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A new species of the genus *Crossodonthina* (Collembola: Neanuridae: Neanurinae: Lobellini) from Yonaguni-jima in southwest Japan

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Abstract

We describe a new species of Collembola, *Crossodonthina elegans* **sp. nov.**, collected from Yonaguni-jima, southwest Japan. This new species differs from other known congeners because it has an unusual white or yellow color pattern on Ant. I and Th. I. It is similar to *C. laterisensillata* Ohira, Kataoka, Tanooka & Nakamori, 2022, in the structure of mouthparts, 3 + 3 eyes, cephalic chaeta O present, and tubercles De and Dl separated on Abd. V. However, it is easily distinguished from the latter species to maxilla without ciliated lamella, cephalic tubercle Dl separated from L and So, 5 chaetae of tubercle L on Abd. I and III, and macrochaetae apically rounded. We provide the key to all species of the genus and discuss the unique color pattern of the new species among the tribe Lobellini.

Key words: taxonomy, springtails, chaetotaxy, East Asia

Introduction

The genus *Crossodonthina* Yosii, 1954, which was established with *C. nipponica* Yosii, 1954, as the type species, is a unique genus in the family Neanuridae that is characterised by the presence of large, fringed mandibles, a weakly developed buccal cone, and heterogenous morphologies of labrum and labium. This genus is present worldwide; most of the species have been found in Asia, with only a few species reported in Japan (Jiang & Wang 2021; Ohira *et al.* 2022).

We discovered an undescribed species from Yonaguni-jima, which has a specific body color. The basic body color is red with a white–yellow band at Ant. I and Th. I. This color pattern is not known otherwise in the genus *Crossodonthina*, in which most species are monochromatic, although some species in the tribe Lobellini are known to be multicolored (e.g., *Paralobella orousseti* Cassagnau & Deharveng, 1984, is tricolored). Thus, we present a new species of *Crossodonthina* collected from Yonaguni-jima, a southwest island of Japan.

Material and methods

Specimens were collected using an aspirator and Tullgren funnels and were deposited in glass tubes filled with 90% ethyl alcohol. Specimens were mounted on slides using Hoyer's solution and subsequently examined under a light microscope.

Terminology. The terminology and layout of the tables used in this study follow those of Deharveng (1983), Deharveng & Weiner (1984), Smolis & Deharveng (2006), and Smolis (2008).

Abbreviations. General morphology: Abd.—abdominal segment, Ant.—antennal segment, AOIII—sensory organ of antennal segment III, Cx—coxa, Fe—femur, Scx2—subcoxa 2, T—tibiotarsus, Th.—thorax, Tr—trochanter, VT—ventral tube.

Groups of chaetae: Ag—antegenital, An—microchaetae of anal lobes, ap—apical, ca—centroapical, cm—

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centromedial, cp—centroposterior, d—dorsal, Fu—furcal, vc—ventrocentral, Ve or ve—ventroexternal, Vea—ventroexternoanterior, Vem—ventroexternomedial, Vep—ventroexternoposterior, Vel—ventroexternolateral, Vec—ventroexternocentral, Vei—ventroexternointernal, Vi or vi—ventrointernal, Vl—ventrolateral.

Tubercles: Af—antenna-frontal, An—antennal, Fr—frontal, Cl—clypeal, De—dorsoexternal, Di—dorsointernal, Dl—dorsolateral, L—lateral, Oc—ocular, So—subocular.

Types of chaetae: Ml—long macrochaeta, Mc—short macrochaeta, me—mesochaeta, mi—microchaeta, ms—s-microchaeta, S or s—chaeta s, bs—s-chaeta on Ant. IV, miA—microchaetae on Ant. IV, iv—ordinary chaetae on ventral Ant. IV, or—organite of Ant. IV, brs—border s-chaeta on Ant. IV, i—ordinary chaeta on Ant. IV, mou—cylindrical s-chaetae on Ant. IV; x—labial papilla x; B4, B5—ordinary chaetae on tibiotarsi.

Taxonomy

Family Neanuridae

Subfamily Neanurinae

Tribus Lobellini Cassagnau 1983

Genus Crossodonthina Yosii, 1954

Type species: *Crossodonthina nipponica* Yosii, 1954

Diagnosis. Eyes 2+2 or 3+3, usually pigmented, rarely absent. Body without blue pigment, Dorsal tubercles developed, sometimes reduced. Ant. IV with 8 sensory setae. Labrum usually truncate and granulated, labral formula 0/2, 2, rarely different. Mandible elongate and fringed, with at least 2 rami and toothed at the base. Maxilla styliform with at least 2 lamellae. Lateral part of head with tubercles separated or fused. Tubercles Di and De on head separated, rarely fused. Tubercles Di on Abd. V separated, rarely fused. Tubercles De and Dl of Abd. V separated or fused (modified and updated from Jiang & Zhang, 2012).

Crossodonthina elegans sp. nov.

[Japanese name: kubiwa-akafusa-ibotobimushi]
Figs. 1–14; Tables 1–3.

Type material. Holotype: female, Japan, Okinawa prefecture, Ryukyu Islands, Yonaguni-jima, Mt. Yonaguni-dake (alt. 131 m, 24°27′15.7″N, 122°58′43.1″E), 18-XI-2018, Hiro Kasai leg. (NMNS, NSMT-Ap 614). Paratypes: 1 female (NMNS, NSMT-Ap 615) and 1 male (NMNS, NSMT-Ap 616), the same data and slide as for holotype; 2 females (NMNS, NSMT-Ap 617–618) and 1 male (NMNS, NSMT-Ap 619), the same locality as for holotype, 21-VIII-2020, Keisuke Matsui leg. All deposited into the Apterygota (Ap) collection of the National Museum of Nature and Science (NMNS; previous name, the National Science Museum, Tokyo: MSMT), Tokyo Province, Japan.

