The species of *Symplocodes* Hebard (Blattodea: Ectobiidae: Blattellinae) with description of a new species from China

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**ABSTRACT**

This paper provides a generic diagnosis, a species list and taxonomy for the genus *Symplocodes* Hebard, 1929. The new species *Symplocodes euryloba* sp. nov. from China is described and illustrated. *Symplocodes tsaii* Bey-Bienko, 1958 is regarded as a subspecies of *Symplocodes marmorata* (Brunner von Wattenwyl, 1893), i.e. *S. marmorata tsaii* comb. nov., and its differences from *S. marmorata marmorata* (Brunner von Wattenwyl, 1893) are discussed. Two known species, *Symplocodes ridleyi* (Shelford, 1912) and *Symplocodes manubria* Feng et Guo, 1990, are redescribed and illustrated, whereas one new specific synonym, i.e. *Symplocodes brachialis*, is proposed. A key to species worldwide is provided. The tarsal claws of these four species as well as one species of *Chorisoserrata* Roth, 1998 are examined and photographed to compare the intergeneric differentiation of claw specialization and to discuss its function.

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**KEYWORDS**

*Chorisoserrata*; new combination; new species; new synonym; tarsal claw

**Introduction**

Hebard (1929) erected *Symplocodes* including the single species *Hemithyrsocera ridleyi* Shelford, 1912, which was distinguished by the following: on average fewer branches of the ulnar vein of the wings, the male genitalia specialized and with strikingly dentate tarsal claws. Princis (1971) recorded six species worldwide, two of which were from China. Feng and Guo (1990) added two species, *Symplocodes brachialis* and *Symplocodes manubria*, from Yunnan, China. Subsequently, Roth (1995) synonymized *Aristiger* Hebard and *Parasymploce* Hebard with *Hemithyrsocera* Saussure; but the first genus has sub-obsolete serrations on the tarsal claws, which does not resemble the distinct dentitions characteristic of *Symplocodes*. At the same time Roth also provided the generic diagnosis, reported *Symplocodes juxtaridleyi*, redescribed *Symplocodes ridleyi* (Shelford, 1912) and *Symplocodes annamensis* (Hanitsch, 1927), and transferred *Ceratinoptera annamensis* (Hanitsch, 1927) to *Symplocodes*. In 1999, Roth synonymized *Symplocodes annamita* with *Symplocodes annamensis*. More importantly, considering the weakly asymmetrical supra-anal plate and ventral view of the subgenital plate, he mentioned that *Symplocodes marmorata* (Brunner von Wattenwyl, 1893) and *Symplocodes tsaii* Bey-Bienko, 1958 might prove to be synonyms. No one has
since revised this group. There are currently nine known species of *Symplocodes* worldwide (Beccaloni, 2014).

After examining specimens deposited in the Insect Collection of Southwest University (SWU), Sun Yat-Sen University (SYSU) and Dali University (DLU), we redescribe *Symplocodes*, provide a key to species worldwide and describe one new species from China. *Symplocodes tsaii* Bey-Bienko, 1958 is degraded to a subspecies of *S. marmorata* (Brunner von Wattenwyl, 1893). Based on types and original descriptions, *Symplocodes brachialis* Feng *et* Guo, 1990 is synonymized with *Symplocodes ridleyi* (Shelford, 1912) here. This genus is compared with *Chorisoserrata* Roth and comments are given on the function of the strikingly dentate tarsal claws. The tarsal claws of all legs of the four species of *Symplocodes* listed here and one species of *Chorisoserrata* were examined using a Leica M205A microscope. This is the first time the tarsomere characters have been studied in detail for this genus.

**Material and methods**

The terminology used in this paper mainly follows Roth (1995, 1999). The nomenclature for wing-venation and male genitalia is according to Rehn (1951) and McKittrick (1964) respectively. Measurements are based on specimens examined. Genital segments of the examined specimens were macerated in 10% NaOH and observed in glycerine jelly using a Motic K400 stereomicroscope. All drawings were made with the aid of a Motic K400 stereomicroscope. Photographs of the specimens were made using a Canon 50D plus a Canon EF 100 mm f/2.8L IS USM Macro lens with the aid of Helicon Focus software. Photographs of the proximal tarsal claw were taken using a Leica M205A microscope with a Leica DFC Camera, and images were produced using the software LAS (Leica Application Suite) V3.7. The map (Figure 5) is downloaded from the website of SinoMaps Press (www.sinomaps.com) and modified with Adobe Photoshop CS5. Materials examined are deposited in the following collections: Southwest University (SWU), Sun Yat-Sen University (SYSU) and Dali University (DLU) as indicated. Type specimens are deposited in the Insect Collection of Southwest University, Beibei, China and Sun Yat-Sen University, Zhongshan, China.

**Taxonomy**

*Symplocodes* Hebard, 1929

*Symplocodes* Hebard, 1929: 75; Princis, 1971: 1129; Roth, 1995: 995; Roth, 1999: 133.

**Type species**

*Hemithyrsocera ridleyi* Shelford, 1912.

