

Notes on the genus *Xenylla* Tullberg, 1896 (Collembola: Hypogastruridae) from China, with description of a new species

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Abstract: A new species, *Xenylla taihangensis* **sp. nov.** from China, is described. It resembles *X. martynovae* Dunger, 1983, *X. mucronata* Axelson, 1903, *X. piceata* Stebaeva & Potapov, 1994 and *X. namia* Park, 2016 due to a well-developed furca (mucro separated from the dens with two setae), head with dorsal setae c_1 present and c_2 absent and two prelabral setae. Remarks on the occurrence of *X. stepposa* Stebaeva, 1980 and *X. welchi* Folsom, 1916 in China and a key to the *Xenylla* species of China are also provided.

Key words: springtails; chactotaxy; taxonomy; key

中国奇蛭属研究及一新种记述（弹尾纲：球角蛭科）

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摘要：记述中国奇蛭属 1 新种：太行奇蛭 *Xenylla taihangensis* **sp. nov.**。该新种有发达的弹器（齿节与端节分离，有 2 根毛），头部背面有 c_1 毛，无 c_2 毛，有 2 根前唇毛，显得与 *X. martynovae* Dunger, 1983、*X. mucronata* Axelson, 1903、*X. piceata* Stebaeva & Potapov, 1994 和 *X. namia* Park, 2016 很近似。文中对采自中国的 *X. stepposa* Stebaeva, 1980 和 *X. welchi* Folsom, 1916 进行了描记，并提供了中国奇蛭属检索表。

关键词：跳虫；毛序；分类；检索表

Introduction

To date, *Xenylla* Tullberg, 1869 consists of 133 species (Bellinger *et al.* 1996–2019) distributed worldwide. Prior to this study, only four species had been recorded in China (Zhao *et al.* 1997; Wu & Yin 2007; Jia & Skarżyński 2019). We herein describe a new species *X. taihangensis* **sp. nov.** and provide remarks on the occurrence of *X. stepposa* Stebaeva, 1980 and *X. welchi* Folsom, 1916 in China. A key to the *Xenylla* species of China is also provided.

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Material and methods

Specimens stored in ethanol were cleared in Nesbitt's fluid (chloral hydrate, concentrated hydrochloric acid, distilled water) and subsequently mounted on slides in Hoyer's medium (distilled water, Arabic gum, chloral hydrate, glycerine). Observations were made using a Nikon Eclipse E600 phase contrast microscope. Figures were drawn with the camera lucida. The following nomenclatural systems were used: for body chaetotaxy — Gama 1988; Thibaud *et al.* 2004; tibiotarsal chaetotaxy — Lawrence 1977; Deharveng 1983; chaetotaxy of anal valves — Hüther 1962; chaetotaxy of labium — Massoud 1967; labial palp — Fjellberg 1999 and maxilla — Fjellberg 1984. Abbreviations: Ant. I–IV — antennomeres I–IV; Th. I–III — thoracic segments I–III; Abd. I–VI — abdominal segments I–VI.

Taxonomy

1. *Xenylla taihangensis* sp. nov. (Figs. 1–13)

Description. Body length 0.8–1.5 mm. Colour (in ethanol). Dorsal side blue gray to black, with pale spots all over the body, ventral side paler. Integument with small primary hexagons.

