



The cricket genus *Gymnogryllus* (Grylloidea: Gryllidae: Gryllinae: Gryllini) from China with description of six new species

LIBIN MA & YALIN ZHANG¹

Key Laboratory of Plant Protection Resources and Pest Management of Ministry of Education, Entomological Museum, Northwest A & F University, Yangling, Shaanxi Province, 712100, China

¹Corresponding author. E-mail: yalinzh@yahoo.com.cn

Abstract

The article reports six new species in the genus *Gymnogryllus* from China. Photographs and illustrations of all species are provided as well as a key to the Chinese species in this genus.

Key words: Orthoptera, Gryllini, morphology, taxonomy, identification

Introduction

Gymnogryllus (Gryllidae: Gryllinae) was established by Henri de Saussure in 1877, with *Gryllus elegans* Guérin-Méneville as the type species. It belongs to the tribe Gryllini and is easily separated from other members by the following characters: face distinctly longer than width; oblique veins of male tegmen nearly straight or slightly S-shaped; ectoparamere with widened distal part of large upper medial process and large proximal endoparameral apodeme; ovipositor short and armed with small hook before apical part of lower valvae (Gorochov 2001). This genus is known to occur in the localities from India to Australia and most species of the genus are distributed in tropical areas of southern Asia, including the Indian subcontinent, west Himalaya, Burma, Vietnam and Malaysia (Gorochov 2001; Eades & Otte 2010). 34 species are currently reported worldwide (Chopard 1936; Chopard 1969; Otte & Alexander 1983; Otte *et al.* 1988; Liu *et al.* 1995; Desutter-Grandcolas 1996; Ichikawa 1996; Gorochov 1983, 1996, 1998, 1999, 2001; Xie & Zheng 2003; Eades & Otte 2010).

In China, three species of the genus are currently known. The first was reported by Chopard in 1936 but the specimen was immature. Therefore, Chopard could only make a tentative and uncertain identification of *Gymnogryllus elegans* Guérin-Méneville (Chopard, 1936). The second species, *Gymnogryllus contractus* Liu *et al.*, was caught from Meng'a Town located in the north of Menghai County of Xishuangbanna, Yunnan, China, in 1958 and described by Pengju Liu *et al.* in 1995. In 2003, Lingde Xie and Zhemin Zheng reported another species, *Gymnogryllus odonopetalus* Xie & Zheng, from Menglun Town, Mengla County, Xishuangbanna, Yunnan, China. In this article we describe six new species and provide a key to aid in recognition of all Chinese *Gymnogryllus* species.

Materials and methods

Identification is primarily based on males. Genitalia were prepared by placing the dissected genitalia complex into a concentrated solution of KOH for about 5 hours. Figures of genitalia and body morphology were produced using a highly sensitive QIMAGING Retiga 2000R digital camera (CCD) and Auto-montage imaging software. Whole bodies were photographed with a Nikon D100 using a Micro-Nikkor 105 mm macro lens.

Abbreviations: BL body length (from head to tip of abdomen); HW head width; PL pronotum length; PW pronotum width (max. width of pronotum); FWL forewing length; AFL length of apical field (max. length); HWL hind wing length (length of uncovered part); HLL hind legs (femur) length; API ratio of AFL to PW; PI ratio of

PW to PL; NST number of stridulatory teeth; SFL length of stridulatory file; DST density of stridulatory teeth on file (teeth number/mm); ep. epiphallus; ec. ectoparamere; at. paired lower apical teeth; no. notch between paired apical teeth. All the measurements are in millimeters (mm).

Type materials are deposited at Northwest A & F University, Shanghai Entomological Museum, Hebei University.

Materials examined are deposited in the following institutions abbreviated in the text as follows:

HBU Hebei University, Baoding, China
SEM (IEAS) Shanghai Entomological Museum, CAS, Shanghai, China
NWAUFU The Entomological Museum of Northwest A & F University, Yangling, China

***Gymnogryllus* Saussure, 1877**

Type species. *Gryllus elegans* Guérin-Méneville (= *Gymnogryllus leucostictus*, (Burmeister)), designated by Kirby, 1906: 23.

Description: Male. From lateral view, occiput wide; vertex inclined, shaped as spherical form with rostrum. Cheek slightly convex and much narrowed below eyes. Epistomal suture straight or curved upward in media. Fifth section of maxillary palpi always longer than third; the end section of labial palpi usually equal to the length of first two. Ocelli arranged in a straight line, media ocellus shaped as half-moon, lateral ocelli round or oval. Scape of antenna shield shaped. Frons always broad and flat, but partly narrow and concave below antennal socket. Top part of clypeus shaped as wide and flat stripe; lower part broad and flat, but slightly inclined inward. Labrum shaped as round shield, basal part somewhat concave medially, remaining part flat; distal edge straight or round in media.

