

Re-Examination of Three Species of *Tomocerus* s.l. (Collembola: Tomoceridae) from China¹

Jian-Xiu Chen, Yi-tong Ma,² and Kenneth Christiansen³

Department of Biology, Nanjing University, Nanjing 210093, China

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Abstract Three species of Collembola (Family Tomoceridae), *Tomocerus* (*Tomocerus*) *folsoni* Denis, 1929 and *Tomocerus* (*Tomocerus*) *violaceus* Yosii, 1956 and *Tomocerus* (*Monodontocerus*) *modificatus* Yosii, 1955, are reexamined. *Tomocerus folsoni* has had no modern description. Our study shows it to be clearly separated from other members of the subgenus *Tomocerus* s.s. by the combination of peculiar spinelets on the dental spines, multidentate lamellae mucro and a "principal" basal dental seta. *Tomocerus* s.s. *violaceus* is separated from other members of the subgenus by simple dental spines plus 3 or fewer setae on the tenaculum. The previously undescribed macrochatae are described and illustrated. *Tomocerus* (*Monodontocerus*) *modificatus* is recorded from China for the first time. While all the previous records were from caves, some of the Chinese specimens are from surface habitats. A number of previously undescribed features are described and illustrated.

Key Words Collembola, Tomoceridae, *Tomocerus*, *Monodontocerus*, new record, China.

The genus *Tomocerus* s.l. is abundantly represented in the East Asian fauna. Yoshii (1967) has described many species and divided the genus into a number of subgenera. While some authors treat these taxa as genera, we feel it better to consider them as subgenera. Our investigations of the Chinese fauna have uncovered specimens of three species: *Tomocerus* s.s. *folsoni* and *violaceus*, and *Tomocerus* (*Monodontocerus*) *modificatus*. The latter two species were re-described by Yoshii (1967); however, we describe features herein which were omitted in that study but have since been found to be taxonomically useful and features, which differ in the Chinese specimens. *Tomocerus* (*Monodontocerus*) *modificatus* has not previously been recorded from China and *T. folsoni* has not been described since 1929; thus, we fully describe it below.

Specimens examined. 67 females and 3 males, China: Guangxi: Baise. 31 July-3 Aug, 1999. Collection Numbers: 8678, 8679, 8680, 8685, 8692, 8694, 8698, and 8699. Collected by Mr. Chen Jian-Xiu and Mr. Wang Songjie. Deposited in the Department of Biology, Nanjing University.

Diagnosis. The peculiar nature of the spinelets on the dental spines combined

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²Department of Biology, Nantong Teacher's College, Nantong 226000, China.

³Department of Biology, Grinnell College, Grinnell, IA 50112. Address inquiries to (email: christak@grinnell.edu).

with the existence of a "principal seta" at the base of the dentes and the mucro shape serve to separate this species from all other species of the subgenus.

***Tomocerus (Tomocerus) folsomi* Denis, 1929 (Figs. 1-2)**

Body length up to 3.7 mm. Ground color pale yellow. Eye patches dark blue. Pale blue pigment sometimes present between eyes. Antennae with blue pigment. Femora and tibiotarsi with pale blue pigment (Fig. 1A). Organ sizes as shown in Table 1.

Head with eyes 6 + 6, all subequal. Antennae short, 0.48 to 0.73 (0.92) times as long as body and 2.3 to 4.1 (5.3) times as long as cephalic diagonal. Labral setae 4/5,5,4, all smooth; each of distal 3 rows beset on papilla. Anterior margin of labrum with 4 recurved setulae, each beset on small papilla (Fig. 1B). Dorsal macrochaetae of head: anterior area (A) 2/4; mid (M) 2/7; lateral (L) 2 (L₁, L₂) on each side; posterior (P) 4. Posterior margin with 1 row of 45 to 68 tiny setulae (Fig. 1C).

