



Four new species of the genus *Phryganogryllacris* (Orthoptera, Gryllacrididae, Gryllacridinae) in China

MIAOMIAO LI^{1,2,3}, XIANWEI LIU^{2,4} & KAI LI^{1,4}

¹School of Life Science, East China Normal University, Shanghai 200062, China. E-mail: kaili@admin.ecnu.edu.cn

²Shanghai Entomology Museum, Chinese Academy of Sciences, Shanghai 200032, China. E-mail: liuxianwei2008@163.com

³fengbang high middle school, shanghai 201803, China

⁴Corresponding author

Abstract

A taxonomic study of the genus *Phryganogryllacris* Karny, 1937 is presented. Four new species are described: *Phryganogryllacris brevipennis* **sp. nov.**, *Phryganogryllacris hubeiensis* **sp. nov.**, *Phryganogryllacris sigillata* **sp. nov.**, *Phryganogryllacris fanjingshanensis* **sp. nov.**. A key to the species and the distributional data of *Phryganogryllacris* are provided.

Key words: Gryllacrididae, Gryllacridinae, *Phryganogryllacris*, new species, China

Introduction

Karny (1937) proposed the genus *Phryganogryllacris*, with the type species *Gryllacris phryganoides* (De Haan, 1842), including 18 described species and 1 new species *P. mascata*. Xian-Wei Liu (1999) provided a key to the genus and included four species from China. Besides, he also redescribed two species *P. subrectis* and *P. mellii* distributed in Fujian. Gorochov (2008) described two additional new species *P. trusmadi* and *P. discus*, one subspecies *P. vinhphuensis minuscula*. We (2014) provided a key to the genus and included five new species of *Phryganogryllacris* from China. They were *P. sichuanensis* (Li *et al.*, 2014) came from Sichuan and Yunnan; *P. parva* (Li *et al.*, 2014) from Guizhou (Leishan), *P. truncata* (Li *et al.*, 2014) from Guizhou (Leishan); *P. interrupta* (Li *et al.*, 2014) from Guangxi (Xingan) and *P. longicerca* (Li *et al.*, 2014) from Guangxi (Longsheng).

According to Orthoptera Species File Online (2015), the genus *Phryganogryllacris* includes twenty species at present, distributed in China, Vietnam, Burma, Cambodia, India, Japan, Philippines and Malesia *et al.* Twelve species were recorded from China, distributed in Henan, Guangxi, Zhejiang *et al.* In this paper, four new species are described: *P. brevipennis* **sp. nov.**, *P. hubeiensis* **sp. nov.**, *P. sigillata* **sp. nov.**, *P. fanjingshanensis* **sp. nov.**. A key to the species and the distributional data of *Phryganogryllacris* are provided. All type specimens are deposited in the Shanghai Entomology Museum, Chinese Academy of Sciences.

Phryganogryllacris Karny, 1937

Phryganogryllacris: Karny, 1937. *Genera Insectorum*, 206: 120; Jin *et al.*, 1994. *Journal of Orthoptera Research*, 3: 17; Liu, 1999. In: Huang (Ed.), *Fauna of Insects Fujian Province of China*, 1: 178; Liu *et al.*, 2001. In: Wu *et al.* (Eds.), *Insect of Tianmushan National Nature Reserve*, 99; Liu *et al.*, 2010. In: Xu, H-C (Ed.), *Insects of Fengyangshan National Nature Reserve*, 60, figs. 5a–d; Li *et al.*, 2014. *Zoological Systematics*, 39(4): 507–519.

Type species. *Gryllacris phryganoides* De Haan, 1842.

