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Brief Summary of Holochlorini (Orthoptera: Tettigoniidae: Phaneropterinae), with Description of Seven New Species from China

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Abstract

Inclusion of the tribe Holochlorini has been questionable, for its complicated history and its controversial important diagnostic character about structure of tibial tympana. Here we briefly introduce its history and summarize its inclusion in the world and in China. We also introduce a newly recorded genus from China, *Arnobia*, and other two genera in the tribe, *Psyrana* and *Phaulula*, provide a list of Chinese species for the three genera, separately, together with the key to species of the three genera. At the same time, we describe seven new species to science in the Holochlorini, i.e., *Arnobia hainanensis* **sp. nov.**, *Arnobia guangxiensis* **sp. nov.**, *Phaulula apicalis* **sp. nov.**, *Psyrana magna* **sp. nov.**, *Psyrana heptagona* **sp. nov.**, *Parapsyra brevicauda* **sp. nov.**, and *Sinochlora semicircula* **sp. nov.** Diagnostic illustrations are presented.

Key words: katydids, Holochlorini, Orthoptera, new species, China

Introduction

Bei-Bienko (1954) combined Brunner von Wattenwyl's (1878) Psyrae and Holochlorae as the tribe Holochlorini and provided detailed description and diagnostic characters of the tribe. At present, inclusion of the tribe Holochlorini needs to be carefully checked out. On one hand, the history of the two groups Psyrae and Holochlorae is very complicated after they were established. On the other hand, the diagnostic character that asymmetric tympana on the fore tibiae is exposed in the exterior side and conchate in the interior side needs to be in careful consideration, as many authors (Ragge 1980, Gorochov & Kang 2002) stated that the structure of tympana is maybe plesiomorphy.

Initially, Brunner von Wattenwyl (1878) stated two groups of genera named Psyrae and Holochlorae, which are characterized by the strong, acute fore coxal spine and by the asymmetric tympana on the fore tibiae, and included 11 genera, i.e., *Ancylecha* Serville, *Phygela* Stål, *Arnobia* Stål, *Tapeina* Brunner von Wattenwyl (synonymized as *Tapiena* Bolívar), *Casigneta* Brunner von Wattenwyl, *Elbenia* Stål, *Phaula* Brunner von Wattenwyl (synonymized as *Phaulula* Bolívar), *Psyra* Stål (synonymized as *Psyrana* Uvarov), *Holochlora* Stål, *Liotrachela* Brunner von Wattenwyl, and *Sympaestria* Brunner von Wattenwyl. Subsequently, Brunner von Wattenwyl (1891) added 7 genera, i.e., African *Weissenbornia* Karsch, Asian *Pyrgophylax* Brunner von Wattenwyl, *Dapanera* Karsch, *Gonatoxia* Karsch, *Habra* Brunner von Wattenwyl, *Calopsyra* Brunner von Wattenwyl, and *Plangiopsis* Karsch, in the two groups. Dohrn (1892) considered that the genus *Pyrgophylax* (which was considered as the synonym of *Molpa* Walker) should be removed from the two groups and put into the genus group Ephippithytae Brunner von Wattenwyl (1878). Kirby (1906) didn't follow Dohrn (1892) in the respect, and added Dohrn's 2 genera, *Dicranopsyra* Dohrn, and *Poecilopsyra* Dohrn in the two groups in his excellent list. Afterwards, Karny (1925a) treated all of these related genera as a big group "*Ancylecha-Holochlora*-group". He considered that the 3 genera, *Habra*, *Sympaestria*, and *Molpa* should be eliminated from the *Ancylecha-Holochlora*-group, and put into the genus group, Dysmorphae Brunner von Wattenwyl (1878). He also thought other 5 genera *Parapsyra* Carl, *Furnia* Stål, *Pseudopsyra* Hebard, *Stictophaula* Hebard, and *Poecilopsyra* should be added in the *Ancylecha-Holochlora*-group, among which *Furnia* was previously considered to belong to the genus group Anaolocomerae Brunner von Watte-

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nywl (1878) in Hebard (1922), due to its symmetric conchate tibial tympana. Recently Otte (1997) added *Pelerinus* Bolívar in the tribe Holochlorini in his list, and Rentz & Webber (2003) erected an Australian genus *Leucopodoptera* and put it into the tribe. Liu and Kang (2007a) presented a key to the Holochlorini genera from China, and added *Ruidocollaris* Liu (which resembles *Tapiena*), *Sinochlora* Tinkham and *Rectimarginalis* Liu and Kang (which resemble *Holochlora*) in the tribe. Maybe *Parapelerinus* Liu and Kang, 2008 also belongs to the tribe Holochlorini, because it is closely related to *Pelerinus*. Now in the latest online list (Eades *et al.* 2011), which is considered most of the changes, there record 26 genera in the Holochlorini in the world. Most genera that we mentioned above possess the asymmetric tympana, except that *Pelerinus*, *Leucopodoptera* and *Parapelerinus* possess symmetric exposed tibial tympana, and *Furnia* possesses symmetric conchate tibial tympana. In summary, total number of the genera in the tribe Holochlorini is maybe 27, but the monophyly and inclusion of the Holochlorini is also in need of additional investigations.

Recently many authors provided a few reviews or descriptions on the genera in the tribe Holochlorini from China, including its type genus *Holochlora* (Liu *et al.* 2008), *Stictophaula* (Gorochov & Kang 2005), *Pseuopsyra* (Liu & Kang 2006a), *Parapsyra* (Liu & Kang 2006b), *Rectimarginalis* (Liu & Kang 2007a), *Sinochlora* (Liu & Kang 2007b), *Parapelerinus* (Liu & Kang 2008), *Tapiena* (Liu & Kang 2010a) and *Ruidocollaris* (Liu & Kang 2010b). In this paper, we also report its other genera distributed in China, including *Psyrana*, *Phaulula*, and one new recorded genus in China, *Arnobia*, and describe 7 new taxa in the tribe. Until now, number of the recorded genera in the tribe Holochlorini from China is up to 11.

Methods and material

Terminology is based on Gorochov (1998) in *Arnobia*, Bey-Bienko (1954) in *Psyrana* and *Phaulula*, Liu & Kang (2006b) in *Parapsyra*, Tinkham (1945), and Liu & Kang (2007b) in *Sinochlora*.

Differentiation of species is based on of male stridulatory area of left and right tegmina, and male and female abdominal terminalia. Characters of male abdominal terminalia are most significant at specific level, which mainly include tenth abdominal tergum, cerci and subgenital plate. The stridulatory file on the underside of the male left tegmen also differs between species. The shape of female subgenital plate is the most useful character for separation of females. Posterior margin of the female tenth abdominal tergum always differs between species.

Key to species uses characters that are easily visible on dried speciemens.

All specimens were examined with a Leica MZ12.5 microscope. A camera lucida fixed on Leica Mz12.5 microscope was used to make drawings. Photographs of the male stridulatory area were taken with a Canon Powershot 50 digital camera fixed on Leica MZ12.5 microscope.

Material comes from the following three depositories, i.e., Insect Collection of Institute of Zoology, the Chinese Academy of Sciences, Beijing, China (IZAS); Institute of Entomology, the Chinese Academy of Sciences, Shanghai, China (MSIE); and Insect Collection of Beijing Agricultural University, Beijing, China (ICAU).

Arnobia Stål, 1876

Type species: *Locusta (Phaneroptera) pilipes* Haan, 1842 (Japan).

Arnobia Stål, 1876, Bihang Svenska Akad. iv (5): 56; Stål, 1878, Bih. Svenska Vet. Akad. Hnadl. Iv (5): 56; Brunner von Wattenwyl, 1878, Verh. zool.-bot. Ges. Vien 28: 19, 162; Brunner von Wattenwyl, 1891, Verh. zool.-bot. Ges. Vien. 41: 11; Jacobson & Bianchi, 1902-3, Orth. and Pseud. Russ. Emp.: 324, 336, 374; Kirby, 1906, Syn. Cat. Orth. 2: 423; Karny, 1923, Jour. Roy. Asiat. Soc., Malay. Branch 1: 139; Karny, J. Fed. Malay States Mus. 13(2-3): 88; Bey-Bieko, 1954, Fauna of the USSR, Vol.2, No. 2: 115.

Six species and subspecies are recorded mostly distributed in Thailand, Vietnam, Japan and Indonesia. Here we report two new species from Guangxi Province and Hainan Island, China.

Species included: type species, *Locusta (Phaneroptera) trichopus* Haan, 1842 (Java), *Stictophaula ocellata* Ingrisch, 1994 (Thailand), *A. vietensis* Gorochov, 1998 (Vietnam), *A. inocellata* Gorochov, 1998 (Thailand), *A. pilipes tropica* Gorochov, 1998.

Description. Bei-Bienko (1954).

