REVISION OF CHINESE *YAMATENTOMON* (PROTURA: ACERENTOMATA: ACERENTOMIDAE), WITH DESCRIPTION OF ONE NEW SPECIES, REDESCRIPTION OF *YAMATENTOMON YAMATO*, AND KEY TO WORLD SPECIES

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ABSTRACT

Chinese *Yamatentomon* is revised and *Yamatentomon guoi* **sp. nov.** is described from northeastern China. The new species is characterized by the extremely long sensillum b on foretarsus, short and slender A1 setae on tergites I-VII, presence of P3a on tergites IV-VII, 5 pairs of A-setae on tergite VII, and pore arrangement on tergites IV-VI. The new species is similar to *Y. kunnepchupi* Imadaté, 1964, but can be distinguished by the length of sensilla b and e on foretarsus, and chaetotaxy of tergites IV and V. DNA barcodes for the new species are provided to give a reference for identification in the future. In addition, *Yamatentomon yamato* (Imadaté & Yosii, 1956) was redescribed based on the specimens from type locality. An updated key to the world species of the genus was also provided.

Key Words: Revision, *Yamatentomon*, Protura, Northeast China, DNA barcodes, Key

RESUMEN

Se revisa las especies del género *Yamatentomon* en China y se describe *Yamatentomon guoi* **sp. nov.** del noreste de China. La nueva especie se caracteriza por un muy largo sensillum b en el tarso anterior, las setas A1 en tergitos I-VII cortas y delgadas, la presencia de P3a en tergitos IV-VII, 5 pares de setas A1 en tergito VII y la disposición de los poros en tergitos IV -VI. La nueva especie es similar a *Y. kunnepchupi* Imadate, 1964, pero se distinguen por la longitud de la sensilla b y e en el tarso anterior y la quetotaxia de los terguitos IV y V. Se provee códigos de barras de ADN para las especies nuevas para dar una referencia para su identificación en el futuro. Además, se redescribe *Yamatentomon yamato* (Imadate y Yosii, 1956) basado en especimenes recolectadas en la localidad de la especie tipo. También, se provee una clave actualizada de las especies de este género para el mundo.

Palabras clave: Revisión, *Yamatentomon*, Protura, noreste de China, códigos de barras de ADN, clave

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Yamatentomon Imadaté, 1964 contains 4 species, all of which occur in eastern Asia (Japan, Korea, northeastern China and Russian Far East) (Imadaté 1974; Szeptycki 2007; Yin 1999; Nakamura 2004). This genus is characterized by 3 pairs of anterior setae on the mesonotum (*A2*, *A3*, *A4*) and four pairs on the metanotum (*A2*, *A3*, *A4*, *A5*), sensillum *t1* on foretarsus claviform, sensillum *b'* absent, calyx of maxillary gland smooth and with a helmet-like dorsal appendix, striate band on abdominal segment VIII well developed, and sternite VIII with four setae. Only one species, *Yamatentomon yamato* (Imadaté & Yosii, 1956), has been recorded in China, first from Heilongjiang province (Yin 1980), later from Changbai Mountain, Jilin Province (Yin 1999).

During a study of Protura collected in northeastern China, we found that many specimens labeled as "*Y. yamato*" from Jilin Province differed from that species in chaetotaxy of the head and sternite VII. After comparison with *Y. yamato* specimens from the type locality (Nara, Japan), we confirmed it is an undescribed species; this new species is described in this paper. In addition, the DNA barcoding sequences for the new species are provided. *Yamatentomon yamato* is redescribed based on the type locality specimens, with special attention paid to the head chaetotaxy and body porotaxy.

Materials and Methods

Specimens were extracted from soil samples with Tullgren funnels into 95% ethanol and mounted on slides in Hoyer's solution. Slides were cured in an oven at 45° C. Specimens were identified and characters were drawn with the aid of NIKON E600 phase contrast microscopes.

Abbreviations. Foretarsus: setae, α1-α7: dorsal setae. β1-β7: ventral setae. γ1-γ5: interior setae. δ1-δ6: exterior setae; sensilla, *a'-c'*: interior sensilla. *a-g*: exterior sensilla. *t1-t3*: dorsal sensilla; indexes, BS: ratio between distances of the foretarsal base to *t-1* and *t-1* to the base of claw. EU: ratio between the length of the empodium and the length of the claw. TR: ratio between the length of foretarsus and length of the claw. Tergites and sternites: setae, *A1-A5*: anterior setae. *Ac*: central anterior seta. *M*: median seta. *Mc*: central median seta. *P1-P5*: posterior setae. *P1a-P5a*: posterior accessory setae. *Pc*: central posterior seta; pores, *al*: anterolateral pore. *l*: lateral pore. *pl*: posterior-lateral pores. *psm*: posterosubmedial pores. *psl*: posterosublateral pores; Head: setae, *ap*: anteropseudocular seta. *pp*: postpseudocular seta. *ls*: lateral seta; pores, *cp*: Clypeal pores. *fp*: frontal pores; indexes, CF: ratio between the length of hind part of maxillary gland and the length of head. PR: ratio between the length of the head and the length of pseudoculus.

