

A new species of the genus *Lepidodens* (Collembola: Entomobryidae) from Wuyanling National Nature Reserve, with description of larval chaetotaxy

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Abstract: The fifth species in the genus *Lepidodens* was reported from Wuyanling National Natural Reserve. *Lepidodens taishunensis* Lin, Wu & Pan **sp. nov.** is the second new species of this genus recorded from Zhejiang Province. This new species could be discriminated from others species in this genus by colour pattern, labial chaetae E and R ciliated, dorsal Abd. I–III and centrodorsal Abd. IV with 2/4/7/8 macrochaetae. A detailed comparison among the five *Lepidodens* species, dorsal body chaetotaxy of larvae and key to species of the genus were provided.

Key words: Entomobryomorpha; taxonomy; key

乌岩岭自然保护区鳞齿蚋属一新种及幼体毛序记述（弹尾纲：长角蚋科）

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摘要: 记述乌岩岭自然保护区鳞齿蚋属 1 新种: 泰顺鳞齿蚋 *Lepidodens taishunensis* Lin, Wu & Pan **sp. nov.**, 该新种是鳞齿蚋属在浙江省发现的第 2 个新物种。其鉴定特征有体色, 纤毛状的下唇刚行 E 和 R, 腹部第 I–III 节背部和第 IV 中背部中间大刚毛数量分别为 2/4/7/8。本文还提供了该新种与其他 4 个已知种的详细特征比较、幼体毛序和分种检索表。

关键词: 长角蚋目; 分类; 检索表

Introduction

The genus *Lepidodens* is identified by the body with pointed scales with relatively long ribs and present on the ventral side of dens, and the first abdominal segment with specialised microchaeta anterior to chaeta m3 (Zhang *et al.* 2016). This genus is affiliated to the subfamily Entomobryinae and was established by Zhang & Pan (2016) based on morphology and molecular evidences, and is distributed in southern China. So far, only four species have been recorded, *Lepidodens hainanicus* Zhang & Pan, 2016, *Lepidodens nigrofasciatus* Zhang

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& Pan, 2016, *Lepidodens similis* Zhang & Pan, 2016 and *Lepidodens huadingensis* Guo & Pan, 2022. *L. nigrofasciatus* from Guangdong Province was designated as the type species of this genus; *L. hainanicus* and *L. similis* were recorded from Hainan Province and Guangdong Province, respectively, and *L. huadingensis* was recorded from Zhejiang Province and as the most northern distribution record of this genus. The species of this genus usually survive on the fresh leaves of shrubs or the surface of barks, rarely in leaf litter.

Wuyanling National Natural Reserve (WYL) is located in southwest Zhejiang Province, adjacent to Fujian Province, as the most eastern point of Wuyi Mountains. The reserve was established to protect the famous bird, *Tragopan caboti*, which was listed for first-class national protection of animals. To date, only five new species of springtails have been reported from WYL, *Folsomina wuyanensis* Zhao & Tamura, 1992, *Folsomia minipunctata* Zhao & Tamura, 1992 of family Isotomidae, *Willowsia qui* Zhang, Chen & Deharveng, 2011, *Willowsia pseudoplatani* Zhang & Pan, 2016 and *Homidia hexasata* Pan, Shi & Zhang, 2011 of Entomobryidae. The sixth species from this region was recorded in the present paper, and the dorsal thoracic and abdominal segmental chaetotaxy of larvae of this new species and a key to species of the genus are provided here as well.

Material and methods

Specimens were sieved from fresh leaves onto a tray, and collected by an aspirator in the field, and then stored in 99% ethanol at -20° in the laboratory. Photographs were captured by a Nikon DS-Fi1 camera mounted on a Nikon SMZ1000 stereomicroscope (Figs 1–5), and a Nikon 80i phase-contrast microscope (Figs 6–9). Lengths were measured by NIS-Elements Documentation 3.1 software. Labels were added by Adobe Photoshop CS5. Specimens were cleared in lactic acid on an electric hot plate and mounted under a coverslip in Hoyer's medium.

The annotations of labial chaetotaxy are after Gisin (1967), labial palp chaetae follows Fjellberg (1998), dorsal thoracic and abdominal macrochaetotaxy is after Szeptycki (1979) and Zhang *et al.* (2019), and tergal sensory chaetae follow Zhang & Deharveng (2015). The number of macrochaetae on the dorsal body is provided by half-tergite in the descriptions.