Key to all known species of *Arnobia*

1. Lateral surface of tegmina with sparse ocellus-like spots on R-M area, which have light centre bordered dark rings; dorsal part of fore femora with 4 darkish spots and 4 yellowish spots 2
- Spots of tegmina and those on fore femora not as above 6
2. Male subgenital plate with two lateral and one median lobules (Plate 1f) 3
- Male subgenital plate with two lateral lobules and without median one (Plate 1h) 5
3. Dorsal part of male tegmina with a large darkening, nearly covered whole stridulatory area (Fig. 13, in Ingrisch 1994); apico-dorsal part of female tegmen with a dark spot occupying the center and extending outwards (Eades *et al.* 2011). Thailand . . . . . *Arnobia ocellata* (Ingrish, 1994)
- Not as above 4
4. Dorsal part of male tegmina darkish with lighter spot before narrow distal half (Fig. 82, in Gorochov 1998); apical-dorsal part of female tegmina just darkish with a distinctly light spot in the centre (Fig. 81, in Gorochov 1998). Vietnam . . . . . *Arnobia vietensis* Gorochov, 1998
- Dorsal part of male tegmina with three smaller darkenings distad, which were separated form each other by light spot; apical-dorsal part of female tegmina just darkish with a indistinct small light spot in the centre (Plate 1c). Hainan, China . . . . . *Arnobia hainanensis* **sp. n.**
5. Dorsal part of male tegmina with distinct darkening near apex and light spot on basal area (Fig. 84, in Gorochov 1998); lateral part of tegmina with several whitish short veinlets, usually situated into transparent spots, and round spots usually with dark rim. Java, Sumatra. . . . . *Arnobia trichopus* (Haan, 1842)
- Dorsal part of male tegmen respectively with a large dark brown spot in basal and apical area, and also with a small dark brown spot in the middle; each cell of tegminal Radial area with a large dark brown and white spot, and each cell of medial area with a large dark brown spot. Guangxi, China . . . . . *Arnobia guangxiensis* **sp. n.**
6. Female with basal dark spot somewhat larger and darkening before narrow distal part without light middle spot (Fig. 85, in Gorochov 1998); lateral part of tegmina with only sparse simple small darkened spots; fore femora with 2 groups of rather sparse darkish dots on their proximal half. Female subgenital plate with apical margin widely roundly emarginated. Thailand . . . . . *Arnobia inocellata* Gorochov, 1998
- Darkenings of dorsal part of female tegmina large, rounded. Lateral part of tegmina with intensively green oblique bands. Female subgenital plate rather narrow, with almost truncated apex . . . . . *Arnobia pilipes tropica* Gorochov, 1998

Arnobia hainanensis sp. nov.

(Plate 1a, c–f, i–j)

Holotype: male, China: Hainan Island: Baisha, Yinggeling Nature Reserve, 2009.V.11, Coll. Dang Lihong (IZAS).

Paratype: China: Hainan Island: Jianfengling, 1 female, 1982.VII.6, Coll. Liu Yuanfu (IZAS); 1 male, 1983.IV.7, Coll. Gu Maobin (IZAS).

Description. Size median. Male stridulatory area with posterior margin sinuate; stridulatory vein cambered; stridulatory file on the underside of left tegmen with about 150 sparsely arranged fine teeth (Plate 1a). Male tenth abdominal tergum normal, with apical margin approximately truncated (Plate 1d). Male supraanal tergite perpendicularly deflexed. Male cerci very long, incurved, robustest at the basal 1/5 part, then equally incurved and gradually acuminated, with apical spine indistinct (Plate 1d,e). Male subgenital plate short, with the basal margin widest, then gradually narrowed, concave ventrad, apical margin with distinct median lobule smaller than lateral apical ones (Plate 1f).

Ovipositor less than twice as long as the length of pronotum, slightly incurved, compressed; lateral surface smooth and both margins thoroughly not serratulate, with apex of dorsal margin blunt (Plate 1i). Female subgenital plate triangular, with apex wide rounded (Plate 1j).

Color. Dark green. Pronotal disc and lateral lobe densely covered brown spots. Tegminal dorsal part respectively with a large dark brown spot in basal, middle and apical area as to male; as to female, basal part and apical part also with a dark brown spot; every cell between radial vein and cubital vein with a large dark brown spot. Dorsal surface of anterior femur with three large stripes which are aggregated with many black dots, and anterior tibiae densely covered black dots, and middle and hind femur and tibiae densely covered brown dots.

Measurements (in mm). Length of body: male 25.0, female 28.0; length of pronotum: male 5.8, female 6.5; length of tegmen: male 40.0, female 41.0; largest width of tegmen: male 10.0, female 10.5; length of hind wing: male 45.0, female 46.0; length of posterior femur: male 20.0, female 24.0; length of ovipositor 9.0.

Etymology. The name refers to the type locality of the species.

Discussion. The new species resembles *A. vietensis* Gorochov, 1998 and *A. ocellata* (Ingrisch, 1994) in the coloration of tegmen and shape of male subgenital plate, but differs from those by the size slightly larger and female subgenital plate with apical margin wide obtuse. And it also differs from *Arnobia vietensis* by the male subgenital plate with a slightly larger median lobule and female tegminal dorsal part with a pair of rather large dark spots, it also differs from *A. ocellata* by female ovipositor rather short.

Distribution. China (Hainan Island).

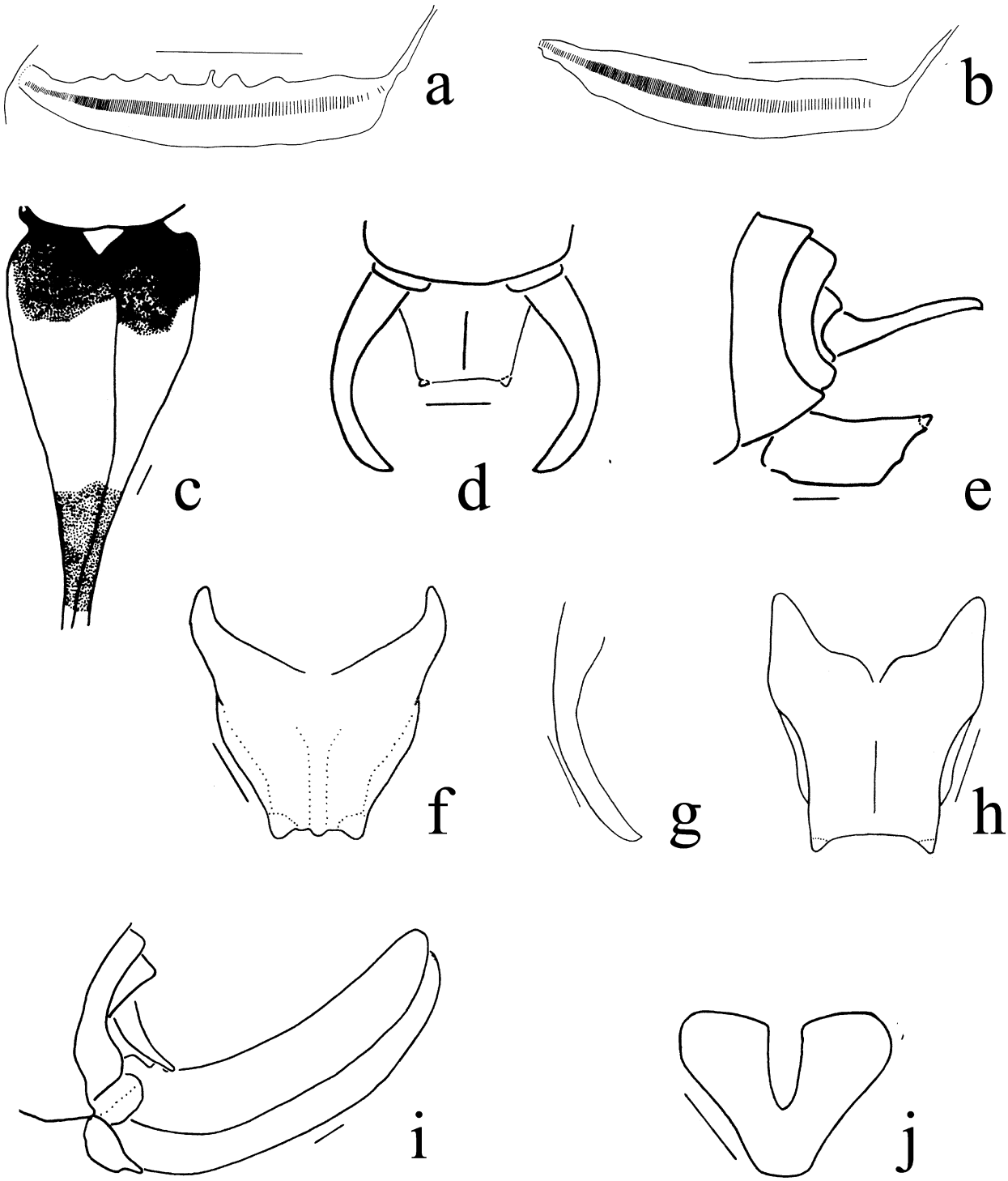

PLATE 1. *Arnobia* species. a, c–f, i–j. *A. hainanensis* **sp. nov.**; b, g–h. *A. guangxiensis* **sp. nov.**. a, b. stridulaltory file underside of male left tegmen; c. tegminal dorsal part of female in dorsal view; d. male abdominal apex in lateral view; e. male abdominal apex in lateral view; f, h. male subgenital plate in ventral view; g. male cerci in dorsal view; i. female abdominal apex in lateral view; j. female subgenital in dorsal view.

