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Four New Species of the Genus *Eosentomon* (Protura) from Yunnan, Southwest China¹⁾

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Abstract Four new species of the genus *Eosentomon* are described from Yunnan, Southwest China. They are *E. bannaense*, *E. chunchengense*, *E. chuxiongense* and *E. huatingense*.

Key words: Protura; new species; *Eosentomon*; Yunnan.

In the present paper, we are going to describe four new eosentomid species from Yunnan Province, Southwest China, as the sixth part of the series dealing with the results of investigations on the proturan collection of our Sino-Japanese Cooperative Program. The type specimens designated in the present paper will be deposited in the collection of the Shanghai Institute of Entomology, Academia Sinica.

We wish to express our hearty thanks to Dr. Shun-Ichi UÉNO, Messrs. CHENG Yi-cun, XIAO Ning-nian, ZHANG Jun and all who favoured us with every kind of help through our works.

Eosentomon bannaense sp. nov.

(Fig. 1)

Specimens examined. 1♂ and 5♀, roadside between Menglun and Mengla (144–145 km road signs from Jinghong), 560 m alt., Xishuangbanna, Yunnan, 10-IV-1992, collected by XIE Rong-dong and others.

Body length 820–860 µm.

Head oval, 112–116 µm in dorsal view. Anterior and posterior additional setae present; subposterior setae about twice the posterior in length; anterior and

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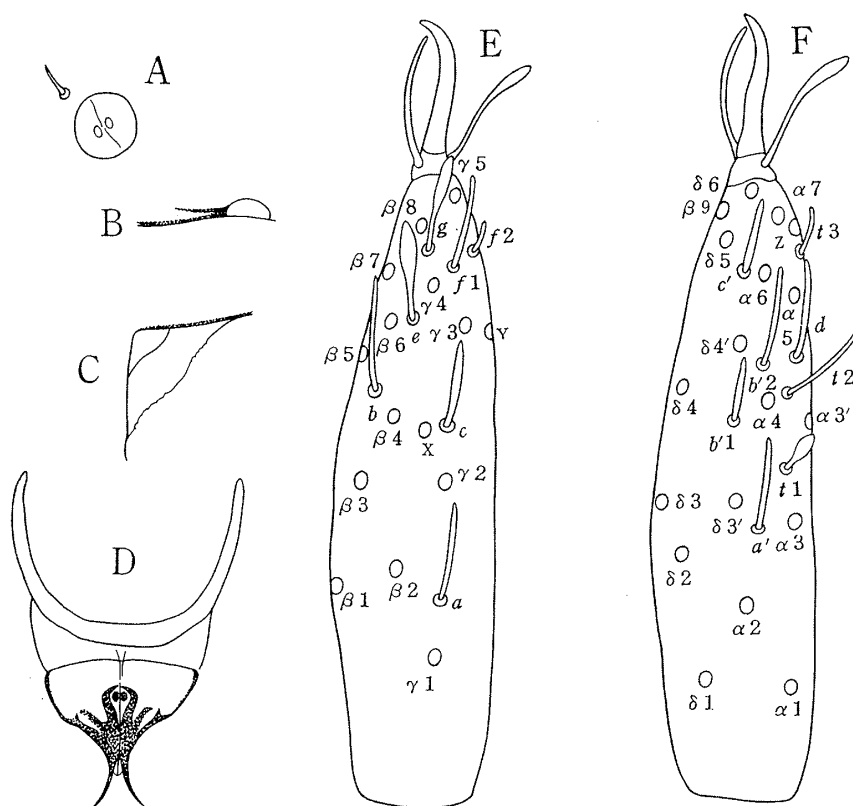