Key to species of the genus *Phryganogryllacris* recorded from China

1	Pronotum without blackish markings	2
-	Pronotum with blackish markings	8
2	Hind margin of male subgenital plate without incision; ovipositor of female not extending beyond tegmina apex	3
-	Hind margin of male subgenital plate with incision; ovipositor of female extending beyond tegmina apex	4
3	10 th abdominal tergite of male broadly rounded; hind margin of male subgenital plate broadly rounded; 7 th abdominal sternum of female specialization, subgenital plate with a median keel	<i>P. subrectis</i> (Matsumura et Shiraki, 1908)
-	10 th abdominal tergite of male conical; hind margin of male subgenital plate projected; 7 th abdominal sternum of female unspecialized; subgenital plate without median keel	<i>P. brevixipha</i> (Brunner von Wattenwyl, 1893)
4	Cerci of male shorter (less than 5mm long); subgenital plate of female with apex incised	5
-	Cerci of male elongate (longer than 7mm long); subgenital plate of female with apex truncate	<i>P. unicolor</i> Liu et Wang, 1998
5	Tegmina extending beyond 25mm; lateral hook of male 10 th abdominal tergite strongly curved	<i>P. sichuanensis</i> Li et al., 2014
-	Tegmina not extending beyond 25mm; lateral hook of male 10 th abdominal tergite straight	6
6	All tibiae unicolorous	7
-	All tibiae with dark markings	<i>P. hubeiensis</i> sp. nov.
7	Tegmina extending far beyond hind femora; cerci of male elongate 3.5mm	<i>P. sheni</i> Niu et Shi, 1999
-	Tegmina hardly extending beyond hind femora; cerci of male elongate 5mm	<i>P. brevipennis</i> sp. nov.
8	Body small (tegmina no longer than 20mm)	9
-	Body larger (tegmina more than 20mm)	10
9	Lateral margin of pronotum with blackish longitudinal band; margin of female subgenital plate slightly concave	<i>P. parva</i> Li et al., 2014
-	Lateral margin and hind margin of pronotum with black bands; margin of female subgenital plate truncate	<i>P. truncata</i> Li et al., 2014
10	Hind femora with black stripes	<i>P. decempunctata</i> Liu et al., 2010
-	Hind femora without black stripes	11
11	Hind margin of male subgenital plate broadly rounded; 7 th abdominal sternum of female with deeply median incision.	<i>P. mellii</i> (Karny, 1926)
-	Hind margin of male subgenital plate with incision; 7 th abdominal sternum of female normal	12
12	Tegmina transparent, brownish yellow; cerci of male, length 5–6mm	13
-	Tegmina semitransparent infusate; cerci of male, length 8–9mm	15
13	Pronotum with two longitudinal bands	<i>P. xiai</i> Liu et Zhang, 2001
-	Dark markings of pronotum not as above	14
14	Dark markings of pronotum reaching to fore margin.	<i>P. sigillata</i> sp. nov.
-	Dark markings of pronotum not reaching to fore margin	<i>P. fanjingshanensis</i> sp. nov.
15	Disk of pronotum with interrupted blackish longitudinal band; both sides of sterna without blackish macula; 10 th abdominal tergite with roundly convex hind margin	<i>P. interrupta</i> Li et al., 2014
-	Disk of pronotum with two pale blackish macula; both sides of sterna with blackish macula; 10 th abdominal tergite with truncated hind margin	<i>P. longicerca</i> Li et al., 2014

1. *Phryganogryllacris brevipennis* sp. nov.