For DNA barcodes, genomic DNA was extracted from three paratypes separately by means of a non-destructive method (after Gilbert et al. 2007) with minor modifications. DNA barcoding sequences of mitochondrial COI gene were amplified and sequenced by primer pair LCO/HCO (Folmer et al. 1994). The barcoding sequences are deposited in GenBank.

Results

Yamatentomon guoi **sp. nov.** (Figs. 1-20, Tables 1)

Material Examined

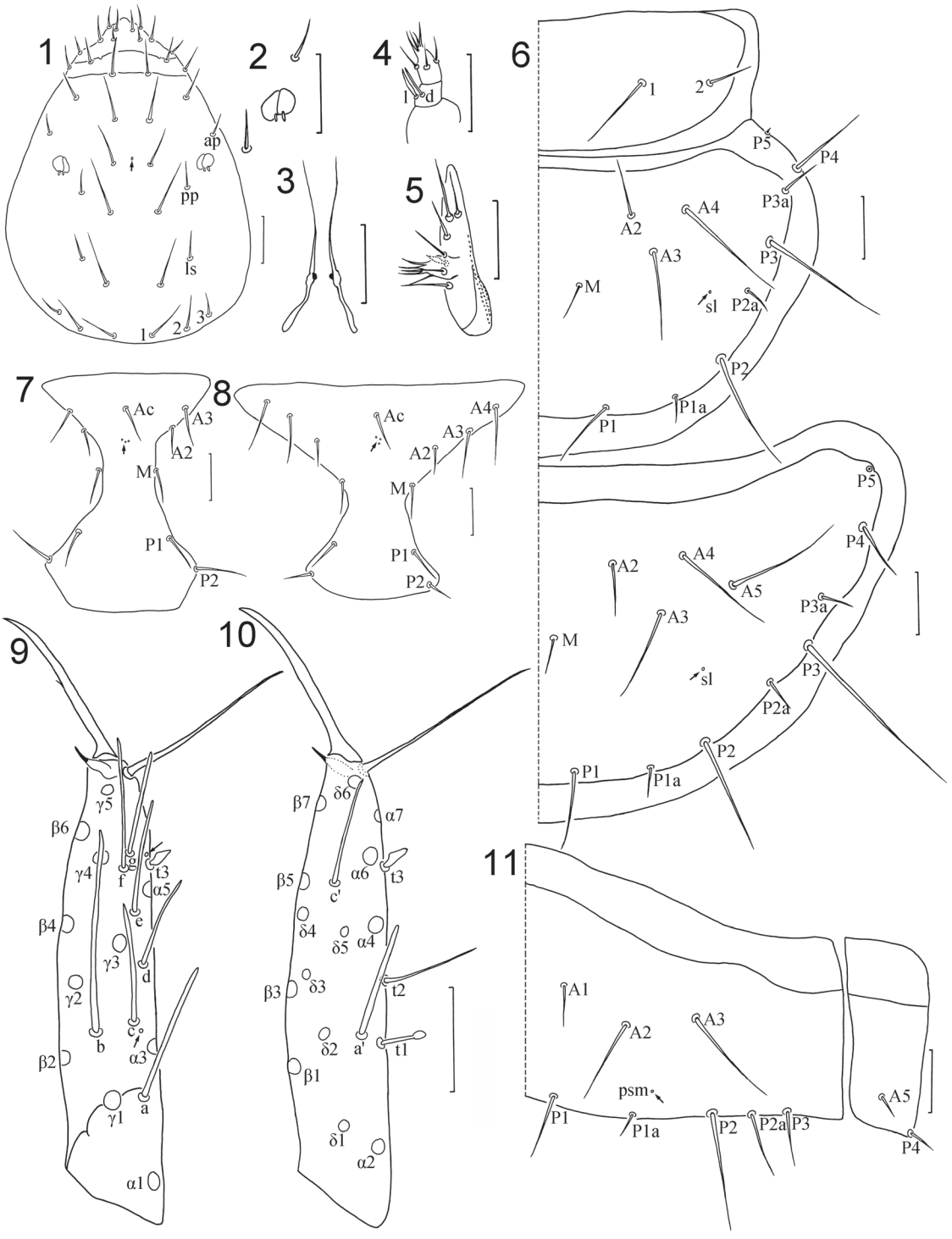
HOLOTYPE female (no. YYH-4-2), from broad-leaved forest composed of *Betula platyphylla*, near Yuanyanghu Lake, Songjianghe town, Fusong County, Baishan City, Jilin Province, northeastern China, 15-VII-2008, 42º 11' 47" N, 127° 29' 51"E, 702 m elev., coll. D. H. Wu. Paratypes: 4 females (nos. YYH-4-1, YYH-4-6, YYH-4-7, YYH-4-8) and 2 males (nos. YYH-4-3, YYH-4-5), same data as holotype; 2 females (nos. J9305L1-1, J9305L2-1) and 2 males (nos. J9305L2-3, J9305L2-4), from mixed broadleaved /red pine forest of Changbai Mountain, Jilin Province, northeastern China, 42° 24' 30" N 128° 28' 45" E, 740 m elev., 15-V-1993, coll. R. Z. Zhang. Other materials: 1 maturus junior, same data as holotype; 10 females, 13 males, 5 maturus junior and 2 larvae II, from broadleaved/red pine forest of Changbai Mountain, Jilin Province, northeastern China, 15-V-1993, coll. R. Z. Zhang. The holotype and eight paratypes are deposited in the Shanghai Entomological Museum (SEM), and two paratypes are kept at Northeast Institute of Geography and Agroecology (NEIGAE). Other materials are deposited in SEM.