***Arnobia guangxiensis* sp. nov.**
(Plate 1b, g–h)

Holotype: male, China: Guangxi Prov.: Longzhou, Nonggang, 1982.V.20, Coll. Li Fasheng (ICAU).

Paratype: 1 male, same data as in holotype; 1 male, China: Guangxi Prov.: Longzhou, Longhu, 1980.VI.17, Coll. Weilin (ICAU).

Description. Size median. Male stridulatory area with posterior margin sinuate; stridulatory vein cambered; stridulatory file on the underside of left tegmen with about 153 sparsely arranged fine teeth. Male tenth abdominal tergum normal, with apical margin approximately truncated (Plate 1b). Male supraanal tergite perpendicularly deflexed. Male cerci very long, incurved, robustest at the basal 1/5 part, then equally incurved and gradually acuminated, with apical spine indistinct (Plate 1g). Male subgenital plate short, with the basal margin widest, then gradually narrowed, concave entad, apical margin with rather large apical lobules and without median one (Plate 1h).

Female unknown.

Color. Dark green. Pronotal disc and lateral lobe with sparse brown dots. Male tegminal dorsal part respectively with a large dark brown spot in basal and apical area, and also with a small dark brown spot in the middle; each cell of tegminal Radial area with a large dark brown and white spot, and each cell of medial area with a large dark brown spot. Dorsal surface of anterior femur with three large stripes which are aggregated with many black dots, and internal surface of anterior femur with a row of regular black spots; median and posterior femur and tibiae densely with brown dots.

Measurements of male (mm). length of body 22.0; pronotum 6.5; length of tegmen 42.0; width of tegmen 10.5; length of anterior femur 7.5; length of median femur 10.5; length of posterior femur 24.0.

Etymology. The name refers to the type locality of the species.

Discussion. The new species resembles in *A. trichopus* (Haan, 1842) in the apical margin of male subgenital plate without median lobule, but differs in the large size, coloration and tegminal venation. It resembles differs *Anobia hainanensis*, *Arnobia ocellata* (Ingrisch, 1994), *A. vietensis* Gorochov, 1998 in the coloration of tegminal lateral part, but distinctly differs from those by coloration of male tegminal dorsal part, the apical margin of male subgenital plate without median lobule.

Distribution. China (Guangxi Province).

Phaulula Bolívar, 1906

Type species: *Phaulula laevis* Brunner von Watterwyl., 1878.

Phaulula Bolívar, 1906, Mem. Soc. espan. Hist. nat. 1: 347; Willemse, 1951, Eos Tomo extraord. 1950 [1951]: 332; Bey-Bienko, 1954, Fauna of the USSR, Vol. 2, No. 2: 105; Kevan, 1987, in Baccetti, Evol. Biol. Orth. Inst.: 319.

Dichophaula Karny, 1926, Treubia 9: 101; Willemse, 1961, Eos Tomo extraord. 1960[1961]: 335; Kevan, 1987, in Baccetti, Evol. Biol. Orth. Inst.: 319 (Syn. of *Phaulula* Bolívar, 1906)

Phaula Brunner von Wattenwyl, 1878, Verh. zool.-bot. Ges. Wien 28: 20, 167; Brunner von Wattenwyl, 1891, Verh. zool.-bot. Ges. Wien 41: 1, 79; Jacobson & Bianchi, 1902-3, Orth. and Pseud. Russ. Emp.: 324, 336, 375; Kirby, 1906, Syn. Cat. Orth. 2: 425; Bolívar, 1906, Mem. Soc. espan. Hist. nat. 1: 347; Bey-Bienko, 1954, Fauna of the USSR, Vol. 2, No. 2: 105; Ragge, 1968, Bull. Brit. Mus. Nat. Hist. Ent. 22(2): 93.

Phauloidea Matsumura & Shiraki, J. Coll. Agric. Tohoku. Imp. Univ. 3(1): 5; Karny, 1926a, Treubia 9(1-3): 90 (syn. of *Phaulula* Bolívar, 1906); Furukawa, 1938, Zool. Jap., 17: 548; Bey-Bienko, 1954, Fauna of the USSR, Vol. 2, No. 2: 105.

Brunner von Wattenwyl (1878) erected the genus *Phaula* for two species *Phaula laevis* Brunner von Wattenwyl, 1878 and *Phaula rugulosa* Brunner von Wattenwyl, 1878 from Philippines, and then Brunner von Wattenwyl (1891) described other ten species from Sumatra. Afterwards, Bolívar (1906) substituted the name *Phaulula* for *Phaula* due to the occupation. Hebard (1922) transferred part of species into *Stictophaula* Hebard, and Karny (1926) transferred some species into the genus *Dichophaula* Karny. However, Kevan (1987) didn't agree with Karny (1926), and considered *Dichophaula* as a synonym of *Phaulula*. In addition, *Phauloidia* Matsumura et Shiraki also was found to be a synonym of *Phaulula* (Karny 1926a, Furukawa 1938). Now in the latest online list (Eades *et al.* 2011), which is considered all these changes and newly added species, there record 27 species in *Phaulula*.

Here we describe one new species from southeastern China, where two known species are also distributed.

Description. Bei-Bienko (1954).

Key to species of *Phaulula* from China

1. Male tenth abdominal tergum with base wide, gradually tapering before distal quarter, distal quarter with both parallel margins until triangular apex (Plate 2d,e; 3b,c); male subgenital plate wide, short, apical margin with obtuse triangular notch (Plate 2g, 3e). Female subgenital plate wide triangular, lateral margin by step in middle (Plate 3g). . . . . *Ph. apicalis* **sp. nov.**
- Male tenth abdominal tergum with base wide, gradually tapering before apex distal part slightly widened, then gradually narrowed toward converse triangular apex; male and female subgenital plate not as above. 2
2. Size rather great. Protrudent part of male tenth abdominal tergum strongly deflexed, with apex dorsally sharp; male subgenital plate emarginated, with styli short. Female subgenital plate with rounded apex . . . . . *Ph. macilenta* Ichikawa, 2004
- Size rather small. Protrudent part of male tenth abdominal tergum straight, not strongly deflexed, with apex dorsally rounded; male subgenital plate with notch rounded, and styli distinct, short. Female subgenital plate emarginated . . . . . *Ph. daitoensis* (Matsumura & Shiraki, 1908)

Phaulula apicalis sp. nov.

(Plate 2 a–g, plate 3 a–g)

Holotype: female, China: Hainan Island: Baisha, Yinggeling Nature Reserve, 2005.VIII.29-IX.4, Coll. Liu Chunxiang (IZAS).

Paratype: 1 female same data as the holotype; 1 female, China: Hainan Island: Baoting, 80m, 1980.VII.24, Coll. Li Changqing (IZAS); 1 male, China: Guangdong: Dianbai, Xiaoliang, 1982.VI.12-17, Coll. Xie Yingshu (MSIE); 1 female, China: Guangdong: Taishan, Shangchuan Island, 1989.VII.4, Coll. Liang Geqiu (MSIE).

Description. Female (holotype). Size median. Fastigium verticis dorsally sulcate, with apex obtuse, not deflexed, narrower than the first segment of antennae, not joining the fastigium frons. Antennae thin, long, flexible. Compound eyes produced. Pronotal disc with prozona smooth and metazona flat, with longitudinal median carina complete and without lateral carina; anterior margin approximately straight, posterior margin obtuse rounded; median transverse furrow "V"-like; lateral lobe of pronotum higher than long, with anterior margin slightly concave, ventral margin oblique backwards, and posterior margin slightly obtuse; humeral sinus distinct.

Tegmen extending beyond apex of posterior femur, hind wing longer than tegmen. Costa vein not distinct, Sc and R running close until the middle of tegmen. Rs vein branching from the middle of the tegmen, not bifurcate; R stem also with more 3 lateral branches to the posterior margin of tegmen. Anterior coxae with a distinct spine. Anterior femur with 5 interior ventral spines; median femur with 4 exterior ventral spines; posterior femur with 5 exterior and 7 interior ventral spines. Anterior tibiae dorsally sulcate; median femur with 3 interior dorsal spines; posterior tibiae with 32 exterior and 35 interior dorsal spines. Each genicular lobe with 1 large and 1 small spines.

Supra-anal plate triangular. Cerci conical, incurve. Ovipositor rather narrow, as long as two and a half times of length of pronotum, with lateral surface smooth, apex of dorsal margin sharp, apical sixth part of dorsal margin and apical 1/4 part of ventral margin crenulated (Plate 3f). Subgenital plate pentagonal, with lateral margin convex, and apical margin obtuse (Plate 3g).