Diagnosis. 3+3 eyes on head. Body ground color red, Ant. I white, Th. I white or yellow. Cephalic chaeta O present. Cephalic tubercle Dl separated from L and So. Mandible with 3 basal teeth, 4 fringed rami, and 1 broad lamella. Maxilla without marginal filaments. Labral formula 0/2, 2. Sensory chaeta on each tubercle L of Abd. I–IV. Tubercles De and Dl of Abd. V separated.

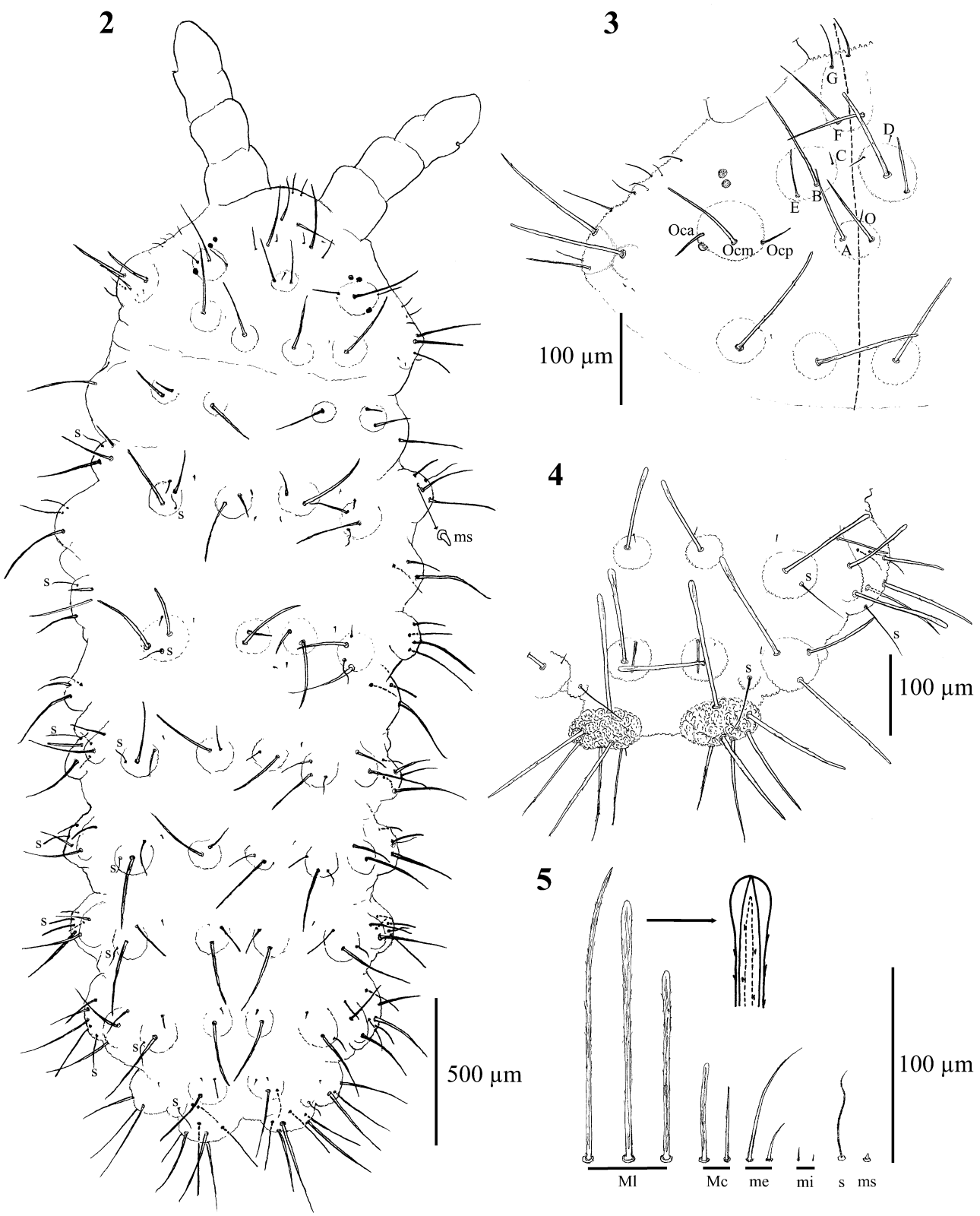
Description. Body length: up to 1.7 mm. Body ground color red, Ant. I white, Th. I white or yellow while alive (Fig.1), completely white in alcohol. Occasionally, sparse white or yellow area between body segments and between tubercles De and Dl from Th. II to Abd. V (Fig. 1). Eyes, 3 + 3, black, 2 on anterior and 1 on posterior of tubercle Oc.

Antenna: Antenna 4-segmented, length subequal to head, Ant. III and IV dorsally fused. Ratio of antennal segments as I: II: (III + IV) = 1: 1.1: 2.4. Ant. I and II with 9 and 11 chaetae, respectively. Ant. III consisting of 5 sensory chaetae, sensillum sgd and sgv weak and blunt, 2 small round rods exposed in separate pits, with sgd well above 2 rods (Fig. 6). S-chaetae of Ant. IV relatively thin. Chaeta d4 very short, Ant. IV with a trilobed apical bulb (Fig. 6). Chaetotaxy of antennae as in Table 1b and Figs 6–7.

FIGURE 1. *Crossodonthina elegans* **sp. nov.**: habitus of living specimen.

