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A taxonomic study on the species of the genus *Furcilarnaca* (Orthoptera, Gryllacrididae, Gryllacridinae)

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Abstract

A taxonomic study of the genus *Furcilarnaca* Gorochov, 2004 is presented. Four new species are described: *F. affinis* **sp. nov.**, *F. hirta* **sp. nov.**, *F. fractiflexa* **sp. nov**., *F. brachyptera* **sp. nov**.. Two new combinations *F. fallax* (Liu et al., 2010) **comb. nov.** and *F. pulex* (Karny, 1928) **comb. nov.** are given. A key to the species and the distributional data of *Furcilarnaca* are provided.

Key words: Gryllacrididae, Gryllacridinae, *Furcilarnaca*, new species, new combination

Introduction

Gorochov (2004) proposed the genus *Furcilarnaca*, with the type species *F. superfurca* Gorochov, 2004. Besides, he described four new species and transferred three species from *Metriogryllacris* to this genus.

Bian *et al*. (2013) reviewed the *Furcilarnaca* of China, provided a key including 6 species and described 1 new species *F. wufengensis* Bian *et al*., 2013. *F. superfurca* Gorochov, 2004 is first recorded from China (Yunnan province) and *F. huangi* Gorochov, 2004 is first found in the Guizhou and Guangxi provinces. To date, *Furcilarnaca* includes 8 species, 7 species are recorded from China, and 1 species occurred in Vietnam. In this paper, 4 new species of *Furcilarnaca* are described and under the names of *F. affinis* **sp. nov.**, *F. hirta* **sp. nov.**, *F. fractiflexa* **sp. nov.**, *F. brachyptera* **sp. nov.**. Two new combinations are proposed: *F. fallax* (Liu *et al*., 2010) **comb. nov.** and *F. pulex* (Karny, 1928) **comb. nov**. All type specimens recorded here are deposited in the Shanghai Entomology Museum, the Chinese Academy of Sciences.

Furcilarnaca Gorochov, 2004

Furcilarnaca: Gorochov, 2004. En. Rev., 84(8): 908–911; Bian *et al*, 2013. Far East. En., 268: 1–8.

Generic diagnosis. Body small sized, slender. Anterior margin of pronotum slightly convex, posterior margin straight. Tegmina and wings well-developed, all veins hyaline or pale, with darkish brown membranes. Tegmina exceeding apex of hind femur or not reaching apex of hind femur; basal area of M vein arising in basal area of tegmina, not united with R vein. Wings slightly extending beyond tegmina. Fore coxae with a short spine, fore and mid tibiae with 5 pairs of spurs on ventral surface, and mid tibia with an apical spur on dorsal surface. Subgenital plate of male divided into two lobes, with styli. Ovipositor short and straight, with subacute apex.

Type species. *Furcilarnaca superfurca* Gorochov, 2004

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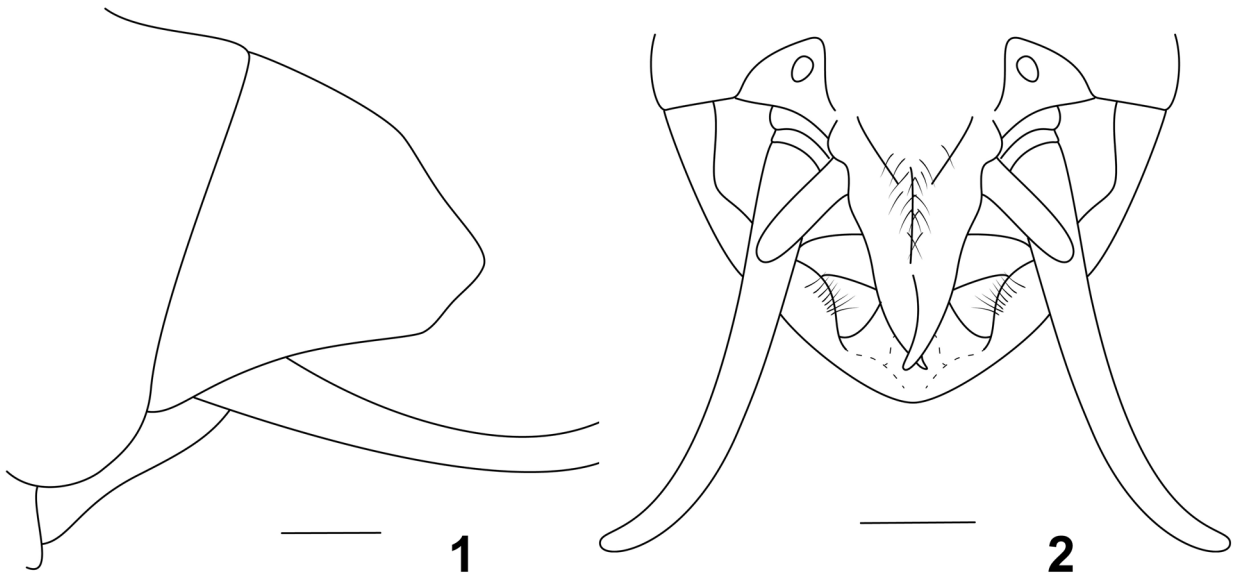
Key to species of the genus *Furcilarnaca*