Description. Head elliptic, dorsal setae *ap*, *pp* and *ls* not modified, additional setae absent. Pores *cp* and *fp* present (Fig. 1). Posterior margin of head with central seta *1* and lateral seta *2* equal in length, 14-15 µm. Labium very short. Pseudoculus broader than long, with short posterior extension, PR = 17-20 (Fig. 2). Calyx of maxillary gland smooth, with helmet-like dorsal appendix, CF = 8.1-9.5 (Fig. 3); terminal filament clavate, entire. Maxillary palpus short, dorsal and lateral sensilla equal in length, 8-9 µm, dorsal sensillum slender, ventral sensillum broadened proximally (Fig. 4). Labial palpus well developed, with broad basal sensillum (Fig. 5). Labium with small teeth on inner margin.

Thoracic chaetotaxy formula given in Table 1. Setae on nota differing distinctly in length (Fig. 6). Length ratio of pronotal setae *1*: *2* as 1.4-1.7:1. Seta *M* and *A2* on meso- and metanotum short and slender, 10-13 and 13-21 µm respectively. Accessory setae *P1a*, *P2a* and *P3a* short, *P5* gemmate on mesonotum and minute on metanotum (Fig. 6). Length ratio of *P1*:*P1a*:*P2* on mesonotum as 3.1-4.1:1:4.5-5.6. Meso- and metanota with pores *sl*. Prosternum without pores; meso- and metasterna usually with three or four closely adjacent median pores (Figs. 7 and 8).

Foretarsus (Figs. 9 and 10) lacking sensillum *b'*. Dorsal sensillum *t1* claviform, *t2* slender, *t3* leaf-like. Exterior sensillum *a* reaching base of *d*, *b* very long and surpassing base of *γ4*, *c* slender and surpassing base of *e*, *d* slender and short, *e* and *f* thin, *g* short, reaching base of claw (Fig. 9,). Interior sensillum *a'* broad, distal to level of *t2* insertion and reaching base of α4, *c'* slender and short, reaching base of *δ*6 (Fig. 10). Setae *β1* and *δ*4 setiform. Claw long and slender, with one short inner tooth. Empodial appendage short. Relative length of foretarsal sensilla: $t3 < t1 < d < t2 < (e = g = a' = c') < c < f < a < b$. BS = 0.58-0.63, TR = 2.3-2.6, EU = 0.14-0.17. Pores present near base of sensilla *c* and *t3*.

Abdominal chaetotaxy given in Table 1. Tergites II-III with five pairs of *A*- setae and eight pairs of *P*-setae. Tergites IV-VII with nine pairs of *P*-setae (*P3a* present). Setae *A1* on tergite I-VII shorter than other *A*-setae, on tergite I 13-17 µm, on tergites II-VI 15-20 µm, on tergite VII 20-26 µm (Fig. 11 and 12). Accessory setae on tergites and sternites I-VII setiform (Figs. 11 and 12). Pores *psm* present on tergites I-VIII, *al* on tergites II-VII and *psl* on tergite VII (Figs. 11-13). Sternites I-V each with single median pore (Fig. 15), sternite VI with three or four adjacent ante-



Figs. 1-11. *Yamatentomon guoi* **sp. nov.** (holotype) 1. Head, dorsal view (ap = anteropseudocular seta, pp = postpseudocular seta, ls = lateral seta); 2. pseudoculus; 3. canal of maxillary gland; 4 maxillary palpus; 5. labial palpus; 6. nota, right side (sl = sublateral pore); 7. mesosternum; 8. metasternum; 9. foretarsus, exterior view; 10. foretarsus, interior view; 11. tergite I, right side (psm = posterosubmedial pore). Arrows indicate pores. Scale bars: 20 μm.

TABLE 1. CHAETOTAXY OF ADULT *YAMATENTOMON GUOI* **SP. NOV.**

		Dorsal		Ventral	
	Segment	Formula	Setae	Formula	Setae
Th.	I	4	1, 2	4 + 4	A1, 2, M1, 2
				6	P1, 2, 3
	II	8	A2, 3, 4, M	5 + 2	Ac, 2, 3, M
		16	P1, 1a, 2, 2a, 3, 3a, 4, 5	4	P1, 2
	III	10	A 2, 3, 4, 5, M	7+ 2	Ac, 2, 3, 4, M
		16	P1, 1a, 2, 2a, 3, 3a, 4, 5	4	P1, 2
Abd.	I	8	A1, 2, 3, 5	3	Ac, 2
		12	P1, 1a, 2, 2a, 3, 4	4	P1, 1a
	II-III	10	A1, 2, 3, 4, 5	5	Ac, 2, 3
		16	P1, 1a, 2, 2a, 3, 4, 4a, 5	5	Pc, 1a, 2
	IV	10 [1]	A1, 2, 3, 4, 5	5	Ac, 2, 3
		18(16)	P1, 1a, 2, 2a, 3, (3a), 4, 4a, 5	8	P1, 1a, 2, 3
	V-VI	10	A1, 2, 3, 4, 5	5	Ac, 2, 3
		18	P1, 1a, 2, 2a, 3, 3a, 4, 4a, 5	8	P1, 1a, 2, 3
	VII	10	A1, 2, 3, 4, 5	5	Ac, 2, 3
		18	P1, 1a, 2, 2a, 3, 3a, 4, 4a, 5	9	Pc, 1, 1a, 2, 3
	VIII	8	A1, 2, 3, 5	4	1, 2
		15	Pc, 1, 1a, 2, 2a, 3, 3a, 5		
	IX	14	1, 2, 3, 3a, 4, 4a, 5	4	1, 2
	X	10	1, 2, 2a, 3, 4	4	1, 2
	XI	6	1, 3, 4	6	1, 2, 3
	XII	9		6	