Thorax macrochaetae and bothriotracha as shown in Figure 1D. Trochanteral or-

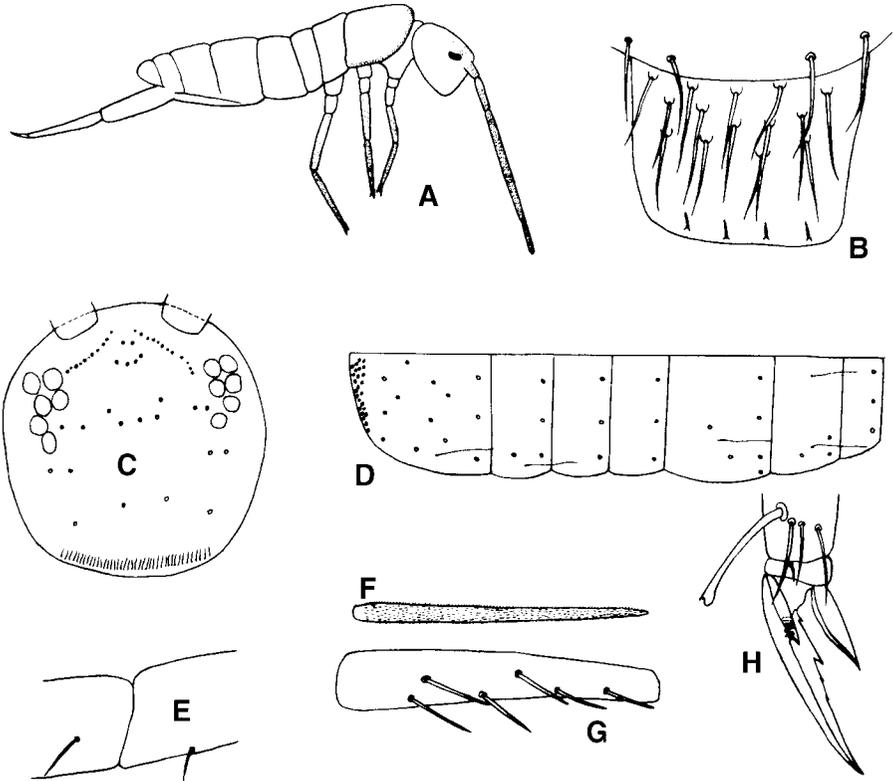


Fig. 1. *Tomocerus folsomi* Denis 1929. 1A. Habitus; 1B. labrum; 1C. dorsum of head; 1D. dorsal chaetotaxy of body (Th. II-Abd V.); 1E. trochanteral organ; 1F. enlargement of one blunt spiny seta. 1G. a. hind tibiotarsus, showing blunt spiny setae; 1H. hind foot complex.