**Diagnosis (Partly after Roth, 1995)**

Vertex with interocular space slightly less than the distance between antennal sockets. Tegmina and wings fully developed (except the female of *Symplocodes impar*, which are reduced). Tegmina with an apical posterior branch of radius (AP. POST. BR) near middle of main stem of radius, median and cubitus veins longitudinal; hind wings with some of Rs and R1 slightly thickened distad, cubitus vein curved, simple,
or with only one complete branch and incomplete branch absent. Front femur Type A3 (Figures 2C, 3C, 4C, 6C, 7C), pulvilli on four proximal tarsomeres, tarsal claws with inner margins heavily and conspicuously dentate, arolia present. Male: seventh abdominal tergum specialized with transparent region in centre, and with lateral lobes present or absent; subgenital plate strongly asymmetrical, with more or less complex structures on left side in dorsal view, most of left stylus absent (except S. juxtaridleyi); hook-like L3 short, on left side.

Remarks
Roth (1995) stated the only character that clearly separates Symplocodes from Hemithyrsocera is the distinctly toothed tarsal claw. Pseudophyllodromiinae genus Chorisoserrata also has toothed claws (Figure 8A–C) but it differs from Symplocodes in terms of characteristics as follows: eyes reduced, interocular space distinctly wider than the distance between antennal sockets; pronotum subelliptical but hind margin nearly truncate; median phallomere very long and slender, totally extending beyond the end of body with apical part protruding. The claw dentation of these two genera differs in some aspects morphologically and may result in (or from) different behaviours or habitats; the details are given in our entry for discussion.

Distribution
Oriental Region.

Symplocodes manubria Feng et Guo, 1990
(Figures 1A, B, 2A–L, 8D–F)

Symplocodes manubria Feng et Guo, 1990: 340.

Materials examined
One male (holotype), China, Yunnan Prov., Xishuangbanna, Meng’a, 1050–1080 m, 6 August 1958, coll. FJ Pu; two males (paratypes), same data as above; one male, China, Yunnan Prov., Simao, 29 May 1986, coll. PZ Feng; one male, China, Yunnan Prov., Xishuangbanna, Dadugang, 11 August 2009, coll. ZQ Wang; one male, China, Yunnan Prov., Simao, 1500 m, 30–31 October 2007, coll. WW Zhang; one male, China, Yunnan Prov., Yingjiang, Tongbiguan, 1287 m, 2 June 2008, coll. WW Zhang; one male, China, Yunnan Prov., Xishuangbanna, Mt Kongmingshan, 2100 m, 20 September 1957, coll. SY Wang. (SWU)

Redescription
Female unknown.

Length, male (holotype in parentheses), overall length including tegmen: 13.6–15.2 (15.2)mm; pronotum length × width: 2.9–3.5 (3.4)mm × 3.8–4.2 (4.2)mm; tegmen length: 11.9–12.5 (12.5)mm.

Body medium, yellowish brown (Figure 1A). Vertex yellowish brown, some individuals with irregular brown maculae (holotype without maculae). Face reddish brown, with one round reddish brown spot near antennal socket (Figure 2A). Ocellar spot yellowish white. Antennae blackish brown with base yellowish brown (Figure 1B). Fifth maxillary
Figure 1. (A, B) *Symlocodes manubria* Feng et Guo from China, Yunnan Prov., Xishuangbanna, Meng’a; male (holotype): (A) dorsal view (B) ventral view. (C, D) *Symlocodes marmorata marmorata* (Brunner von Wattenwyl) from China, Xizang Aut. Reg., motuo; male: (C) dorsal view (D) ventral view. (E, F) *Symlocodes marmorata tsaii* (Bey-Bienko) comb. nov. from China, Sichuan Prov., Xichang; male: (E) dorsal view (F) ventral view. (G, H) *Symlocodes ridleyi* (Shelford) from China, Yunnan Prov., Menglun; male: (G) dorsal view (H) ventral view. (I, J) *Symlocodes euryloba* sp. nov. from China, Hainan Prov., Mt Jianfengling; male (paratype): (I) dorsal view (G) ventral view. Scale bars = 10.0 mm.
Figure 2. *Symplocodes manubria* Feng et Guo from China, Yunnan Prov., xishuangbanna, meng’a. (A) Head, frontal view; (B) maxillary palps 3–5; (C) front femur; (D) pronotum; (E) tegmen; (F) hind wing; (G) abdominal tergum 7, dorsal view; (H) supra-anal plate and paraprocts, ventral view; (I) subgenital plate, dorsal view; (J) phallomere L3; (K) phallomere L2vm; (L) phallomeres R2 & R3. Scale bars = 0.5 mm (A–D, G, H, J–L), 1 mm (E, F, I).
palpomere blackish brown with apex yellowish white, the others yellowish brown (Figure 1B). Pronotum yellowish brown, with two distinct reddish brown V-shaped maculae near hind margin; each lateral corner with one curved blackish brown stripe (Figures 1A, 2D). Tegmina yellowish brown, hind wings hyaline. First through ninth abdominal terga blackish brown; sterna yellowish brown and first through seventh segment’s lateral borders with black irregular maculae (Figure 1B).

