

## A newly recorded species, *Sergentia kizakiensis* (Tokunaga, 1940) (Diptera: Chironomidae), from Oriental China with DNA barcode

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### Abstract

*Sergentia kizakiensis* (Tokunaga, 1940) is newly recorded from Oriental China. Here, adult males are redescribed and illustrated. Additionally, we provide a DNA barcode of *S. kizakiensis* from China.

### Introduction

The lentic chironomid genus *Sergentia* includes 17 species known to Holarctic and Oriental regions (Papoucheva et al. 2003, Wülker et al. 1999, Yamamoto et al. 2019). Papoucheva et al. (2003) explored the phylogeny of *Sergentia* using molecular data, concluding that the genus appears to be monophyletic. Yamamoto et al. (2019) formally transferred the Japanese species *Phaenopsectra kizakiensis* to the genus *Sergentia*, documenting its synonymy. However, *Sergentia* is poorly studied in China, and with only two recorded species: *Sergentia baueri* and *Sergentia prima*. Recently, we found another *Sergentia* species from Oriental China, which was difficult to identify morphologically, especially considering the high morphological similarity among most species in the genus. Considering that DNA barcodes have proven efficient in species delimitation in chironomids (Anderson et al. 2013, Lin et al. 2015, Lin et al. 2018), we use DNA barcodes to confirm the taxonomic status of this unidentified *Sergentia* species from China.

Based on the material from China, adult males of *Sergentia kizakiensis* are redescribed and illustrated. A DNA barcode of *S. kizakiensis* from China is also included.

### Material and Methods

Five adults were collected using a sweep net near an alpine lake from Oriental China. The material examined was mounted on slides, following the procedure outlined by Sæther (1969). Digital photographs were taken using a Nikon Digital Sight DS-Fi1 camera mounted on Nikon Eclipse 80i compound microscope at the Nankai University. All specimens were deposited in the College of Life Sciences, Nankai University (NKU), China. Morphological nomenclature in the description below follows Sæther (1980).

DNA amplifications of COI barcode sequences with the universal primers LCO1490 and HCO2198 (Folmer et al. 1994) followed methods outlined by Lin et al. (2015) and were carried out at the College of Fishery, Tianjin Agricultural University. PCR products were electrophoresed in 1.0% agarose gel, purified and sequenced at BGI TechSolutions Co., Ltd. (Beijing, China). Raw sequences were edited and assembled in SeqMan (DNASTAR, Madison, USA), and then uploaded on Barcode of Life Data systems (BOLD) (Ratnasingham and Hebert 2007, Ratnasingham and Hebert 2013) along with collateral information and an image.

### *Sergentia* (*Baicalosergentia*) *kizakiensis* (Tokunaga, 1940)

*Pentapedilum kizakiensis* Tokunaga, 1940: 290 (as subgenus *Phaenopsectra*).

*Phaenopsectra kizakiensis*: Sasa & Yamamoto, 1977: 313; Sasa, 1984: 54; Sasa & Hirabayashi, 1991: 110; Sasa & Suzuki, 2000: 179.

*Sergentia kizakiensis*: Yamamoto, 2010: 224; Yamamoto & Yamamoto, 2014: 339; Yamamoto, Suzuki & Yamamoto, 2019: 67 (as subgenus *Baicalosergentia*).

*Stictochironomus kamiprimus* Sasa & Hirabayashi, 1991: 110.

**Material examined.** 5 ♂♂ (NKU: K5B28, K5B28, K5B42, K5B44; NKU & BOLD Sample ID: K5B45), CHINA: Zhejiang Province, Taizhou City, Tiantai County, Huadingshan Mountain, 29.2523°N, 121.091°E, 1000m a.s.l., 12.IV.2011, Sweep net, leg. X.L. Lin.

**Diagnostic characters.** The male imago can be distinguished from known species of the genus by having wings covered with microtrichia;  $LR_1 > 1$ ; mid tarsomere 1 with 10–14, 12 sensilla chaetica; superior volsella curved only at tip, without lateral seta.

### Description

**Male** (n = 5)

Total length 5.68–7.08, 6.24 mm. Wing length 3.40–4.20, 3.71 mm. Total length/wing length 1.60–1.78, 1.68. Wing length/length of profemur 2.62–2.89, 2.78.