Pronotum broad. Median area with a straight groove, but short, always far from the posterior margin. Beside groove, a pair of crescent patterns, the color usually distinguished among different species. Pronotal anterior margin concave, posterior margin sinuated. Lower part of lateral lobes often in light color, but varied in size of different species. Lateral lobes covered in pubescence.

Forewings do not reach tip of abdomen. Oblique veins two to three or four: outermost vein short, nearly vertical, but connects with Cu1; remainder of veins longer, arise from the base. Diagonal vein sinuate. Chord strongly bent. Two cross-veins between diagonal vein and chord, one of them free distally. Another cross-vein may or may not link chord with mirror. Mirror shaped as non-convex quadrilateral, its inner line always varies in different species. Mirror with one dividing vein. Apical field long, nearly half length of FWs. The apex of Cu1 with seven to ten inside branches, numbers varying by species. Stridulatory file feebly sinuate with inner margin armed with a cluster of long hairs. The distance between the file inner face and hairs varies by species. Teeth are mainly anvil-like with a few angular at the inside apex, sparse outside and medially, slightly dense from originating point of inside oblique vein inward apically. Hind wings longer than FWs.

Foreleg thick; inner tympanum small and oval, outer one large and longer-oval shaped. Fore tibiae with three apical spurs; first section of fore tarsus smooth and bald, under first and second section with enlarged euplantula. Hind tibiae with five to six inner sub-apical spurs, five outer ones, and six apical spurs, both medial apical spurs of the two sides longer than others. Hind tarsus first section with short and thick spines along two sides dorsally, underneath with hard hair resembling thin spine.

Cercus granulate, covered with dense sub-erect short hair and sparse long and thin hair. Epiproctum flat. Lamina subgenitalis hood-like in ventral view.

Male genitalia robust, epiphallus shaped as half-tube in dorsal view and bulging distally; the distal section of epiphallus armed with a pair of long teeth; ectoparamere with widened distal part of large upper medial process and large proximal endoparameral apodeme. Ovipositor is relatively short and armed with a small hook before apical part of lower valvae.

Key to the species of *Gymnogryllus* from China

1. Smaller species (BL 23 mm) *Gymnogryllus contractus* Liu, Yin & Liu
- Larger species (BL more than 25 mm) 2
2. FWs extended to tip of abdomen 3
- FWs not extended to tip of abdomen 4
3. Coloration uniform blackish brown in head and pronotum *Gymnogryllus dolichodens* **nov. sp.**
- Coloration rufous and with light angular patch on frons *Gymnogryllus longus* **nov. sp.**
4. Subapical of hind femur with pale brown patch dorsally 5
- Subapical of hind femur with inconspicuously dark brown patch dorsally, or totally without 7
5. Occiput obviously wide and pronotum dilated in front *Gymnogryllus tumidulus* **nov. sp.**
- Occiput and pronotum different from above 6
6. Epistomal suture curved upward medially, frons with light angular patch
- *Gymnogryllus odonopetalus* Xie & Zheng
- Epistomal suture straight, frons uniform colored *Gymnogryllus extrarius* **nov. sp.**
7. Body blackish brown, frons normal colored *Gymnogryllus yunnanensis* **nov. sp.**
- Body rufous, frons with pale stripe and light angular patch *Gymnogryllus striatus* **nov. sp.**

Gymnogryllus dolichodens **nov. sp.**

(Fig. A. 1, 7–9; B. 1, 7; C. 1; D. 1)

Type material. **Holotype** male, **China:** Yunnan, Honghe, Jinping, Wendang, 11 Jun. 2009, coll. Libin Ma (NWFU). **Paratype** female: the data same to holotype.

Diagnosis. Male. Frons normal. Epistomal suture wide and straight. Distal edge of labrum narrow and straight. Lateral ocelli rounded and flat. Occiput nearly the same width as anterior pronotum. Pronotum parallel-sided. Oblique veins three with outermost vein near the corner of stridulatory vein. Inner side of mirror slightly bent (strongly bent on covered tegmen, and inner cell besides mirror divided into two by a short longitudinal vein). The cross-vein between the chord and mirror reach to below inside corner of mirror. Inner branches of Cu1 at apical field ten, of them, first and second as well as third and fourth connected at base (on covered tegmen, branches nine, first closing to second at base and fourth dividing into two nearly midway). Forewings slightly overreaching tip of abdomen. Stridulatory file, inside apex apart from hairs, with 55 anvil-like teeth and smaller angular tooth inside. Hind wings long, well beyond tip of cercus. Genitalia: Median notch between paired lower apical teeth reaching dorsal edge of epiphallallic apex, and longer than others.

Female. Tegmen somewhat regularly reticulate, longitudinal veins run oblique right and posterior, and transverse crossveins divide them into numeral cells, mainly forming rhombus pattern. Ovipositor very short (3.5 mm), almost straight; superior valves lanceolate, rather acute, inferior ones deeply notched at base of the apical part with a short and acute spine ventrally at base. Otherwise the same as male.