Male. Structure of tegminal veins similar to the female (Plate 2a). Stridulatory file on underside of left tegmen cambered on the whole, basal eighth part with about 20 fine teeth, which gradually becoming larger distad, and remaining seven eighths part with about 50 densely arranged equal-sized big teeth (Plate 2f, 3a). Tenth abdominal tergum strongly produced, in dorsal view, base widest, gradually narrowed until distal fifth, which bearing approximately parallel lateral margins, and wide triangular apical margin (Plate 2e, 3b); in lateral view, apical half slightly deflexed, with apical margin truncated, middle third dorsally swollen and distinctly ventrally concave (Plate 2d, 3c). Cerci distinctly longer than subgenital plate (Plate 2d, 3d). Subgenital plate with basal part wide, short, distal 2/5 slightly contracted, trapeziform, gradually narrowed, apical margin with a rather large short triangular notch, shaped into posterior lateral false styli; ventral surface with distinct central and lateral carinae (Plate 2g, 3e).

Color. Yellow green (green in life). Compound eyes brown. Antenna yellowish green. Tegmen green.

Measurements (mm). length of body: male 23.2, female 24.0; length of pronotum: male 5.5, female 5.5; length of tegmen: male 32.6, female 34.0; largest width of tegmen: male 8.4, female 8.0; length of hind wing: male 34.1, female 35.5; length of posterior femur: male 20.3, female 19.0; length of ovipositor: 13.0.

Etymology. The name refers that the new species possesses special male and female apex.

Discussion. The new species differs from other congeners by the shape of the male tenth abdominal tergum, the male subgenital plate, and the female subgenital plate.

Distribution. China (Guangdong Province, Hainan Island).

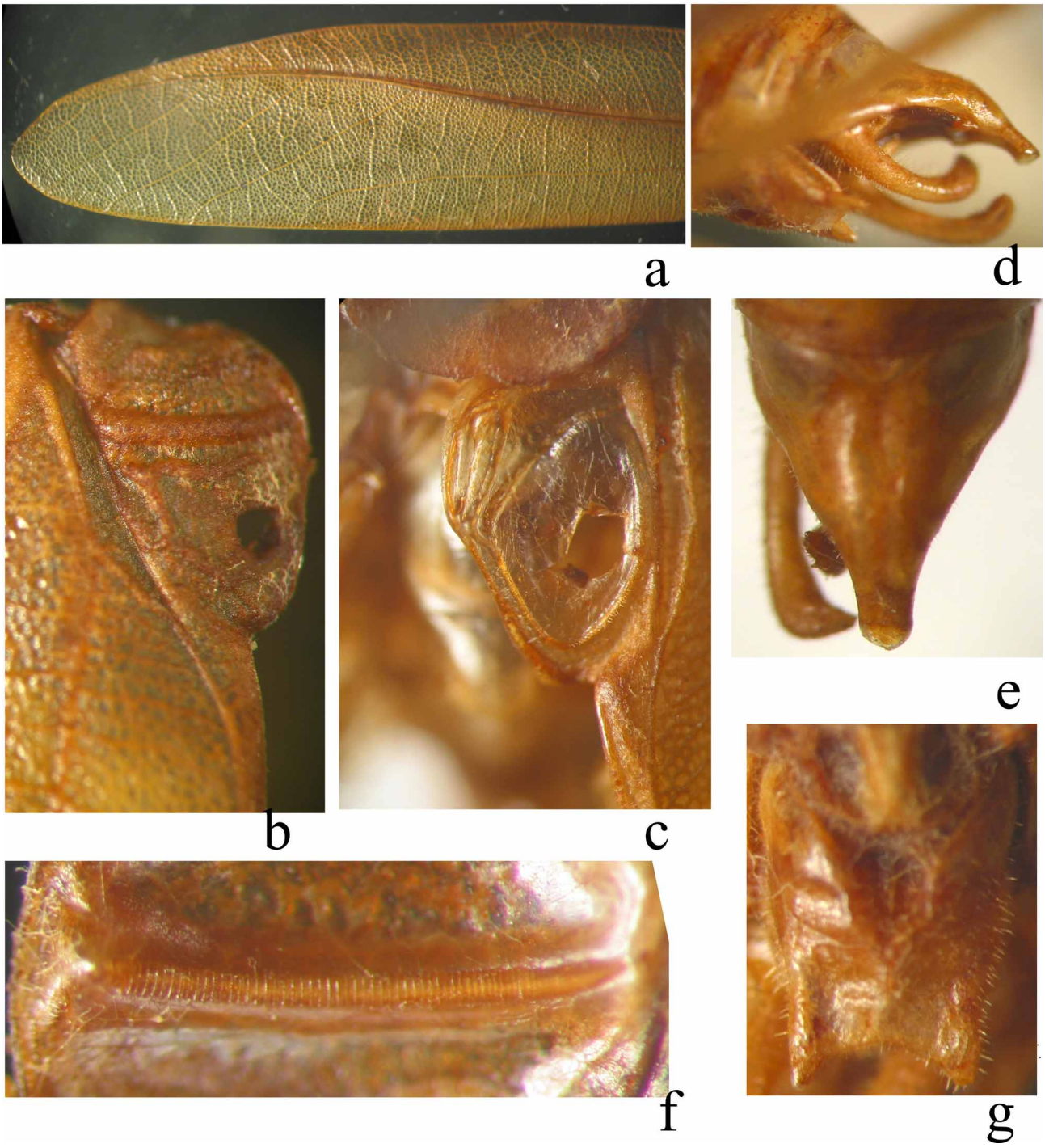

PLATE 2. Colour photograph of *Phaulula apicalis* **sp. nov.**. a, photograph of male tegmen, lateral view; b, photograph of male left stridulatory area, dorsal view; c, photograph of male right stridulatory area, dorsal view; d, photograph of male abdominal apex, lateral view; e, photograph of male tenth abdominal tergum, dorsal view; f, photograph of male stridulatory file on underside of left tegmen; g, photograph of male subgenital plate, ventral view.

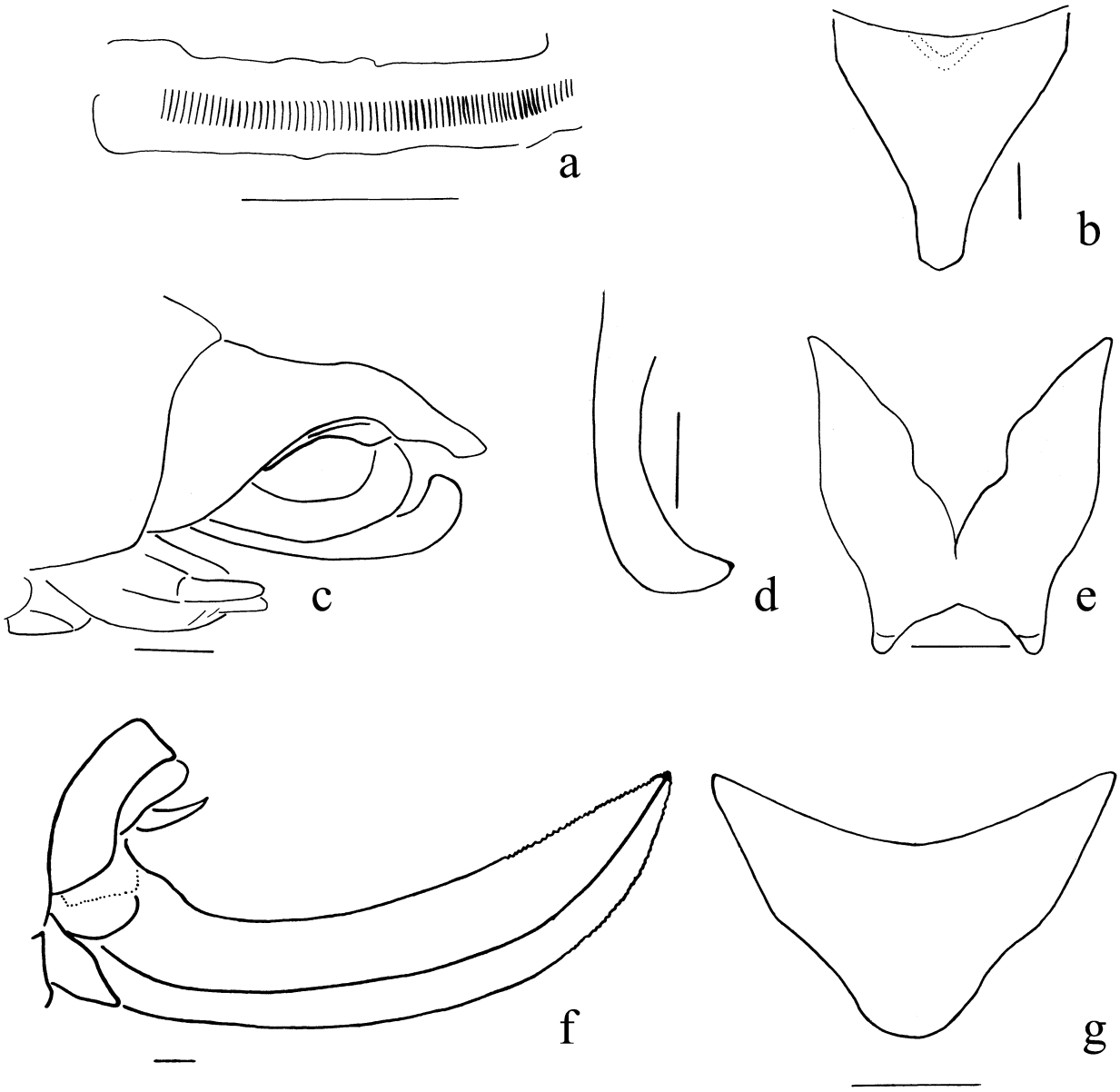

PLATE 3. *Phaulula apicalis* **sp. nov.**. a, stridulaltory file underside of male left tegmen; b, male tenth abdominal tergum, dorsal view; c, male abdominal apex, lateral view; d, male cerci, dorsal view; e, male subgenital plate, ventral view; f, female abdominal apex, lateral view; g, female subgenital plate, ventral view.