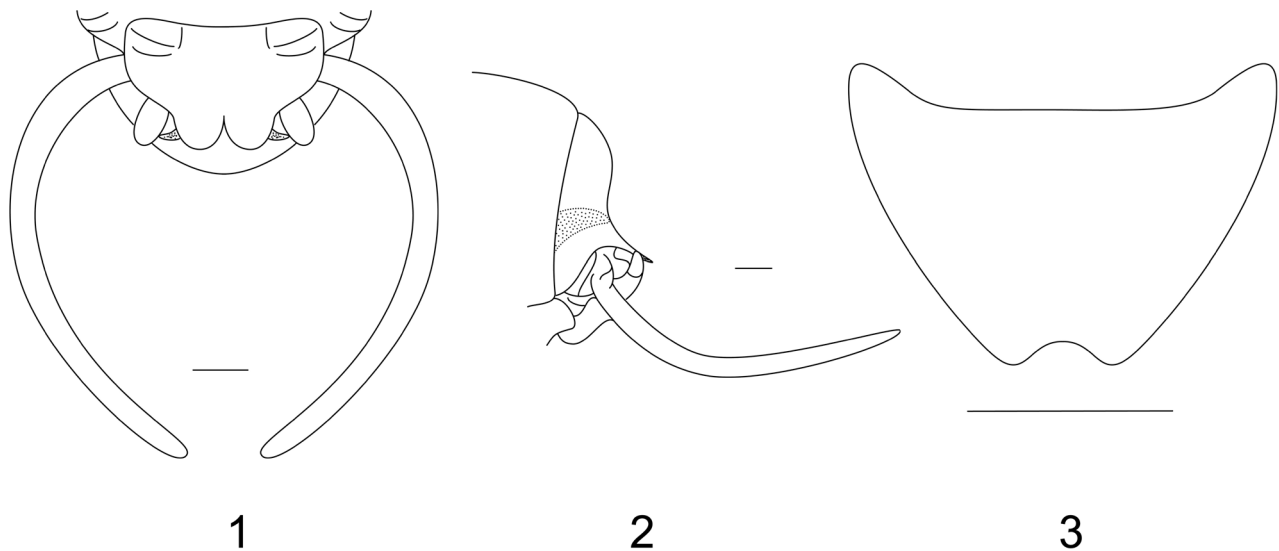
Figs. 1–3

<http://lsid.speciesfile.org/urn:lsid:Orthoptera.speciesfile.org:TaxonName:474283>

Description. Male. Body medium-sized, stout. Fastigium of vertex about 1.5 times as broad as scape. Anterior margin of pronotum slightly roundly projecting, posterior margin straight. Tegmina hardly extending beyond the apex of abdomen; R vein with 5 branches, Rs vein arising after the middle of R vein, with branches, CuA vein simple; A veins 4, the last of them united at base. Wings slightly extending beyond tegmina. Hind femora with 3–4 external and 5–6 internal spines beneath, hind tibiae with 5–6 external and 5–6 internal spines above. Both sides of 10th abdominal tergite with hook-like processes directed internally (Fig. 1). Cerci rather elongate, 5mm long; lateral margin of subgenital plate rounded, hind margin with a deep incision, apical lobe rounded (Fig. 2); styli short and flattened.

Female. Subgenital plate roundly triangular, with apex slightly incised (Fig. 3). Ovipositor slightly longer than hind femora, almost straight.

Coloration. Body yellowish brown. Ocelli yellow. Eyes, apex of abdomen and spines of legs dark, black.



FIGURES 1–3. *Phryganogryllacris brevipennis* sp. nov. 1. End of male abdominal, lateral view; 2. Subgenital plate of male, ventral view; 3. Subgenital plate of female, ventral view. Scale bars=1mm.

Measurements. (length in mm)

	Body	Pronotum	Tegmina	Hind femora	Ovipositor
♂	15.0–17.0	3.5	14.0–15.0	9.0–10.0	/
♀	20.0	4.5	18.0	11.0–12.0	13.0

Material. Holotype ♂, paratype 2 ♂♂, China, Henan, Tongbaixian, Tongbai Mountain, 2000.IX.11, collected by Liu Xian-Wei and Zhang Wei-Nian ; 2 ♀♀, China, Henan, Luoshandongzhai, 1994.VII.23–26, collected by Niu Yao.

Distribution. China (Henan).

Discussion. This new species is very similar to *Phryganogryllacris sheni* Niu et Shi, 1999, but differs from the latter in: tegmina hardly extending beyond the apex of abdomen; cerci of male longer.

2. *Phryganogryllacris hubeiensis* sp. nov.