Table 1. Chaetotaxy of *Eosentomon bannaense* sp. nov.*

		Dorsal		Ventral	
		Formula	Composition of setae	Formula	Composition of setae
Thorax	I	4		$\frac{6-2}{6}$	A1, 2, 3, M P1, 2, 3
	II	$\frac{6}{16}$	A2, 4, M P1, 1a, 2, 2a, 3, 3a, 4, 5	$\frac{6-2}{6}$	A1, 2, 3, M P1, 2, 3
	III	$\frac{6}{18}$	A2, 4, M P1, 1a, 2, 2a, 3, 3a, 4, 5, 5a	$\frac{6-4}{8}$	A1, 2, 3, M1, 2 P1, 2, 3, 4
	Abdomen I	$\frac{4}{12}$	A1, 2 P1, 1a, 2, 2a, 3, 4	$\frac{4}{4}$	A1, 2 P1, 2
	II-III	$\frac{10}{16}$	A1, 2, 3, 4, 5 P1, 1a, 2, 2a, 3, 4, 4a, 5	$\frac{6}{4}$	A1, 2, 3 P1, 2
	IV	$\frac{10}{16}$	A1, 2, 3, 4, 5 P1, 1a, 2, 2a, 3, 4, 4a, 5	$\frac{6}{10}$	A1, 2, 3 P1, 2, 2a, 2a', 3
	V	$\frac{6}{16}$	A1, 4, 5 P1, 1a, 2, 2a, 3, 4, 4a, 5	$\frac{6}{10}$	A1, 2, 3 P1, 2, 2a, 2a', 3
	VI	$\frac{4}{16}$	A4, 5 P1, 1a, 2, 2a, 3, 4, 4a, 5	$\frac{6}{10}$	A1, 2, 3 P1, 2, 2a, 2a', 3
	VII	$\frac{2}{16}$	A5 P1, 1a, 2, 2a, 3, 4, 4a, 5	$\frac{6}{10}$	A1, 2, 3 P1, 2, 2a, 2a', 3
	VIII	$\frac{6}{9}$	M2, 4, 5 Pc, 1a, 1a', 2, 2a	$\frac{0}{7}$	
	IX-X	8	1, 2, 3, 4	4	Pc, 1, 1a, 2 1, 2
	XI	8	1, 2, 3, 4	8	
	XII	9		12	

* Notation of body setae is referred to that in IMADATÉ and others (1994).

Abdominal tergites II-IV each with five pairs of anterior setae; terg. V with three pairs, A1, 4 and 5; terg. VI with two pairs, A4 and 5; terg. VII with a single pair, A5; terg. IX-XI each with four pairs of tergal setae; sternite VIII with seven posterior setae, without anterior seta; stern. IX-X each with four sternal setae, 1 and 2, without 1a. On terg. I, P1a situated somewhat posterior to the row of P1 and 2, hair-like and subequal to P1 in length, P3 sensilla-like and very short, P4 rudimentary. On terg. II-VI P1a and 2a situated somewhat posterior to P1 and 2, hair-like and subequal to P1 in length. On terg. VII, P1a situated on about the same row as P1 and 2, sensilla-like, short and less than one-third of P1 in length, P2a situated somewhat posterior to the row of P1 and 2, hair-like and subequal to P1 in length. On terg. VIII, P1a' without basal dilatation, in normal position. Lateral stigmata II-IV present, with no reticulation (Fig. 1B). Lateral sclerotization on stern. VIII distinct (Fig. 1C).

On female squama genitalis, caput processus shaped like duck's head, with oblique appendices, round median sclerotization distinct, lateral sclerotization present, filum processus relatively long (Fig. 1D).

Holotype. 1 ♀, roadside between Menglun and Mengla (144–145 km road signs from Jinghong), 560 m alt., Xishuangbanna, Yunnan, 10-IV-1992, collected by XIE Rong-dong and others.

Notes. The present new species is similar in many respects to *E. jinhongense* from Yunnan (YIN, 1982) and Hainan (YIN, 1986) Provinces, China, but it is different from the latter in such structure of female squama genitalis as the presence of median sclerotization and the shape of caput processus, and in the structure of pseudoculus.

Abnormality seems rare in chaetotaxy. In one female of the six specimens examined, asymmetric and extra occurrence of A1 on abdominal tergite VI is observed.

The specific name is derived from Xishuangbanna, the name of the general area, in which was found this new proturan.

Eosentomon chunchengense sp. nov.

(Figs. 2–3)

Specimens examined. 1 ♀, Taihua Temple, 2,100 m alt., Xishan, Kunming, Yunnan, 7-XI-1992, collected by YIN Wen-ying and others; 1 ♂ and 2 ♀, Huating Temple, 2,000 m alt., Xishan, Kunming, Yunnan, 7-XI-1992, XIE Rongdong and others.

Body length 880–1,180 μm .