[1]*P3a* absent in half of specimens examined.

rior pores located before first line (Fig. 16), sternite VII with three or four anterior pores and two posterior lateral pores (Fig. 17).

Abdominal appendages typical of the genus. Subapical seta of abdominal legs II and III slightly longer than apical seta, 14-16 and 13-14 µm respectively.

Abdominal segment VIII with distinct striate band and two irregular, parallel rows of small scattered denticles anteriorly. Comb VIII composed of 16-18 irregular teeth (Fig. 18). Pore *psm* on tegite VIII with several surrounding teeth. Tergite XII with single median pore, sternite with 1+1 anterolateral pores.

Female squama genitalis with short, broad acrostyli (Fig. 19). Male squama genitalis with 6+6 setae (Fig. 20).

Measurements (11 adults, in µm). Maximum body length 1400 µm, head length 140-145, head width 90-110, pseudoculus 8-9, posterior part of maxillary gland 14-18, posterior marginal setae on head: seta *1* 15-20, seta *2* 15-20, seta *3* 8-10; pronotal seta *1* 25-30, pronotal seta *2* 15-20; mesonotal setae *P1* 23-32, *P1a* 7-9, *P2* 40-47, *M* 10-13; foretarsus 85-93, claw 33-38, empodial appendage 5-6, middle tarsus 45-48, claw 20-23, hind tarsus 50-55, claw 23-25.

Chaetal variability. On mesonotum, asymmetrical absence of P2a (on 1 specimen); on prosternum, asymmetrical absence of A1 and P3 (1); on tergite II, asymmetrical absence of A4 (1), P2a (1), P4a (1); on tergite IV, symmetrical (7) or asymmetrical (1) absent of P3a; on tergite V, symmetrical (3) or asymmetrical (2) absent of P3a; on tergite VII, asymmetrical absence of A1 (1), A2 (1), P1 (1); on sternite I, asymmetrical absence of A2 (1); on sternite II, asymmetrical absence of A2 (2), P1a (1); on sternite III, asymmetrical absence of P2 (1); on sternite VI, presence of Pc (1); on sternite VII, asymmetrical absence of A2 and P3 (1); on sternite VIII, presence of five setae (1).

Etymology

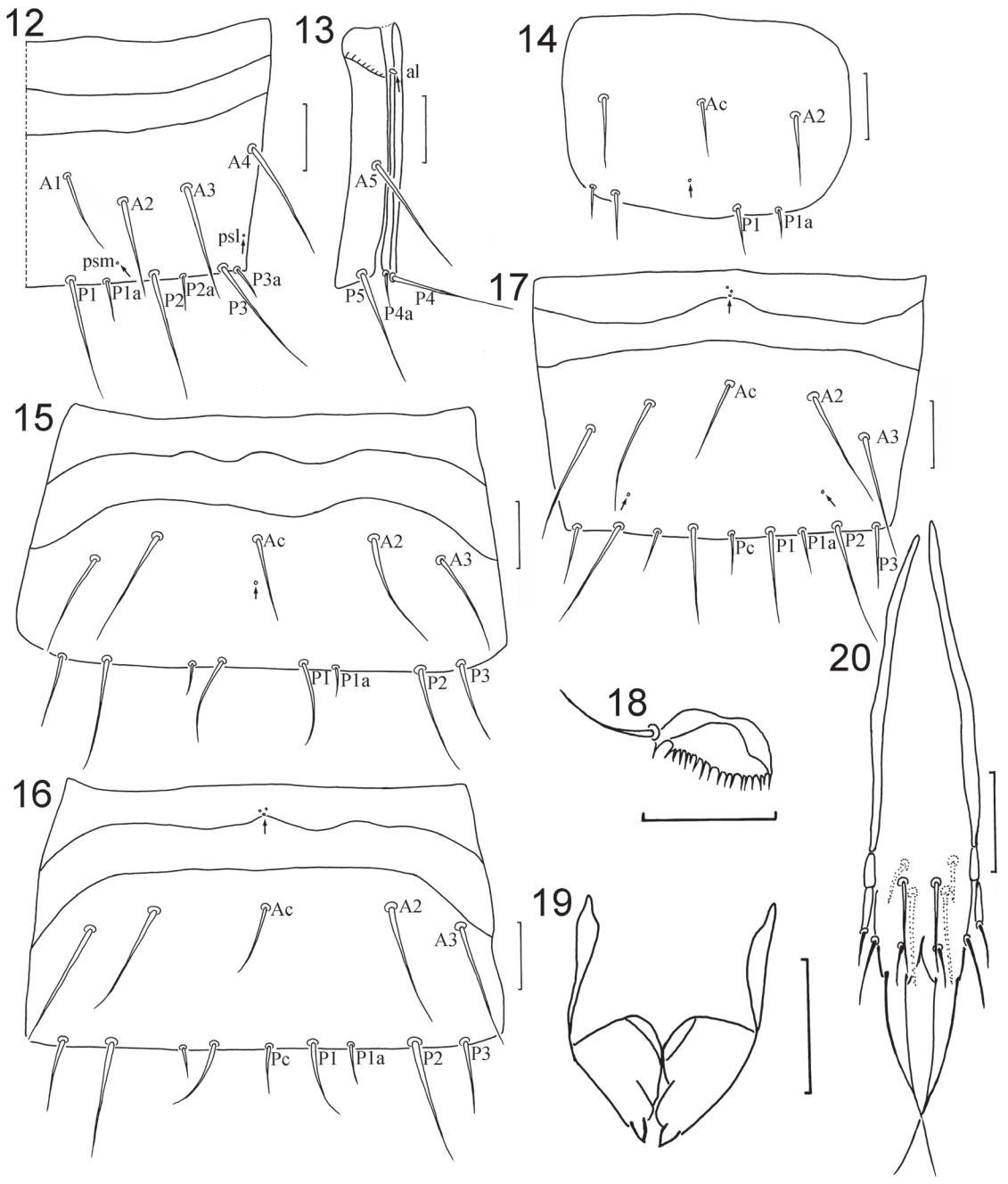
Yamatentomon guoi is named after Mr. Pei-Fu Guo who first collected the *Yamatentomon* specimens from China in 1979, in remembrance of his great contribution to collection of Protura from China.