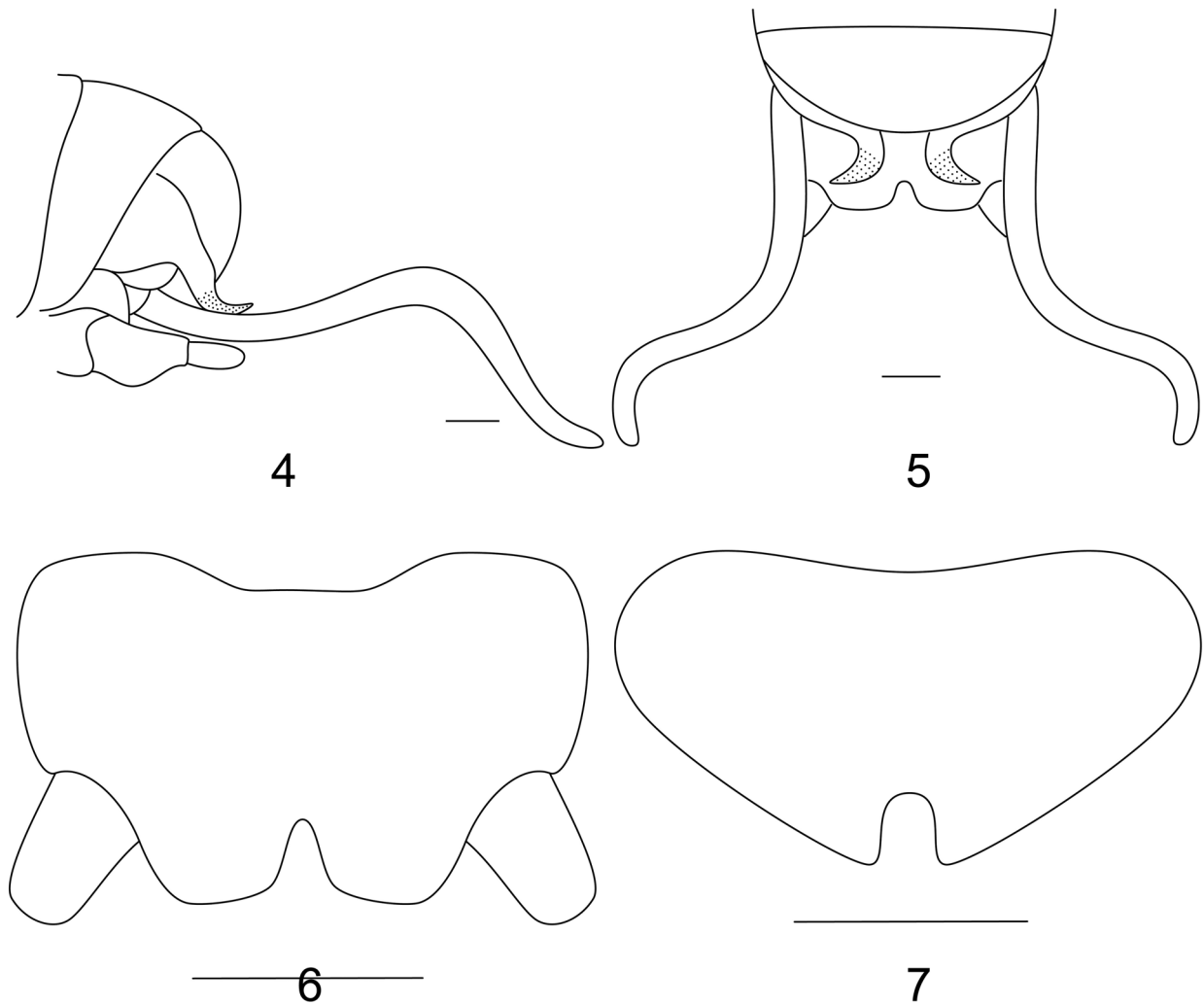
Figs. 4–7

<http://lsid.speciesfile.org/urn:lsid:Orthoptera.speciesfile.org:TaxonName:474284>

Description. Male. Body medium, stout. Fastigium of vertex about 2 times as broad as scape. Anterior margin of pronotum slightly projected, posterior margin straight. Tegmina rather extending beyond the apex of hind femora, M vein independent, furcated near base; CuA vein with 2 branches, between the first and the second branches with a short oblique vein connecting with the M vein, A veins 4, the last of them united at base. Wings slightly extending beyond tegmina. Hind femora with 6 external spines and 8–10 internal spines beneath; hind tibiae with 6 external spines and 5 internal spines above. 10th abdominal tergite broadly rounded, each side with a hook-like process, slightly S-curved (Figs. 4–5). Cerci rather long, about 5.0 mm long, cylindrical. Hind margin of subgenital plate angularly incised (Fig. 5), lobes narrowly rounded; styli rather flattened.