*Coloration.* Head, legs and abdomen dark brown; wing brown; thorax dark brown.

*Head.* AR 2.49–3.38, 2.83. Ultimate flagellomere 0.98–1.19, 1.04 mm long. Temporal setae 16–21, 19 including 3–6, 4 inner verticals; 11–13, 11 outer verticals and 2–4, 3 postorbital. Clypeus with 23–38, 31 setae. Tentorium 185–215, 196  $\mu\text{m}$  long, 62–80, 68  $\mu\text{m}$  wide. Palpomere lengths (in  $\mu\text{m}$ ): 70–79, 75; 70–92, 84; 189–220, 202; 198–251, 223; 253–317, 275. L: 5<sup>th</sup>/3<sup>rd</sup> 1.29–1.44, 1.36.

*Wing* (Fig. 1A). VR 1.02–1.03. Brachiolum with 2–3, 2 setae. R with 46–56, 52 setae,  $R_1$  with 48–58, 53 setae,  $R_{4+5}$  with 120–130, 126 setae,  $M_{1+2}$  with 69–89, 80 setae,  $M_{3+4}$  with 54–73, 64 setae,  $Cu_1$  with 18–31, 24 setae, remaining veins bare. Cell  $r_{4+5}$ ,  $m_{1+2}$  with and  $m_{3+4}$  with numerous setae. Squama with 28–30, 28 setae.

*Thorax* (Fig. 1B). Dorsocentrals 17–28, 22; acrostichals 4–5, 5; prealars 6–8, 6. Scutellum with 24–30, 26 setae.

*Legs.* Scale on fore tibia rounded, 50–75, 60  $\mu\text{m}$  long, sometimes with a small lateral spine. Mid tibia with one 28–32, 30  $\mu\text{m}$  long spur; spurs of hind tibia 28–33, 30  $\mu\text{m}$  and 13–16, 15  $\mu\text{m}$  long. Width at apex of fore tibia 75–88, 81  $\mu\text{m}$ , of mid tibia 63–90, 78  $\mu\text{m}$ , of hind tibia 75–95, 83  $\mu\text{m}$ . Mid tarsomere 1 with 10–14, 12 sensilla chaetica. Lengths (in  $\mu\text{m}$ ) and proportions of legs as in Table 1.