Distribution

China (Jilin, Changbai Mountain).

Remarks

Yamatentomon guoi **sp. nov.** is characterized by the extremely long sensillum *b* on foretarsus, short and slender *A1* setae on tergite I-VII, present of *P3a* on tergite IV-VII, five pairs of *A*-setae on tergite VII, and porotaxy on tergite VI-VI. It is similar to *Y. kunnepchupi* Imadaté, 1964 in having five pairs of *A*-setae (*A4'* absent)



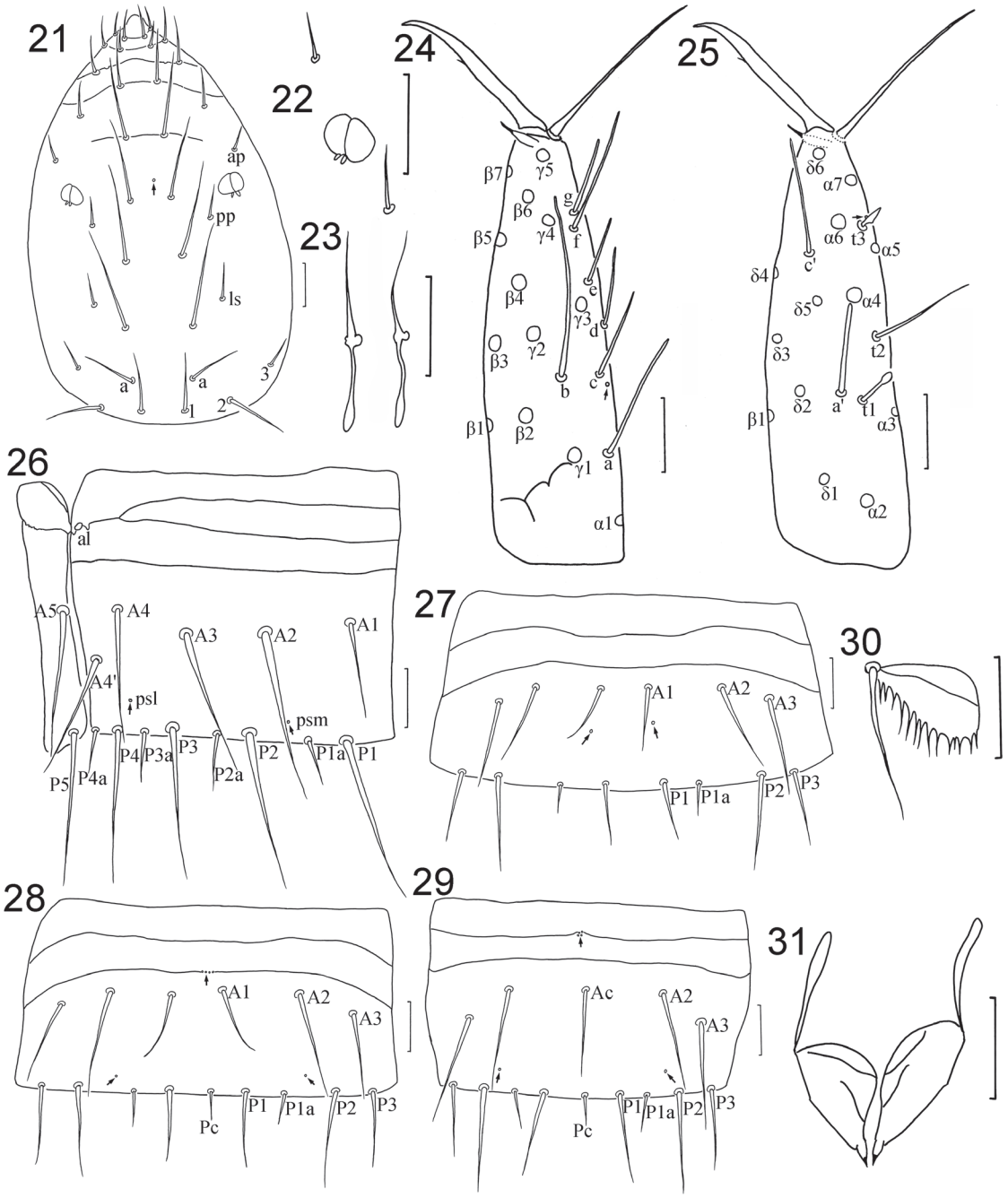
Figs. 12-20. *Yamatentomon guoi* **sp. nov.** (holotype) 12. tergite VII, right side (psl = posterosublateral pore); 13. part of laterotergites of abdominal segments VII; 14. sternite I; 15 sternite V; 16. sternites VI; 17. sternites VII; 18. comb on abdominal segment VIII; 19. female squama genitalis; 20. male squama genitalis. Arrows indicate pores. Scale bars: 20 µm.