Mouthparts: Buccal cone poorly developed. Labrum truncate and frontal margin weakly curved, chaetal formula 0/2, 2 (Fig. 10). Labium with chaetae (A, C, D) on proximal part of palp (labial papilla x not observed), 4 (E, F, G, f) on submentum and 4 (b, c, d, e) on mentum (Fig. 11). Mandibular head elongated, comprising 1 lamella, 1 fringed ramus inside, and 3 fringed rami outside (Figs 12–13). The inner fringed ramus longest and twice as long as the outer ramus, thinner towards the upper side and thicker towards the lower side, with 2 rows of approximately 30 marginal acute protruding chaetae. Inner and outer margins of the base fused, with 6–7 basal spinal teeth (Fig. 13A). The middle lamella short and broad, and 1/3 of the length of the inner ramus, with 2 strong curved basal teeth and 1 small round tooth in between, followed by a row of 12–16 small apical teeth (Fig. 13B). The outer ramus consists of 3 fringed rami (long, medium, and short) (Fig. 13C). The long ramus plumate-like, with approximately 9 small chaetae (rarely apically bifurcated). Medium and short ramus dendritic, repeatedly branching, with approximately 15 and 12 small chaetae, respectively. The short ramus basely with 1 long ramus (often branched) and 2 short rami; further down with 2 short spine-like chaetae, one of which bifurcated. These outer rami show some variation in the number and location of branching among individuals. Maxillary head consists of 2 subequal styliform rami without ciliates; apex of inner one hook-like with 1 blunt apical tooth and 1 small subapical tooth, and 1 minute tooth near the top between them. The outer rami pointed with needle-like protrusions on the lower side (Fig. 14).

Chaetal morphology: Ordinary dorsal chaetae of four types (Fig. 5): Ml, Mc, me, and mi. Macrochaetae (Ml) about 100–160 μm, thick, straight, sheathed, apically rounded and slightly knobbed longitudinally with slightly serrated margins. Some lateral chaetae weakly acuminate with slightly sheathed. Short macrochaetae (Mc) morphologically similar to Ml and at most approximately 1/2 the length of Ml. Mesochaeta (me) similar to ventral chaetae: thin, smooth, and pointed. Microchaetae (mi) quite pointed, simple, without a socket, and at most approximately 1/10 the length of Ml, sometimes move away from tubercles. Among mi, chaeta D, chaeta De2, and microchaetae of tubercle Dl on the head: chaeta Di3 (posterior medial chaetae) and chaeta De4 (anterior medial chaetae) of Th. II–III, chaeta De3 (medial chaetae) of Abd. I–III, chaeta Di3 (posterior chaetae), and chaeta Dl4 (anterior medial chaetae) of Abd. V, which are particularly small and easily overlooked. Dorsal sensory chaetae of two types (Fig. 5): s and ms. Sensory chaetae (s) thin, smooth, and equal or longer than mesochaetae.



FIGURES 2–5. *Crossodonthina elegans* **sp. nov.**: 2, habitus and dorsal chaetotaxy (holotype); 3, dorsal chaetotaxy of head; 4, dorsal chaetotaxy of Abd. IV–VI; 5, type of body chaetae.

Cephalic tubercles and chaetotaxy: Dorsal central area consists of 6 separate tubercles: tubercle Cl with 2 Ml (F) and 2 me (G); 2 tubercles An, each with 1 Ml (B), 1 Mc (E), and 2 Mc or me (C, D); tubercle Fr with 2 Ml (A) and 1 Mc or me (O); and 2 tubercles Oc, each with 1 Ml (Ocm) and 2 Mc (Oca, Ocp). Dorsal posterior area

with 4 separate tubercles: 2 tubercles Di, each with 1 Ml (Di1) and 2 tubercles De, each with 1 Ml (De1) and 1 mi (De2), chaetae De2 sometimes absent. Dorsal lateral area with 2 separate tubercles and 2 fused tubercles (L + So): 2 tubercles Dl, each with 1 Ml and 2 mi and 2 tubercles (L + So), each with 2 Ml, 2 Mc, and 5 me (Fig. 3). Group Vi with 6+6 chaetae. Groups Vea, Vem and Vep with 4, 3 and 4 chaetae respectively. Dorsal chaetotaxy of head as in Table 1a and Figs 2–3.

TABLE 1. Cephalic chaetotaxy of *Crossodonthina elegans* **sp. nov.**

a) Cephalic chaetotaxy—dorsal side.

