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NEW SPECIES OF SENSILLONYCHIURUS (COLLEMBOLA: ONYCHIURIDAE: ONYCHIURINAE) IN HEILONGJIANG PROVINCE, CHINA

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ABSTRACT

Two new species, Sensillonychiurus pseudogeminus sp. nov. and Sensillonychiurus zhuajiensis sp. nov., are reported from Heilongjiang Province, China. S. pseudogeminus sp. nov. is very similar to the S. geminus Pomorski & Sveenkova 2006, but it can be recognized by shorter unguiculus, longer anal spines and presence of sternal parapseudocelli on Abd. II and Abd. IV instead of pseudocelli. Sensillonychiurus zhuajiensis sp. nov. can easily be distinguished from other known congeners by its peculiar dorsal pso formula (32/144/44453).

Key Words: taxonomy, Thalassaphorurini, Sensillonychiurus pseudogeminus sp. nov., Sensillonychiurus zhuajiensis sp. nov., Collembola

RESUMEN

Se informa de dos especies nuevas, Sensillonychiurus pseudogeminus sp. nov. y Sensillonychiurus zhuajiensis sp. nov., de la provincia de Heilongjiang, China. La especie S. pseudogeminus sp. nov. es muy similar a la especie S. geminus Pomorski & Sveenkova 2006, pero se puede distinguirla por el unguículo más corto, las espinas anales más largas y por la presencia de parapseudocelli externales sobre los segmentos II y IV del abdomen, en lugar de pseudocelli. Se puede distinguir S. pseudogeminus sp. nov. de los otros congéneres conocidos por su fórmula pso dorsal peculiar (32/144/44453).

Palabras Clave: taxonomía, Thalassaphorurini, Sensillonychiurus pseudogeminus sp. nov., Sensillonychiurus zhuajiensis sp. nov., Collembola

The genus Sensillonychiurus Pomorski & Sveenkova 2006 belongs to the tribe Thalassaphorurini as having the furcal remnant with 4 small chaetae arranged in 2 rows posterior to a finely granulated area (Pomorski & Sveenkova 2006). It differs from other genera of the tribe by the following characters: d0 absent, postantennal organ with compound vesicles, guard chaetae in the Ant. III sensory organ as 3–4, Abd. III sternum not subdivided, Abd. V–VI clearly separated, furca reduced to a small area of fine granulations situated adjacent to the border between Abd. III and IV sterna, and tibiotarsi with 7 or 9 distal chaetae (Babenko et al. 2011). Until now, among the 12 known species all over the world, all 3 Chinese species are from Jilin Province (Sun & Wu 2012a; Sun & Wu 2012b; Bellinger et al. 1996–2014). During our recent investigations of Collembola from Heilongjiang Province (the highest latitudes and the northernmost region of China), 2 new species of the genus Sensillonychiurus are found. In the present paper, their descriptions and the main diagnostic characters of all known Chinese species of this genus are given.

MATERIAL AND METHODS

Wu Donghui and colleagues collected the studied specimens by Berlese extraction, cleared them in lactic acid and then mounted them in Marc André II solution. They were studied by a Nikon Eclipse 80i microscope. The material is deposited in the Key Laboratory of Wetland Ecology and Environment, Northeast Institute of Geography and Agroecology, Chinese Academy of Sciences, Changchun.

Labial types are named in accordance with Fjellberg (1999). Labium areas and chaetal nomenclature follow Massoud (1967) and D’Haese (2003). Chaetae on anal valves are named in accordance with Yoshii (1996). Tibiotarsus chaetotaxy formula follows Deharveng (1983), and is expressed as: total...
number of chaetae (number of chaetae in row C, number of chaetae in row B, number of chaetae in distal row A+T), for example 17 (1, 7, 9).

Abbreviations Used in Descriptions and Figures
Ant.—antennal segments, PAO—postantennal organ, Th.—thoracic segments, Abd.—abdominal segments, ms—microsensillum, pso—pseudocellus, psp—pseudopore, psx—parapseudocellus, AIIIO—Ant. III sensory organ, Sp—posterior S-chaeta on Abd. V tergum, “—unpaired pseudopore, AS—anl spines.

The pseudocelli, parapseudocelli and pseudopores formulae are the number of corresponding structures by half-tergum (dorsally) or half-sternum (ventrally) as follows: head anterior, head posterior/Th. I–III/Abd. I–V (for instance: 32/144/44453).

**Sensillonychiurus Pseudogeminus sp. nov.**
(Figs 1–10; Table 1)

**Material Examined**

**HOLOTYPE** female, CHINA, Jiamusi City, Tongjiang country, Jiejinshan (N 47.92° E 132.85°), LD-10-472, 07-VIII-2010, litter and soil under *Quercus mongolica* Fisch. ex Ledeb.