Coloration. Head, pronotum and much of hind femur blackish brown. FWs taupe. Occiput uniform blackish brown. 1/3 part of cheek bottom brown. Frons black. Crescent pattern of pronotum almost uniform blackish brown. 1/4 part of lateral lobe bottom with a light stripe which is distinct in front. The subapex of hind femur with a dark brown patch dorsally.

Measurements. BL 28; HW 7; PL 5.5; PW 7.5; FWL 19.5; FWW 7.5; AFL 10; HWL 8.5; HLL 16; CL 10.5; API 1.33; PI 1.36; NST 56; SFL 4.46; DST 12.

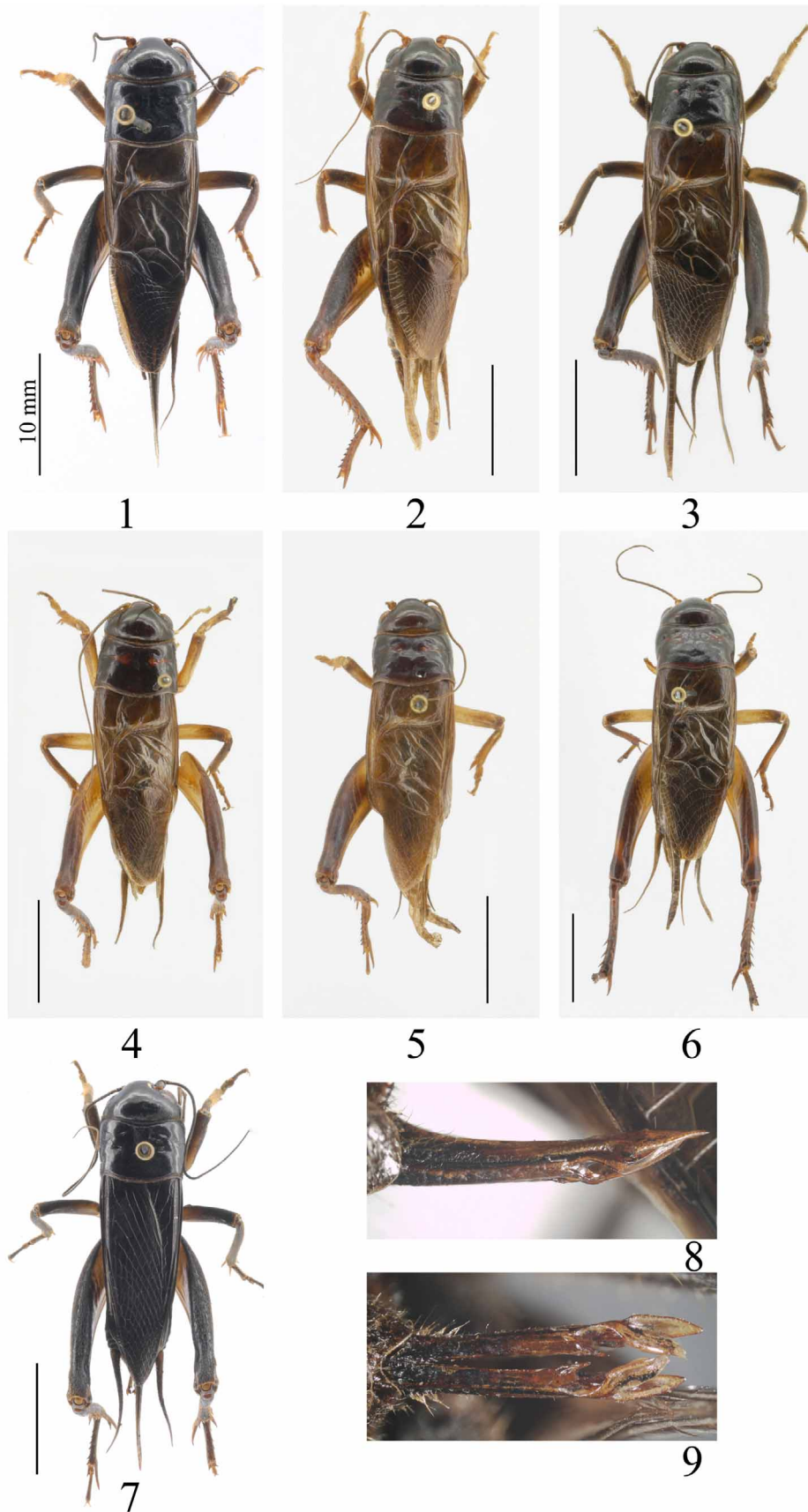
Etymology. The specific epithet “dolichodens” refers to the distinctly longer, paired, lower apical teeth of this species.

Distribution and Ecology: Specimens were attracted to light in a village located in south Yunnan Province, China, and adjacent to Vietnam. This village is surrounded by hills; its altitude is about 900m.