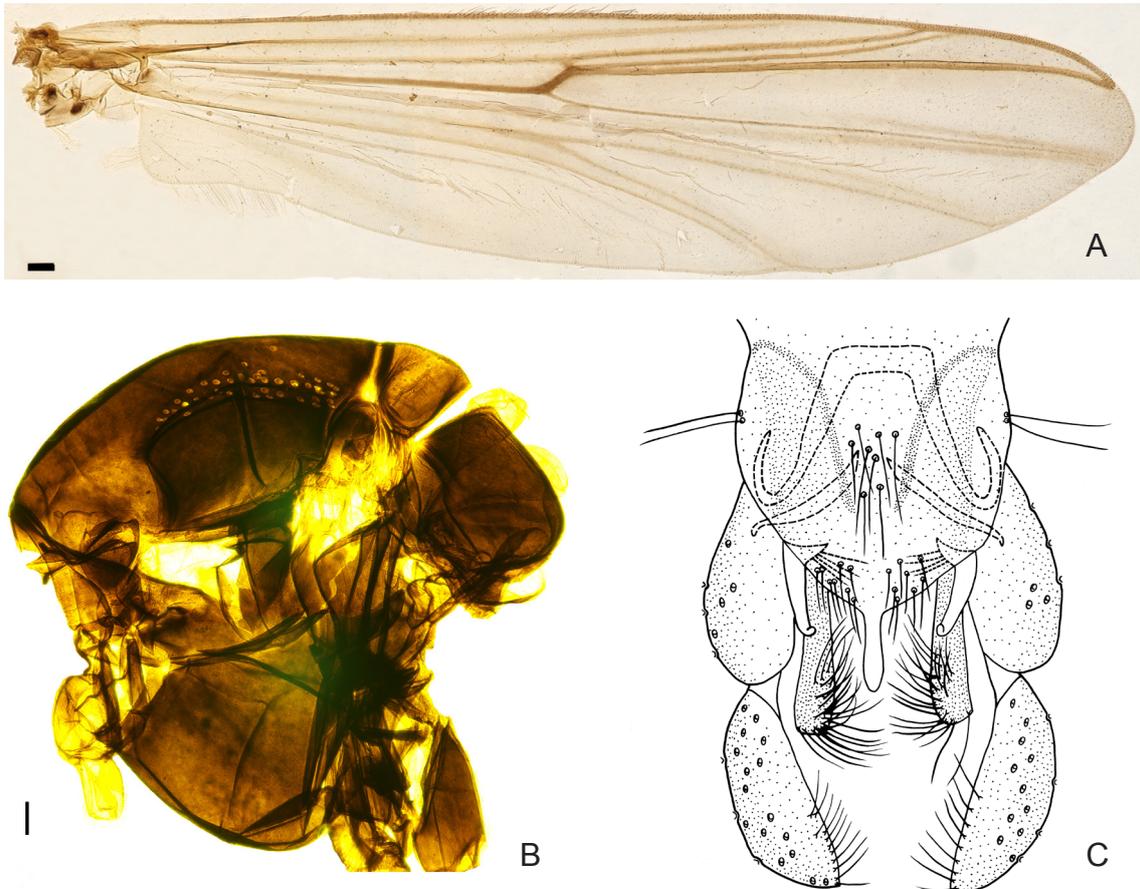


Figure 1. *Sergentia* (*Baicalosergentia*) *kizakiensis* (Tokunaga, 1940). A) wing; B) thorax; scale bar = 100  $\mu\text{m}$ ; C) hypopygium.

**Table 1.** Lengths (in  $\mu\text{m}$ ) and proportions of legs of *Sergentia kizakiensis* (Tokunaga, 1940), male (n = 5).

	P <sub>1</sub>	P <sub>2</sub>	P <sub>3</sub>
fe	1250–1475, 1335	1325–1600, 1405	1475–1775, 1575
ti	1250–1450, 1335	1250–1475, 1325	1500–1825, 1630
ta <sub>1</sub>	1425–1755, 1546	725–875, 783	1075–1350, 1185
ta <sub>2</sub>	875–1075, 945	500–600, 540	700–875, 743
ta <sub>3</sub>	640–750, 676	380–440, 398	500–640, 552
ta <sub>4</sub>	500–580, 522	240–280, 258	320–380, 340
ta <sub>5</sub>	250–290, 260	160–190, 173	180–210, 195
LR	1.14–1.19, 1.36	0.57–0.58, 0.58	0.72–0.74, 0.73
BV	1.68–1.79, 1.74	2.54–2.65, 2.59	1.50–2.50, 2.40
SV	1.67–1.79, 1.71	3.50–3.59, 3.54	2.70–2.77, 2.73
BR	7.80–8.89, 8.39	2.9–7.86, 6.56	7.71–10.7, 8.86

*Hypopygium* (Fig. 1C). Tergite IX with 4–10, 8 median setae. Anal point with rounded apex. Laterosernite IX with 2–3, 2 setae. Superior volsella digitiform, with four inner setae, and without lateral setae. Phallopodeme 115–155, 134  $\mu\text{m}$  long. Transverse sternapodeme 75–105, 85  $\mu\text{m}$  long. Gonocoxite 233–273, 249  $\mu\text{m}$  long. Gonostylus  $\mu\text{m}$  172–216, 192  $\mu\text{m}$  long. Inferior volsella straight, 145–175  $\mu\text{m}$  long, with 24–30, 26 setae. HR 1.26–1.35, 1.30. HV 3.03–3.58, 3.25.

**Distribution.** China, Japan.

**Remarks.** *Sergentia kizakiensis* is redescribed here based on additional material from China. Based on morphological characters, Chinese specimens fit well with the original description (Tokunaga 1940), but a few differences are noted: Chinese specimens have a higher AR (2.49–3.38), and 3–7 inner setae on superior volsella, as compared to Japanese specimens (Sasa 1984, Sasa and Suzuki 2000), described with AR = 2.3–2.4 and superior volsella with 3–7 inner setae. *Sergentia kizakiensis* includes two DNA barcodes clustering into two BINs in BOLD: the BIN (BOLD: ADY6241) from China with a genetic divergence of 4.65% to the BIN (BOLD: ACH8232) from Japan.

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