Female. Tegmina slightly short, extending beyond hind femora. Subgenital plate with apex triangularly excised (Fig. 7). Ovipositor slightly longer than hind femora, slightly upcurved.

Coloration. Body yellowish brown. Ocelli yellow, eyes brown. Tegmina with venations blackish brown, apex of abdomen and spines of legs blackish, all tibiae with marks.



FIGURES 4–7. *Phryganogryllacris hubeiensis* sp. nov. 4. End of male abdominal, lateral view; 5. End of male abdominal, dorsal view; 6. Subgenital plate of male, ventral view; 7. Subgenital plate of female, ventral view. Scale bars=1 mm.

Measurements. (length in mm)

	Body	Pronotum	Tegmina	Hind femora	Ovipositor
♂	19.0	5.0	21.0–24.0	13.0	/
♀	23.0–24.0	5.0	23.0	13.0	14.0–15.0

Material. Holotype ♂, paratype 2♂♂, China, Henan, Tongbai Mountain, 2000.IX.11, collected by Liu Xian-Wei and Zhang Wei-Nian; 2♀♀, China, Henan, Luoshandongzhai, 1994.VII 23–24, collected by Niu Yao.

Distribution. China (Henan).

Discussion. This new species is very similar to *Phryganogryllacris sheni* Niu et Shi, 1999, but differs from the latter in: all tibiae with marks and cerci of male rather longer.

3. *Phryganogryllacris sigillata* sp. nov.