Abbreviations. Ant. — antennal segment; Th. — thoracic segment; Abd. — abdominal segment; ms — specialised microchaeta(e); sens — specialised ordinary chaeta(e); S-chaeta(e) — specialised chaetae, including ms and sens; mac — macrochaeta(e); mic — microchaeta(e); VT — ventral tube.

The type specimens are deposited in the School of Life Sciences, Taizhou University, Taizhou, Zhejiang, China and the management center of WYL.

Taxonomy

Key to species of genus *Lepidodens*

1. Whole head and Abd. I–III with dark pigment 2
- Whole head and Abd. I–III without dark pigment 3
2. Th. II–III and Abd. IV with blue pigment *L. similis* Zhang & Pan

- . Th. II–III and Abd. IV without blue pigment *L. nigrofasciatus* Zhang & Pan
 3. Labial chaeta M doubled *L. huadingensis* Guo & Pan
 -. Labial chaeta M not doubled 4
 4. Only one mac (m3) on dorsal Abd. I *L. hainanicus* Zhang & Pan
 -. Two mac (m3 and m4) on dorsal Abd. I *L. taishunensis* Lin, Wu & Pan **sp. nov.**

***Lepidodens taishunensis* Lin, Wu & Pan sp. nov.** (Figs 1–4)

Adult. Size. Body length up to 2.34 mm.

Colour pattern. Ground colour pale or yellow in ethanol (Fig. 1). Dorsal thorax and abdomen mostly without dark pigment except lateral Abd. III and Abd. IV with short irregularly narrow bands. Eye patches dark blue. Coax of leg I–III with dark spots. Median and distal femur and tibiotarsus of leg II–III with two dark rings, distal one slightly darker than median. Ventral side of body without pigment. Larvae with same pattern as adults (Fig. 1).