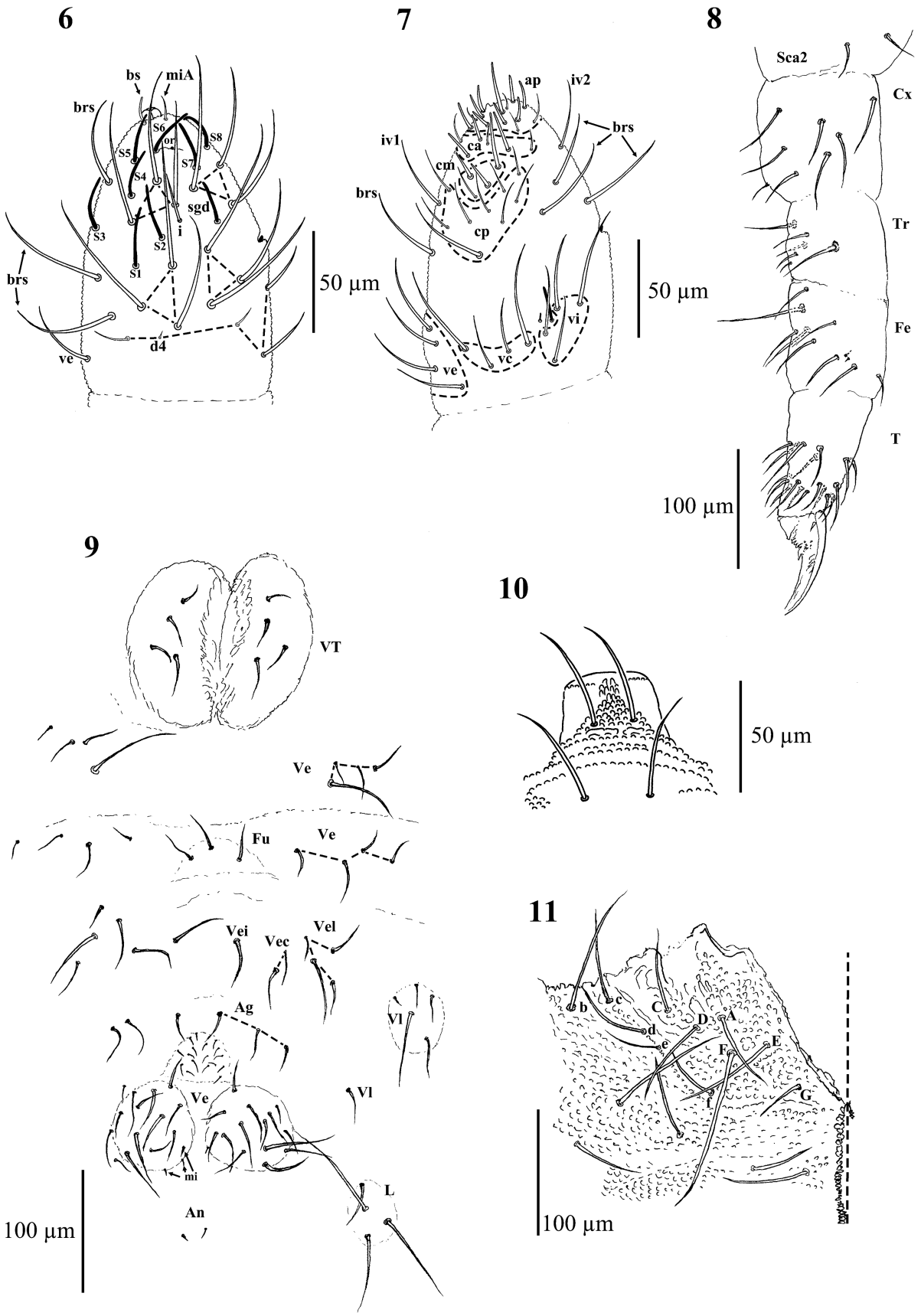
Tubecle	Number of setae	Type of setae	Name of setae
Cl	2	Ml	F
	2	me	G
An	1	Ml	B
	1	Mc	E
	2	Mc or me	C, D
Fr	2	Ml	A
	1	Mc or me	O
Oc	1	Ml	Ocm
	2	Mc	Oca, Ocp
Di	1	Ml	Di1
De	1	Ml	De1
	1	mi	De2 (rarely absent)
Dl	1	Ml	uncertain
	2	mi	
L+So	2	Ml	uncertain
	2	Mc	
	5	me	

b) Chaetotaxy of antennae.

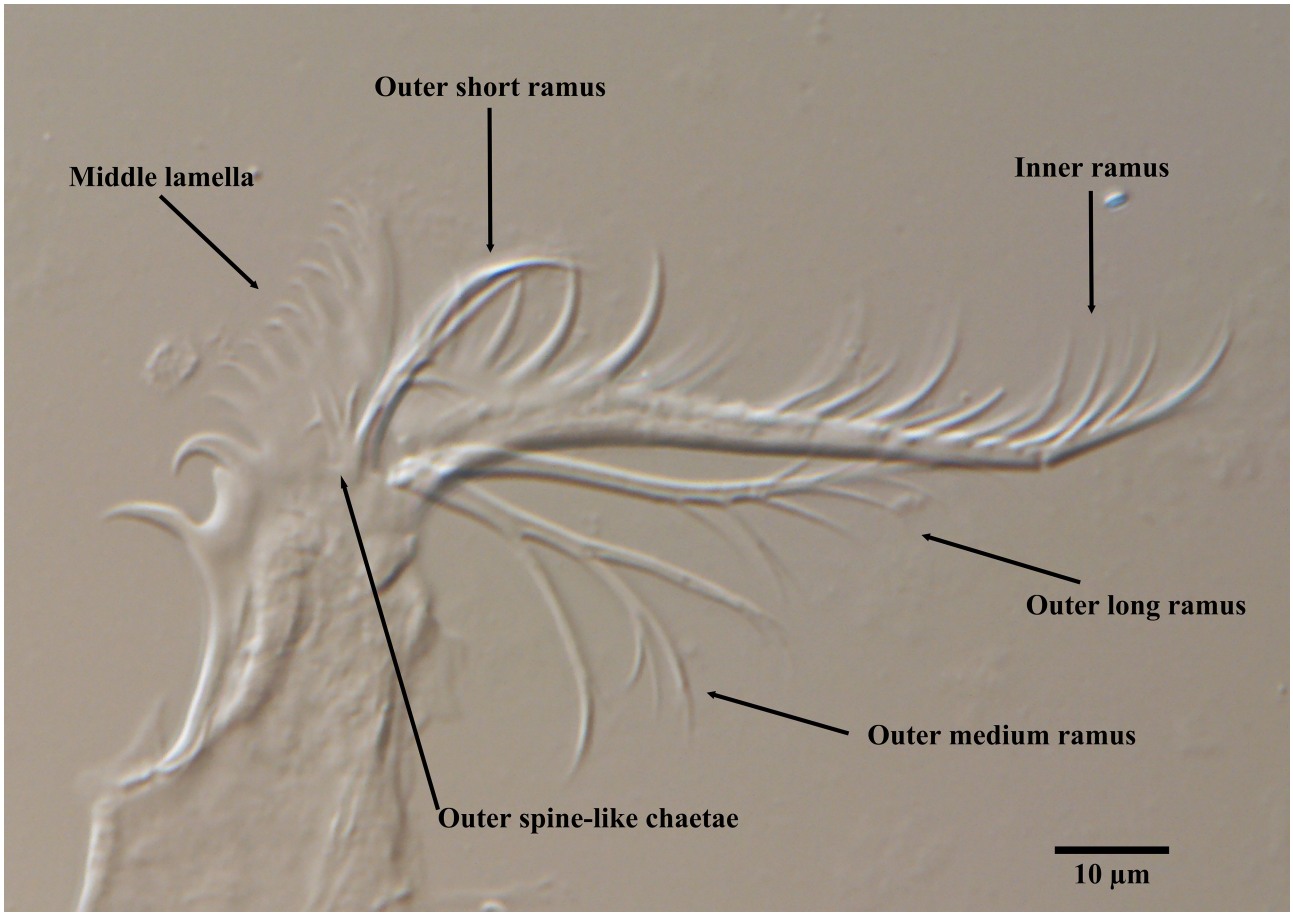
Segment, Group	Number of chaetae	Segment, Group	Number of chaetae adult
I	9	IV	or, 8 S, i, 12 mou, 7 brs, 2 iv
II	11		
III	5 sensilla AOIII		
ve	5	ap	10 bs, 5 miA
vc	4	ca	3 bs, 3 miA
vi	4	cm	3 bs, 1 miA
d	5	cp	8 miA, 1 brs