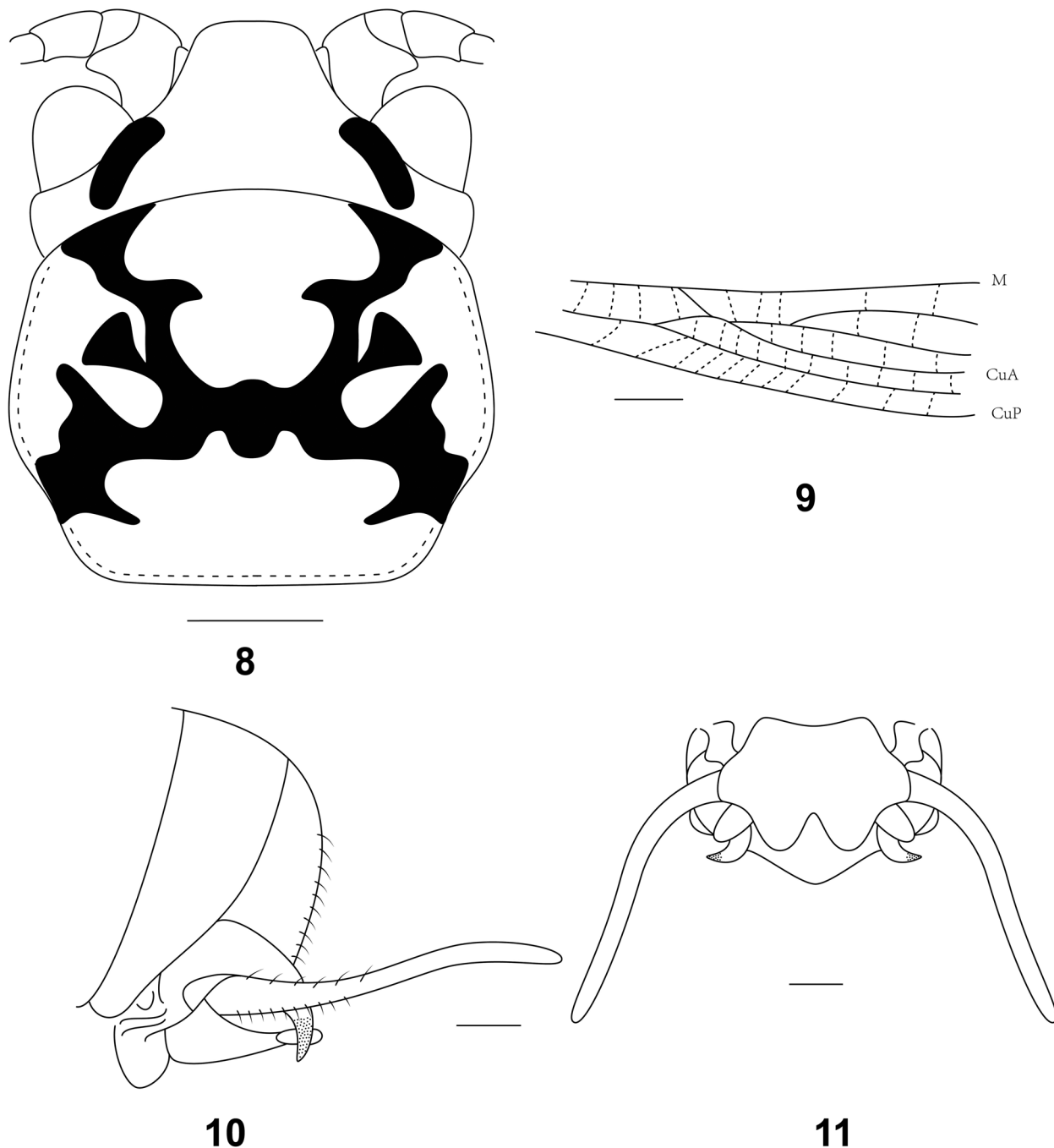
Figs. 8–11

<http://lsid.speciesfile.org/urn:lsid:Orthoptera.speciesfile.org:TaxonName:474285>

Description. Male. Body medium. Fastigium of vertex about 2 times as broad as scape. Eyes elongate to ovate, prominent. Fore margin of pronotum slightly roundly projected, hind margin straight; lateral plate lower. Tegmina rather extending beyond the apex of hind femora, M vein bifurcate, the posterior branches merged with the anterior branches of CuA (Fig. 9), Cup simple; A 4, the last of them united at base. Wings slightly extending beyond tegmina. Mid tibiae above with an apical spur. Hind femora beneath with 6–7 external spines and 6–8 internal spines; hind tibiae above with 5–7 external spines and 5–6 internal spines. 10th abdominal tergites roundly convex, each side with a hook-like process (Fig. 10). Cerci rather long, cylindrical. Hind margin of subgenital plate deeply split into two rounded lobes (Fig. 11); styli short and slightly flattened.

Female. Unknown.

Coloration. Body yellowish brown, occiput with 2 instinct dark spots, pronotum with irregular dark markings (Fig. 8), spines of legs with blackish apex.



FIGURES 8–11. *Phryganogryllacris sigillata* sp. nov. 8. Head and pronotum of male, dorsal view; 9. Part veins of tegmina, dorsal view; 10. End of male abdominal, lateral view; 11. End of male abdominal, ventral view. Scale bars=1 mm.