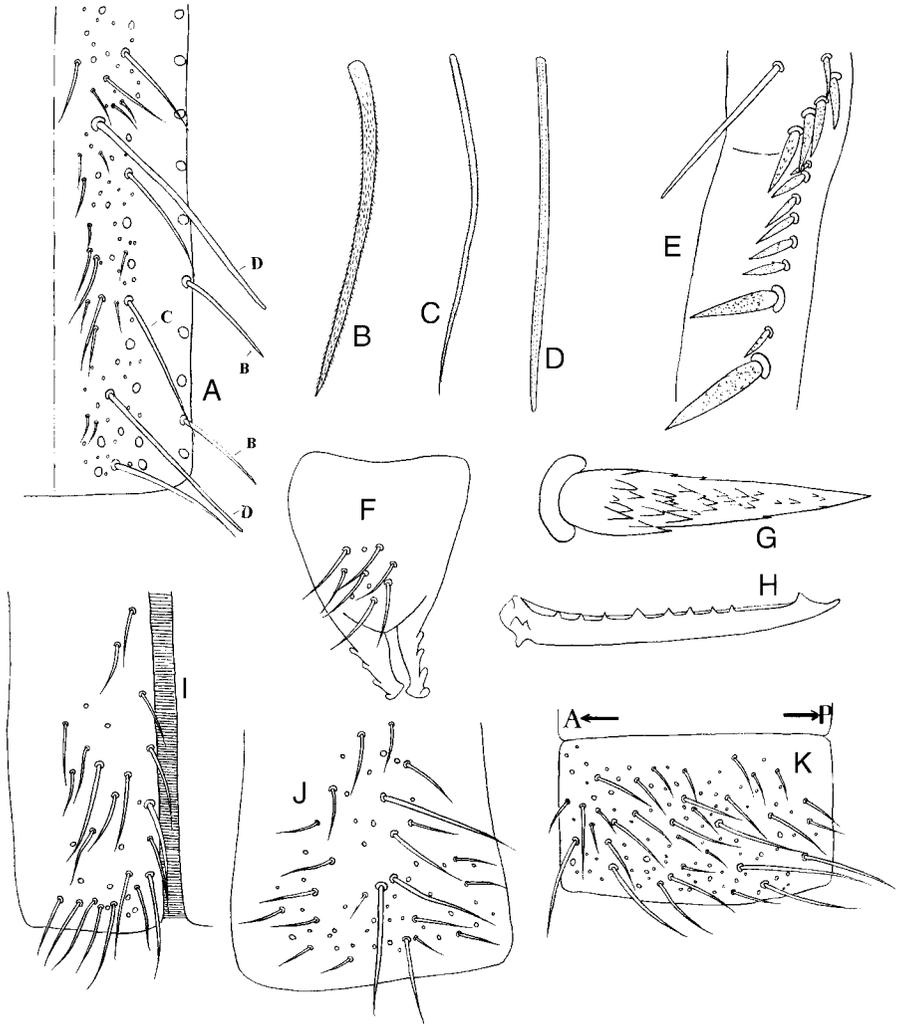


Fig. 2. *Tomocerus folsomi* Denis 1929. 2A. manubrium; 2B. enlargement of dorso-lateral seta; 2C. enlargement of large seta on setaceous stripe; 2D. enlargement of "principal" seta on setaceous stripe; 2E. dental spines; 2F. tenaculum; 2G. enlargement of one dental spine; 2H. mucro; 2I. ventral tube, anterior face of right half, 2J. ventral tube, posterior face; 2K. Ventral tube, lateral flap.

gan 1/1 (Fig. 1E). In addition to the erect smooth setae characteristic of this organ, there are numerous normal ciliate setae of different sizes on the trochanter. Fore to hind tibiotarsi, respectively, with 3-6, 4-6(8), 4 to 7 blunt spiny setae on ventral side of leg I-III (Fig. 1F,G). Unguis slender usually with 1 tooth moderate in size, rarely with 1 moderate and 1 or 2 minute inner teeth; a pair of well developed pseudonychia, 0.35

to 0.58 times as long as inner edge of unguis. Unguiculus lanceolate, inner edge usually without tooth, rarely with 1 or 2 minute teeth. Tenent hair short, 0.55-0.84 times as long as inner edge of unguis, apex spatulate (Fig. 1H).

Abdominal macrochaetae and bothriotricha on Abd. I-V as shown in Fig. 3. Tenaculum unscaled, with 4 + 4 teeth, 3 to 16 very weakly ciliate or smooth setae on corpus (Fig. 2A). Ventral tube scaled with longitudinally striate setae of different sizes: anterior face 18 to 39 setae on each side (Fig. 2I); posterior face with about 63 setae (Fig. 2J); lateral flap with 116 to 120 setae (Fig. 2K).

Lengths of manubrium dens and mucro shown in Table 1. Manubrium scaled, dorso-laterally with 1 row of 9 to 11 large setae on each side, all weakly ciliate and strongly tapered only near apex (Fig. 2A,B); dorsally with 2 setaceous stripes, each consisting of numerous acuminate, striate setae of different sizes, 17 to 21 of them large and very weakly ciliate (Fig. 2A,C); dorsally they have 2 + 2 very long and blunt "principal" setae (Yosii 1965) (Fig. 10A,C). Dental spines: 4(3)-6/2-6, I, 1(2), I, heavy chestnut brown, each with many toothlets along the whole distal surface of the spines (Fig. 2G). None of these is sharply larger or small than the neighboring toothlets but they rather gradually reduce in size from the base to the apex of each spine. One "principal" seta also present at base of dens beside dental spines (Fig. 2E). Mucro elongate with numerous ciliate setae; outer dorsal lamella with 2 to 7 (9) intermittent teeth; apical tooth larger than anteapical one (Fig. 2H). Upper anal flap of Abd. VI not clearly seen.

Scales brownish, hyaline and heavily striated. Trunk macrochaetae and bothriotricha surrounded by 0 to 4 setulae.

Habitat. Found in decayed wood or litter in broadleaf forests.

Discussion

The species *Tomocerus (Tomocerus) folsomi* Denis 1929 was described from Yunnan, China and the description was very brief. The species has never been recorded again since its original description. The material examined in the present study well agreed with Denis's (1929) description and figures of the species.