on tergite VII. It differs from *Y. kunnepchupi* in the length of sensillum *b* on foretarsus (extremely long in *Y. guoi* **sp. nov.**, short in *Y. kunnepchupi*), sensillum *e* (far surpassing base of sensillum *g* in *Y. guoi* **sp. nov.**, reaching base of sensillum *g* in *Y. kunnepchupi*)) and chaetotaxy of tergite IV-V (*P3a* present in *Y. guoi* **sp. nov.**, absent in *Y. kunnepchupi*).

Yamatentomon yamato (Imadaté & Yosii, 1956) (Figs. 21-31, Table 2)

Material Examined

Two females (no.7065, mounted on one slide), from Nagataui, Nara, Kinki, Honshu, Japan, 21-XI-1986, coll. G. Imadaté; 1 female and 1 male (no. 7060, mounted on one slide), from Tohnomine, Nara,



Figs. 21-31. *Yamatentomon* yamato (no. 7065) 21. head, dorsal view; 22. pseudoculus; 23. canal of maxillary gland; 24. foretarsus, exterior view; 25. foretarsus, interior view; 26. tergite VII, left side; 27. sternite V; 28. sternites VI; 29. sternites VII; 30. comb on abdominal segment VIII; 31. female squama genitalis. Arrows indicate pores. Scale bars: 20 µm.

TABLE 2. CHAETOTAXY OF ADULT *YAMATENTOMON YAMATO*.

		Dorsal		Ventral	
	Segment	Formula	Setae	Formula	Setae
Th.	I	4	1, 2	4 + 4	A1, 2, M1, 2
				6	P1, 2, 3
	II	8	A2, 3, 4, M	5 + 2	Ac, 2, 3, M
		16	P1, 1a, 2, 2a, 3, 3a, 4, 5	4	P1, 2
	III	10	A 2, 3, 4, 5, M	7 + 2	Ac, 2, 3, 4, M
		16	P1, 1a, 2, 2a, 3, 3a, 4, 5	4	P1, 2
Abd.	I	8	A1, 2, 3, 5	3	Ac, 2
		12	P1, 1a, 2, 2a, 3, 4	4	P1, 1a
	II-III	10	A1, 2, 3, 4, 5	5	Ac, 2, 3
		18	P1, 1a, 2, 2a, 3, 3a, 4, 4a, 5	5	Pc, 1a, 2
	IV-V	10	A1, 2, 3, 4, 5	5 - 7[1]	(Ac), (1), 2, 3
		18	P1, 1a, 2, 2a, 3, 3a, 4, 4a, 5	8	P1, 1a, 2, 3
	VI	10	A1, 2, 3, 4, 5	5 - 7[1]	(Ac), (1), 2, 3
		18	P1, 1a, 2, 2a, 3, 3a, 4, 4a, 5	9	Pc, 1, 1a, 2, 3
	VII	12	A1, 2, 3, 4, 4', 5	5	Ac, 2, 3
		8	P1, 1a, 2, 2a, 3, 3a, 4, 4a, 5	9	Pc, 1, 1a, 2, 3
	VIII	8	A1, 2, 3, 5	4	1, 2
		15	Pc, 1, 1a, 2, 2a, 3, 3a, 5		
	IX	14	1, 2, 3, 3a, 4, 4a, 5	4	1, 2
	X	10	1, 2, 2a, 3, 4	4	1, 2
	XI	6	1, 3, 4	6	1, 2, 3
	XII	9		6	

[1]Numbers of anterior setae varied from 5 to 7 depending on the presence or absence of setae *Ac* and *A1*.