Vertex with interocular space less than the distance between antennal sockets (Figure 2A). Third and fifth maxillary palpomeres approximately same length, and both weakly longer than the fourth (Figure 2B). Pronotum subelliptical, widest behind the middle (Figure 2D). Both tegmina and hind wings fully developed, extending beyond end of abdomen (Figure 1A). Tegmen with six or seven (holotype with seven) anterior rami of radius (ANT. R. RAMI) and nine to twelve (holotype with nine) apical rami of radius (AP. RAMI), one or two (holotype with two) apical rami with branches; median (M) and cubitus (CU) veins longitudinal, with complex branches (Figure 2E). Hind wing with one anterior ramus of radius, R1 without branch; median and cubitus veins weakly curved, the former simple and cubitus vein with one complete branch after the middle, incomplete branch absent (Figure 2F). Front femur Type A3 (Figure 2C), pulvilli on four proximal tarsomeres. Tarsal claws symmetrical, distinctly dentate (Figure 8D–F). Seventh abdominal tergum specialized with the centre hyaline and with a scattered cluster of minute setae (Figure 2G).

Supra-anal plate (Figure 2H) symmetrical in ventral view, hind margin slightly concave in the middle, posterior region scattered with six spines; right and left intercercal processes dissimilar, apex acute, left process slender with a spine-like process near the middle, pointing to the right; right process more or less short with apex branched. Left posterolateral corner of subgenital plate (Figure 2I) without obvious process, but with incision; right posterolateral corner with process perpendicular to subgenital plate; hind margin produced in the middle and bearing a conical stylus; left posterolateral margin with a large, long process (as indicated in Figure 2I) pointing to the left and somewhat upwards, whose outer margin has a row of setae; the dorsal surface of subgenital plate with one complex sclerite in centre, whose hind margin is setose; left stylus absent. Genitalia with L3 (Figure 2J) very small, without pre-apical incision; L2vm (Figure 2K) slender and apically tapering, with filamentous branch near apical third; R2 (Figure 2L) with a curved sclerite, R3 (Figure 2L) with two obvious sclerites, one of which is rod-like, the other is discoidal.

**Remarks**

This species is similar to *S. marmorata marmorata* (Brunner von Wattenwyl, 1893), but can be distinguished in the following characteristics. First, for the former, subgenital plate with a long process pointing to the left, while in the latter, the process is short. Second, intercercal processes of the former dissimilar, the right process slender with a large “spine”, the left one shorter with apex branched; but in the latter, symmetrical and broad, strongly curved and each with a large dark spine. Third, paraprocts of the former without spines, while in the latter, several spines are present.

**Distribution**

China (Yunnan).
**Symplocodes marmorata marmorata** (Brunner von Wattenwyl, 1893)  
(Figures 1C, D, 3A–L, 8G–I)

*Phyllodromia marmorata* Brunner von Wattenwyl, 1893: 19.  
*Hemithyrsocera marmorata*: Shelford, 1912: 661.  
*Symplocodes marmorata*: Princis, 1971: 1130; Roth, 1999: 137.  
*Phyllodromia feae* Shelford, 1908: 13.  
*Symplocodes feae*: Princis, 1971: 1130.

**Materials examined**

Two males, China, Xizang Aut. Reg., Motuo, 1050 m, 1 August 1979, coll. GT Jin and JY Wu; one male, China, Yunnan Prov., Yingjiang, Nabang, 282 m, 11 July 2012, coll. D Wang; one male, China, Xizang Aut. Reg., Motuo, 9 July 2013, coll. KL Wu. (SWU)

**Distribution**

China (Yunnan, Xizang); Myanmar, Thailand.

**Symplocodes marmorata tsaii** (Bey-Bienko, 1958) comb. nov.  
(Figures 1E, F, 4A–O, 8J–L)

*Symplocodes tsaii* Bey-Bienko, 1958: 673.

**Materials examined**

One male, China, Yunnan Prov., Simao, 29 May 1986, coll. PZ Feng (SWU); one male, China, Sichuan Prov., Yanyuan, Jinhe, 1270 m, 30 June 1984, coll. SY Wang (SWU); two males, China, Guizhou Prov., Wangmo, 5–7 June 1982, coll. PZ Feng (SWU); two males, China, Yunnan Prov., Xishuangbanna, Meng’a, 1050–1080 m, 8 July 1958, coll. FJ Pu (SWU); one female, China, Yunnan Prov., Xishuangbanna, Meng’a, 1050–1080 m, 17 July 1958, coll. FJ Pu (SWU); two males and one female, China, Yunnan Prov., Dali, Yangbi, west bank of Yangbi River, 15 June 1999, coll. SH Yang (DLU); one female, China, Yunnan Prov., Dali, Pingpo, 1600 m, 15 June 1999, coll. H An (DLU); one female, China, Yunnan Prov., Dali, Pingpo, 1600 m, 15 June 1999, coll. Z Xu (DLU); one male, China, Sichuan Prov., Xichang, 18 July 2004, coll. J Li and CX Yuan (SYSU); one male, China, Yunnan Prov., Dali, Yangbi, Pingpo, 1600 m, 15 June 1999, coll. Z Xu (DLU); two females, China, Yunnan Prov., Zhaotong, Huanghua, Yangjiawan, 3–30 August 2007, collector unknown (SWU); three males and two females, China, Yunnan Prov., Zhaotong, Huanghua, 7–19 September 2007, collector unknown (SWU).