Specimens examined. Four females, China: Guangxi: Guilin. 28 July, 1995. Collection Number: 8485. Collected by Mr. Ge Jia-chun. Deposited in the Department of Biology, Nanjing University.

Diagnosis. The simple dental spines and small number of setae on the tenaculum serve to separate this species from all other East Asian species of the subgenus.

Tomocerus (s.s) violaceus Yosii, 1956 (Figs. 3A-3C)

Body length up to 2.5 mm. Ground color pale yellowish. Eye patches dark blue to black. Antennae blue, gradually darker from base to tip. Antennae 0.35 to 0.40 times as long as body, Lengths of segments as shown in Table 1. Dorsal large setae of head as: A, 2/4, M, 2/7, L, 2, P, 0 (Fig. 3A).

Macrochaetae on Th. III-Abd. IV as shown in Figure 3B. Tenaculum unscaled with 4 + 4 teeth, corpus with 2-3 setae. Dental spines 6-9/4-5, I; proximal spines arranged in 2 irregular rows; all simple with fine longitudinal striations, chestnut brown (Fig. 2). Mucro elongate with numerous ciliate setae; outer dorsal lamella with 3 to 6 intermediate teeth; apical and anteapical teeth subequal.

Habitat. Unknown.

Table 1. Length of some organs of the most complete Chinese specimens in micra (μm)

Species	Specimen	Antennal segment				Cephalic diagonal	Body*	Manubrium	Dens	Mucro
		1	2	3	4					
<i>T. folsomi</i>	8685-117	155	262	1242		520	2524	590	702	192
	8685-132	127	157	780	124	470	2016	376	527	125
	8685-133	105	166	832	128	403	1832	792	478	130
	8679-4	190	252	1631		530	2396	422	714	166
<i>T. violaceus</i>	8699-40	114	197	999	86	367	1584	325	600	121
	8699-66	154	232	1276	105	507	2203	390	615	148
	8485-1	72	121	340	102	305	1238	256	334	82
	8485-2	91	150	469	124	422	1991	401	459	134
<i>T. modificatus</i>	8485-3	82	95	308	109	317	1381	261	308	110
	8485-4	88	110	397	105	386	1305	356	426	120
	8536-1	86	128	642	135	347	1454	298	511	86
	8553-1	144	208	670	86	412	2045	521	631	109
	8553-2	66	164	471	104	305	1540	400	490	102
	8098	100	174	707	112	308	1509	391	530	108
	8099	86	168	800	132	391	1886	442	600	130

* Not including the head.

Remarks

This species was described from Japan and Ms. Qiao-yun Yue first reported it from China in 1999.

Tomocerus (Monodontocerus) modificatus Yosii, 1955 has previously been recorded only from Japan. We add records from China and add to the available information concerning its features.

Specimens examined. Jiangxi Province: 3 females, Ruichang Co.: Donggeli Cave, 8098 and 8099, 1990-V-19; 1 female, Mt. Lushan, 8498, 1995-8-13; Zhejiang Province: 3 females, Linxian Co.: Mt. Tiantong, 8462, 1995-VI-11; 7 females, Tiantai Co.: Mt. Tiantai 8536, 1996-VII-16; Anhui Province: 3 females, Mt. Yellow, 8167 and 8168, 1990-VI-3; Beijing: 3 females, Beihai Park, 8553, 1997-III-16. Guangxi Autonomous Region: 4 females, Guilin: Mt. Diecai, 8485, 1995-VII-28. All specimens are deposited in the Department of Biology, Nanjing University, Nanjing 210093, China.

Diagnosis. The cephalic chaetotaxy is different from the only other species of the subgenus.

Tomocerus (Monodontocerus) modificatus Yosii, 1955 (Figs. 3D-3G).

Body length up to 2 mm. Ground color pale yellow. Eye patches violet. Ant. III and IV, anterior margin of Th. II and legs may with violet pigment (Fig. 3D).

Antennae short, 0.50-0.67 times as long as body and 2.9-4.0 times as head. Length of antennal segments as shown in Table 1. Labral setae as shown in Figure 3E.