Head oval, 135–147 μm in dorsal view. Anterior and posterior additional setae present; subposterior setae about twice the posterior in length; anterior and

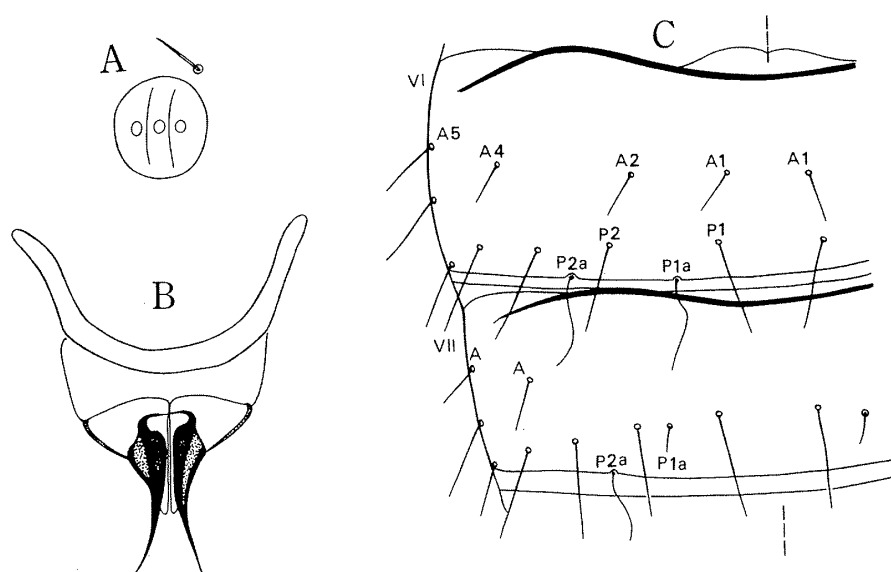


Fig. 2. *Eosentomon chunchengense* sp. nov. A, Pseudoculus; B, female squama genitalis; C, dorsal chaetotaxy, abdomen VI-VII. Signs: VI, abdomen VI; VII, abd. VII.

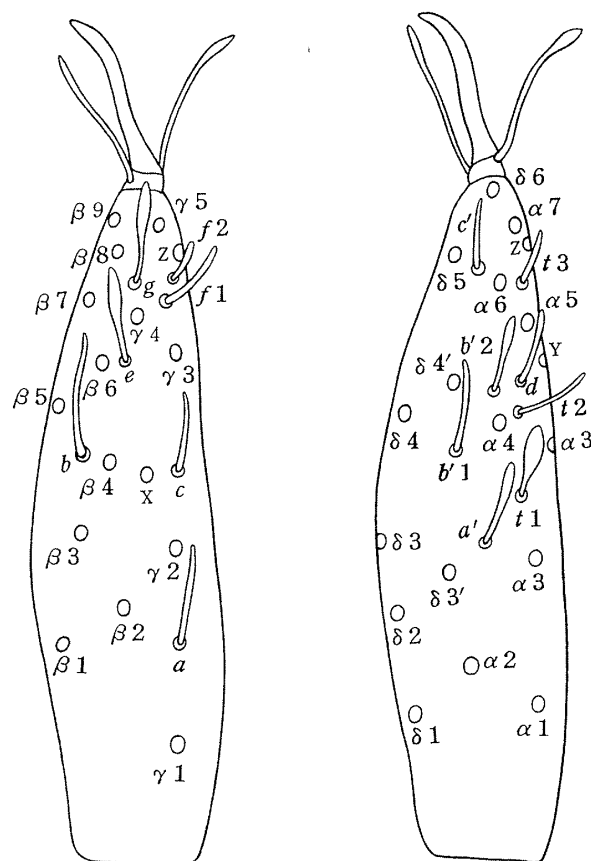


Fig. 3. *Eosentomon chunchengense* sp. nov. Foretarsus, exterior (left) and interior (right) views.

posterior sensillae present. Labral setae present; rostral setae with basal dilatation, a little shorter than the subrostral; clypeal apodeme present. Maxillary palpus with two sensillae, dorsal sensilla a little longer than the lateral. Pseud-oculus ovoid, with two median striae and three inner globules (Fig. 2A), PR=9.

Foretarsus (Fig. 3) 90–92 μm , TR=4.3–4.6; empodium and S-shaped seta subequal to the claw in length. Dorsal sensilla *t1* about a halfway between $\alpha 3$ and $\alpha 3'$, BS=1.0–1.2; *t2* thin; *t3* relatively long. Exterior sensilla *a* thin, its apex hardly reaching the base of $\gamma 2$; the apex of *d* slightly surpassing the base of $\alpha 5$; *e* and *g* spatulate; the apex of *f1* not reaching the base of $\gamma 5$. Interior sensilla *a'* broad distally, situated somewhat proximal to the level of $\alpha 3$ and $\delta 3'$; *b'1* present; *b'2* somewhat broad distally; *c'* thin, its apex hardly reaching the base of $\delta 6$. Middle tarsus 42–44 μm ; its claw 14–15 μm ; empodium very short, less than one-ninth the claw in length. Hind tarsus 55–62 μm ; its claw 17–18 μm ; empodium very short, less than one-ninth the claw in length.