**Redescription**

Length, male, overall length including tegmen: 15.5–16.5 mm; pronotum length × width: 2.7–3.1 mm × 3.5–4.2 mm; tegmen length: 13.5–14.5 mm. Female, overall length including tegmen: 15.1–16.0 mm; pronotum length × width: 3.0–3.1 mm × 4.0–4.1 mm; tegmen length: 13.5–14.6 mm.

Body medium, yellowish brown (*Figure 1E*). Vertex blackish brown. Face yellowish brown, with one reddish brown spot near antennal socket (*Figure 4A*). Ocellar spot yellowish white. Fifth maxillary palpmere brown with apex yellowish white, the others
Figure 3. *Symplocodes marmorata marmorata* (Brunner von Wattenwyl) from China, Xizang Aut. Reg., motuo. (A) Head, frontal view; (B) maxillary palps 3–5; (C) front femur; (D) pronotum; (E) tegmen; (F) hind wing; (G) abdominal tergum 7, dorsal view; (H) supra-anal plate and paraprocts, ventral view; (I) subgenital plate, dorsal view; (J) phallomere L3; (K) phallomere L2vm; (L) phallosomes R2 & R3. Scale bars = 0.5 mm.
Figure 4. *Symplocodes marmorata tsaii* (Bey-Bienko) comb. nov., (A–H, J–O) from China, Yunnan Prov., Xishuangbanna, Meng'a; (I) from Yunnan Prov., Yangbi, west bank of Yangbi River. (A) Head, frontal view; (B) maxillary palps 3–5; (C) front femur; (D) pronotum; (E) tegmen; (F) hind wing; (G) abdominal tergum; 7, dorsal view; (H–J) supra-anal plate and paraprocts, ventral view; (K, L) subgenital plate, dorsal view; (M) phallomere L3; (N) phallomere L2vm; (O) phallomeres R2 & R3. Scale bars = 0.5 mm (A–D, G–I, K, M–O), 1 mm (E, F, J, L).
yellowish brown (Figure 1F). Antennae yellowish brown with apex blackish brown. Pronotum yellowish brown, without macula or with two V-shaped maculae; each lateral corner with one curved dark brown stripe, lateral borders nearly hyaline (Figures 1E, 4D). Tegmina yellowish brown and hind wings hyaline. First through sixth abdominal terga blackish brown; sterna yellowish brown and lateral borders with black irregular maculae, or first through seventh segments black in centre (Figure 1F).

Vertex with interocular space narrow, less than the distance between antennal sockets (Figure 4A). Third and fourth maxillary palpi approximately same length, and both slightly longer than the fifth (Figure 4B). Pronotum subelliptical, widest near the middle posteriorly, hind margin slightly produced at middle (Figure 4D). Both tegmina and hind wings fully developed, extending beyond the end of abdomen. Tegmen with nine anterior rami of radius and 11 apical rami of radius, one apical ramus branched at the apical margin; median vein with three branches; cubitus vein with two branches, one of which is forked again (Figure 4E). Hind wing with branches of R1 and one anterior ramus of radius; median vein curved and simple; cubitus vein with a single complete branch after the middle (Figure 4F). Front femur Type A3 (Figure 4C), pulvilli on four proximal tarsomeres. Tarsal claws symmetrical and distinctly dentate (Figure 8J–L).

Seventh abdominal tergum with a pair of oblique ridges meeting near posterior margin of the sixth segment (visible in pinned specimen); the centre hyaline with a scattered group of minute setae (invisible in pinned specimen) (Figure 4G).

Supra-anal plate (Figure 4H–J) in ventral view symmetrical or slightly asymmetrical, with hind margin more or less concave in the middle and several spines near hind margin; right and left paraprocts dissimilar, each with 6–10 spines. Intercercal processes varied, of which apices are divided into two to four spinous up-curved branches, the upper one obviously larger than the rest. Subgenital plate (Figure 4K, L) strongly asymmetrical, in dorsal view right posterolateral corner with hairy process protruding to upper right; left lateral margin with a cylindrical process, whose apex is setose, and with a row of setae at inner basal margin; one irregular sclerite twisting and protruding near the centre of subgenital plate or close to the incision, with apex setose; one sclerite with long setae reaching left posterolateral corner. Right stylus finger-like, left stylus absent. Male genitalia with sclerotized portion of L3 (Figure 4M) very short and without pre-apical incision; L2vm (Figure 4N) slender, rod-like and curved, with a slim membranous branch near apical third; R2 (Figure 4O) with a curved cleft, resembling a bean with a short bud; R3 (Figure 4O) with upper lobe rod-like and swelling at apex, and with lower lobe irregular.

Female similar to male, supra-anal plate symmetrical or slightly asymmetrical, subgenital plate simple with hind margin rounded.

Remarks
Based on specimens of this species from various localities and illustrations provided by Roth (1999), the intraspecific variation of the intercercal process has a stable geographical gradient (Figure 5). The intercercal processes of individuals from the east to Hengduan mountains (Figure 5) have the upper spine-like branch larger than the lower (Figure 4H–J), while those of samples from the west, S. marmorata marmorata (Brunner von Wattenwyl, 1893), are the opposite (Figure 3H). In the context of other characters including phallomeres, samples exhibit no differences between the east and
the west. So it is reasonable to treat these two populations as different subspecies isolated by a geographical barrier.