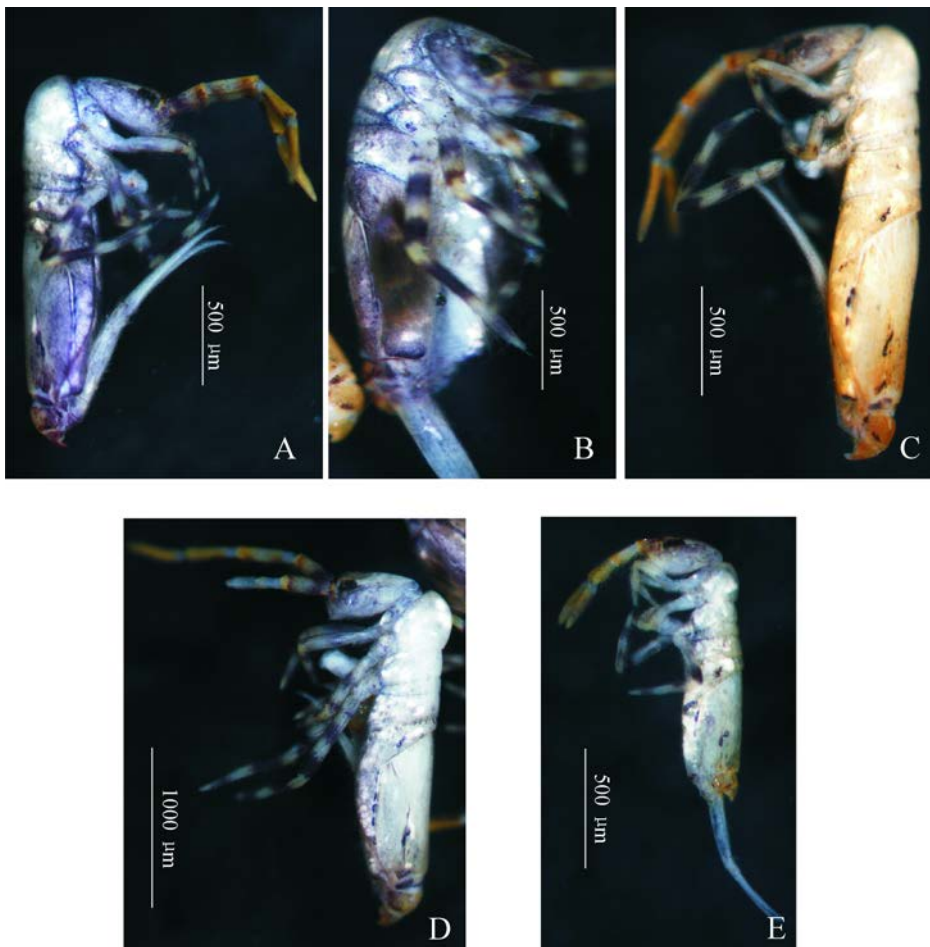


Figure 1. *Lepidodens taishunensis* Lin, Wu & Pan **sp. nov.**, colour pattern. A–D. Adults; E. Larvae. A, C–E. Lateral views, C showing yellow ground pattern; B. Lateral ventral view;

Scale. Scales pointed, heavily striate with basal ribs longer than distal ones (Fig. 2). Scales present on Ant. I–II (Fig. 2B), head, dorsal body, coxae to femur of legs and ventral

side of manubrium and dens (Figs 2A, 2C, 2D) but absent on Ant. III–IV, ventral tube and tenaculum.

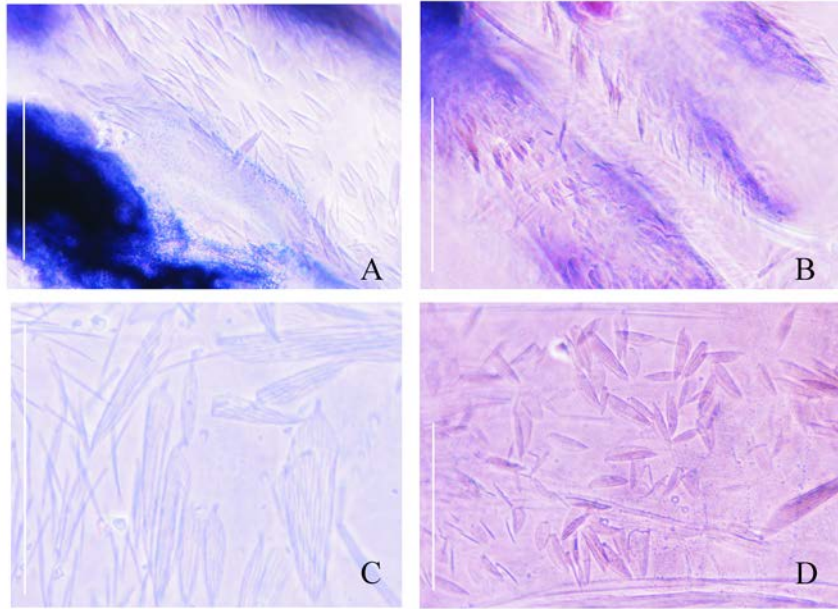


Figure 2. *Lepidodens taishunensis* Lin, Wu & Pan **sp. nov.**, scales. A. Dorsal head, dark pigmented as eye-patch; B. Ant. I; C. Abd. IV; D. Abd. III. Scales bars = 50 μm .

Head. Antenna 1.73–2.34 as long as cephalic diagonal. Antennal segment ratio as I : II : III : IV = 1 : 1.25–1.93 : 1.12–1.59 : 1.87–2.14. Basal dorsal Ant. I with three dorsal spin-like chaetae, ventral side unclear (Fig. 3A). Ant. III organ with two rods and three guard chaetae (Fig. 3B). Antennal apical bulb unilobed (Fig. 3C). Eyes 8+8. Labral margin papillae unclearly seen. Prelabral and labral chaetae 4/5, 5, 4, prelabrals ciliate. Clypeal chaetae ciliate. Dorsal cephalic chaetotaxy unclear. Labial chaetae MREL₁L₂, all ciliate; R shorter than M (Fig. 3D). Labial papillae A–E with 0, 5, 0, 4, 4 guard chaetae, respectively; lateral process thin, and with tip reaching apex of labial papilla E (Fig. 3E). Chaetae posterior to labium ciliate and not expanded. Subapical chaeta of maxillary outer lobe subequal to apical one; three hairs on sublobal plate (Fig. 3F). Mandibles with four and five teeth.