1	Tegmina rather extending beyond apex of hind femur.	2
-	Tegmina not reaching apex of hind femur.	8
2	Last abdominal tergite of male without spine. (Fig. 1)	*F. fallax* (Liu *et al.*, 2010)
-	Last abdominal tergite of male with 2 or 4 spines	3
3	Subgenital plate of male divided at apex. (Fig. 3)	*F. forceps* (Bey-Bienko, 1962)
-	Subgenital plate of male deeply divided to basal half.	4
4	Lobes of male subgenital plate with acute apex	5
-	Lobes of male subgenital plate with obtuse apex. (Figs. 6, 7)	*F. fractiflexa* **sp. nov.**
5	Lobes of male subgenital plate broader (Fig. 8), apical part incurved. (Fig. 9).	*F. chirurga* (Bey-Bienko, 1962)
-	Lobes of male subgenital plate narrow, apical part curved externally.	6
6	Lobes of male subgenital plate not hirsute	7
-	Lobes of male subgenital plate hirsute. (Fig. 10)	*F. hirta* **sp. nov.**
7	Apical half of lateral lobes of subgenital plate distinctly curved upwards. (Figs. 12, 13)	*F. superfurca* Gorochov, 2004
-	Apical half of lateral lobes of subgenital plate, not curved upwards. (Fig. 15)	*F. affinis* **sp. nov.**
8	Tegmina reaching or exceeding apex of abdomen	9
-	Tegmina not reaching apex of abdomen	*F. brachyptera* **sp. nov.**
9	Last abdominal tergite of male with paired of processes	10
-	Last abdominal tergite of male without paired of processes.	11
10	Last abdominal tergite of male with one pair of processes. (Fig. 18)	*F. beybienkoi* Gorochov, 2004
-	Last abdominal tergite of male with two pairs of processes. (Figs. 20, 21).	*F. armata* (Bey-Bienko, 1957)
11	Subgenital plate of male with lobes subcontiguous and apex not pointed. (Fig. 23)	*F. pulex* (Karny, 1928)
-	Subgenital plate of male with lobes remote and apically pointed.	12
12	Subgenital plate of male with apex broadly notched. (Fig. 25)	*F. huangi* Gorochov, 2004
-	Subgenital plate of male with apex narrowly notched. (Fig. 27, 28)	*F. wufengensis* Bian *et al.* 2013

1. Furcilarnaca fallax (Liu *et al.*, 2010) comb. nov.

(Figs. 1–2)

Metriogryllacris fallax: Liu *et al.*, 2010. Insec. of Fengyangshan Nati. Nat. Res., 58: 62, figs. 6a–b.



FIGURES 1–2. *Furcilarnaca fallax* (Liu *et al.*, 2010) comb. nov. 1. End of male abdominal, lateral view; 2. End of male abdominal, ventral view. Scale bars=1mm.

Measurements. (in mm)

	Body	Pronotum	Tegmina	Hind femora	Ovipositor
♂	12.0	3.0	21.0	7.5	/

Material. 1♂, China, Zhejiang, Longquan, Fengyang Mountain, 1986. VII.1, collector unknown.