Phaulula daitoensis (Matsumura and Shiraki, 1908)

Phauloidia daitoensis Matsumura and Shiraki, 1908, J. Coll. Agric. Tohoku Imp. Univ. 3(1): 13. (Syntypes M,F, origi. descrip.; type localities: Taiwan, Koshun, Japan, Daito, Okinawa; Type depository: Matsumura's Coll.);
Phaulula daitoensis: Furukawa, 1938, Zool. Jap., 17: 558, 559; Bei-Bienko, 1954, Fauna of the USSR, Vol. 2, No. 2: 106.

Distribution. China (Taiwan Island); Japan.

Phaulula macilenta (Matsumura and Shiraki, 1908)

Phauloidia gracilis Matsumura and Shiraki, 1908, J. Coll. Agric. Tohoku Imp. Univ. 3(1): 14. (Syntypes M,F, origi. descrip.; type localities: Taiwan, Hokuto; Okinawa; Type depository: Matsumura's Coll.);
Phaulula gracilis: Furukawa, 1938, Zool. Jap., 17: 558, 559; Bei-Bienko, 1954, Fauna of the USSR, Vol. 2, No. 2: 106.
Phaulula macilenta Ichikawa, 2004. Tettigonia: Memoirs of the Orthopterological Society of Japan (Tettigonia), 6: 15 [nom. nov. pro *P. gracilis* (Matsumura and Shiraki, 1908)]

Distribution. China (Taiwan Island); Japan.

Psyrana Uvarov, 1940

Type species: *Psyra melanonota* Stål, 1876.
Psyrana Uvarov, 1940, Ann. Mag. Nat. Hist. (11) 6:117; Bey-Bienko, 1954, Fauna of the USSR, Vol.2, No. 2: 108.
Psyra Stål, 1876, Oefv. Vet.-Akad. Forh. 33(3): 55; Brunner von Wattenwyl, 1878, Verh. zool.-bot. Ges. Wien 28: 169, 170; Brunner von Wattenwyl, 1891, Verh. zool.-bot. Ges. Wien 41: 13, 87; Kirby, 1906, Syn. Cat. Orth. 2: 427; Karny, 1906, J. Fed. Malay States Mus. 13(2-3): 99; Uvarov, 1940, Ann. Mag. NAT. Hist. (11) 6: 117; Bei-Bienko, 1954, Fauna of the USSR, Vol. 2, No. 2: 105.

Uvarov (1940) substituted *Psyra* for *Psyrana*, which was erected by Stål (1876), due to preoccupation. Subsequently, many authors (Brunner von Wattenwyl, 1878, 1891; Kirby, 1900; Fritze & Carl, 1908; Karny, 1920, 1923, 1931; Carl, 1921; Shiraki, 1930; Willemse, 1933, 1953; Ichikawa, 2001) described 22 species and 2 subspecies, among which 18 species were described from Oriental Region, 4 species and 2 subspecies were distributed in Japan. Recently there has been recorded one species *Psyrana japonica* Shiraki from Taiwan Island (Huang, 2004), and no other species from China mainland. In this paper, we describe two new species, one from China, another from Vietnam.

Description. Bei-Bienko (1954).

Key to species of *Psyrana* known from China

1. Metazona of pronotum with a black transverse stripe in middle or posterior margin. Female subgenital plate not as below . . . 2
- Metazona of pronotum without a black transverse stripe. Female subgenital plate approximately heptagonal, with lateral margin firstly convex then concave, and apical margin blunt (Plate 5g). Male unknown . . . . . *Ps. heptagona* **sp. nov.**
2. Size large. Metazona of pronotum with a black transverse stripe in middle (Plate 4e). Male cerci conical, with apex abruptly incurved (Plate 5b). Female subgenital plate approximately circular, with apical margin emarginated (Plate 5e). . . . . *Ps. magna* **sp. nov.**
- Size medium. Metazona of pronotum with a black transverse stripe along posterior margin. Male cerci robust at base, cylindrical, shaped a long sharp spine, deflexed and strongly incurved; dorsal portion forked in the middle, apex sharp. Female subgenital plate approximately heptagonal, with lateral margins convex basally, and then concave towards blunt apex. . . . . *Ps. japonica* Shiraki, 1930

Psyrana magna sp. nov.

(Plate 4 a–e, plate 5 a–f)

Holotype: male, at light, China: Guangxi Province, Guilin, Huaping National Nature Reserve, Cujiang Spot, 2007.VI.28, Coll. Liu Chunxiang (IZAS).

Paratype: 1 female, China: Guangxi Prov., Longsheng, Baiyan, 150m, 1963.VI.18, Coll. Wang Chunguang (IZAS).

Description. Male (Holotype). Size large. Fastigium verticis dorsally sulcate, with obtuse apex; not deflexed, narrower than first segment of antennae, not touching fastigium frons. Antennae thin, long, flexible. Compound eyes produced. Pronotal disc with prozona smooth and metazona flat, with longitudinal median carina complete and without lateral carina; anterior margin approximately straight, posterior margin obtuse rounded; median transverse furrow "V"-like; lateral lobe of pronotum about high as long, with anterior margin slightly concave, ventral

margin obtuse, and posterior margin straight; humeral sinus distinct (Plate 4a,e). Anterior coxae with a distinct spine. Anterior femur with 7 interior ventral spines; median femur with 7 exterior ventral spines; posterior femur with 7 exterior and 6 interior ventral spines. Anterior tibiae dorsally sulcate and with 4 interior spines; median tibiae with 10 interior and 8 exterior dorsal spines; posterior tibiae with 34 exterior and 28 interior dorsal spines. Each genicular lobe with 1 large middle sharp spine and 1 small lower one.

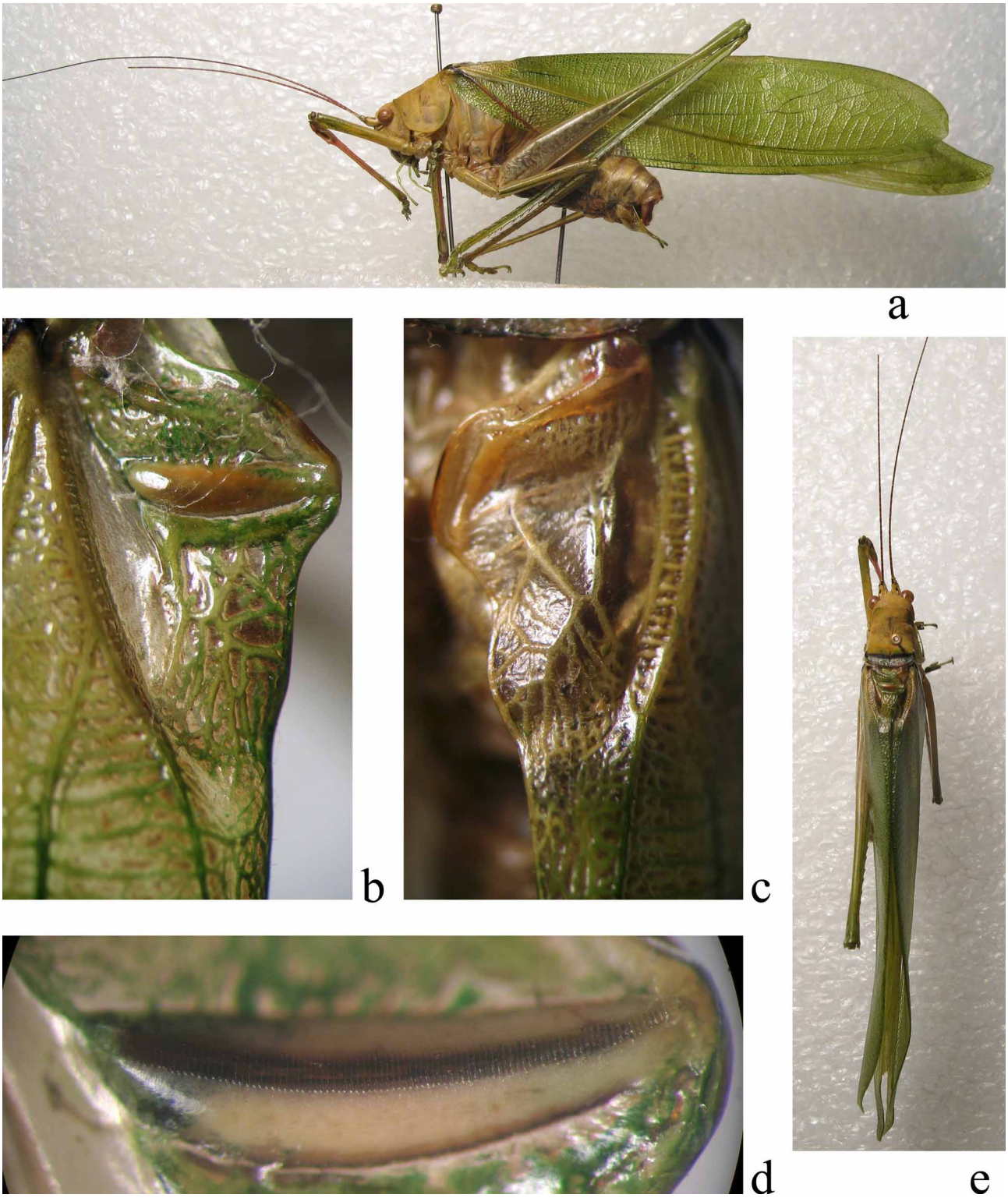

PLATE 4. Colour photograph of *Psyrana magna* **sp. nov.**. a, photograph of male whole body in lateral view; b, photograph of male left stridulatory area in dorsal view; c, photograph of male right stridulatory area in dorsal view; d, photograph of male whole body in dorsal view; e, photograph of male stridulatory file on underside of left tegmen.