Body tubercles and chaetotaxy: Th. I with 3 + 3 tubercles; the interval of tubercles Di wider than those on the other body segments, with tubercles De and Dl shifted outwards. Th. II–III with 4 + 4 tubercles (Di, De, Dl, L); tubercle Dl shifted forward and tubercle L shifted backward or to the ventral side (Fig. 2). Abd. I–V with 4 + 4 tubercles (Di, De, Dl, L); tubercle De on Abd. V small, with only 1 sensory chaeta, and clearly separated from tubercle Dl; tubercle L on Abd. V shifted towards the ventral side. Abd. VI with 1 tubercle on each side and no cryptopygy (Fig. 4). Dorsal chaetotaxy as in Table 2 and Figs 2, 4. Genital plates with 15–21 and 20 chaetae in females and males, respectively. Furcal remnant with 3 mesochaetae (Fig. 9). Ventral tube comprises 4 + 4 chaetae (1 + 1 proximal and 3 + 3 distal). Ventral chaetotaxy as in Table 2 and Fig. 9.

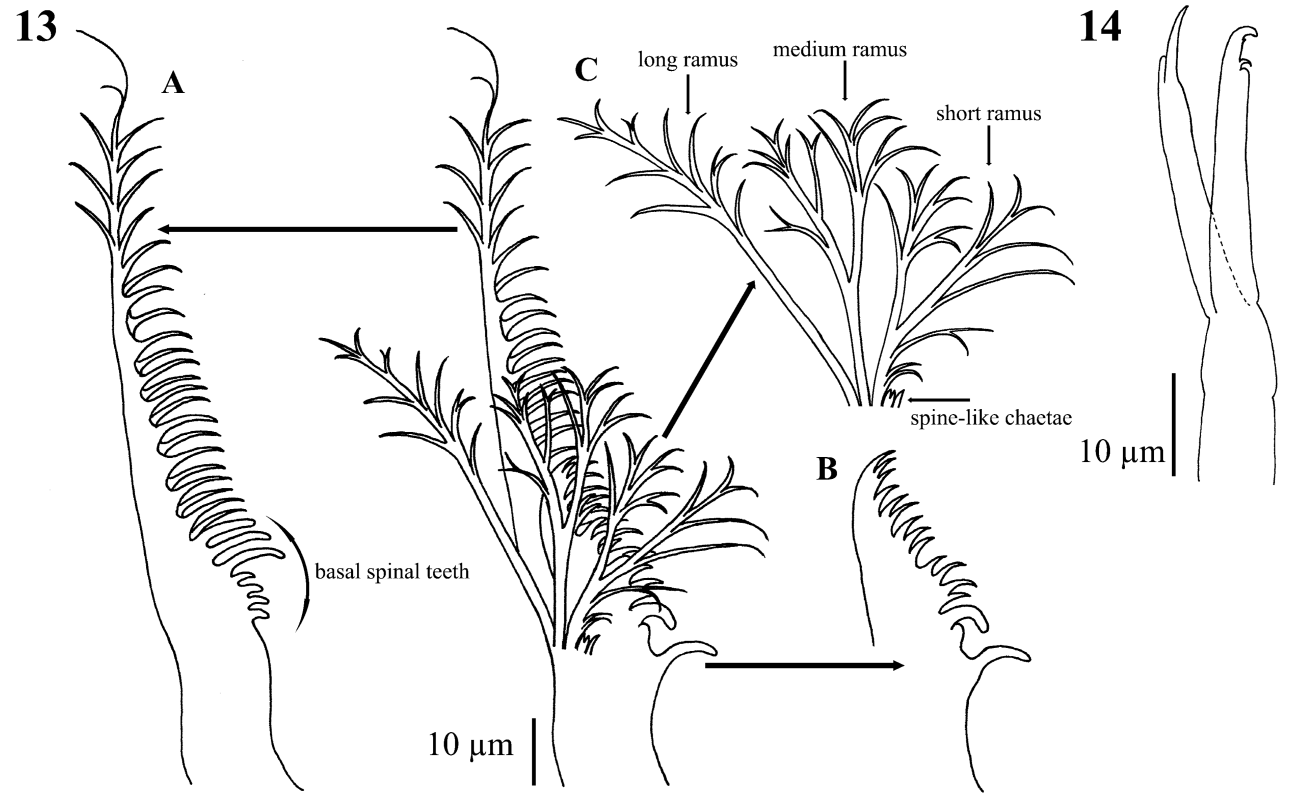
Legs: Tibiotarsus III with 18 chaetae (T1–T4, A1–A7, B1–B6, M); B4 and B5 shorter than the inner edge of the unguis and pointed. Unguis ventral with 1 inner tooth and basal granules. Two minute chaetae (each with anterior and posterior surfaces) on the apical row of Fe on legs I–III. Unguiculus and tenant hair absent (Fig. 8). Chaetotaxy of legs as in Table 2 and Fig. 8.