Chaetotaxy as shown in Table 2. On thoraces II–III, dorsal P1a situated somewhat posterior to the row of P1 and 2, seta-like, subequal to P1 in length.

Table 2. Chaetotaxy of *Eosentomon chunchengense* sp. nov.

		Dorsal		Ventral	
		Formula	Composition of setae	Formula	Composition of setae
Thorax	I	4		$\frac{6-2}{6}$	A1, 2, 3, M P1, 2, 3
	II	$\frac{6}{16}$	A2, 4, M P1, 1a, 2, 2a, 3, 3a, 4, 5	$\frac{6-2}{6}$	A1, 2, 3, M P1, 2, 3
	III	$\frac{6}{18}$	A2, 4, M P1, 1a, 2, 2a, 3, 3a, 4, 5, 5a	$\frac{6-4}{8}$	A1, 2, 3, M1, 2 P1, 2, 3, 4
	Abdomen I	$\frac{4}{12}$	A1, 2 P1, 1a, 2, 2a, 3, 4	$\frac{4}{4}$	A1, 2 P1, 2
	II-III	$\frac{10}{16}$	A1, 2, 3, 4, 5 P1, 1a, 2, 2a, 3, 4, 4a, 5	$\frac{6}{4}$	A1, 2, 3 P1, 2
	IV	$\frac{10}{16}$	A1, 2, 3, 4, 5 P1, 1a, 2, 2a, 3, 4, 4a, 5	$\frac{6}{10}$	A1, 2, 3 P1, 2, 2a, 2a', 3
	V-VI	$\frac{8}{16}$	A1, 2, 4, 5 P1, 1a, 2, 2a, 3, 4, 4a, 5	$\frac{6}{10}$	A1, 2, 3 P1, 2, 2a, 2a', 3
	VII	$\frac{4}{16}$	A4, 5 P1, 1a, 2, 2a, 3, 4, 4a, 5	$\frac{6}{10}$	A1, 2, 3 P1, 2, 2a, 2a', 3
	VIII	$\frac{6}{9}$	M2, 4, 5 Pc, 1, 1a, 1a', 2, 2a	$\frac{0}{7}$	
	IX-X	8	1, 2, 3, 4	4	1, 2
	XI	8	1, 2, 3, 4	8	
	XII	9		12	

Thorax III with short dorsal P5a. Abdominal tergites II-IV each with five anterior setae; terg. V-VI each with four pairs, A1, 2, 4 and 5; terg. VII with two pairs, A4 and 5; terg. IX-XI each with four pairs of tergal setae; sternite VIII with seven posterior setae, without anterior seta; stern. IX-X with four sternal setae, 1 and 2, without 1a. On terg. I, P1a situated somewhat posterior to the row of P1 and 2, hair-like and subequal to P1 in length, P3 sensilla-like, very short, P4 rudimentary. On terg. II-VI, P1a and 2a situated somewhat posterior to the row of P1 and 2, hair-like and a little longer than P1 in length. On terg. VII, P1a situated on the same row as P1 and 2, sensilla-like and less than one-sixth of P1 in length, P2a situated somewhat posterior to row of P1 and 2, hair-like and more than a half of P1 in length (Fig. 2C). On terg. VIII, P1a' with basal dilatation, in normal position. Lateral stigmata II-VI present, with no reticulation. Lateral sclerotization on stern. VIII distinct.

On female squama genitalis, caput processus shaped like duck's head, beak thin, relatively long and perpendicular to median line, filum processus of medium length, lateral sclerotization distinct (Fig. 2B).

Holotype. ♀, Huating Temple, 2,000 m alt., Xishan, Kunming, Yunnan, 7-XI-1992, collected by Xie Rong-dong and others.

Notes. This species is closely similar in many respects to *Eosentomon*

chishiaense (*chishiaensis*) from Jiangsu (YIN, 1965), Hubei (YIN, 1987), Zhejiang (YIN & ZHAO, 1988; YIN, 1989) and Hunan (YIN, 1992) Provinces in China. It is, however, distinguished from the latter by the structure of female squama genitalis and of pseudoculus, by the position of foretarsal sensilla *a'* and by the ratios TR and PR.