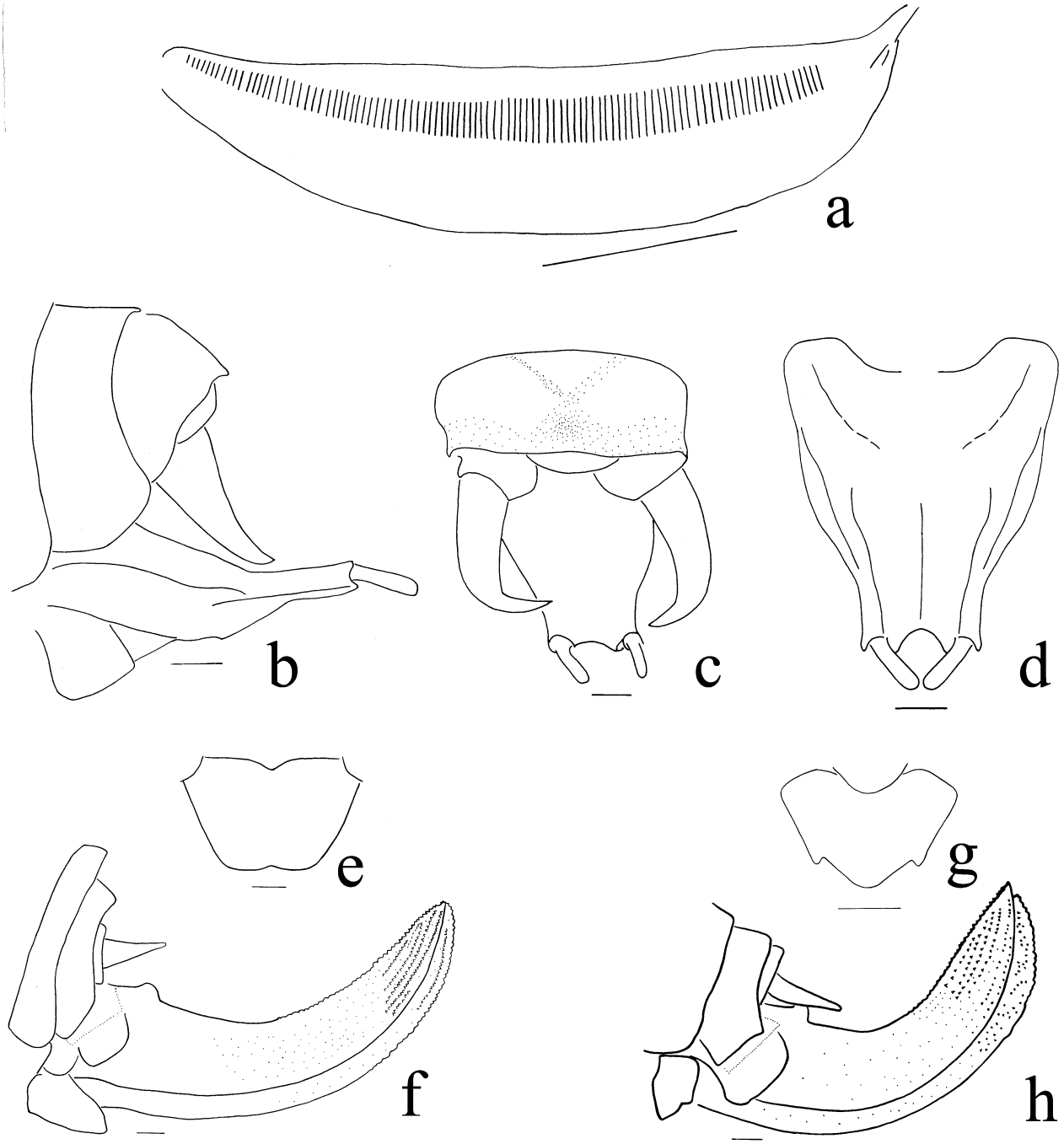

PLATE 5. a–f, *Psyrana magna* **sp. nov.**; g–h, *Psyrana minor* **sp. nov.**. a, stridulatory file on underside of left tegmen; b, male abdominal apex, lateral view; c, male abdominal apex, dorsal view); d, male subgenital plate in ventral view; e, g, female subgenital plate ventral view?f, h, female abdominal apex in lateral view.

Tegmen extending beyond apex of posterior femur, hind wing longer than tegmen (Plate 4a,e). Costa vein indistinct, Sc and R running closely until middle of tegmen. Rs vein branching slightly before middle of tegmen, bifurcate; R stem without other lateral branches (Plate 4a).

Male stridulatory file on underside of left tegmen with about 100 densely arranged fine teeth, which gradually becoming smaller from middle towards both ends (Plate 4d,5a). Male tenth abdominal tergum normal, not strongly specialized, central part of dorsal surface with an "X"-like concavity, apical margin emarginated in middle (Plate 5c). Cerci robust, conical, apex incurved into an acute angular spine (Plate 5b,c). Subgenital plate elongate, base widest, gradually tapering towards middle, abruptly constrict at distal half; distal quarter with approximately parallel lateral margins, apical margin with a semicircular concavity in middle; styli slender, as long as quarter length of subgenital plate (Plate 5c,d).

Female. Supra-anal plate semi-circular. Cerci short, robustest at base, then abruptly sharpened, conical, equally incurve (Plate 5f). Ovipositor rather narrow, but not twice longer than length of pronotum; apical third part of lateral surface denticulate; apical 2/3 part of dorsal margin and apical 1/3 part of ventral margin crenulated, apex of dorsal margin sharp (Plate 5f). Subgenital plate approximately rounded, with apical margin emarginated (Plate 5e).

Color. Light green. Compound eyes brown. Antenna yellowish green. Metazona of pronotum with a black transverse stripe. Ventral spines of femur with tips dark brown. Base of Sc vein of tegmen with black dots. Anal area close to posterior margin with many small brown dots.

Measurements (mm). length of body: male 30.5, female 34.0; length of pronotum: male 5.0, female 8.0; length of tegmen: male 51.5, female 55.0; largest width of tegmen: male 11.5, female 13.5; length of hind wing: male 32.5, female 33.5; length of posterior femur: male 32.5, female 33.5; length of ovipositor 15.0.

Etymology. The name refers that the new species is large-sized, compared with other congeners.

Discussion. The new species differs from other congeners by the large size, the shape of the male tenth abdominal tergum, the male subgenital plate, the female subgenital plate, and the female ovipositor.

Distribution. China (Guangxi Province).

***Psyrana heptagona* sp. nov.**
(Plate 5 g–h)

Holotype: female, KIBVNE, 1931.IX.23, Coll. K. EKI (IZAS).

Description. Size median. Fastigium verticis dorsally sulcate, with obtuse apex; deflexed towards frons, narrower than first segment of antennae, not contacting fastigium frons. Antennae thin, long, flexible. Compound eyes oval, produced. Pronotal disc with prozona smooth and metazona flat, with longitudinal median carina complete and without lateral carina; anterior margin approximately straight, posterior margin slightly rounded and approximately truncated; median transverse furrow "V"-like; lateral lobe of pronotum about as long as high, with anterior margin slightly concave, ventral margin obtuse, and posterior margin straight; humeral sinus distinct. Anterior coxae with a distinct spine. Anterior femur with 6 interior ventral spines; median femur with 4 exterior ventral spines; posterior femur with 7 exterior and 6 interior ventral spines. Anterior tibiae dorsally sulcate and with 3 spines as well as 1 spine above tympana; median femur with 10 exterior and 6 interior dorsal spines; posterior tibiae with 30 exterior and 29 interior dorsal spines. Each genicular lobe with 1 large median spine and 1 small lower one.

Tegmen extending beyond apex of posterior femur, hind wing longer than tegmen. Costa vein indistinct, Sc and R running closely until middle of tegmen. Rs vein branching slightly before middle of tegmen, bifurcate at right tegmen (not bifurcate at left tegmen); R stem also with more 2 lateral branches to posterior margin of tegmen.