In addition, intrasubspecific variations occur in the intercercal process (Figure 4H–J) and subgenital plate (Figure 4K, L). Based on the materials examined, similar intercercal processes are found in different localities, e.g. the form similar to Figure 4H being distributed in different locations of Yunnan (Meng’a, Simao, Yangbi). On the contrary, varied intercercal processes could be found at the same locality, e.g. specimens depicted as Figure 4H and 4J are from Meng’a, while those depicted as Figure 4I and 4H are both found in Yangbi. The same situation applies for the subgenital plate.

**Distribution**
China (Yunnan, Guizhou, Sichuan).
Symplocodes ridleyi (Shelford, 1912)  
(Figures 1G, H, 6A–M, 8M–O, 9A–C, 10A–B)

Hemithyrscocera ridleyi Shelford, 1912: 660.
Symplocodes ridleyi: Hebard, 1929: 75; Roth, 1995: 996.
Symplocodes secunda Princis, 1957: 148, 152. Synonymized by Princis, 1971: 1130.
Symplocodes brachialis Feng et Guo, 1990: 339. Syn. nov.

Material examined
Three males (holotype and paratypes of Symplocodes brachialis), China, Yunnan Prov., Xishuangbanna, 850 m, 29 May 1986, coll. PZ Feng; one male, China, Yunnan Prov., Xishuangbanna, Jinghong, 650 m, 12 July 1958, coll. XW Meng; one male, China, Yunnan Prov., Xishuangbanna, Xiaomengyang, 850 m, 18 August 1958, coll. XW Meng; one male, China, Yunnan Prov., Xishuangbanna, Xiaomengyang, 850 m, 4 September 1958, coll. XW Meng; one male, China, Yunnan Prov., Xishuangbanna, Xiaomengyang, 850 m, August 1958, coll. YR Zhang; one male, China, Yunnan Prov., Xishuangbanna, Mengla, 650 m, 18 May 1982, coll. GT Jin; three males, China, Yunnan Prov., Xishuangbanna, Jinghong, 650 m, 3 March 1958, coll. CP Hong; three males, China, Yunnan Prov., Xishuangbanna, Xiaomengyang, 850 m, 27–29 August 1958, coll. Xuwu Meng; one male, China, Yunnan Prov., Xishuangbanna, Xiaomengyang, 850 m, 21 August 1958, coll. LY Zheng; one male, China, Yunnan Prov., Xishuangbanna, Menghun, 750 m, 5 June 1958, coll. XW Meng; one male, China, Yunnan Prov., Daluo, 650 m, 31 May 1991, coll. GC Liu and WZ Cai; one male, China, Yunnan Prov., Mohan, 8 August 2009, coll. ZQ Wang; two males and one female, China, Yunnan Prov., Menglun, 1 August 2009, coll. ZQ Wang; two males, China, Yunnan Prov., Menglun, Green Stone Forest Park, 3 August 2009, coll. ZQ Wang; one male and one female, China, Yunnan Prov., Menglun, 31 July 2009, coll. ZQ Wang; one male and one female, China, Yunnan Prov., Mohan, 7 August 2009, coll. ZQ Wang; two females, China, Yunnan Prov., Mohan, 8 August 2009, coll. ZQ Wang; two males, China, Yunnan Prov., Dadugang, 12 August 2009, coll. ZQ Wang; six males and three females, China, Yunnan Prov., Jinghong, Dadugang, 1299 m, 27 April 2014. coll. XR Li and HG Liu. (SWU)

Redescription
Length, male, overall length including tegmen: 13.5–16.0 mm; pronotum length × width: 2.1–2.9 mm × 3.5–4.0 mm; tegmen length: 12.0–12.5 mm. Female, overall length including tegmen: 14.1–15.2 mm; pronotum length × width: 3.5–4.0 mm × 4.0–4.3 mm; tegmen length: 10.1–10.3 mm.

Body medium, yellowish brown (Figure 1G). Vertex brown. Ocellar spot yellowish white. Antennae blackish brown with base yellowish brown. Fifth maxillary palpomere brown with apex yellowish white, the others yellowish white (Figure 1H). Pronotum yellowish brown, with one dark brown curved stripe on each lateral corner (Figures 1G, 6D). Tegmina yellowish brown, hind wings hyaline and pale brown. Second through seventh abdominal terga with disc blackish brown, sterna yellowish brown and lateral borders with black irregular maculae (Figure 1H).