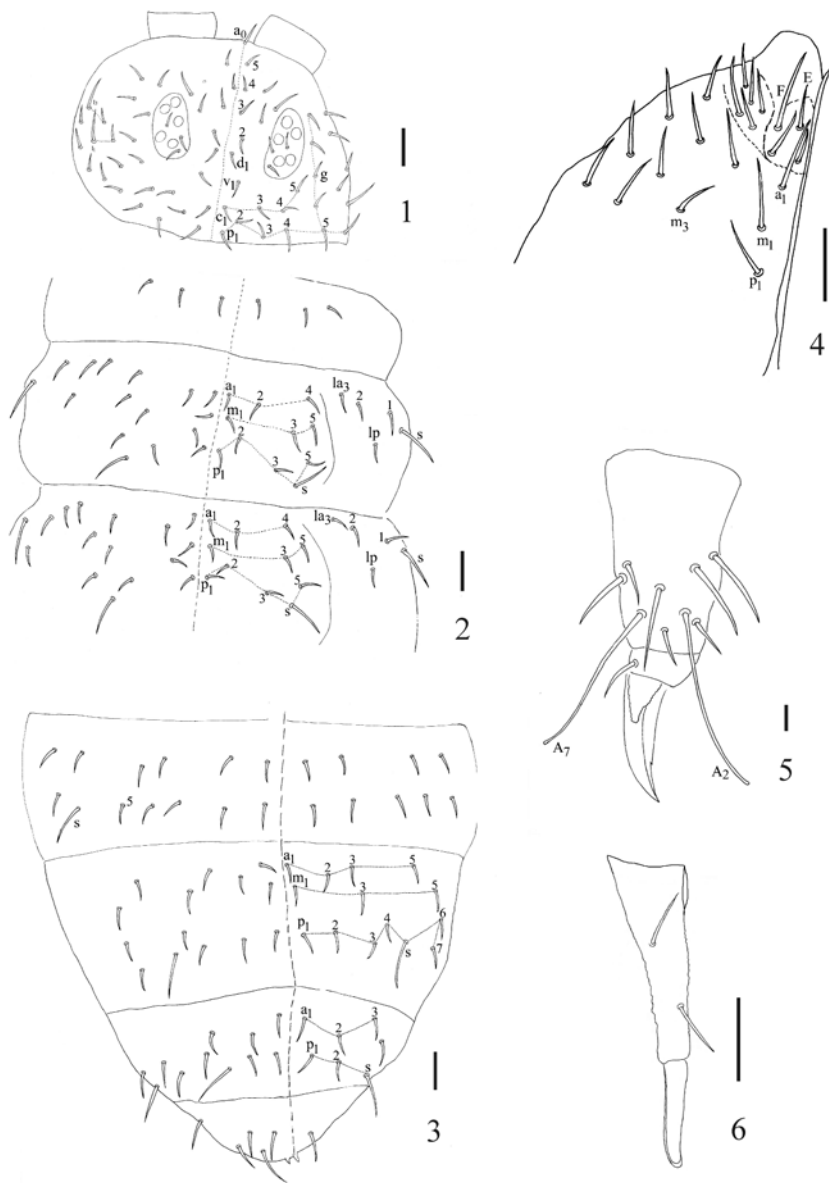
Ant. IV with simple apical vesicle (av), subapical organite (or), microsensillum (ms), 4 cylindrical, thickened sensilla (3 dorsoexternal and 1 dorsointernal, A and B thicker than C and D) and 7–10 short pointed setae in ventral file (Figs. 7, 8). Ant. III-organ with subequal and rather small dorsal and ventral guard sensilla, two short inner sensilla (Fig. 7), ventral microsensillum present. Ant. I with 7 setae.

Ocelli 5 + 5 (Fig. 1). Labrum with apical papillae. Labral setae 5, 5, 4, prelabrals 2 (Fig. 10). Labium with 4 setae in basomedian field and 5 in basolateral, seta F about two times longer than seta E (Fig. 4). Labial palp with 6 proximal setae, 5 papillae (A–E), 10 guard setae (short and blunt at the tip: a₁, b₁, b₂, d₂; prolonged: b₃, b₄, d₃, d₄, e₃ and e₄) and 3 hypostomal setae (H, h₁–2) (Fig. 11). Head of maxilla with six lamellae, of which 1 and 2 with marginal filaments, protrude clearly above the teeth (Fig. 9). Outer lobe of maxilla with 2 sublobal hairs.

Chaetotaxy (c, h₁, h₂). Dorsal chaetotaxy (Figs. 1–3). Setae short and slightly serrated. Body sensilla (s) 2–3× longer than ordinary setae, fine and smooth. Head with setae a₀, c₁, c₃; c₂ absent (c), setae l₁ subequal to l₃. Th. I with 3 + 3 setae in a row. Th. II and III with setae a₂ displaced posteriorly compared with setae a₁ (h₁), setae p₂ displaced anteriorly compared with setae p₁ (h₂); setae p₃, m₃ and la₁₋₃ present. Abd. I–III with setae p₅. Abd. IV with setae a₃, m₃, m₅ and p₃ present. Setae a₂ on Abd. V present.