**PARATYPES** 7 females, LD-10-472, LD-10-486, LD-10-491, LD-10-492, same data as holotype.

Other materials: 3 females, Jiamusi City, Tongjiang country, Lintiang town (N 48.08° E 133.54°), LD-10-479, LD-10-483, 07-VIII-2010, litter and soil under *Betula costata* Trautv.; 2 females, Shuangyashan City, Raohe country, Zhenbao island (N 46.49° E 133.85°), LD-10-405, LD-10-406, 16-VIII-2010, litter and soil under *Pinus Koraiensis* Sieb. et Zucc.; 1 female, Jiamusi City, Fuyuan country, Haiqing town (N 47.89° E 134.66°), LD-10-451, 01-VIII-2010, soil of farm-land planted with soybean.

**Description**

Body white in alcohol. Length of body 0.48–0.56 mm in females; holotype: 0.5 mm. Shape of body typical of the genus, i.e., subcylindrical with small anal spines. Anal spines 0.7 times as long as inner edge of unguis.

Pso formulae 32/133/33343 dorsally and 10/000/00000 ventrally (Figs. 1, 7, 9), subcoxa 1 of legs I–III with 1, 1 and 1 pso respectively. Pax formula 00/000/010100 ventrally (Figs. 1, 7, 9). Psp formulae 0111/111110 dorsally and 00/111000000 ventrally (Figs. 1, 7, 9).

Head. Antennae as long as head. Length ratio of Ant. I: II: III: IV as about 1: 1.5: 1.5: 2. Ant. IV with 2 distinct thickened S-chaetae, subapical organelle with globular apex; basolateral ms at about ¼ length from base, above the proximal row of chaetae (Fig. 3). Ant. III sensory organ consists

| Table 1. Main diagnostic characters of the known Chinese species of Sensillonychiurus |
|---------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|
| S. zhongjiensis sp. nov. | S. pseudoreductus | S. pseudogeminus sp. nov. | S. changdehunensis | S. reductus |
| Dorsal pso | 2 32/133/33343 | 32/133/33343 | 32/133/33343 | 32/133/33343 |
| Ventral pso | invisible | invisible | invisible | invisible |
| Sublobal hair on maxillary palp | 2 | 2 | 2 | 2 |
| Papillar groove chaetae of AIIIO | 6-7 | 6-7 | 6-7 | 6-7 |
| Number of chaetae on Th. II tergum | + | + | + | + |
| Chaetae m/s on Th. II tergum | + | + | + | + |
| Chaetae b2 on the upper anal valve | + | + | + | + |
| Chaetae on subcoxa 1 of legs I–III | 3 | 3 | 3 | 3 |
| Unguiculus/unguis ratio | 0.6 | 0.6 | 0.6 | 0.6 |
| 5+5 | 5+5 | 5+5 | 5+5 |
| Chaeta p2 on Th. II–III terga | + | + | + | + |
| Chaetae ms on Th. III tergum | + | + | + | + |
| Anal spines | 3.3 | 3.3 | 3.3 | 3.3 |
Figs. 1–7. Sensillonychiurus pseudogeminus sp. nov. 1. Dorsal chaetotaxy of body; 2. PAO and anterior cephalic pseudocelli; 3. Ant. III–IV; 4. Sensory rods and sensory clubs on antennal sensory organ; 5. Distal part of leg II; 6. Distal part of leg III; 7. Chaetotaxy of Abd. I–VI sterna. Scale bars: 0.1 mm (Figs. 1, 7), 0.01 mm (Figs. 2–6).
of 5 papillae, 3 guard chaetae, 2 sensory rods, 2 smooth sensory clubs, and lateral ms (Fig. 3–4). Ant. II with 13 chaetae. Ant. I with 8 chaetae. Antennal base not marked (Fig. 1). PAO with 6–7 compound vesicles (Fig. 2). On head 4+4 p-chaetae present between 2 posterior pso, p4 anterior to p1, p2 and p3 (Fig. 1). Mandible with strong molar plate and 4 apical teeth. Maxilla bearing 3 teeth and 6 lamellae. Maxillary palp simple with 1 basal chaeta and 2 sublobal hairs. Labral formula 2/322; Labium with 6 proximal, 4 basomedian (E, F, G, f) and 5 basolateral (b, c, d, e, e') chaetae (Fig. 9); labial type AC, papillae A–E with 1, 4, 0, 3 and 3 guard chaetae respectively. Head ventrally with 3+3 postlabial chaetae along ventral groove (Fig. 9).