Kinki, Honshu, Japan, 7-VII-1986, coll. G. Imadaté; 1 female (no. 6), from Cuiluan district, Yichun City, Heilongjiang Province, northeastern China, 47° 23' 50" N 128° 12' 30" E, 370 m elev., 5-VI-1979, coll. P. F. Guo; 1 female (no. HBBH-8-3), collected in broad-leaved forest of Honghe Nature Reserve, Tongjiang City, Heilongjiang Province, China, 47° 44' 30" N 133° 36' 20" E, 53 m elev., 15-VIII-2009, coll. D. H. Wu. All specimens are deposited at SEM.

Redescription. Head elliptic, dorsal setae *ls*, *ap* and *pp* not modified, additional setae present, length 20-22 µm. Pores *cp* and *fp* present (Fig. 21). Posterior margin of head with central seta *1* and lateral seta *2* equal in the length, 23-28 µm. Labium short. Pseudoculus broader than long, with short posterior extension, PR = 19-23 (Fig. 22). Calyx of maxillary gland smooth, with helmet-like dorsal appendix, CF = 9.3-9.5 (Fig. 23). Maxillary palpus short, dorsal and lateral sensilla equal in length, dorsal sensillum slender, ventral sensillum broadened proximally. Labial palpus well developed, with broad basal sensillum.

Thoracic chaetotaxy formula given in Table 2. Length ratio of pronotal setae *1*: *2* as 1.5-1.7:1. Seta *M* and *A2* on meso- and metanotum short and slender, 20-25 and 33-35 µm, respectively. Accessory seta *P1a* longer than *P2a* and *P3a*; *P5* gemmate on mesonotum, minute on metanotum. Length ratio of *P1*:*P1a*:*P2* on mesonotum as 1.5-1.5:1:1.9-2.0. Meso- and metanotum with pores *sl*. Prosternum without pores; meso- and metasterna with three or four closely adjacent median pores.

Foretarsus lacking sensillum *b'*. Dorsal sensillum *t1* claviform, *t2* slender, *t3* leaf-like. Exterior sensillum *a* reaching base of *d*, *b* broad, extremely long and surpassing base of *β4*, *c* slender and reaching base of *e*, *d* and *e* slender and short, *f* slender and surpassing base of claw, *g* short and reaching base of claw (Fig. 24). Interior sensillum *a'* broad and short, proximal to level of *t2* insertion and reaching base of α4; *c'* slender, reaching base of claw (Fig. 25). Seta *β1* and *δ*4 setiform. Claw long and slender, with one short inner tooth. Empodial appendage short. Relative length of foretarsal sensilla: *t3* < *t1* < (*e* = *d*) < (*c* = *g* = *a'*) < *t2* < *f* < (*a* = *c'*) < *b*. BS = 0.58-0.60, TR = 2.6-2.9, EU = 0.12-0.14. Pores present near bases of sensilla *c* and *t3*.

Abdominal chaetotaxy given in Table 2. Seta *P3a* present on tergites II-VII. Seta *A1* on tergite I-VII shorter than other *A*-setae, on tergite I 22-23 µm, on tergites II-VI 28-33 µm, on tergite VII 36-39 µm. Seta *A4'* present on tergite VII (Fig. 26). Accessory setae on tergites and sternites I-VII setiform. Pores *psm* present on tergites I-VIII, *al* on tergites II-VII and *psl* on tergite VII (Fig. 26). Sternites I-III each with single median pore, sternites IV-V each with two median pores (Fig. 27), sternite VI with three or four adjacent anterior pores located on middle of second line and two posterior lateral pores (Fig. 28), sternite VII with three or four adjacent anterior pores on middle of first line and two posterior lateral pores (Fig. 29).

Abdominal appendages with 4, 2, 2 setae. Subapical seta of abdominal legs II and III slightly

longer than the apical seta, 18-20 and 16-17 µm, respectively.

Abdominal segment VIII with distinct striate band and with two irregular, parallel rows of small scattered denticles anteriorly. Comb VIII composed of 14-20 irregular teeth (Fig. 30). Pore *psm* on tergite VIII with several surrounding teeth. Tergite XII with single median pore, sternite with 1+1 anterolateral pores. Female squama genitalis with slender, pointed acrostyli (Fig. 31).

Measurements of Japanese specimens (4 adults, in µm). Maximum body length 1650 µm, head length 180-190, width 120-140, pseudoculus 8-9, posterior part of maxillary gland 20, posterior marginal setae on head: seta *1* 25-28; seta *2* 27-28, seta *3* 12-13; pronotal seta *1* 40-47, pronotal seta *2* 25-30, mesonotal setae *P1* 37-38, *P1a* 7-9, *P2* 30-35, *M* 20-25, foretarsus 115-117, claw 40-45, empodial appendage 5, middle tarsus 50-58, claw 23-25, hind tarsus 60-65, claw 25-27.

Measurements of Chinese specimens (2 adults, in µm). Maximum body length 1400 µm, head length 185, width 140, pseudoculus 8-10, posterior part of maxillary gland 20, posterior marginal setae on head: seta *1* 23-25; seta *2* 23-25, seta *3* 10; pronotal seta *1* 45, pronotal seta *2* 28, mesonotal setae *P1* 30, *P1a* 15, *P2* 45, *M* 18; foretarsus 115-120, claw 40-46, empodial appendage 5, middle tarsus 55-60, claw 25-28, hind tarsus 65-70, claw 27-30.