FIGURES 6–11. *Crossodonthina elegans* **sp. nov.**: 6, dorsal chaetotaxy of Ant. III–IV; 7, ventral chaetotaxy of Ant. III–IV; 8, chaetotaxy of leg III; 9, ventral chaetotaxy of abdomen; 10, labrum; 11, labium.



FIGURES 12. *Crossodonthina elegans* **sp. nov.**: photomicrograph of the mandible.



FIGURES 13–14. *Crossodonthina elegans* **sp. nov.**: 13, mandible (A, inner ramus; B, middle lamella; C, outer ramus); 14, maxilla.

TABLE 2. Postcephalic chaetotaxy of *Crossodonthina elegans* **sp. nov.**

Terga					Legs				
	Di	De	Dl	L	Scx2	Cx	Tr	Fe	T
Th. I	Ml	Ml+Mc	Ml	-	0	3	6	13	19
Th. II	Ml+Mc+mi	2Ml+Mc+mi+s	2Ml+Mc+s+ms	Ml+2Mc	2	7	6	12	19
Th. III	Ml+Mc+mi	2Ml+Mc+mi+s	2Ml+Mc+s	Ml+2Mc(Mc+me)	2	8	6	11	18
Terga					sterna				
Abd. I	Ml+Mc	Ml+Mc+mi+s	Ml+Mc	Ml+Mc+2me+s	VT: 4				
Abd. II	Ml+Mc	Ml+Mc+mi+s	Ml+Mc	Ml+Mc+2(1)me+s	Ve: 4				
Abd. III	Ml+Mc	Ml+Mc+mi+s	Ml+Mc	Ml+Mc+2me+s	Ve: 3–4, Fu: 3				
Abd. IV	Ml+mi	Ml+mi+s	2Ml+Mc	2Ml+2Mc+1(0)me+s	Vei: 1, Vec: 2, Vel: 4, Vl: 4–5				
Abd. V	Ml+Mc(mi)+mi	s	3Ml+mi	3Mc+2(1)me	Ag: 3, Vl: 1				
Abd. VI	6Ml+me				Ve: 14me+3(2)mi, An: 2–3 mi				

Ecology. Found under the fallen leaves and bark of decayed branches in evergreen broad-leaved forests dominated by *Castanopsis sieboldii* var. *lutchuensis* and *Adinandra yaeyamensis*.

Remarks. This is a unique species among members of the genus due to the white or yellow color of its Ant. I and Th. I. *Crossodonthina elegans* **sp. nov.** is most similar to *C. laterisensillata* Ohira, Kataoka, Tanooka & Nakamori, 2022; however, the two differ in a number of characteristics as follows: cephalic tubercles on lateral part (Dl separated to L and So in *C. elegans* **sp. nov.**, Dl fused to L and So in *C. laterisensillata*), basic body macrochaetae (apically rounded in *C. elegans* **sp. nov.**, pointed in *C. laterisensillata*), number of chaetae on tubercle L of Abd. I and III (5 in *C. elegans* **sp. nov.**, 4 in *C. laterisensillata*), and number of chaetae on tubercle L of Abd. IV (5 or 6 in *C. elegans* **sp. nov.**, 7 in *C. laterisensillata*). More differences were apparent in *C. elegans* **sp. nov.**: mouthparts, mandible lamella (12–16 upper teeth in *C. elegans* **sp. nov.**, 22 upper teeth in *C. laterisensillata*), mandible outer ramus (basal rami weakly developed in *C. elegans* **sp. nov.**, developed in *C. laterisensillata*), and maxillary ciliate on apex (absent in *C. elegans* **sp. nov.**, present in *C. laterisensillata*). The new species is also similar to *C. tridentiens* Yue & Yin, 1999, *C. choui* Jiang & Zhang, 2012, and *C. clavata* Jiang & Wang, 2021, in that it has 3 + 3 eyes, cephalic chaeta O present, cephalic tubercle Oc with 3 chaetae, cephalic tubercle L fused to So, and thick macrochaetae that are apically rounded. However, the following features can distinguish these species: *C. choui* has a maxilla with 3 rami (2 in *C. elegans* **sp. nov.**), 2 ordinary chaetae on the tubercle Di of Th. II–III (3 in *C. elegans* **sp. nov.**), and sensory chaetae absent on tubercle L of Abd. I–III (present in *C. elegans* **sp. nov.**); *C. clavata* has a mandible with 4 basal teeth (3 in C. *elegans* **sp. nov.**), cephalic tubercle Dl fused to L and So (separated in *C. elegans* **sp. nov.**), and 3 ordinary chaetae on tubercle De of Th. II (4 in *C. elegans* **sp. nov.**). *C. tridentiens* is particularly similar in mandible morphology to that of *C. elegans* **sp. nov.** in having 3 prominent basal teeth and dendritic rami. However, in *C. elegans* **sp. nov.**, the upper part of the basal tooth is a board-like lamella (fringed lamella in *C. tridentiens*), with 3 medium-sized rami (2 in *C. tridentiens*). The new species can be distinguished from the above species by the characters listed in Table 3.