Body chaetotaxy. S-chaetae subcylindrical, distributed on half body as 10/011/221111 (dorsally) and 11/000/000100 (ventrally) (Figs. 1, 7, 9). Subcoxae 2 of legs I, II and III with 0, 0, 1 S-chaeta respectively. Tiny and blunt lateral ms present on both Th. II and III (Fig. 1). Ratio Sp: m1; p1 on Abd. V tergum = 1: 0.5: 1. Th. I tergum with 5+5 chaetae. Th. II–III terga with 3+3 chaetae and Abd. I–III terga with 2+2 chaetae along axis respectively (Fig. 1). Abd. IV tergum with 2

Figs. 8–10. Sensillonychiurus pseudogeminus sp. nov. 8. Chaetotaxy of Abd. IV–VI terga; 9. Ventral chaetotaxy of head; 10. Central part of Abd. IV sternum. Scale bars: 0.01 mm (Figs. 8–10).
unpaired chaetae m0 and p0, Abd. V tergum with chaeta p0, Abd. VI tergum with chaeta m0 (Fig. 8). Sterna of Th. I, II, and III without chaetae.

Appendages. Subcoxae 1 of legs I–III with 3, 4 and 4 chaetae, subcoxae 2 with 1, 4 and 4 chaetae respectively. Coxae of legs I, II and III with 3, 10 and 12 chaetae, trochanters with 8 chaetae each and femora with 13, 13 and 12 chaetae. Tibiotarsi of legs I, II and III with 17 (1, 7, 9), 17 (1, 7, 9) and 16 (1, 6, 9) chaetae (Figs. 5–6). Unguis without teeth. Unguiculus about 0.5 times as long as inner edge of unguis, with inner basal lamella (Figs. 5–6). Ventral tube with 5–6+5–6 distal chaetae, without anterior or basal chaetae (Fig. 7). Furca reduced to a small area of fine granulations situated adjacent to the border between Abd. III and IV sterna, with 4 small areas of fine granulations situated adjacent to the border between Abd. III and IV sterna, with 4 small dental chaetae arranged in 2 rows posteriorly and 2 manubrial rows of chaetae (Fig. 10).

Female genital plate with 8–10 chaetae. Anal valves with numerous acuminate chaetae; each lateral valve with a0, 2a1; upper valves with a0, 2a1, 2a2, 2c1, c0, 2c2 (Fig. 7).

Etymology

Named to recognize the similarity with Sensillonchyirus geminus Pomorski & Sveenkova, 2006.

Distribution.

Known only from the type locality.

Remarks

The new species is very similar to S. geminus Pomorski & Sveenkova, 2006 from Russia (Primorskiy Kray, the easternmost part of Russia) as having the same dorsal pso formula (32/133/33343), number of papillae and guard chaetae in AIIIO (5 and 3), chaetae on Th. I tergum (5+5) and on subcoxae 1 of legs I–III (3, 4, 4), as well as ms on Th. III tergum. The most notable difference between these species is the presence of sternal parapseudocelli on Abd. II and Abd. IV in S. pseudogeminus sp. nov., whereas true pseudocelli are developed at the same positions in S. geminus. Apart from this, S. pseudogeminus sp. nov. is characterized by shorter unguiculus (unguiculus/unguis ratio is 0.5 in S. pseudogeminus sp. nov. and 0.75 in S. geminus) and longer and stronger AS (AS/unguis ration is 0.7 in S. pseudogeminus sp. nov. and 0.33 in S. geminus).

SENSILLONYCHIURUS ZHUAIJENSIIS SP. NOV.

(Figs. 11–21; Table 1)

Material Examined

HOLOTYPE male, CHINA, Heilongjiang Province, Jiamusi City, Fuyuan county, Zhuaji town (N 48.15° E 134.56°), LD-10-466, 05-VIII-2010, litter and soil under Populus davidiana Dode. PARATYPES 8 females and 1 male, same data as holotype.

Description

Body white in alcohol. Length of body 0.6–0.66 mm in females, 0.58–0.6 mm in male; holotype: 0.6 mm. Shape of body typical of the genus: subcylindrical without anal spines.

Pso formulae 32/144/44453 dorsally and 10/000/00000 ventrally (Figs. 11, 16, 18), subcoxae 1 of legs I–III with 1, 1 and 1 pso respectively. Psp formula 00/000/112100 ventrally (Figs. 11, 16, 18), subcoxae 1 of legs I–III with 1, 1 and 1 psp respectively. Psp formulae 0/011/11110 dorsally and 00/111/00010 ventrally (Figs. 11, 16, 18).