The specific name is derived from Chuncheng, an poetic appellation of Kunming.

Eosentomon chuxiongense sp. nov.

(Figs. 4–5)

Specimens examined. 2♂1♀, Mt. Zixishan, 2,200 m alt., Chuxiong, Yunnan, 20-VIII-1993, collected by XIAO Ning-nian.

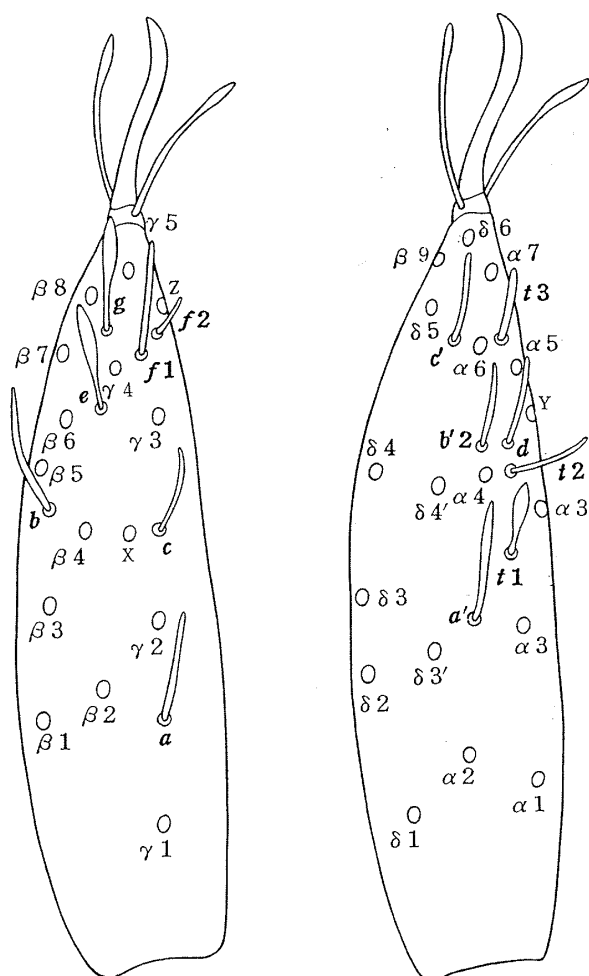


Fig. 4. *Eosentomon chuxiongense* sp. nov. Foretarsus, exterior (left) and interior (right) views.

Body length 1,300–1,410 μm .

Head oval, 152–158 μm in dorsal view. Anterior and posterior additional setae present; subposterior setae more than twice the posterior in length; anterior and posterior sensillae present. Labral setae present; rostral setae with basal dilatation, a little shorter than the subrostral; clypeal apodeme distinct. Maxillary palpus with two sensillae, dorsal sensilla slightly longer than the lateral. Pseudoculus ovoid, with one long median, two short lateral striae and three inner globules (Fig. 5A), PR=9.

Foretarsus (Fig. 4) 99–103 μm , TR=4.2–4.6; empodium and S-shaped seta subequal to the claw in length. Dorsal sensilla *t1* slightly closer to $\alpha 3'$ than to $\alpha 3$; BS=1.2–1.3; *t2* thin and relatively short; *t3* normal. Exterior sensilla *a* of medium size; *e* and *g* spatulate; *f1* thin and long, its apex surpassing the base of $\alpha 5$; *f2* short. Interior sensilla *a'* situated on about the same row as $\alpha 3$ and somewhat proximal to $\delta 3'$; *b'1* absent; *b'2* a little shorter than *d*; *c'* thin. Middle tarsus 54–58 μm ; its claw 16–18 μm ; empodium very short, less than one-ninth the claw in length. Hind tarsus 65–70 μm ; its claw 19–20 μm ; empodium very short, less than one-ninth the claw in length.

Chaetotaxy as shown in Table 3. On thoraces II–III, dorsal P1a situated somewhat posterior to the row of P1 and 2, seta-like and longer than P1.

Table 3. Chaetotaxy of *Eosentomon chuxiongense* sp. nov.