Vertex with interocular space less than distance between antennal sockets (Figure 6A). Fourth and third maxillary palpomeres about same length, and both slightly longer than
Figure 6. *Symplocodes ridleyi* (Shelford), (A–G, I–M) from China, Yunnan Prov., Simao, (H) from Yunnan Prov., Daluo. (A) Head, frontal view; (B) maxillary palps 3–5 (C) front femur; (D) pronotum; (E) tegmen; (F) hind wing; (G) abdominal tergum 7, dorsal view; (H, I) supra-anal plate and paraprocts, ventral view; (J) subgenital plate, dorsal view; (K) phallomere L3; (L) phallomere L2vm; (M) phallomeres R2 & R3. Scale bars = 0.5 mm (A–D, G–M), 1 mm (E, F).
the fifth (Figure 6B). Pronotum subelliptical, broadest width behind the middle (Figure 6D). Tegmina and hind wings well developed, entirely covering abdomen (Figure 1G). Tegmen with eight anterior rami of radius and 11 apical rami of radius, one of apical rami with secondary divisions; median and cubitus veins longitudinal, the former with two complete branches and the latter with four complete branches (Figure 6E). R1 of hind wing with branches, anterior rami of radius absent; median and cubitus veins weakly curved, the former simple and cubitus vein with one small complete branch originating near the apical margin, incomplete branch absent (Figure 6F). Front femur Type A3 (Figure 6C), pulvilli on four proximal tarsomeres (Figure 9A–C); tarsal claws symmetrical, distinctly dentate (Figure 8M–O). Seventh abdominal tergum specialized, with a pair of oblique ridges converging at posterior margin of sixth segment (visible in pinned specimen); the centre hyaline, with a scattered group of minute setae (Figure 6G).

Supra-anal plate (Figure 6H, I) symmetrical, with hind margin slightly concave in the middle; intercercal processes large and similar, with three to five spinous processes near apex; paraprocts dissimilar, the left one with an acute sclerotized process, the right one irregular. Subgenital plate (Figure 6J) in dorsal view obviously asymmetrical, the postero-lateral corners bearing protrusions, of which the right one narrow, sinuous, and finger-like, with long setae at apex; the left one unevenly broader, with apex broadly rounded and without seta; posterior margin convex, with a group of long setae, and on left margin a robust process bearing a row of small spines apically; a curved structure with setae at apex near left posterior margin. Right stylus conical, left stylus absent. Male genitalia with sclerotized portion of L3 (Figure 6K) short and without pre-apical incision; L2vm (Figure 6L) slender, rod-like, with apex acute and with filamentous branch near apical third; R2 (Figure 6M) pyriform, with a slim sclerite at the margin; R3 (Figure 6M) with two obvious sclerites, one of which is rod-like and broadened at one apex, the other curved.

Female similar to male. Subgenital plate simple with hind margin rounded.

Remarks
Feng and Guo (1990) established S. brachialis based only on morphological characters. Roth (1995) examined the type specimen of S. ridleyi and redescribed it in detail. We find that S. brachialis bears a strong resemblance to S. ridleyi in terms of morphology and male genitalia except for the amount of spine-like processes at the apical intercercal processes. There are three to four spine-like processes in S. brachialis from China, while Roth (1995) described four to five in S. ridleyi. But we find this variation to be intraspecific and too variable to be of use in specific diagnostics. Consequently, S. brachialis is designated a junior synonym of S. ridleyi.

Distribution
China (Yunnan); Singapore, Indonesia, Malaysia.

Symplocodes euryloba sp. nov.
(Figures 1I, J, 7A–L, 8P)
Figure 7. *Symplocodes euryloba* sp. nov. from China, Hainan Prov., Nada. (A) Head, frontal view; (B) maxillary palps 3–5; (C) front femur; (D) pronotum; (E) tegmen; (F) hind wing; (G) abdominal tergum 7, dorsal view; (H) supra-anal plate and paraprocts, ventral view; (I) subgenital plate, dorsal view; (J) phallosome L3; (K) phallosome L2vm; (L) phallosomes R2 & R3. Scale bars = 0.5 mm (A–D, G–L), 1 mm (E, F).
**Type specimens**

Holotype: male, China, Hainan Prov., Nada, April 1962, coll. Y Zhou (SWU). Paratype: one male, China, Hainan Prov., Mt Jianfengling, 17 June 1982, coll. LY Zheng (SYSU).

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**Figure 8.** Tarsal claws. (A–C) *Chorisoserrata biceps* Wang et Feng, male: (A) front leg; (B) middle leg; (C) hind leg. (D–F) *Symplocodes manubria* Feng et Guo, male: (D) front leg; (E) middle leg; (F) hind leg. (G–I) *Symplocodes marmorata marmorata* (Brunner von Wattenwyl), male: (G) front leg; (H) middle leg; (I) hind leg. (J–L) *Symplocodes marmorata tsaii* (Bey-Bienko) comb. nov., male: (J) front leg; (K) middle leg; (L) hind leg. (M–O) *Symplocodes ridleyi* (Shelford), male: (M) front leg; (N) middle leg; (O) hind leg. (P) Front tarsal claw of *Symplocodes eurylopa* sp. nov., male. Scale bars = 0.2 mm.
**Description**

Length, male, overall length including tegmen: 11.5 mm; pronotum length × width: 2.6 × 3.7 mm; tegmen length: 9.0 mm.

Body small, pale yellow to yellowish brown (Figure 1J). Vertex yellowish brown with irregular brown maculae. Face blackish brown. Ocellar spot yellowish white (Figure 1I). Antennae yellowish brown. Fifth maxillary palpomere brown with apical part yellowish white, the others yellowish brown (Figure 1I). Pronotum yellowish brown, with one dark brown curved stripe on lateral corner, and lateral borders nearly hyaline (Figures 1J, 7D). Tegmina yellowish brown (Figure 1J), hind wings hyaline. Abdominal terga blackish brown, sterna yellowish brown with brown spots on lateral borders (Figure 1J).