Head. Antennae as long as head. Length ratio of Ant. I: II: III: IV as about 1: 1.5: 1.5: 2. Ant. IV with 2 distinct thickened S-chaetae, subapical organelle with globular apex; basolateral ms at about 1/4 length from base, above the proximal row of chaetae (Fig. 13). Ant. III sensory organ consists of 4 papillae, 3 guard chaetae, 2 sensory rods, 2 smooth sensory clubs, and lateral ms (Fig. 13–14). Ant. II with 13 chaetae. Ant. I with 8 chaetae. Antennal base not marked (Fig. 11). PAO with 6 compound vesicles. On head 4+4 p-chaetae present between 2 posterior pso, p1 and p3 anterior to p2 and p4 (Fig. 17). Mandible with strong molar plate and 4 apical teeth. Maxilla bearing 3 teeth and 6 lamellae. Maxillary palp simple with 1 basal chaeta and 2 sublobal hairs. Labral formula 2/322; Labium with 6 proximal, 4 basomedian (E, F, G, f) and 2 sublobal hairs. Labial formula 2/322; Labium with 6 proximal, 4 basomedian (E, F, G, f) and 5 basolateral (b, c, d, e, e’) chaetae (Fig. 18); labial type AC, papillae A–E with 1, 4, 2/322; Labium with 6 proximal, 4 basomedian (E, F, G, f) and 6 compound vesicles. On head 4+4 p-chaetae present between 2 posterior pso, p1 and p3 anterior to p2 and p4 (Fig. 17).

Body chaetotaxy. S-chaetae subcylindrical, apically rounded, distributed on half body as 10/011/22111 (dorsally) and 11/000/000100 (ventrally) (Figs. 11, 16, 18). Subcoxae 2 of legs I, II and III with 0, 0, 1 S-chaeta respectively. Tiny and blunt ms, present on Th. II, absent on III (Fig. 11). Ratio Sp: m1: p1 on Abd. V tergum = 1: 1: 1.4. Th. I tergum with 6–7+6–7 chaetae. Th. II–III terga with 3+3 chaetae and Abd. I–III terga with 2+2 chaetae along axis respectively (Fig. 11). Abd. IV tergum with 2 unpaired chaetae m0 and p0, Abd. V tergum with chaeta p0, Abd. VI tergum with chaeta m0 (Fig. 19). Sterna of Th. I, II, and III without chaetae.

Appendages. Subcoxae 1 of legs I–III with 3, 4 and 4 chaetae, subcoxa 2 with 1, 4 and 4 chaetae respectively. Coxae of legs I, II and III with 3, 10 and 12 chaetae, trochanters with 8 chaetae each and femora with 13, 13 and 12 chaetae. Tibiotarsi of legs I, II and III with 17 (1, 7, 9), 17 (1, 7, 9) and 16 (1, 6, 9) chaetae each (Fig. 15). Unguis
Figs. 11–16. *Sensillonychiurus zhuajiensis* sp. nov. 11. Dorsal chaetotaxy of body; 12. Labium; 13. Antenna; 14. Sensory rods and sensory clubs on antennal sensory organ; 15. Distal part of leg III; 16. Chaetotaxy of Abd. I–VI sterna. Scale bars: 0.1 mm (Figs. 11 and 16), 0.01 mm (Figs. 12–15).
Figs. 17–21. Sensillonychiurus zhuajiensis sp. nov. 17. Dorsal chaetotaxy of head; 18. Ventral chaetotaxy of head; 19. Chaetotaxy of Abd. IV–VI terga; 20. Female Abd. V–VI sterna; 21. Central part of Abd. IV sternum. Scale bars: 0.1 mm (Figs. 17–19), 0.01 mm (Figs. 20–21).
without teeth. Unguiculus about 0.6 times as long as inner edge of unguis, without inner basal lamella (Fig. 15). Ventral tube with 6+6 distal chaetae, without anterior or basal chaetae (Fig. 16).

Female genital plate with 14–18 chaetae and male with 26–30 chaetae. Male ventral organ absent. Anal valves with numerous acuminate chaetae; each lateral valve with a0, 2a1; upper valves with chaetae a0, 2b1, 2b2, c0, 2c1, 2c2 (Fig. 20).

Etymology

Named after the town of the type locality.

Remarks

The new species is similar to the 6 known species (S. changchunensis Sun & Wu, 2012, S. eisi (Rusek, 1976), S. minusculus Pomorski & Sveenkova, 2006, S. pseudoreductus Sun & Wu, 2012, S. reductus Sun & Wu, 2012, and S. virginis Pomorski & Sveenkova, 2006), and has no anal spines. But it can be easily distinguished by its peculiar dorsal pso formula (32/144/44453). The main diagnostic characters of 5 species known from the Chinese territory are shown in Table 1.

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