Macrochaetae on Th. II-Abd. V as shown in Figure 3H. Tibiotarsal blunt setae 0, 0, 1-2. Unguis with 4, 4, 4 or 5 inner teeth. Unguiculus lanceolate, shorter than inner edge of unguis, with 1(2) inner tooth; a pair of pseudonychia well developed, about 0.38 to 0.53 times as long as inner edge of unguis (Fig. 3). Corpus of tenaculum with 1 (rarely with 3 to 6) smooth setae. Furcal segment sizes as shown in Table 1. Dental spines (3) 4-5(6)/(2) 3-4, 1, 2-4, 1, each with 2 to 4 basal spinules (Fig. 3). Mucro elongate, with one basal tooth; outer lamella with 2 to 7 (usually 5) intermittent teeth.

Habitat. Found in deciduous forests: in litter, debris and rotten logs, under stones, bricks and debris, in green moss on wet rocks, in caves: in litter and under stones in the twilight zone.

Discussion

Yosii created the subgenus *Monodontocerus* in 1955 for the species having one basal tooth of mucro. So far, only 2 species in the subgenus have been described: *modificatus* Yosii, 1955 from Japan and *odongnyeoensis* Park and Lee, 1955 from Korea.

Tomocerus (Monodontocerus) modificatus Yosii 1955. The specimens examined in the present study agree with Yosii's descriptions and figures of this species (1955 and 1967) except that the row of dorsal short setae along the posterior margin of head is not interrupted at the cephalic midline. In this regard it resembles the Korean

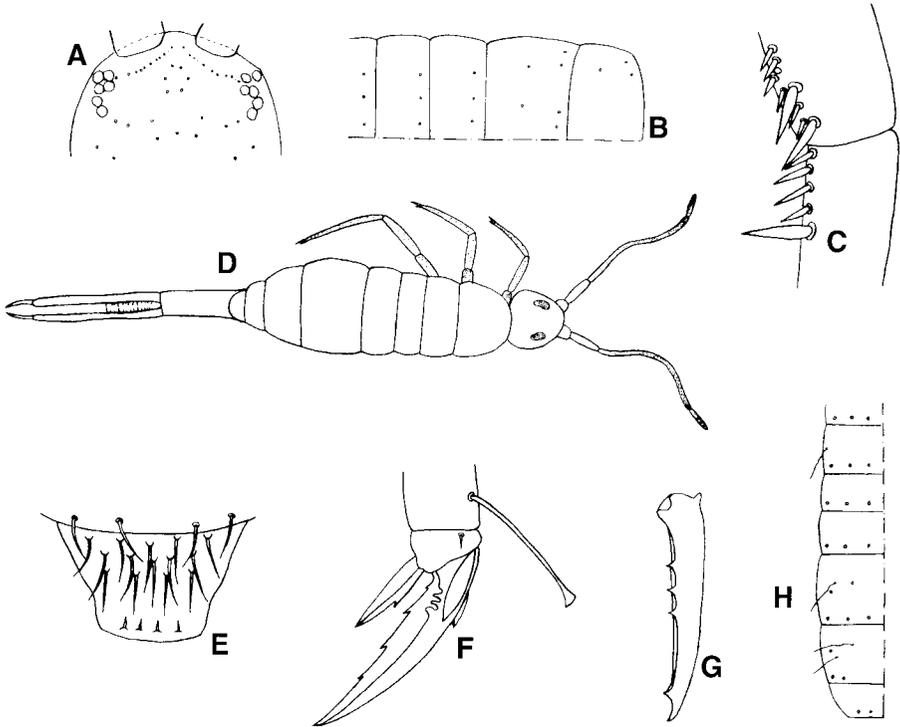


Fig. 3. *Tomocerus s.s. violaceus*, Yosii, 1956; 3A. anterior dorsum of head; 3B. dorsal chaetotaxy of body (Th. III-Abd. IV) bothriotracha omitted; 3C. dental spines; *Tomocerus (Monodontocerus) modificatus* Yosii, 1955. 3D. habitus; 3E. labral chaetotaxy; 3F. hind foot complex; 3G. mucro; 3H. dorsal chaetotaxy of Th. II-Abd. V.

species *odongnyeoensis* but differs from that species in the anterior cephalic macrochaetae (4 vs 6) Yosii's specimens were all found in caves; however, 18 of the 23 specimens examined in the present study were found in surface habitats. It is obvious that this is a troglophile species.

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