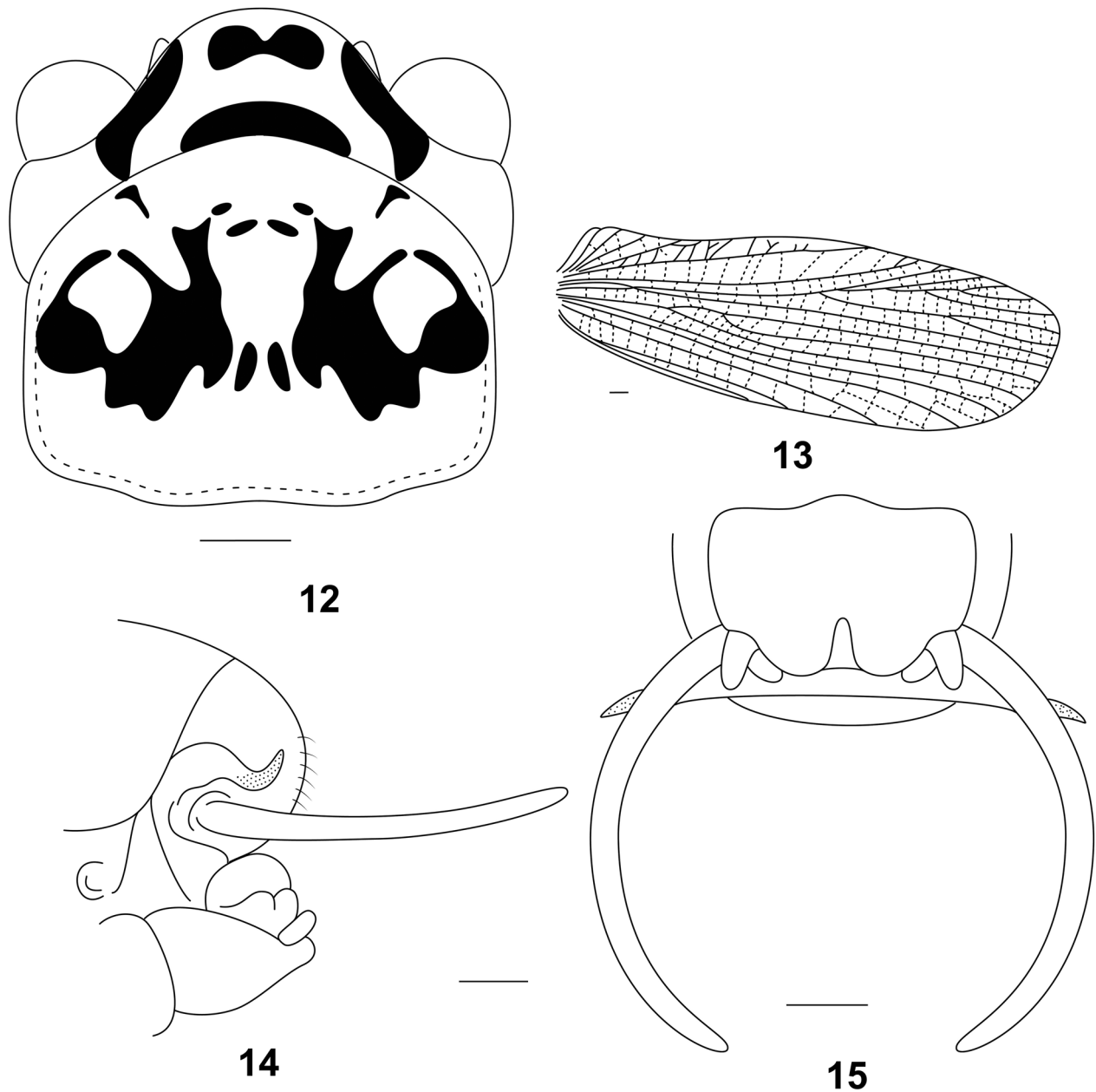
Measurements. (length in mm)

	Body	Pronotum	Tegmina	Hind femora	Ovipositor
♂	20.0	4.5	29.0–30.0	14.0	/

Material. Holotype ♂, paratype 1♂, China, Hubei, Luotian, Qingtaiguan, Alt. 560–880m, 2014.VII.3, Zhu Wei-Bing.

Distribution. China (Hubei).

Discussion. This new species is very similar to *Phryganogryllacris xiai* Liu *et* Zhang, 2001. But differ from the latter in head and pronotum with markings different.



FIGURES 12–15. *Phryganogryllacris fanjingshanensis* sp. nov. 12. Head and pronotum of male, dorsal view; 13. Veins of tegmina, dorsal view; 14. End of male abdominal, lateral view; 15. End of male abdominal, ventral view. Scale bars=1 mm.

4. *Phryganogryllacris fanjingshanensis* sp. nov.