Discussion

To date, 15 species of the genus *Crossodonthina* have been reported in Asia, and only one species, *C. radiata* (Salmon, 1941) has been found in Oceania (New Zealand). Mainland China is the habitat for most species of the genus, and a total of eight species have been reported there: three species (*C. bidenata* Luo & Chen 2009; *C. tiantongshana* Xiong, Chen & Yin, 2005; *C. tridentiens* Xiong, Chen & Yin, 2005) from Central China (Shanghai and Zeijang) and five species (*C. hainana* Xiong, Chen & Yin, 2005; *C. acuminata* Jiang & Wang 2021; *C. choui*, *C. clavata*, and *C. langshanensis* Hu *et al.*, 2019) from Southern China (Hunan and Hainan) (Hu *et al.* 2019; Jiang & Wang 2021; Jiang & Zhang 2012). Three species (*C. formosana* Yosii, 1965; *C. alatoserrata* Yosii, 1965; *C. montana* Lee & Kim, 1990) were found on Taiwan Island, which is close to Yonaguni-jima. *C. altamontana* Yoshii, 1981 and *C. koreana* Yosii & Lee, 1963 were discovered in Malaysia and Korea, respectively (Jiang & Zhang 2012). In Japan, three species, *C. koreana*, *C. laterisensillata*, and *C. nipponica*, have been reported (Ohira *et al.* 2022;

Yosii 1977); thus, *C. elegans* **sp. nov.** is the fourth *Crossodonthina* species to be found in Japan. As most of the species of *Crossodonthina* have been reported in the southern area of East Asia, this genus is likely of South-East Asian origin, as described in the tribe Lobellini (Cassagnau 1983). Japan and South Korea would be the northern limits of the distribution of this genus.

TABLE 3. Comparison of morphology between *Crossodonthina elegans* **sp. nov.** and related species.

	elegans **sp. nov.**	*laterisensillata*	*tridentiens*	*choui*	*clavata*
Body color	bicolor	red	bright red	red	red
Body macrochaeta	blunt	acuminate	blunt	blunt	blunt
Mandible with dendritically branched rami	present	present	present	absent	absent
Mandible rami and lamella	5	6	4	5	5
Mandible basal teeth	3	3	3	3	4
Marginal filaments on maxilla	absent	present	present	absent	absent
Lateral tubercles on head	Dl+(L+So)	(Dl+L+So)	(Dl+L+So)	Dl+(L+So)	(Dl+L+So)
Tubercles De and Dl on Abd. V	separated	separated	fused	separated	separated
Number of chaetae on De of Th. II	4+s	4+s	3+s	4+s	3+s
Number of chaetae on Di of Th. II	3	3	2	2	2
Sensory chaetae on L of Abd. I–III	present	present	?	absent	absent

The tribe Lobellini is a large group consisting of 17 genera and more than 160 species, mainly from Southeast Asia, East Asia, and the Australian-Oceania region (Bellinger *et al.* 1996–2022). Although most of the species of the tribe have monochromatic body colors, collembolans with bi- or tri-color bodies have been found in three genera and six species, namely *Paralobella orousseti*, *Telobella bicincta* (Cassagnau & Deharveng, 1984), *T. bicolor* (Cassagnau & Deharveng, 1984), *T. monocincta* (Cassagnau & Deharveng, 1984), *T. punctata* (Cassagnau & Deharveng, 1984), and *Lobella palmeri* (Wray, 1967) (Table 4). To the best of our knowledge, no collembolans with bi-colored body have been reported in *Crossodonthina*; thus, *C. elegans* **sp. nov.** is the only known collembolan with a bi-colored body among *Crossodonthina* species.

Most of the species of Lobellini with color patterns have been found in the Philippines and New Guinea (in Southeast Asia) (Cassagnau & Deharveng 1984), and this is the first time that bi-colored species have been found in Japan. The color pattern of *C. elegans* **sp. nov.** could be discriminated from the viewpoints of the positions of colored body segments of the other species of Lobellini (Table 4). *C elegans* **sp. nov.**, is similar to both *T. bicincta* and *T. bicolor* in having a red ground color, and two or more contiguous body segments that are not colored. However, *C. elegans* **sp. nov.** can be differentiated from the latter by the features of only the Th. I of body segments (Th. I and Abd. IV in *T. bicincta* and *T. bicolor*) and Ant. I of antennal segments being colored (not colored in *T. bicincta* and *T. bicolor*). Yonaguni-jima, which is the locality of *C. elegans* **sp. nov.,** is the westernmost island in Japan and is close to Iriomote Island and Taiwan Island. In the former, which is about 79 km to the east, a monochromatic *Crossodonthina* was found (Ohira *et al.* 2022); and in the latter, which is about 111 km to the west, only monochromatic species have been reported (Lee & Kim 1990; Yosii 1965). Therefore, this color pattern may have evolved originally in *Crossodonthina* on Yonaguni-jima. In addition, although Cassagnau (1989) defined Lobellini as not possessing blue pigment, *L. pulmei* is a species with a dark purple body color and its locality is far from other species; thus, the affiliation of *L. pulmei* needs to be re-examined. Further morphological and molecular analyses of Lobellini species are required to clarify the phylogenetic relationships of this group.