Gymnogryllus extrarius **nov. sp.**

(Fig. A. 2; B. 2, 8; C. 2; D. 2)

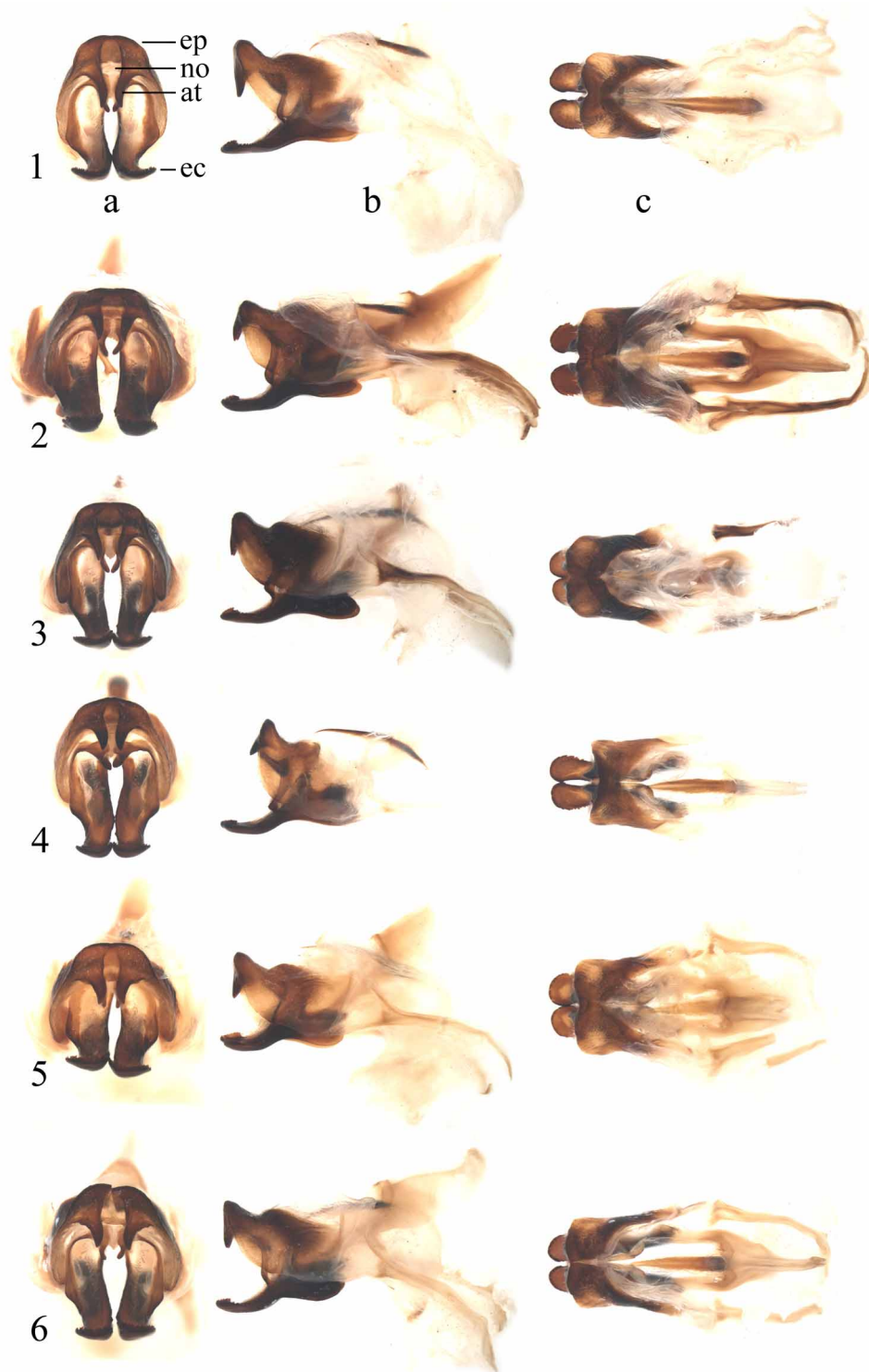
Type material. **Holotype** male, **China:** Yunnan, Xishuangbanna, Mengla, 23~27 Jul. 1995, coll. Xianwei Liu, Weinian Zhang and Xinbao Jin (SEM).