Ventral chaetotaxy (Figs. 12, 13). Head with setae p₁ and m₃. Th. II and III with a pair of medial setae. Abd. II with a pair of medial setae and setae a₆, p₁₋₂, p₆ present and a₅ absent, Abd. III with setae p₅ and median seta (in front of retinaculum) present, Abd. IV with seta m₁. Two anterior anal valves with 2 setae hr each.

Tibiotarsi I, II and III with 19, 19 and 18 setae respectively, with setae A₂ and A₇ capitate (Fig. 5), ratio capitate setae/inner edge of claw III = 1.4–1.6. Chaetotaxy of legs I, II and III respectively as: femora with 10–11, 10–11 and 9–10; trochanter with 4–5, 4–5 and 4; coxae with 3, 7–8 and 7; subcoxae 2 with 0, 2 and 2; subcoxae 1 with 1, 2 and 3. Claws with inner tooth on upper third near apex (Fig. 5).

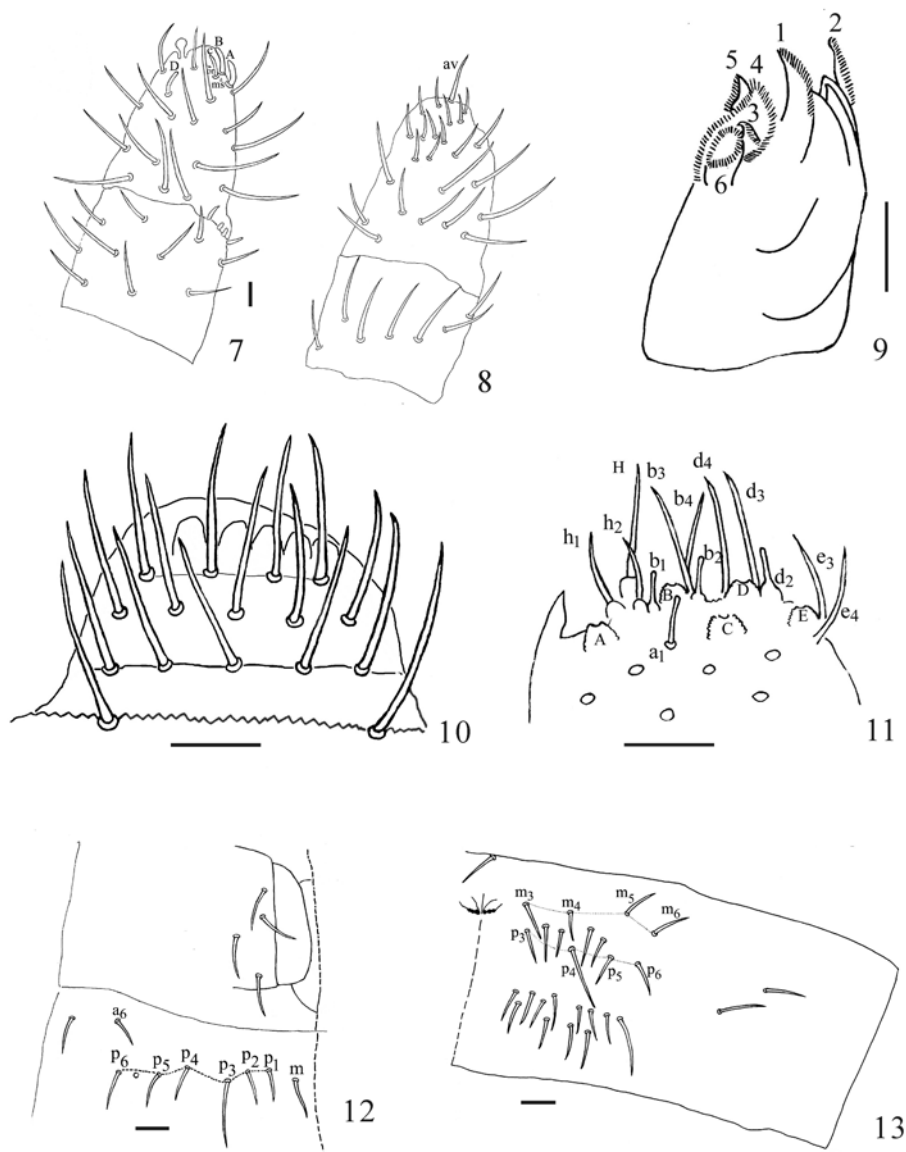


Figures 1–6. *Xenylla taihangensis* sp. nov. 1. Dorsal chaetotaxy of head; 2. Dorsal chaetotaxy of Th. I–III; 3. Dorsal chaetotaxy of Abd. III–VI; 4. Ventral chaetotaxy of head; 5. Tibiotarsus and claw III; 6. Dens and mucro. Scale bars = 100 μ m (Figs. 1–3); 20 μ m (Figs. 4–6).

Ventral tube with 4 + 4 setae (Fig. 12). Retinaculum with 3 + 3 teeth. Furca complete and well-developed (Fig. 6), ratio dens + mucro/inner edge of claws III = 2.5–3.5. Mucro separated from dens, straight narrow without clear lamella. Ratio dens/mucro = 1.8–2.4. Dens with two posterior setae. Anal spines small, situated on low basal papillae (Fig. 3).

Holotype. ♀, **China**, Shanxi Province, litter in coniferous forest near the Yan Emperor

statue, N 36°19', E 113°16', Laoding Mountain National Forest Park, Taihang Mountains, 30-X-2009, leg. Junli JIA & Taisheng JIA. **Paratypes.** 2♀, same data as holotype; 10♀4♂, same data as holotype, but 05-VI-2019, leg. Chenjun WANG & Junli JIA. Holotype and 6 paratypes are deposited at the College of Life Science, Shanxi Normal University, Linfen, China and 10 paratypes are deposited at the Institute of Environmental Biology, Wroclaw University, Poland.