Thorax. Th. II slightly protruded (Fig. 1), with three (m1, m2, m2i) medio-medial, two (m4, m4i) medio-lateral, 10 posterior mac; m5 as mac; S-chaetae unclear. Th. III with 15 mac and two S-chaetae (Fig. 3G). Fore, mid and hind coxae with 3/10/7 chaetae, pseudopore unclear (Fig. 3H). Trochanteral organ of leg III with about 73 smooth spine-like chaetae (Fig. 3I). Unguis with two lateral and four inner teeth, most distal inner one very tiny. Unguiculus truncate with outer edge smooth. Tenent hairs clavate and subequal to unguis in length (Fig. 3J).

Abdomen. Abd. IV 7.35–11.23 as long as Abd. III along dorsal midline. Abd. I with two (m3–4) mac and two S-chaetae; ms antero-external to m3. Abd. II with four (a2, m3, m3e, m5) mac and two S-chaetae. Abd. III with seven (a2, a3, m3, am6, pm6, m7a, p6) mac and three S-chaetae (Fig. 3G). Chaetotaxy on dorsal Abd. IV shown in Figure T, central chaetae A2, B2, C1, T1, Si, Sm, B5, B6 as mac; A3–6, B3, B4 present; S-chaetae unclear. Abd. V with a5, m2,

m5, p1, p3, p4, p5, ap6 as mac and three S-chaetae (Fig. 4A). Accessory mic of bothriotrichial complexes on Abd. II–IV unmodified (Figs 3G, 4A). Smooth chaetae on posterior and lateral flap of ventral tube unclear. Manubrial plaque with one pseudopore and 10 ciliate chaetae, inner two larger than others (Fig. 4B). Distal smooth part of dens subequal to mucro. Mucro bidentate, basal spine short with tip reaching apex of subapical tooth (Fig. 4C). Tenaculum with 4+4 teeth and one large striate chaeta (Fig. 4D).