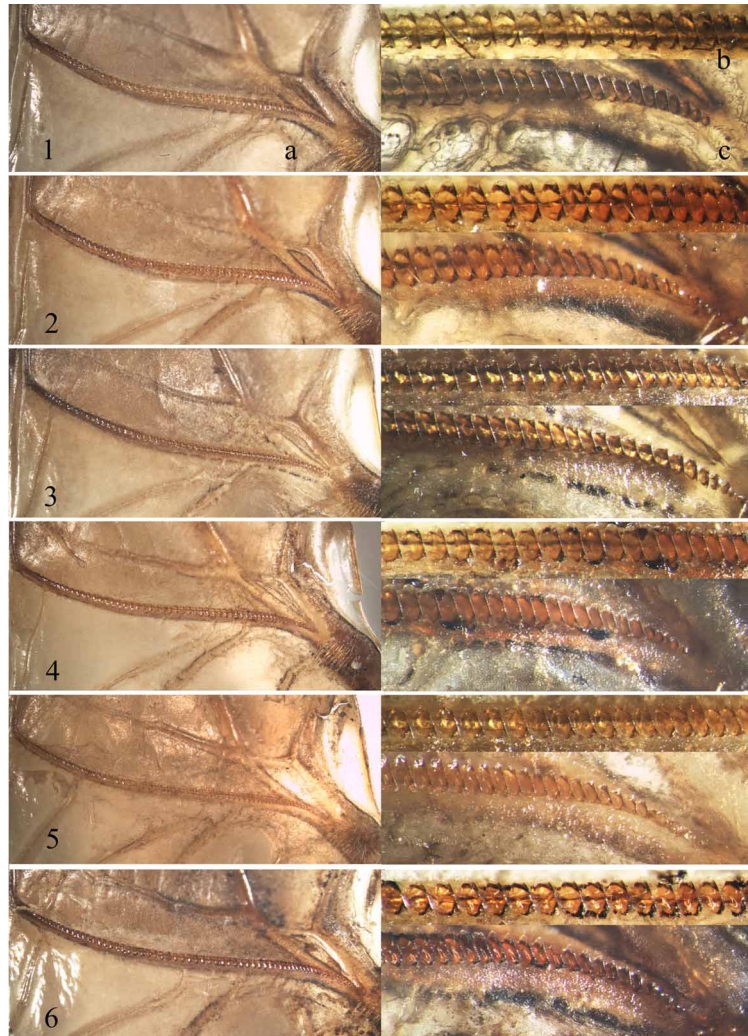
FIGURES A, 1–6. Body (male) in dorsal view: 1. *G. dolichodens* nov. sp.; 2. *G. extrarius* nov. sp.; 3. *G. yunnanensis* nov. sp.; 4. *G. striatus* nov. sp.; 5. *G. longus* nov. sp.; 6. *G. tumidulus* nov. sp.. 7–9. *G. dolichodens* nov. sp. (female): 7. Body in dorsal view; 8. Occiput in lateral view; 9. Occiput in ventral view.



FIGURES B, 1–6. Head in front view: 1. *G. dolichodens* **nov. sp.**; 2. *G. extrarius* **nov. sp.**; 3. *G. yunnanensis* **nov. sp.**; 4. *G. striatus* **nov. sp.**; 5. *G. longus* **nov. sp.**; 6. *G. tumidulus* **nov. sp.**. 7–12. Tegmen: 1. *G. Dolichodens* **nov. sp.**; 2. *G. extrarius* **nov. sp.**; 3. *G. yunnanensis* **nov. sp.**; 4. *G. striatus* **nov. sp.**; 5. *G. longus* **nov. sp.**; 6. *G. tumidulus* **nov. sp.**.



FIGURES C, 1–6. Genitalia, a. in front view; b. in lateral view; c. in dorsal view: 1. *G. dolichodens* **nov. sp.**; 2. *G. extrarius* **nov. sp.**; 3. *G. yunnanensis* **nov. sp.**; 4. *G. striatus* **nov. sp.**; 5. *G. longus* **nov. sp.**; 6. *G. tumidulus* **nov. sp.**.



FIGURES D, 1–6. Stridulatory file, a. whole illustration for file; b. media part of file; c. the inside part of file: 1. *G. dolichodens* **nov. sp.**; 2. *G. extrarius* **nov. sp.**; 3. *G. yunnanensis* **nov. sp.**; 4. *G. striatus* **nov. sp.**; 5. *G. longus* **nov. sp.**; 6. *G. tumidulus* **nov. sp.**.

Diagnosis. Male. Frons normal. Epistomal suture narrow and straight. Distal edge of labrum rounded. Lateral ocelli rounded and slightly convex. Occiput somewhat narrower than anterior pronotum. Pronotum slightly narrowed in front. Oblique veins three, the outermost vein at the corner of stridulatory vein. Inner side of mirror hardly bent (bending on covered tegmen). The crossvein between the chord and mirror reaches to below the inside corner of mirror. Inner branches of Cu1 at apical field nine (branches eight, under the seventh irregular, on covered tegmen). Forewings do not reach apex of abdomen. Stridulatory file inside apex almost connect to hairs, with 54 anvil-like teeth and three irregular angular teeth inside. Hindwings long, reaching just beyond the tip of cercus. Genitalia: Median notch between paired lower apical teeth not reaching dorsal edge of epiphallic apex, and an outward oblique section above it; paired lower apical teeth strong and pointed outward in lateral view.