Figures 7–13. *Xenylla taihangensis* **sp. nov.** 7. Dorsal chaetotaxy of Ant. III–IV; 8. Ventral chaetotaxy of Ant. III–IV; 9. Head of maxilla; 10. Labrum; 11. Labial palp; 12. Ventral chaetotaxy of Abd. I–II; 13. Ventral chaetotaxy of Abd. III. Scale bars = 20 μ m (Figs. 7–11); 50 μ m (Figs. 12, 13).

Etymology. This new species is named after the type locality, Taihang Mountains.

Diagnosis. Having well-developed furca (mucro separated from the dens with two setae), head with dorsal setae c_1 present, c_2 absent (group V(c) according to Babenko *et al.* 1994) and ventral setae p_1 , m_3 present, Th. II with setae la_2 present and two prelabral setae *X. taihangensis* **sp. nov.** resembles *X. martynovae* Dunger, 1983 (Mongolia, Central Asia, Siberia) and *X. mucronata* Axelson, 1903 (Palearctic) (Jia & Skarżyński 2019). This new species differs from them by straight narrow mucro without clear lamella, *X. martynovae* has mucro with lamella on its basal part (Dunger (1983), while *X. mucronata* has mucro with lamella on its distal part (Axelson (1903). Such a feature is characteristic also for *X. piceeta* Stebaeva & Potapov, 1994 (Russia, Far East) and *X. namia* Park, 2016 (Korea). First mentioned species can be easily distinguished from *X. taihangensis* **sp. nov.** by the presence of subapical tooth on mucro, absence of ventral setae p_1 on the head and Th. II with setae la_2 usually absent (Babenko *et al.* 1994). Also easy to separate from *X. taihangensis* **sp. nov.** is *X. namia*, which has Th. II with setae la_2 absent, Abd. IV with setae m_5 absent and labial palp with only one guard seta e (e_3) (Park 2016) (vs labial palp with two guard setae e_3 and e_4). Differences between *X. taihangensis* **sp. nov.** and other species of the genus *Xenylla* recorded from China are illustrated in the identification key below.

2. *Xenylla stepposa* Stebaeva, 1980, new record to China

Specimens examined. 10♀3♂, 16 spp. in alcohol, **China**, Shanxi Province, litter in pine forest N39°19', E113°15', Nan Shan Reserve, near Shuozhou City, Yingxian County, 10-VII-2019, leg. Chunjun WANG & Junli JIA.