Vertex with interocular space less than the distance between antennal sockets (Figure 7A). Fourth and fifth maxillary palpomeres approximately same length, and both shorter than the third (Figure 7B). Pronotum subelliptical, broadest width behind the middle, hind margin slightly produced medially (Figure 7D). Tegmen with six anterior rami of radius; with 10 apical rami of radius and unbranched; median and cubitus veins longitudinal, median vein with one complete branch before the middle, and cubitus vein with three complete branches, one with secondary divisions (Figure 7E). Hind wing with branched R1 and with one anterior rami of radius; median and cubitus veins weakly curved, the former simple and cubitus vein with one single complete branch near apex, incomplete branch absent (Figure 7F). Front femur Type A3 (Figure 7C), pulvilli on four proximal tarsomeres. Tarsal claws symmetrical, distinctly dentate (Figure 8P). Seventh abdominal tergum specialized, with a pair of oblique ridges (visible in pinned specimen) through centre and posterior part, the centre hyaline, and with reduced lateral lobes at disc (Figure 7G).

Supra-anal plate (Figure 7H) in ventral view symmetrical and nearly triangular, with hind margin slightly concave in the middle; right and left intercercal processes similar, large and upturned, apex tapering and each with a spinous process near apical third. Right and left paraprocts (Figure 7H) irregular and dissimilar. Subgenital plate (Figure 7I) in dorsal view asymmetrical, left posterolateral corner with a non-setose process which is broad, upturned and blunt at apex, the right posterolateral corner weakly produced and with setae; hind margin arcuate and produced in the middle, left side with small spines, setae, and a process with spines on right side; right stylus arising at the concavity of right side of subgenital plate, left stylus absent. Genitalia with L3 (Figure 7J) very small, without pre-apical incision; L2vm (Figure 7K) slender and rod-like, with distal part curved and apex acute, the membranous filament arising near the apical quarter; R2 (Figure 7L) curved, R3 (Figure 7L) with upper lobe resembling a long handle and lower lobe nearly fan-shaped.

**Remarks**

This species bears a close resemblance to *S. juxtaridleyi* Roth, 1995, but differs from the latter in the following: (1) subgenital plate with hind margin arcuate and produced in the middle, but in the latter coniform; (2) left posterolateral corner process of subgenital plate upturned and blunt at apex, but the process of the latter with apex acute; (3) L2vm with inner margin smooth, but the latter with inner margin minutely serrated; (4) left stylus absent, but the latter with left stylus.
**Etymology**
The specific epithet is derived from the Latin word “eurylobus”, referring to the subgenital plate being broad as a result of the protrusion on the left posterolateral corner.

**Distribution**
China (Hainan).

**Checklist of the species and subspecies of Symplocodes**

1. *Symplocodes amicus* Bey-Bienko, 1958: 673. (China)
2. *Symplocodes annamensis* (Hanitsch, 1927: 9, Ceratinoptera). (Vietnam, Thailand)
3. *Symplocodes impar* Bey-Bienko, 1969: 857. (India)
4. *Symplocodes juxtaridleyi* Roth, 1995: 997. (Thailand)
5. *Symplocodes manubria* Feng et Guo, 1990: 340. (China)
6. *Symplocodes marmorata* (Brunner von Wattenwyl, 1893: 19, Phyllodromia). (China, Myanmar, Thailand)
   Subspecies *Symplocodes marmorata marmorata* (Brunner von Wattenwyl, 1893: 19). (China, Myanmar, Thailand)
   Subspecies *Symplocodes marmorata tsaii* (Bey-Bienko, 1958: 673) comb. nov. (China)
7. *Symplocodes ridleyi* (Shelford, 1912: 660, Hemithyrsocera). (China, Singapore, Indonesia, Malaysia)
8. *Symplocodes euryloba* sp. nov. (China)

**Key to species and subspecies of Symplocodes worldwide (males)**

1. Right stylus present (Figures 2I, 3I, 4K–L, 6J, 7I).............................................................. 2
   Right stylus absent.............................................................................................................. *Symplocodes impar*
2. Hind margin of subgenital plate produced, left portion with a large or small process ................................................................................................................................. 3
   Hind margin of subgenital plate slightly produced to left, without process..........
   ............................................................................................................................................ *Symplocodes amicus*
3. Left stylus present................................................................. *Symplocodes juxtaridleyi*
   Left stylus absent (Figures 2I, 3I, 4K, L, 6J, 7I).................................................................. 4
4. Ventral surface of supra-anal plate with several spines near hind margin (Figures 2H, 3H, 4H–J).............................................................................................................. 5
   Ventral surface of supra-anal plate without spines (Figures 6H, I, 7H) ....................... 7
5. Left posterolateral margin of subgenital plate with a large and long handle-like process, pointed to the left and somewhat upwards; paraprocts without spine-like process (Figure 2H–I).............................................................................................................. *Symplocodes manubria*
Left posterolateral margin of subgenital plate with a small process, pointed to the lower left corner; paraprocts with several spine-like processes (Figures 3H, I, 4H–L) ................................................................. 6

6. Intercercal processes with apices divided into two to four spinous branches and upcurved; the upper branch obviously larger than the lower ones (Figure 4H–J) ................................................................. Symplocodes marmorata tsaii comb. nov.