Lobellini with red, orange, yellow, or other reddish pigments turn white in alcohol; therefore, depending on the collection method, it may be difficult to confirm the living color. Cassagnau & Deharveng (1984) pointed out that there are many species for which there is no description of living color. Therefore, it is possible that there are species with unknown color patterns. In the future, it will be necessary to re-examine species that do not have a description of their body color when alive.

TABLE 4. Comparison of color patterns in Lobellini. W = white, Y = yellow.

Species	*Crossodonthina elegans* **sp. nov.**	*Paralobella orousseti*	*Telobella bicincta*	*T. monocincta*	*T. punctata*	*T. bicolor*	*Lobella palmeri*
Type locality	Japan	Philippines	Philippines	Philippines	Philippines	Philippines	USA
Ground color	red	red	red	red	red	red	dark purple
Antennae	W (Ant. I)	Y	-	-	-	Y (apical)	W
Head	-	Y	-	-	Y	-	-
Th. I	W/Y	Y	-	(Y)	Y	-	-
Th. II	-	-	Y	(Y)	Y	Y	-
Th. III	-	-	-	Y	Y	-	-
Abd. I	-	-	-	-	Y	-	-
Abd. II	-	-	-	-	Y	-	-
Abd. III	-	(W)	-	-	Y	-	-
Abd. IV	-	(W)	Y	-	Y	Y	-
Abd. V	-	(W)	-	-	Y	-	-
Abd. VI	-	(W)	-	-	Y	-	W
Notes	Sometimes with sparse white or yellow parts between body segments and between tubercles De and Dl from Th. II to Abd. V.	Some individuals without white color.		Sometimes with yellow bands on Th. II or Th. I–II.	Most tubercles red (with some tubercles pink or yellow), sometimes with red parts between tubercles Di from each segment.	Tubercle Fr, and between tubercles Di and De from Th. III to Abd. III yellow. Tubercles De on Abd. IV and between tubercles Di on Th. II red.	Some white spots on the dorsal side.

Key to the genus *Crossodonthina*

This key is partially based on Luo & Chen (2009) and Jiang & Wang (2021).

1	Eyes 2+2	2
-	Eyes 3+3	5
2	Tubercle Oc with 2 chaetae	*C. hainana* Xiong, Chen & Yin, 2005 (China)
-	Tubercle Oc with 3 chaetae	3
3	Tubercles Di fused on Abd. V	*C. bidentata* Luo & Chen, 2009 (China)
-	Tubercles Di separated on Abd. V	4
4	Mandible with 3 rami and 1 basal tooth	*C. montana* Lee & Kim, 1990 (China)
-	Mandible with 2 rami and 2 basal teeth	*C. langshanensis* Hu, Jiang C. & Jiang J.G., 2019 (China)
5	Body macrochaetae smooth	6
-	Body macrochaetae sheathed or serrated	9
6	Tubercle Di on Th. II–Abd. IV reduced, represented by some chaetae	7
-	Tubercle Di on Th. II–Abd. IV well defined	8
7	Tubercles De and Dl separated on Abd. V, mandible with 3 rami	*C. nipponica* Yosii, 1954 (Japan)
-	Tubercles De and Dl fused on Abd. V, mandible with 4 rami	*C. koreana* Yosii & Lee, 1963 (Korea & Japan)
8	Cephalic tubercles Dl, L and So fused, mandible with 1 basal tooth	*C. formosana* Yosii, 1965 (China)
-	Cephalic tubercles Dl, L and So independent, mandible with 3 basal teeth	*C. acuminata* Jiang & Wang, 2021 (China)
9	Cephalic tubercles 2Di and 2De fused	*C. altamontana* Yoshii, 1981 (Malaysia)
-	Cephalic tubercles 2Di and 2De separated	10
10	Tubercle Oc with 2 chaetae, tubercle Di, De, Dl on Th. I with 3, 2, 3 chaetae respectively	*C. radiata* (Salmon, 1941) (New Zealand)
-	Tubercle Oc with 3 chaetae, tubercle Di, De, Dl on Th. I with 1, 2, 1 chaetae respectively	11
11	Mandible with dendritic rami	12
-	Mandible without dendritic rami	14
12	Tubercles De and Dl fused on Abd. V, mandible with fringed lamella	*C. tridentiens* Yue & Yin, 1999 (China)
-	Tubercles De and Dl separated on Abd. V, mandible without fringed lamella	13
13	Maxillary head with ciliates, macrochaeta pointed, body monocolor	*C. laterisensillata* Ohira, Kataoka, Tanooka & Nakamori, 2022 (Japan)
-	Maxillary head without ciliates, macrochaeta blunt, body bicolor	*C. elegans* **sp. nov.** (Japan)
14	Cephalic tubercle L separate from So, mandible with 2 basal teeth	*C. alatoserrata* Yosii, 1965 (China)
-	Cephalic tubercle L fused to So, mandible with at least 3 basal teeth	15
15	Mandible with 3 rami and 5 basal teeth	*C. tiantongshana* Xiong, Chen & Yin, 2005 (China)
-	Mandible with 5 rami and 3 or 4 basal teeth	16
16	Tubercle De on Th. II with 5 (4+s) chaetae, mandible with 3 basal teeth	*C. choui* Jiang & Zhang, 2012 (China)
-	Tubercle De on Th. II with 4 (3+s) chaetae, mandible with 4 basal teeth	*C. clavata* Jiang & Wang, 2021 (China)

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