Coloration. Head and pronotum rufous to dark brown. Hind femur dark brown and FWs light brown. Occiput rufous with wide black stripe. Cheek with 1/3 brown part at bottom. Frons uniform colored. Crescent pattern of pronotum colored rufous inside and around with black color. 1/4 part of lateral lobe bottom with an indistinct light stripe. Subapex of hind femur with brown patch dorsally.

Measurements. BL 29; HW 6.5; PL 5; PW 8.5; FWL 19.5; FWW 8.5; AFL 9; HWL 9; HLL 15.5; CL 8; API 1.06; PI 1.70; NST 57; SFL 4.39; DST 12.

Etymology. The specific epithet “extrarius” refers to the paired lower apical teeth being strong and pointed outward in lateral view.

***Gymnogryllus yunnanensis* nov. sp.**

(Fig. A. 3 ; B. 3, 9 ; C. 3 ; D. 3)

Type material. Holotype male, **China:** Yunnan, Xishuangbanna, Mengla, Nanman, 6~7 Jun. 2009, coll. Xianwei Liu and Jie Wu (SEM).

Diagnosis. Male. Frons normal. Epistomal suture narrow and upwardly arched. Distal edge of labrum narrow and straight. Lateral ocelli rounded and flat. Occiput somewhat narrower than anterior pronotum. Pronotum slightly narrowed in front. Oblique veins three, the outermost vein apart from the corner of stridulatory vein. The inner side of mirror strongly bent (normally bending and upper root of side divided on covered tegmen). The crossvein between the chord and mirror reach to below the inside corner of mirror. Inner branches of Cu1 at apical field seven (eight on covered tegmen), the third vein divided at midlength. Forewings reaching the tip of abdomen. Stridulatory file, inside apex connect with hairs, with 59 anvil-like teeth and two angular ones inside. Hindwings long, obviously extended to apex of cercus. Genitalia: Median notch between paired lower apical teeth not reaching dorsal edge of epiphallallic apex, above notch with a curved surface.

Coloration. Head, pronotum and most of hind femur blackish brown. FWs brown. Occiput uniform black. Cheek with bottom 1/3 brown. Frons uniform in color. Crescent pattern of pronotum brown. Bottom 1/5 of lateral lobe with light stripe. Subapex of hind femur with dark brown patch dorsally.

Measurements. BL 26; HW 6.5; PL 5; PW 7.5; FWL 19; FWW 7.5; AFL 9; HWL 10.5; HLL 15.5; CL 8.5; API 1.20; PI 1.50; NST 61; SFL 4.68; DST 13.

Etymology. The specific epithet “yunnanensis” is named after the type locality.

***Gymnogryllus striatus* nov. sp.**

(Fig. A. 4; B. 4, 10; C. 4; D. 4)

Type material. Holotype male, **China:** Yunnan, Xishuangbanna, Menghai, 2 Aug. 2000, coll. Zhe Li (HBU).

Diagnosis. Male. Frons normal. Epistomal suture wide and almost straight. Distal edge of labrum slightly concave. Lateral ocelli rounded and slightly convex. Occiput somewhat narrower than anterior pronotum. Pronotum slightly narrowed in front. Oblique veins three, the outermost vein apart from the corner of stridulatory vein. The inner side of mirror strongly bent (same on covered tegmen). The crossvein between the chord and mirror arrives at the inside corner of mirror. Inner branches of Cu1 at apical field eight (seven on covered tegmen). Forewings do not reach the tip of abdomen. Stridulatory file, inside apex distant from hairs, with 55 anvil-like teeth and four angular ones inside. Hindwings short, slightly overreaching the end of abdomen. Genitalia: Median notch between paired lower apical teeth not reaching dorsal edge of epiphallallic apex, above it with a lappet; epiphallus very short and distinctly raised dorsally.

Coloration. Head and pronotum rufous. The apical half of hind femur brown, remainder yellow brown. FWs light brown. Occiput rufous with inconspicuous wide black stripe. Cheek with bottom 1/3 brown. Frons with a yellow strip across the median ocellus, and an angular yellow patch under the stripe, between them a pair of brown spots. Crescent pattern of pronotum distinctly red. Bottom 1/3 part of lateral lobe with a light stripe which is distinct in front. The subapex of hind femur without any dorsal patch.

Measurements. BL 27.5; HW 6.5; PL 5; PW 8; FWL 17.5; FWW 8.5; AFL 8.5; HWL 2; HLL 16; CL 8.5; API 1.06; PI 1.60; NST 59; SFL 4.29; DST 13.

Etymology. The specific epithet “striatus” refers to the yellow stripe across the median ocellus on the frons in this species.

***Gymnogryllus longus* nov. sp.**

(Fig. A. 5; B. 5, 11; C. 5; D. 5)

Type material. Holotype male, **China:** Guangxi, Fangfenggang, Shangsì, 10 Jul. 1991, coll. Wen Lu (SEM).