		Dorsal		Ventral	
		Formula	Composition of setae	Formula	Composition of setae
Thorax	I	4		6–2	A1, 2, 3, M
				6	P1, 2, 3
	II	6	A2, 4, M	6–2	A1, 2, 3, M
		16	P1, 1a, 2, 2a, 3, 3a, 4, 5	6	P1, 2, 3
	III	6	A2, 4, M	6–4	A1, 2, 3, M1, 2
		18	P1, 1a, 2, 2a, 3, 3a, 4, 5, 5a	8	P1, 2, 3, 4
Abdomen	I	4	A1, 2	4	A1, 2
		16	P1, 1a, 2, 2a, 3, 4	4	P1, 2
	II–III	10	A1, 2, 3, 4, 5	6	A1, 2, 3
		16	P1, 1a, 2, 2a, 3, 4, 4a, 5	4	P1, 2
	IV	10	A1, 2, 3, 4, 5	6	A1, 2, 3
		16	P1, 1a, 2, 2a, 3, 4, 4a, 5	10	P1, 2, 2a, 2a', 3
	V	8	A1, 2, 4, 5	6	A1, 2, 3
		16	P1, 1a, 2, 2a, 3, 4, 4a, 5	10	P1, 2, 2a, 2a', 3
	VI–VII	4	A4, 5	6	A1, 2, 3
		16	P1, 1a, 2, 2a, 3, 4, 3a, 5	10	P1, 2, 2a, 2a', 3
	VIII	6	M2, 4, 5	0	
		9	Pc, 1a, 1a', 2, 2a	7	Pc, 1, 1a, 2
	Ix–X	8	1, 2, 3, 4	4	1, 2
	XI	8	1, 2, 3, 4	8	
	XII	9		12	

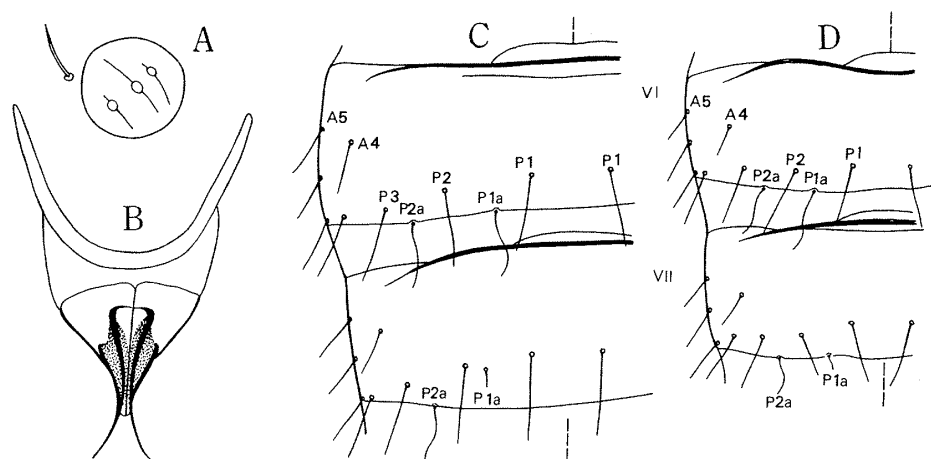


Fig. 5. A-C. *Eosentomon chuxiongense* sp. nov. A, Pseudoculus; B, female squama genitalis; C, dorsal chaetotaxy of abdomen VI-VII.—D. *Eosentomon huatingense* sp. nov.; dorsal chaetotaxy of abdomen VI-VII. Signs: VI, abdomen VI; VII, abd. VII.

Abdominal tergites II–IV each with five pairs of anterior setae; terg. V with four pairs, A1, 2, 4 and 5; terg. VI–VII each with two pairs, A4 and 5; terg. IX–XI with four pairs of tergal setae; sternite VIII with seven posterior setae, without anterior seta; stern. IX–X each with two pairs of sternal setae, 1 and 2, without 1a. On terg. I, P 1a situated somewhat posterior to the row of P1 and 2, hair-like and longer than P1, P 3 and 4 minute, sensilla-like. On terg. II–VI, P1a and 2a situated somewhat posterior to the row of P1 and 2, hair-like and longer than P1. On terg. VII, P1a situated on about the same row as P1 and 2, sensilla-like and short, less than one-sixth of P1 in length, P2a situated somewhat posterior to the row of P1 and 2, hair-like and more than a half of P1 in length (Fig. 5C). On terg. VIII, P1a' with basal dilatation, in normal position. Lateral stigmata II–IV present, with no reticulation. Lateral sclerotization on stern. VIII distinct.