Epiproct plate triangular, wider than long. Cerci conical, robustest at base and then gradually tapering, slightly incurve. Ovipositor rather narrow, not twice longer than length of pronotum; apical 1/3 part of lateral surface denticulate; apical 1/2 part of dorsal margin and apical 1/4 part of ventral margin crenulated, and apex of dorsal margin sharp (Plate 5h). Subgenital plate approximately heptagonal, with lateral margin spreading outwards in basal part, and then running inwards towards apex; apical margin obtuse (Plate 5g).

Color. Yellow green (maybe green at alive). Compound eyes brown. Antenna yellow green. Spines of posterior leg with tip brown. Tegmen green, Costa red brown, base of Sc vein with black dots. Apical 1/4 part of ovipositor brown.

Male unknown.

Measurements of female (mm). length of body 27.0; length of pronotum 5.5; length of tegmen 38.5; largest width of tegmen 9.5; length of hind wing 42.0; length of posterior femur 29.0; length of ovipositor 11.0.

Etymology. The name refers to the shape of the female subgenital plate of the new species.

Discussion. The new species differs from other congeners by the shape of the female subgenital plate and ovipositior.

Distribution. Vietnam.

Psyrana japonica (Shiraki, 1930)

Psyra japonica Shiraki, 1930, Trans. Nat. Hist. Soc. Formosa, 20(111): 339
Psyrana japonica: Uvarov, 1940, Ann. Mag. nat. Hist., 11(6): 117
Psyrana japonica: Huang, 2004: 62–64; figs. 45–47.

Distribution. China (Taiwan Island), Japan, Korea.

Parapsyra Carl, 1914

Type species (by monotypy): *Parapsyra notablis* Carl 1914.
Parapsyra Carl, 1914, Rev. Suisse Zool. 22: 547; Karny, 1926, J. Fed. Malay States Mus. 13(2-3): 99; Liu & Kang, 2006b, Ori. Insects 40: 219–230.

Description. Carl (1914); Liu & Kang (2006b).

Parapsyra brevicauda sp. nov.
(Plate 6 a–g)

Holotype: males, at light, China: Jiangxi Prov.: Jiulianshan [Mt.], 580m, 2000.VII.24-30, Coll. Yuan Decheng (IZAS).

Paratype: 1 male, same in holotype (IZAS); 5 males, 2 females, China: Jiangxi Prov.: Jiulianshan [Mt.], 590m, 2000.VIII.28, Coll. Ding Dongsun (IZAS); 1 male, China: Fujian Prov., Jianyang, 1982.VII.18, Coll. Wu Jianyi (MSIE); China: Guangxi Prov.: Guilin, Huping National Nature Reserve, Cujian Spot, 4 males, 2 females, 2007.VI.28, 23 males, 24 females, 2007.IX.27–X.3, Coll. Liu Chunxiang (IZAS).

Description. Anterior coxae with a distinct spine. Anterior femur with 4 interior ventral spines; median femur with 3 exterior ventral spines; posterior femur with 2 exterior ventral spines. Anterior tibiae dorsally sulcate and with 2 interior dorsal spines; median tibiae with 4 exterior dorsal spines; posterior tibiae with 28 exterior and 34 interior dorsal spines. Each genicular lobe with 1 large middle sharp spine and 1 small lower one.

Stridulatory file on underside of left tegmen rather short, totally with about 60 densely arranged teeth which becoming larger from both sides to the center (Plate 6b,c). Tenth abdominal tergum normal, with apical margin emarginated. Epirpoct broad, triangular, with apex obtuse. Cerci robust, short, gradually acuminated at basal half area, exterior and interior margins sub-parallel at distal half, and apical part slightly incurved with a small spine (Plate 6e). Subgenital plate elongate, basal part wide, gradually tapering, and apical third part with lateral margins slightly outspreading; apical margin with a rather sharp shallow obtuse notch as long as one third length of styli; styli thick, short (Plate 6d).

Female: Subgenital plate short, wide, triangular, without distinct middle carina; lateral margin approximately straight, apex sharp angular (Plate 6f). Ovipositor narrow, shorter than twice length of pronotum; lateral surface granulated and densely covered with teeth; dorsal margin strongly serrated, and ventral margin with dense obtuse teeth (Plate 6g).

Color. Body green. Antennae dark brown, with sparse white annulation. Lateral margin of occiput with dark brown markings. Both lateral margins of pronotal disc edged by systematrical dark brown stripes, and posterior margin of pronotal disc edged by a dark brown margin (Plate 6a). Tegmen green, Sc, R and MA vein brown, basal part which R and M vein joining at is black; each cell of distal half of R-M area interspersed with sparse dark brown dots; area near posterior margin densely with brown dots. Hind wing transparent, only with apex slightly green. Anterior femur with rows of black dots. Ovipositor dark brown.

Measurements (mm). Length of body: male 22.5, female 22.5; length of pronotum: male 4.5, female 5.5; length of tegmen: male 39.5, female 42.3; largest width of tegmen: male 6.0, female 7.0; length of hind wing: male 44.5, female 47.5; length of anterior femur: male 7.5, female 9.5; length of median femur: male 12.5, female 13.0; length of posterior femur: male 34.4, female 35.5; length of anterior tibiae: male 9.6, female 11.0; length of median tibiae: male 14.0, female 15.5; length of posterior tibiae: male 34.4, female 35.5; length of ovipositor 9.3.

Etymology. Named with reference to the shorter ovipositor relative to other species.

Discussion. The new species differs from other congeners by the shape of the male stridulatory file, the male subgenital plate and the short ovipositor.

Distribution. China (Jiangxi Province, Fujian Province, Guangxi Province).

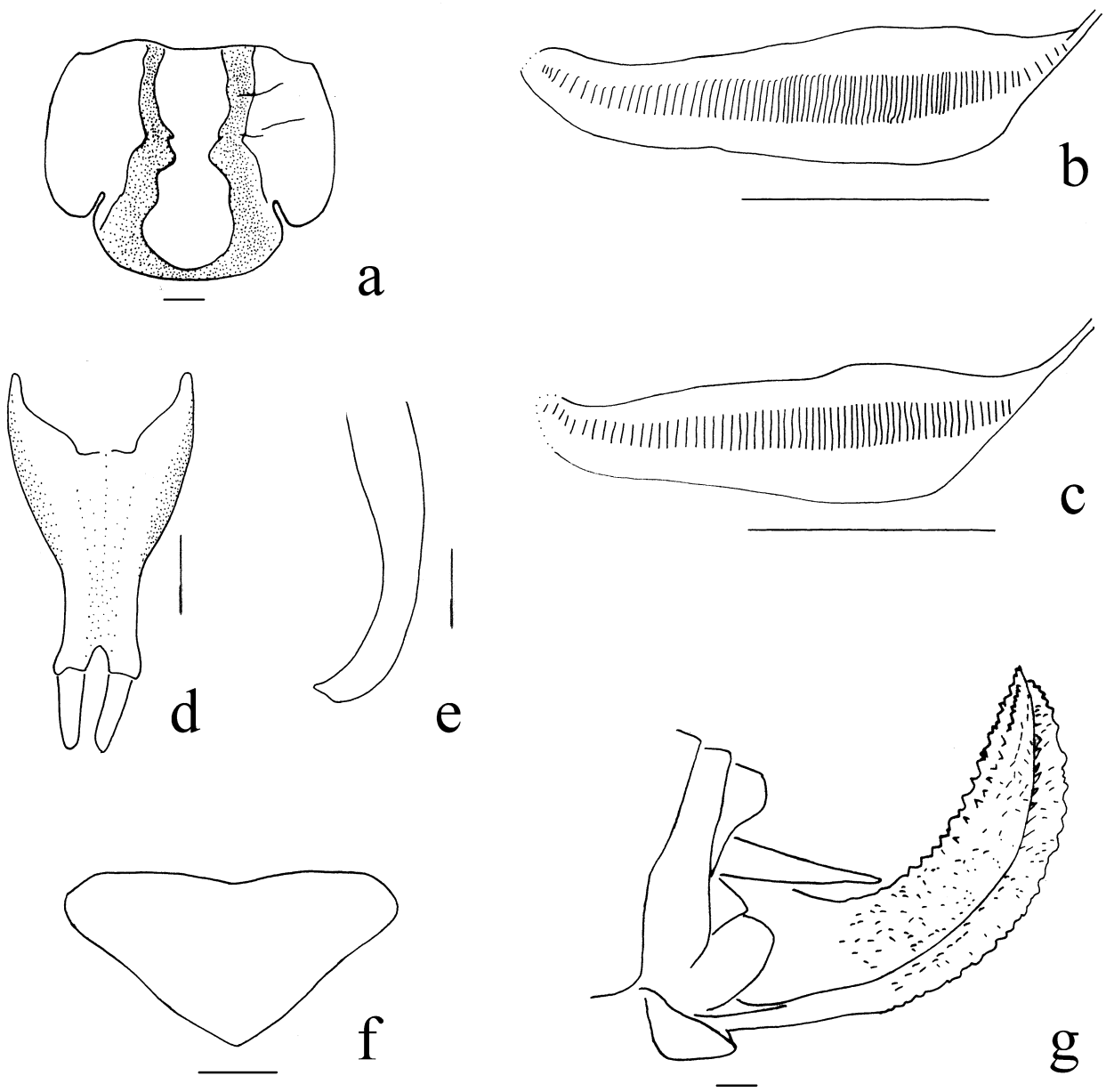

PLATE 6. *Parapsyra brevicauda* **sp. nov.**. a. head and pronotum in dorsal view; b, c. stridulatory file on underside of left tegmen; d. male subgenital plate in ventral view; e. male cerci in dorsal view; f. female subgenital plate in ventral view; g. female abdominal apex in lateral view. (scale bar=1mm).

