bear thick wax filaments (Figs 31, 35). The aphids damage the leaves along the veins, young branches and fruits of the host. Fundatrices hatch in March (Fig. 32), and usually have parasitic mites (Fig 33). In November, after mating, oviparae lay eggs in cracks of the bark or around the overwintering leaf-buds (Fig. 36).

**Remarks.** This species belongs to subgenus *Sinishivaphis* by having confluent pigmented zones on media and vein  $Cu_1$  in fore wing (Figs 8, 22, 29). It differs from the others in the genus by bearing numerous long dorsal setae and feeding on *Pteroceltis tatarinowii* (the other species bear sparse short dorsal setae and feed on *Celtis*, *Tilia* or *Ulmus*). Abdominal tergites I–V each have 3–6 pairs of spino-pleural setae and 2–5 pairs of marginal setae (in the other species, abdominal tergites I–VII each have 1 pair of spinal and 1 pair of marginal setae). Body dorsal setae length is 3.00–5.25 times longer than the basal diameter of antennal segment III in apterous viviparous females, and 2.00–4.00 times longer in alate viviparous females (in the other species 1.10–1.30 times in apterous viviparous females, and 1.40–2.10 times in alate viviparous females) (Quednau, 2003, Qiao *et al.*, 2005).

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