On female squama genitalis, caput processus shaped like duck's head, with oblique appendices, filum processus of medium length, lateral sclerotization distinct (Fig. 5B).

Holotype. ♀, Mt. Zixishan, 2,200 alt., Chuxiong, Yunnan, 20-VIII-1993, collected by XIAO Ning-nian.

Notes. The present new species is related to *Eosentomon yanshanense* from Guangxi (YIN & ZHANG, 1982), Hainan (YIN, 1986), Hubei and Hunan (YIN, 1992) Provinces, China. It is, however, different from the latter in the relative length of foretarsal sensillae *fl* and *a'*, in the structure of pseudoculus and in such ratios as BS, PR and TR.

The specific name is derived from Chuxiong, the name of the general area, in which was collected this new form.

Eosentomon huatingense sp. nov.

(Figs. 5–6)

Specimens examined. 3♂4♀, Huating Temple, 2,000 m alt., Xishan, Kunming, Yunnan, 7-XI-1992, collected by YIN Wen-ying and others.

Body length 650–820 μm .

Head oval, 108–117 μm in dorsal view. Anterior and posterior additional setae present; subposterior setae about 1.5 times the posterior in length; anterior and posterior sensillae present. Labral setae present; rostral setae with basal dilatation, a little shorter than the subrostral; clypeal apodeme present. Maxillary palpus with two sensillae, dorsal sensilla subequal to the lateral in length and in shape. Pseudoculus ovoid, with two long, three short striae and three globules (Fig. 6A), PR=10–11.

Foretarsus (Fig. 6D–E) 71–74 μm , TR=3.0–4.3; empodium and S-shaped seta a little shorter than the claw. Dorsal sensilla *t1* close to $\alpha 3$, BS=1.0–1.1; *t2* thin; *t3* normal. Exterior sensilla *a* of medium size; the apex of *d* reaching the base of *t3*; *e* and *g* spatulate; *f1* thin, relatively long, its apex surpassing the tarsus. Interior sensilla *a'* situated on the same level as $\alpha 3$ and somewhat proximal to

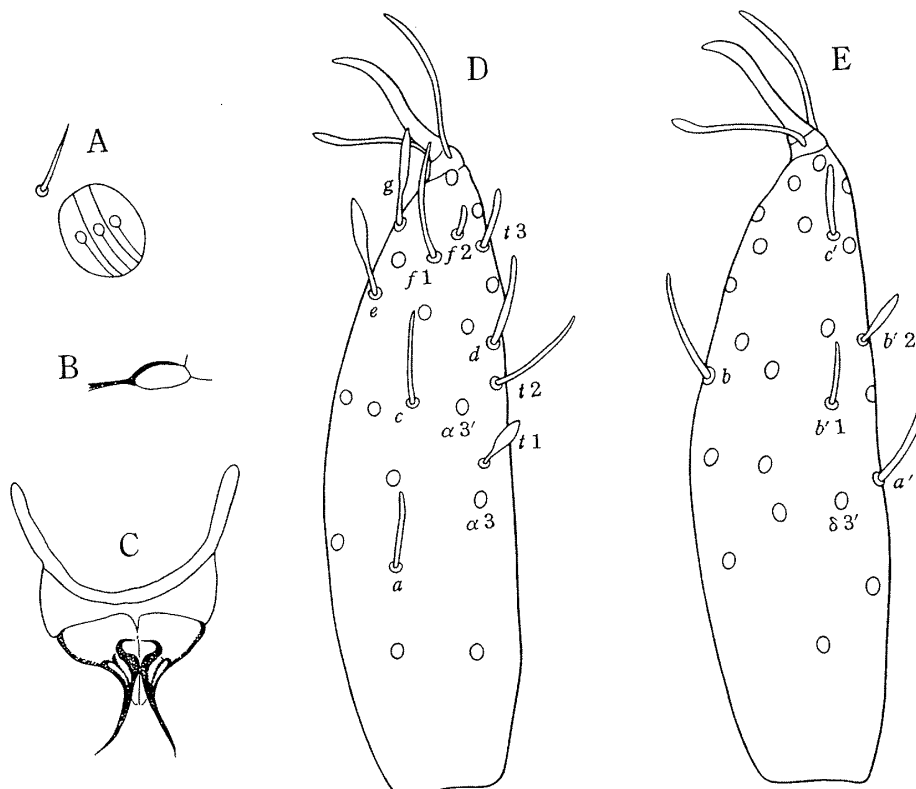


Fig. 6. *Eosentomon huatingense* sp. nov. A, Pseudoculus; B, laterostigma on tergite III; C, female squama genitalis; D, foretarsus, exterior view; E, same, interior view.