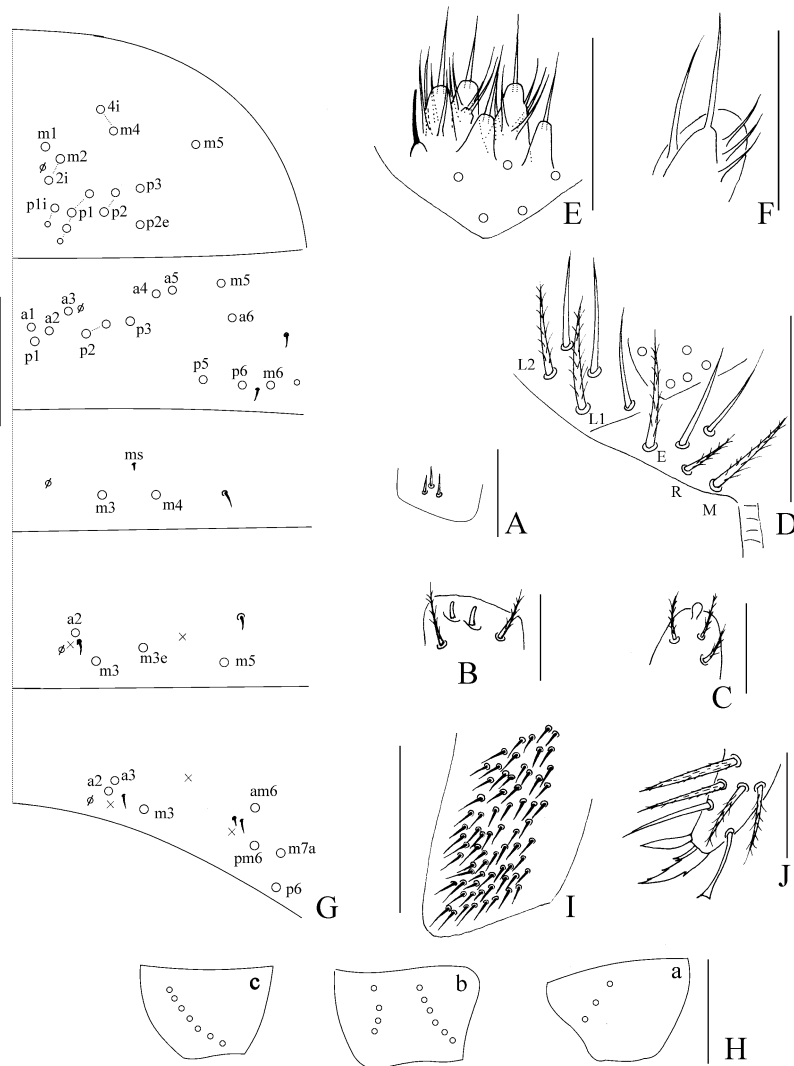
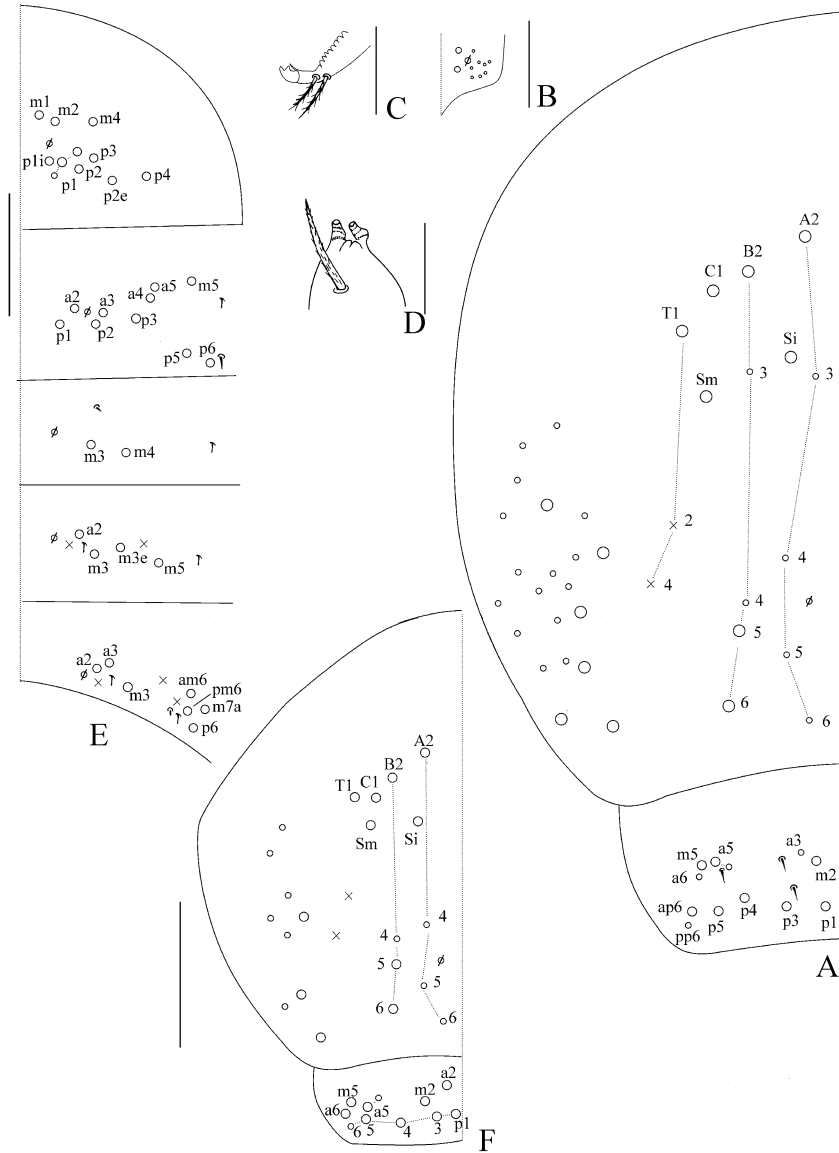


Figure 3. *Lepidodens taishunensis* Lin, Wu & Pan **sp. nov.** A. Basal Ant. I; B. Ant. III organ; C. Distal Ant. IV; D. Labium; E. Labial papillae; F. Maxillary outer lobe; G. Dorsal chaetotaxy on Th. II–Abd. III; H. Chaetotaxy on leg I–III coxae (a. fore leg; b. mid leg; c. hind leg); I. Trochanteral organ; J. Distal tibiotarsus and claw. A, D, G. Dorsal views; B, C, F, H–J. Lateral views. Scale bars = 50 μ m.