Chaetal variability. Adult (n = 6): on tergite II, symmetrical absence of *P3a* (on 3 specimens); on tergite III, asymmetrical absent of *P3a* (1); on tergite VII, asymmetrical absence of A4 (1); on sternite VII, asymmetrical absence of *P2* (1), presence of two *Pc* (2).

Distribution

China (Jilin, Heilongjiang), Japan, Korea.

Remarks

Yamatentomon yamato is the type species of the genus *Yamatentomon*. It is characterized by the extremely long sensillum *b* on foretarsus, presence of *A4'* setae on tergite VII, *P3a* on tergite II-VII, *Pc* on tergite VI, and pore arrangement on tergite IV-VII. The body chaetotaxy and porotaxy of Chinese and Japanese specimens are identical. The Chinese specimens generally are smaller (maximum length 1400 µm) than Japanese specimens (maximum length 1650 µm) and the lack the additional seta on the head.

DNA Barcoding Sequence

The standard DNA barcoding sequence (COI gene) from 3 paratypes (nos. YYH-4-5, YYH-4-6, YYH-4-7) of *Y. guoi* **sp. nov.** were sequenced and deposited in GenBank with accession numberd JQ846460-JQ846462. The sequences each are composed of 658 base pairs. The nucleotide compositions are: A = 25.6%, T = 41.5%, C = 16.5%, G =16.3%, on average. The genetic divergence between individuals is 0.61%, which indicates they are quite conserved.

Disscussion

The porotaxy of genus *Yamatentomon* previously was studied only in *Y. kunnepchupi* (Nakamura 2004). In the present paper, the porotaxy and head chaetotaxy of *Y. guoi* **sp. nov.** and *Y. yamto* were studied in detail. We found that the pores on the nota, sterna, and tergites are relatively stable among the species, while the pores on sternites I-VII differ both in numbers and locations. Therefore, porotaxic characters may be important in identification of other species of *Yamententomon.*

Key to Species of *Yamatentomon* Imadaté, 1964

1. Tergite VII with seta *A4'*. 4

— Tergite VII without seta *A4'*. 2

2. Tergite IV-V with seta *P3a*, sensillum *b* surpassing base of seta *γ4* . . . . . *Y. guoi* **sp. nov.**; China (Jilin, Changbai Mountain)

— Tergite IV-V without seta *P3a*, sensillum *b* not reaching base of seta *γ4* . . . . . *Y. kunnepchupi* Imadaté, 1964; Japan (Hokkaido), Russia (Khabarovsk)

3. Tergite VII without seta *A1* . . . . . *Y. brevisetum* Szeptycki & Imadaté, 1987; Korea

— Tergite VII with seta *A1* 4

4. Accessory setae on tergite II-VI longer than 1/4 of seta *P1*, sensillum *b* surpassing base of *γ4*. . . . . *Y. yamto* (Imadaté & Yosii, 1956); China (Northeast), Japan, Korea

— Accessory setae on tergite II-VI shorter than 1/8 of seta *P1*, sensillum *b* not reaching base of *γ4* . . . . . *Y. fujisanum* Imadaté, 1987; Japan (Honshu)

Acknowledgments

We cordially thank Dr. Yan Gao for her help in the treatment of figures. This study was supported by National Basic Research Program of China (2010CB951304, 2012CB956103), Innovative Program for The Excellent Youth Talents of Shanghai Institutes for Biological Sciences (no: 2011KIP305), National Natural Sciences Foundation of China (no: 31201706, 31071887), Knowledge Innovation Programs of Chinese Academy of Sciences (KZCX2-YW-BR-16), and Chinese Academy of Sciences Visiting Professorship for Senior Foreign Scientists (NO. 2011T2Z13).

References Cited

Folmer, O., Black M., Hoeh, W., Lutz, R., and Vrijenhoek, R. 1994. DNA primers for amplification of mitochondrial cytochrome c oxidase subunit I from diverse metazoan invertebrates. Mol. Marine Biol. Biotechnol. 3: 294-299.

Gilbert, M. T. P., Moore, W., Melchior L., and Worobey M. 2007. DNA extraction from dry museum beetles without conferring external morphological damage. PLoS ONE 2(3): e272.

Imadaté, G. 1974. Protura (Insecta). Fauna Japonica. Keigaku Publ., Tokyo. 320 pp.

Imadaté, G. 1956. A new species and a new subspecies of Protura from Shikoku. Trans. Shikoku Entomol. Soc. 4: 103-106.

Nakamura, O. 2004. Protura from Khabarovsk, the Russian Far East. Edaphologia 75: 17-35.

Szeptycki, A. 2007. Catalogue of the world Protura. Acta Zool. Cracoviensia 50B (1): 1-210.

Yin, W. Y. 1999. Fauna Sinica. Arthropoda. Protura. Science Press, Beijing, China. 510 pp. In Chinese with English summaries.

Yin, W. Y. 1980. Studies on Chinese Protura: Description of new species and new genera of the family Acerentomidae with discussions on their phylogenetic significance. Contrib. Shanghai Inst. Entomol. 135-156. In Chinese with English summary.