Table 4. Chaetotaxy of *Eosentomon huatingense* sp. nov.

	Dorsal		Ventral	
	Formula	Composition of setae	Formula	Composition of setae
Thorax I	4		$\frac{6-2}{6}$	A1, 2, 3, M P1, 2, 3
II	$\frac{6}{16}$	A2, 4, M P1, 1a, 2, 2a, 3, 3a, 4, 5	$\frac{6-2}{6}$	A1, 2, 3, M P1, 2, 3
III	$\frac{6}{16}$	A2, 4, M P1, 1a, 2, 2a, 3, 3a, 4, 5	$\frac{6-4}{8}$	A1, 2, 3, M1, 2 P1, 2, 3, 4
Abdomen I	$\frac{4}{12}$	A1, 2 P1, 1a, 2, 2a, 3, 4	$\frac{4}{4}$	A1, 2 P1, 2
II-III	$\frac{10}{16}$	A1, 2, 3, 4, 5 P1, 1a, 2, 2a, 3, 4, 4a, 5	$\frac{6}{4}$	A1, 2, 3 P1, 2
IV	$\frac{10}{16}$	A1, 2, 3, 4, 5 P1, 1a, 2, 2a, 3, 4, 4a, 5	$\frac{6}{10}$	A1, 2, 3 P1, 2, 2a, 2a', 3
V	$\frac{8}{16}$	A1, 2, 4, 5 P1, 1a, 2, 2a, 3, 4, 4a, 5	$\frac{6}{10}$	A1, 2, 3 P1, 2, 2a, 2a', 3
VI-VII	$\frac{4}{16}$	A4, 5 P1, 1a, 2, 2a, 3, 4, 4a, 5	$\frac{6}{10}$	A1, 2, 3 P1, 2, 2a, 2a', 3
VIII	$\frac{6}{9}$	M2, 4, 5 Pc, 1a, 1a', 2, 2a	$\frac{0}{7}$	
IX-X	8	1, 2, 3, 4	4	Pc, 1, 1a, 2 1, 2
XI	8	1, 2, 3, 4	8	
XII	9		12	

$\delta 3'$; $b'1$ present; $b'2$ and c' slightly broad. Middle tarsus 30–32 μm ; its claw 10–11 μm ; empodium very short, less than one-ninth the claw in length. Hind tarsus 41–43 μm ; its claw 11–13 μm , empodium very short, less than one-ninth the claw in length.

Chaetotaxy as shown in Table 4. On thoraces II–III, dorsal P1a situated somewhat posterior to the row of P1 and 2, seta-like and a little longer than P1 in length. Abdominal tergites II–IV each with five pairs of anterior setae; terg. V with four pairs, A1, 2, 4 and 5; terg. VI–VII each with two pairs, A4 and 5; terg. IX–XI each with four pairs of tergal setae; sternite VIII with seven posterior setae, without anterior seta; terg. IX–X each with four sternal setae, 1 and 2, without 1a. On terg. I, P1a slightly posterior to the row of P1 and 2, hair-like and a little longer than P1, P3 and 4 minute and sensilla-like. On terg. II–VI, P1a and 2a situated somewhat posterior to the row of P1 and 2, hair-like and long, more than 1.2 times P1 in length. On terg. VII, P1a and 2a situated somewhat posterior to the row of P1 and 2, P1a sensilla-like and very short, less than one-third of P1 in length, P2a hair-like and subequal to P1 in length (Fig. 5D). On terg. VIII, P1a' with basal dilatation, in normal position. Lateral stigmata on terg. II–IV distinct, with no reticulation (Fig. 6B). Lateral sclerotization on sternite VIII distinct.

On female squama genitalis, caput processus shaped like duck's head, with oblique appendices, filum processus of medium length, lateral sclerotization distinct (Fig. 6C).

Holotype. ♀, Huating Temple, 2,000 m alt., Xishan, Kunming, Yunnan, 7-XI-1992, collected by YIN Wen-ying and others.

Notes. This new species is related to the former species, *Eosentomon chuxiongense* sp. nov., but is distinguishable from it by the presence of foretarsal sensilla *b'1* and by the ratios BS, TR and PR as well as by the position of tergal setae Pl_a on abdomen VII.

The specific name is derived from the name of the type locality, Huating Temple.

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