Remarks. This species was recorded from southern Siberia: central and southeastern Altai Mountains and Novosibirsk Oblast (Babenko *et al.* 1994). Chinese specimens of *X. stepposa* fit the original description (Stebaeva 1980) and redescription (Babenko *et al.* 1994). Considering the variable number of teeth in the retinaculum (2 + 2 or 3 + 3) reported by Babenko *et al.* (1994) for different populations, it is worth noting that all specimens studied had 2 + 2 teeth just like specimens from the Altai Mts.

3. *Xenylla welchi* Folsom, 1916

Specimens examined. 3♀, **China**, Guangdong Province, rapeseed field, Fenghuang Mountain, N22°18', E113°33', near Zhuhai City, 13-XI-2018, leg. Junli JIA; 5♀, **China**, Anhui Province, peanut field, N30°00', E117°59', Hongcun Village, near Huangshan City, Yi County, 16-XI-2012, leg. Feng ZHANG, Zhixiang PAN & Zhaohui LI; 3♀, **China**, Hubei Province, soil under *Chenopodium album* Linn, entrance to Taohuachong Forest Park, N30°59', E116°28', near Huanggang City, Yinshan County, 23-VI-2014 leg. Feng ZHANG & Daoyuan YU; 6♀, **China**, Zhejiang Province, rice field, Jiangcun Village, N29°57', E120°38', near Zhuji City, 01-X-2006, leg. Zhixiang PAN. 7♀5♂, **China**, Zhejiang Province, rice field, Jinyun Village, N29°54', E121°36', near Jinhua City, 01-X-2006, leg. Zhixiang PAN.

Remarks. This species is common and a widely distributed in the tropics. In the Holarctic it occurs in greenhouses, mushroom cultures and decaying organic material (Babenko *et al.* 1994; Thibaud *et al.* 2004). In China it was found in mushroom farms in the provinces Henan and Fujian (Sun *et al.* in press). New data presented here greatly expand our knowledge on *X. welchi* distribution in China. Chinese specimens under study fit the descriptions by Thibaud *et al.* (2004) and Babenko *et al.* (1994). It is worth mentioning that all specimens studied had 2

sublobal hairs on the outer lobe of maxilla (2–3 according to Thibaud *et al.* 2004).

Discussion

Considering all of the above mentioned species, 7 *Xenylla* spp. are known from China: *X. boernerii* (Axelson, 1905), *X. changlingensis* Wu & Yin, 2007, *X. changchunensis* Wu & Yin, 2007, *X. stepposa*, *X. weinerae* Jia & Skarżyński, 2019, *X. welchi* and *X. taihangensis* **sp. nov.** Jia & Skarżyński (2019) mention 47 *Xenylla* species from Asia. In this context, the present number of *Xenylla* species listed for China seems to be still underestimated. Further studies are needed to recognize the real level of *Xenylla* diversity in this country.

Key to *Xenylla* species of China

This key is based on Jia & Skarżyński (2019). Encoding of chaetotactic characters is after Gama (1969, 1988) and Thibaud *et al.* (2004).

1. Dens with one seta, mucro absent, dens strongly reduced, papilla-like 2
- . Dens with two setae, mucro present 3
2. Head with dorsal setae c_1 present and c_2 absent (c). (Europe; China) *X. boernerii* Axelson
- . Head with dorsal setae c_1 absent (b) and c_2 present. (Southern Siberia; China) *X. stepposa* Stebaeva
3. Head with dorsal setae c_1 and c_2 *X. welchi* Folsom (Cosmopolitan)
- . Head without dorsal setae c_1 or c_2 (b/c) 4
4. Head with dorsal setae c_1 absent (b) and c_2 present 5
- . Head with dorsal setae c_1 present and c_2 absent (c) 6
5. Th. II and III with a pair of ventral medial setae, Ant. IV with four cylindrical sensilla. (China)
..... *X. changchunensis* Wu & Yin
- . Th. II and III without ventral medial setae (t), Ant. IV with six cylindrical sensilla. (China)
..... *X. weinerae* Jia & Skarżyński
6. Head without ventral setae p_1 (r) and m_3 (s). (China) *X. changlingensis* Wu & Yin
- . Head with ventral setae p_1 (r) and m_3 (s). (China) *X. taihangensis* **sp. nov.**

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