Diagnosis. Male. Bottom of rostrum truncated slightly inward. Epistomal suture slightly wide and distinctly curved upward. Distal edge of labrum narrow and straight. Lateral ocelli a little large, oval and flat. Occiput somewhat narrower than anterior pronotum. Pronotum slightly parallel-sided. Oblique veins four (three, on covered teg-

men, and outermost vein apart from corner), the outermost vein normally close to the corner of stridulatory vein; second vein short and very distant from that corner. Inner side of mirror normally bent (strongly bending on covered tegmen). Crossvein between chord and mirror reaches to a little below the inside corner of mirror. Inner branches of Cu1 at apical field nine, the last vein being very short (eight on covered tegmen and fourth closing to fifth at base). Forewings distinctly reach well beyond the tip of abdomen. Stridulatory file, inside apex apart from hair, with only 58 anvil-like teeth. Hindwings long, obviously reaching beyond the tip of cercus. Genitalia: Median notch between paired lower apical teeth not reaching dorsal edge of epiphallus apex, above it with a lappet slightly inclined inward. Outer edge of paired lower apical teeth with an ear-like boss at median.

Coloration. Head and pronotum rufous. Most of hind femur brown. FWs light brown. Occiput uniform rufous. Bottom 1/3 of cheek brown. Frons with inconspicuous angular light patch. Crescent pattern of pronotum distinctly red. Bottom 1/3 part of lateral lobe with a distinct light stripe. Subapex of hind femur with brown dorsal patch.

Measurements. BL 25; HW 6.5; PL 5; PW 7.5; FWL 18.5; FWW 7.5; AFL 9.5; HWL 7.5; HLL 15.5; CL 7; API 1.27; PI 1.50; NST 58; SFL 4.43; DST 13.

Etymology. The specific epithet “longus” alludes to the longer FWs of the species which conspicuously reach well beyond the tip of the abdomen.

Gymnogryllus tumidulus nov. sp.

(Fig. A. 6 ; B. 6, 12 ; C. 6 ; D. 6)

Type material. Holotype male, **China:** Guangdong, Shenzhen, Sept. 2009, coll. Zhuqing He (NWFU).

Diagnosis. Male. Frons normal. Epistomal suture wide and obviously curved upward. Distal edge of labrum rounded. Lateral ocelli a little large, oval and flat. Occiput obviously wide. Pronotum dilated in front. The lateral lobes almost without pubescence. Oblique veins three, the outermost vein apart from the corner of stridulatory vein. Inner side of mirror bent (slightly bending on covered tegmen). The crossvein between the chord and mirror arrived at the inside corner of mirror. Inner branches of Cu1 at apical field seven (same on covered tegmen). Forewings reaching the tip of abdomen. Stridulatory file, inside apex near the hair, with 61 anvil-like teeth and four angular ones inside. Hindwings long, more or less equal to the length of cercus. Genitalia: Epiphallus naturally split into two parts, median notch also not reaching dorsal edge of epiphallus apex, above it with a lappet.

Coloration. Head and pronotum from rufous to dark brown. Apical half of hind femur brown and FWs taupe. Occiput uniform rufous; vertex dark brown. Cheek with bottom 2/3 brown. Frons uniform colored. Crescent pattern of pronotum distinctly red. Bottom half of lateral lobe with a distinct light stripe. Subapex of hind femur with a large yellowish brown patch dorsally.

Measurements. BL 29.5; HW 8; PL 5.5; PW 9; FWL 21; FWW 9; AFL 10; HWL 8.5; HLL 17; CL 10.5; API 1.11; PI 1.64; NST 65; SFL 5.14; DST 12.

Etymology. The specific epithet “tumidulus” refers to the pronotum being dilated in front.

Discussion

The species mentioned above, including *G. contractus* and *G. odonopetalus*, are related species with characters in common: mirror shaped as non-convex quadrilateral of which inner side always incurved; the paired lower apical teeth (always straight in lateral view) originates from the outside of epiphallus without juncture. In numerous related species this originates from the inside with an obvious juncture between them, and teeth are always incurved in lateral view. Other related species that also possess these main characters: *Gymnogryllus brachyxiplus* Chopard, *Gymnogryllus equinus* Gorochov, *Gymnogryllus kuznetzovi* Gorochov and *Gymnogryllus vietnamensis* Gorochov.