Dorsal thoracic and abdominal chaetotaxy of larvae

Th. II with two (m1, m2) medio-medial, one (m4) medio-lateral, 8 posterior mac; m5, p5

and p6 and S-chaetae unclear. Th. III with 10 (a2–5, m5, p1–3, p5–6) mac. Abd. I with two (m3–4) mac and two S-chaetae; ms antero-external to m3. Abd. II with four (a2, m3, m3e, m5) mac and two S-chaetae. Abd. III with seven (a2, a3, m3, am6, pm6, m7a, p6) mac and three S-chaetae (Fig. 4E). Abd. IV with 8 (A2, B2, C1, T1, Si, Sm, B5, B6) central mac (Fig. 4F); A4–6, B4 present; S-chaetae unclear. Abd. V with a2, a5, a6, m2, m5, p1, p3, p4, p5, ap6 as mac and three S-chaetae (Fig. 4F).



Figures 4. *Lepidodens taishunensis* Lin, Wu & Pan **sp. nov.** A–D. Adult. E, F. Larvae. A. Chaetotaxy of Abd. IV–V. B. Manubrial plaque; C. Distal dens and mucro; D. Tenaculum; E. Chaetotaxy of Th. II–Abd. III; F. Chaetotaxy of Abd. IV–V. A, D–F. Dorsal views; B. Lateral view; C. Ventral view. Scale bars = 50 μ m.

Holotype. ♀ (on slide), **China**, Zhejiang, Wenzhou, Taishun, Wuyanling National Nature

Reserve, 27.79504683°N, 119.75688134°E, alt. 726±5 m, coll. Zhixiang PAN, Jiawei WU, Ruifeng LIN & Tingting XIANG, 22-VIII-2023, sample number 4721. **Paratypes.** One male and one female of adult and one larvae individual on slides, three in ethanol. Same data as holotype.

Etymology. Named after the type locality Taishun County.

Habitat. Living on fresh leaves of *Dicranopteris pedata* (Houtt.).

Diagnosis. *Lepidodens taishunensis* Lin, Wu & Pan **sp. nov.** is most similar to *L. hainanicus* in colour pattern and chaetotaxy on dorsal Th. II–III and labium. However, it can be distinguished from the latter by mesothorax not protruded (protruded and overlapping head in the latter), distal Ant. I–III without dark pigment (present in the latter), femur of leg III with median dark pigment (absent in the latter), Mac on Abd. I/II/III as 2/4/7 (1/4/6 in the latter), and outer edge of unguiculus smooth (serrate in the latter). This new species can be easily discriminated from *L. huadingensis* (distributed in Zhejiang Province) by lacking longitudinal stripes on lateral head (present in the latter), labial chaeta M₂ absent (present in the latter), and 2/4 mac on Abd. I–II (3/6 in the latter). Also, this new species can be easily distinguished from *L. nigrofasciatus* and *L. similis* by colour pattern. A detailed comparison among these five recorded species of this genus is listed in Table 1.

Table 1. Detailed comparison between five recorded species of genus *Lepidodens*

Characters	<i>L. taishunensis</i> sp. nov.	<i>L. huadingensis</i>	<i>L. hainanicus</i>	<i>L. nigrofasciatus</i>	<i>L. similis</i>
Body length up to (mm)	2.34	4.21	2.2	1.3	3.5
Mesothorax protruded and overlapping head	Yes (slight)	yes	yes	no	no
Head dark pigmented	no	no	no	yes	yes
Lateral head to Th. III with longitudinal stripes	no	yes	no	no	no
Abd. I–III wholly dark pigmented on dorsal side	no	no	no	yes	yes
Dark rings on apical part of Ant. I–III	no	no	yes	no	no
Median and distal femur of leg III with dark pigment.	yes	yes	only distal one	no	no
Prelabral chaetae	ciliate	ciliate	ciliate	smooth	smooth
Tip of lateral process reaching apex of labial papilla E	yes	not	not	not	not
Labial chaetal formula	MREL ₁ L ₂	M ₁ M ₂ R (R ₂)EL ₁ L ₂	MREL ₁ L ₂	MEL ₁ L ₂	MEL ₁ L ₂
Mac on Abd. I/II/III	2/4/7	3/6/7	1/4/6	2/4/7	2/4/7
Mac on central dorsal Abd. IV	8	5	7–13	6–8	12–16
Smooth chaetae of trochanteral organ	about 73	about 57	about 28	8–12	8–11
Outer edge of unguiculus	smooth	serrate	serrate	smooth	smooth
Distribution	Zhejiang	Zhejiang	Hainan	Guangdong	Guangdong

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