Figs. 12–15

<http://lsid.speciesfile.org/urn:lsid:Orthoptera.speciesfile.org:TaxonName:474286>

Description. Male. Body medium. Fastigium of vertex about 2 times as broad as scape; eyes elongate to ovate, prominent. Fore margin of pronotum slightly roundly projected, hind margin straight; lateral plate lower. Tegmina rather extending beyond the apex of hind femora, M simple, CuA with 3 branches, A 4, the last of them united at base (Fig. 13). Wings slightly extending beyond tegmina. Mid tibiae above with an apical spur. Hind femora beneath with 3 external spines and 3 internal spines; hind tibiae above with 6–8 external spines and 4–6 internal spines. 10th abdominal tergites roundly convex, each side with a hook-like process (Fig. 14). Cerci rather long, cylindrical. Hind margin of subgenital plate deeply split into two rounded lobes (Fig. 15); styli short and slightly flattened.

Female. Unknown.

Coloration. Body yellowish brown, head and pronotum with irregular dark markings (Fig. 12), abdominal tergites blackish brown, with a broad yellowish hyaline posterior margins (except apex); all femora with brown stripes, spines of legs with blackish.

Measurements. (length in mm)

	Body	Pronotum	Tegmina	Hind femora	Ovipositor
♂	27.0	5.0	29.0	13.0	/

Material. Holotype ♂, paratype 1♂, China, Guizhou, Jiangkou, Fanjingshan, Alt. 1000–1800m, 2014.VIII.5, Sun Mei-Ling *et* Li Miao-Miao.

Distribution. China (Guizhou).

Discussion. This new species is very similar to *Phryganogryllacris sigillata* sp. nov., but differs from the latter in markings of head and pronotum, veins of tegmen, colour of abdomen.

Acknowledgements

We thank Wang Han-Qiang & Dai Li for their help on the manuscript; we are grateful to all collectors of the specimens recorded in this paper. This research was supported by the Natural Science Foundation of Shanghai, China (No. 14ZR1413000), The Ministry of Science and Technology of the People's Republic of China (Grant No. 2005DKA21402) and Chinese Academy of Sciences (Grant No. XXH12504-1-03).

References

- Gorochov, A.V. (2005) A contribution to the fauna and systematics of the Stenopelmatoidea (Orthoptera) of Indochina and some other territories VI. *Entomologicheskoe Obozrenie*, 84 (4), 806.
- Jin, X.-B. & Xia, K.-L. (1994) An Index-Catalogue of Chinese Tettigonioidea (Orthopteroidea: Grylloptera). *Journal of Orthoptera Research*, 3, 17.
- Karny, H.H. (1937) Orthoptera Fam Gryllacrididae. *Genera Insectorum*, 206, 1–317.
- Liu, X.-W. (1999) Stenopelmatoidea. In: Huang, B.-K. (Ed.), *Fauna of Insects Fujian Province of China. Vol. 1*. Fujian science and technology press, Fuzhou, pp. 178–180.
- Liu, X.-W. & Zhang, W.-N. (2001) Orthoptera: Tettigonioidea, Rhaphidophoroidea, Gryllacrididae. In: Wu, H. & Pan, C.-W. (Ed.), *Insect of Tianmushan National Nature Reserve*. Beijing Science and Technology Press, Beijing, pp. 99–100.
- Eades, D.C., Otte, D., Cigliano, M.M. & Braun, H. (2015) Orthoptera Species File. Version 5.0/5.0. Available from: <http://Orthoptera.SpeciesFile.org> (accessed 24 February 2016)
- Liu, X.-W. (2010) Orthoptera: Stenopelmatoidea. In: Xu, H.-C. (Ed.), *Insects of Fengyangshan National Nature Reserve*. China's Forest University Press, Beijing, pp. 58.
- Li, M.-M., Fang, Y., Liu, X.-W. & Li, K. (2014) Taxonomic revision of the genus *Phryganogryllacris* (Orthoptera: Gryllacrididae) from China. *Zoological Systematics*, 39 (4), 507–519. <http://dx.doi.org/110.11865/zs.20140404>