G. contractus is a blackish and very small species (23 mm length) by which this species differs from all the others. *G. dolichodens* nov. sp., *G. yunnanensis* nov. sp. and *G. kuznetzovi* are blackish species. However, *G. dolichodens* nov. sp. has much longer paired lower apical teeth on the epiphallus, by which it can be distinguished from the others. The apical part of epiphallus in *G. yunnanensis* nov. sp. is narrower than that of *G. kuznetzovi*. The remainders are rufous or rufous to dark brown. The frons of *G. striatus* nov. sp. has a yellow stripe across the median ocellus, under it an angular yellow patch, and between them a pair of brown spots, by which, with very

short and outward pointed apical teeth on the epiphallus, this species can be distinguished from others. *G. tumidulus* **nov. sp.** has an anteriorly dilated pronotum and wider occiput. Importantly, its genitalia naturally split into two parts. These characters make it unique from others. *G. extrarius* **nov. sp.** is slightly similar to *G. equinus* in that the epiphallus of both species have a distance between their paired lower apical teeth. But, in the new species, the median notch between the paired lower apical teeth does not reach the dorsal edge of epiphallic apex (it does reach the edge in *G. equinus*). That notch of *G. longus* **nov. sp.** is an average distance neither as wide as *G. equinus* nor as narrow as *G. vietnamensis* and *G. brachyxiphus*. *G. longus* **nov. sp.** is also similar to *G. odonopetalus*, but the former is lightly colored and its FWs conspicuously just reaches the apex of the abdomen, the latter species being darker and its FWs not reaching the abdominal tip.

Acknowledgements

We appreciate Andrey V. Gorochov, Zoological Institute, Russian Academy of Sciences, St. Petersburg, for guidance in specimen identification and providing us many valuable advices and important references. We thank Haisheng Yin, Shanghai Entomological Museum, CAS, Shanghai, China, Prof. Guodong Ren, Hebei University, Baoding, China, and Zhuqing He, East China Normal University, Shanghai, China, for lending us specimens for this investigation. We also give our sincere thanks to Zongli Liang and Zhiyong Yu, Jinping Watershed National Nature Reserve, for their help in our field work. We are grateful to Xianwei Liu, Shanghai Entomological Museum, CAS, Shanghai, China, Prof. Fumin Shi, Hebei University, Baoding, China, Prof. Makio Takeda, Kobe University, Kobe, Japan, and Mr. Akihiko Ichikawa, Orthopterological Society of Japan, Osaka, Japan, for providing references and valuable advice. We sincerely thank Prof. John Richard Schrock for help in revising this manuscript. This study is funded by “The Ministry of Science and Technology of the People’s Republic of China” (2006FY120100).

References

- Chopard, L. (1936) Note sur les Gryllides de Chine. *Notes D'Entomologie Chinoise*, 3–4.
- Chopard, L. (1969) Orthoptera Vol. II. Grylloidea. In: Sewell, R.B.S. (Ed.), *The Fauna of India and the Adjacent Countries*. Calcutta: Baptist Mission Press, pp. 21–31.
- Desutter-Grandcolas, L. (1996) Description of a new species of the genus *Gymnogryllus* from Singapore (Orthoptera, Grylloidea, Gryllidae). *Revue Francaise d'Entomologie (Nouvelle Serie)*, 18(1), 27–29.
- Eades, D.C. & Otte, D. (2010) *Orthoptera Species File Online*. Version 2.0/4.0. [18 June 2010]. <<http://Orthoptera.Species-File.org>>.
- Gorochov, A.V. (1983) Contribution to the study of the cricket tribe Gryllini (Orthoptera, Gryllidae). *Entomologicheskoe Obozrenie*, 62(2), 314–330.
- Gorochov, A.V. (1996) New and little known crickets from the collection of the Humboldt University and some other collections (Orthoptera: Grylloidea). Part 1. *Zoosystematica Rossica*, 4, 87–92.
- Gorochov, A.V. (1998) On homonymy of *Gymnogryllus elegans* (Guér.) (Orthoptera: Gryllidae). *Zoosystematica Rossica*, 7(2), 228.
- Gorochov, A.V. (1999) New crickets (Orthoptera: Gryllidae) from Indo-Malayan region. *Acta Zoologica Cracoviensia*, 42(2), 273.
- Gorochov, A.V. (2001) Remarkable example of convergence and new taxa of Gryllini (Orthoptera: Gryllidae). *Zoosystematica Rossica*, 345–347.
- Ichikawa, A. (1996) A new species of *Gymnogryllus* Saussure (Orthoptera: Gryllidae) from Sabah, Borneo, E. Malaysia. *Tetragonia*, 1(1), 29–35.
- Liu, J.P., Yin, H.S. & Liu, X.W. (1995) Descriptions of two new species and a recorded species of Grylloidea from China. *Sinozoologia*, (12), 281–284.
- Kirby, W.F. (1906) *A synonymic catalogue of Orthoptera*. Vol. II. London: British Museum (Nature History), 562pp.
- Otte, D. & Alexander, R.D. (1983) The Australian Crickets (Orthoptera: Gryllidae). *Academy of Natural Sciences of Philadelphia, Monograph*, 22, 34–36.
- Otte, D., Toms, R. & Cade, W. (1988) New species and records of East and Southern African crickets (Orthoptera: Gryllidae: Gryllinae). *Annals of the Transvaal Museum*, 34, 405–486.
- Xie, L.D. & Zheng, Z.M. (2003) Description of a new species of the Genus *Gymnogryllus* from China (Orthoptera, Gryllidae). *Acta Zootaxonomica*, 28(3), 496–498.