Sinochlora Tinkham, 1945

Sinochlora Tinkham, 1945. Trans. Amer. ent. Soc., Philadelphia, 70 (1944) 1945: 235-246; Type speices: *Sinochlora kwangtungensis* Tinkham, 1945.

Sinochlora: Shi et Chang 2004, Ori. Insects, 38: 335–340; Liu et Kang, 2007. J. Nat. Hist, 41 (21-24): 1313–1341.

Description. Tinkham (1945); Liu & Kang (2007b).

Sinochlora is widespread distributed in south China, except that type species *S. longifissa* Matsumura and Shiraki is also distributed in Korea and Japan.

Sinochlora was established for five species from China including type species *S. kwangtungensis* Tinkham, by Tinkham (1945). Subsequently, some authors (Shi & Zheng 1996, Shi & Chang 2004) described several new species from China; and others (Kang 1987, Jin 1999) gave synonymies. Recently Liu and Kang (2007) gave a complete revision about *Sinochlora* including systematics, phylogeny, biology and biogeography, together with new findings of six new species and the previously undescribed male of some species, detailed descriptions and illustrations of structure of male epiproct and male stridulatory file of all thirteen species.

In this paper, we describe one new species from Maoershan mountain in southwestern China.

***Sinochlora semicircula* sp. nov.**
(Plate 7 a–e)

Holotype: male, China: Guangxi Prov.: Maoershan Mt., Jinshi, 2007.VII.20, Coll. Liu Chunxiang (IZAS).

Description. Male (Holotype). Size large. Fastigium verticis dorsally sulcate, with obtuse apex; not deflexed, narrower than first segment of antennae, not touching fastigium frons. Antennae thin, long. Compound eyes moderately large, almost round. Pronotal disc with fully cylindrical prozona, and without lateral carina; anterior margin approximately straight, posterior margin obtuse rounded; median transverse furrow "V"-like. Lateral lobe of pronotum moderately higher than long; humeral sinus distinct.

Anterior coxae with a distinct spine. Anterior femur with 6-7 interior and 6 exterior ventral spines; median femur with 6 exterior ventral spines; posterior femur with 8 exterior and 7 interior ventral spines. Anterior tibiae dorsally sulcate and with 2 interior spines as well as 1 interior spine above tympana; median tibiae with 8 interior and 3 exterior dorsal spines; posterior tibiae with numerous exterior and interior dorsal spines. Each genicular lobe with 1 large middle sharp spine and 1 small lower one.

Tegmen extending beyond apex of posterior femur, hind wing longer than tegmen. Costa vein indistinct, Sc and R running closely until middle of tegmen. Rs vein branching slightly before middle of tegmen, bifurcate; R stem also with other 2 lateral branches.

Tenth abdominal tergum produced backwards, with lateral margins concave in middle; lateral forcipate processes gently decurved in apical half, middle protuberance indistinct, apical margin with distinct semicircular notch (Plate 7a,c). Epriproct rather short, wider than long, approximately trapeziform, dorsally sulcate; apical part upcurved, with two lateral posterior spines which directing dorso-apicad, notch between which wide trapeziform (Plate 7d). Cerci long, conical; exterior margin slightly concave in apical half, interior margin slightly convex in apical third (Plate 7b). Subgenital plate broad at base and very deeply cleft at basal third, and long arms strongly recurved and terminated with minute apical styli, notch between shaped into obtuse 60-degree angle (Plate 7a,e).

Female unknown.

Color. Green. Costal vein white and black, each tegmen with a black spot at base of the green subcostal vein.

Measurements (mm). length of body 36.0; length of pronotum 7.1; length of tegmen 50.5; largest width of tegmen 10.5; hind wing 58.2; length of anterior femur 8.9; length of median femur 13.0; length of posterior femur 33.5; length of anterior tibiae 11.5; length of median tibiae 15.0; length of posterior tibiae 36.5.

Etymology. The name shows that the new species possesses the apical margin of male tenth abdominal tergite with distinct semicircular notch.

Discussion. The new species distinctly differs from other congeners by the male tenth abdominal tergum with lateral margins concave in middle, lateral forcipate processes gently decurved in apical half, middle protuberance indistinct, apical margin with distinct semicircular notch (Plate 7a,c), and male epriproct wider than long, approximately trapeziform, with two lateral posterior spines at apex which directing dorso-apicad, notch between which wide trapeziform (Plate 7d).

Distribution. China (Guangxi Province).

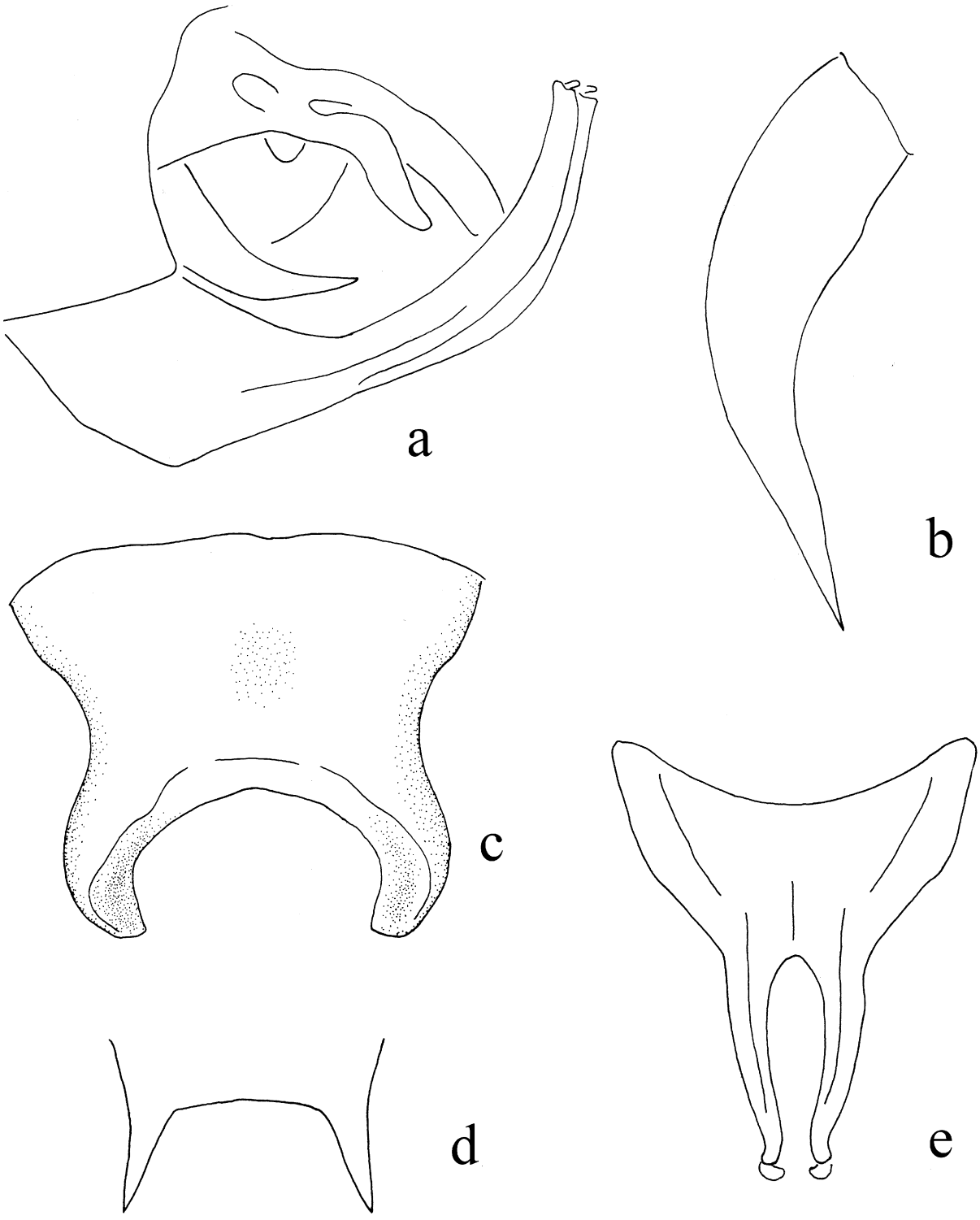

PLATE 7. *Sinochlora semicircula* **sp. nov.** a, male abdominal apex, lateral view;b, male cerci, dorsal view; c, male tenth abdominal tergum, dorsal view; d, male subgenital plate, ventral view; e, male epiproct, dorso-apical view.

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