Intercercal processes with apex tapering and each with a spine-like process pre-apically, which is connected to the main part of the process by membrane (Figure 3H) .................................................................................. Symplocodes marmorata marmorata

7. Seventh abdominal tergum modified, without setae in the middle (Figure 7G) .................................................................................. Symplocodes euryloba sp. nov.

Seventh abdominal tergum modified, with setae in the middle (Figure 6G) .... 8

8. Seventh abdominal tergum with reduced lateral lobes, subgenital plate with left posterolateral corner produced and elongated, apex slightly concave .................................................. Symplocodes annamensis

Seventh abdominal tergum without reduced lateral lobe, subgenital plate with left posterolateral corner produced and unevenly broad, apex broadly rounded (Figure 6G, J) .................................................................................. Symplocodes ridleyi

Discussion

Generally, when a cockroach walks on a smooth or rough surface, some of the tarsal pulvilli touch the substrate, but the arolia do not. The tarsal claws function only when the insect climbs rough surfaces (Bell et al. 2007). The claw dentation may produce a coupling when the insects stand or walk on plant surface with pubescences or setae. Both Chorisoserrata and Symplocodes have teeth on the inner margin of tarsal claws, but the number of teeth on the former (Figure 8A–C) is significantly less than in Symplocodes (Figure 8D–P) and the shapes of the claws and the teeth differ between these genera; distal teeth on claws are more valuable in climbing than those on the basal part of claws. In addition, both of these two genera possess tarsal pulvilli and arolia (Figures 8A–P, 9A–F), from which we could not arrive at a conclusion. We obtained a batch of Chorisoserrata (130 including adults and nymphs, preserved in alcohol) that had been provided by Prof. Shuqiang Li (Institute of Zoology, The Chinese Academy of Sciences) by means of canopy spraying conducted mainly in Hainan Province from 2009 to 2010. However, only 16 specimens of Chorisoserrata were obtained by traditional sweep collecting over the past few decades in Hainan and Guangxi. So we speculate that members of Chorisoserrata live in the canopy and are skilled at climbing, their claw dentation can provide a firm grasp on the plant surface even when there comes a gale. However, currently specimens of Symplocodes have been collected mainly in Yunnan with some from Hainan and Xizang but up until now no Symplocodes have been collected by canopy spraying. We have collected many Symplocodes by traditional sweeping in 2009. Arnold (1974) considered that the tarsal features are varied within cockroach families and among species that inhabit similar environments. On the other hand, different cockroach genera with similar tarsal features may inhabit different habitats. So we speculate that members of Symplocodes will not live in the canopy
Figure 9. (A–C) Tarsus of *Symplocodes ridleyi* (Shelford), male: (A) front leg; (B) middle leg; (C) hind leg. (D–F) Tarsus of *Chorisoserrata biceps* Wang et Feng, male: (D) front leg; (E) middle leg; (F) hind leg. Scale bars = 0.5 mm.
but occur on the ground, especially under dry branches and fallen leaves; their claw dentation may not or may seldom serve to climb but to clean their body since the shape of the dentate claws resembles a comb and the insects live in comparatively “dirty” environments, and since the claw bears larger teeth medially instead of distally.

There is a lack of knowledge about the function of the intercercal processes of cockroaches. In *Blattella germanica*, a pair of lateral sclerites, the paraprocts, grip the ovipositor valves from each side (Khalifa 1950). The function of intercercal processes may be similar to that of paraprocts and they may play a role in correctly fixing the mating position. The intercercal processes of *Symplocodes* differ in shape and size among individuals of the same species (Figures 4H–J, 6H, I), let alone among different species; therefore this feature does not contribute to reproductive isolation.

The higher taxonomy and female taxonomy of Blattodea have not yet been ideally established, especially the latter; so it also provides a long way for taxonomists to complete our knowledge of the natural history of *Symplocodes*. We consider a revision of the relationship between *Symplocodes* and *Hemithyrsocera* to be at first on the agenda. Hebard (1929) and Roth (1995) both stated these two genera are close to each other, especially Roth pointed that the only diagnostic character to separate them is the claw dentation. *Symplocodes* and *Hemithyrsocera* are similar and homologous in male genitalia, genital segments and tergal specialization, which are the most valuable characters in cockroach taxonomy; even the members of these two genera share the same habitats such as leaf litter and shrubwood (Figure 10). Therefore *Symplocodes* may be subordinate in *Hemithyrsocera*, with the claw dentation specialization as an autapomorphy within a larger and monophyletic *Hemithyrsocera* which may be paraphyletic at present condition. This issue should be studied in further research with molecular methods.

**Figure 10.** *Symplocodes ridleyi* (Shelford), from China, Yunnan Prov., Jinghong, Dadugang; (A) photographed by Guiqiang Huang; (B) photographed by Xinran Li (=Conlin McCat).
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Disclosure statement

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