Distribution. China (Zhejiang).

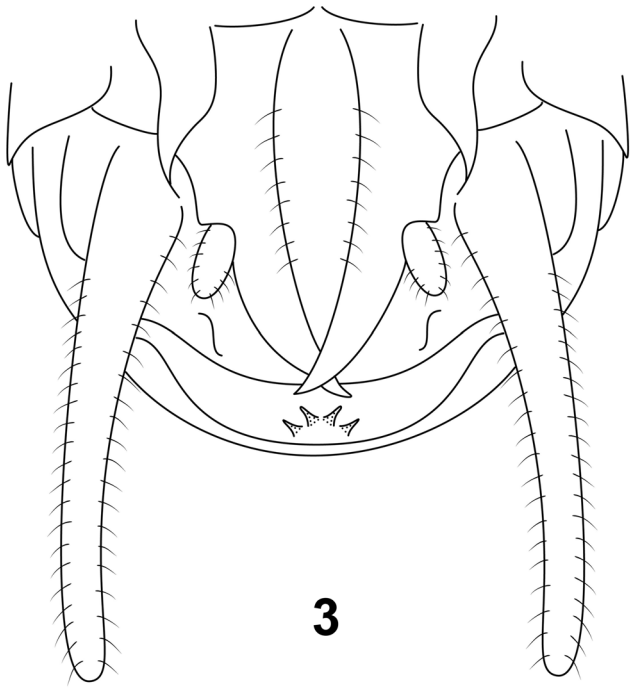
Discussion. This new combination is differed from the species of *Metriogryllacris* by apex of subgenital plate of male divided into two acute lobes.

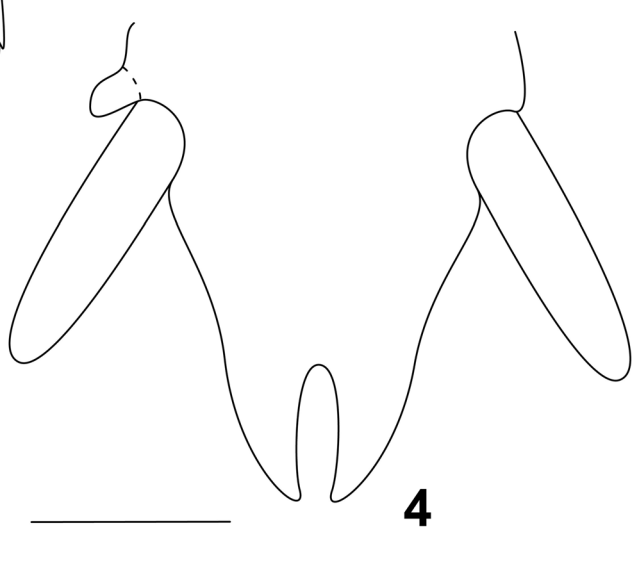
2. *Furcilarnaca forceps* (Bey-bienko, 1962)

(Figs. 3–4)

Metriogryllacris forceps: Bey-Bienko, 1962. Proc. Zool. Inst. Leningrad, 30: 113; Liu *et al.*, 2010. Insec. of Fengyangshan Nation. Nat. Res., 58: 61.

Furcilarnaca forceps: Gorochov, 2004. En. Rev., 84(8): 908; Bian *et al*, 2013. Far East. En., 268: 4.





FIGURES 3–4. *Furcilarnaca forceps* (Bey-bienko, 1962). 3. End of male abdominal, ventral view; 4. Subgenital plate of male, ventral view. Scale bars=1mm.

Measurements. (in mm)

	Body	Pronotum	Tegmina	Hind femora	Ovipositor
♂	12.0–15.0	2.5–3.0	15.0–19.0	7.5–8.0	/

Material. 1♂, China, Yunnan, Xishuangbanna, Jinghong, 1974.V.14–16, collected by Zhou Yao and Yuan Feng; 1♂, China, Yunnan, Jinuo, 1995.VIII.5–9, collected by Liu Xian-Wei *et al*; 1♂, China, Yunnan, Mengla, 1995.VIII.23–27, collected by Liu Xian-Wei *et al*.

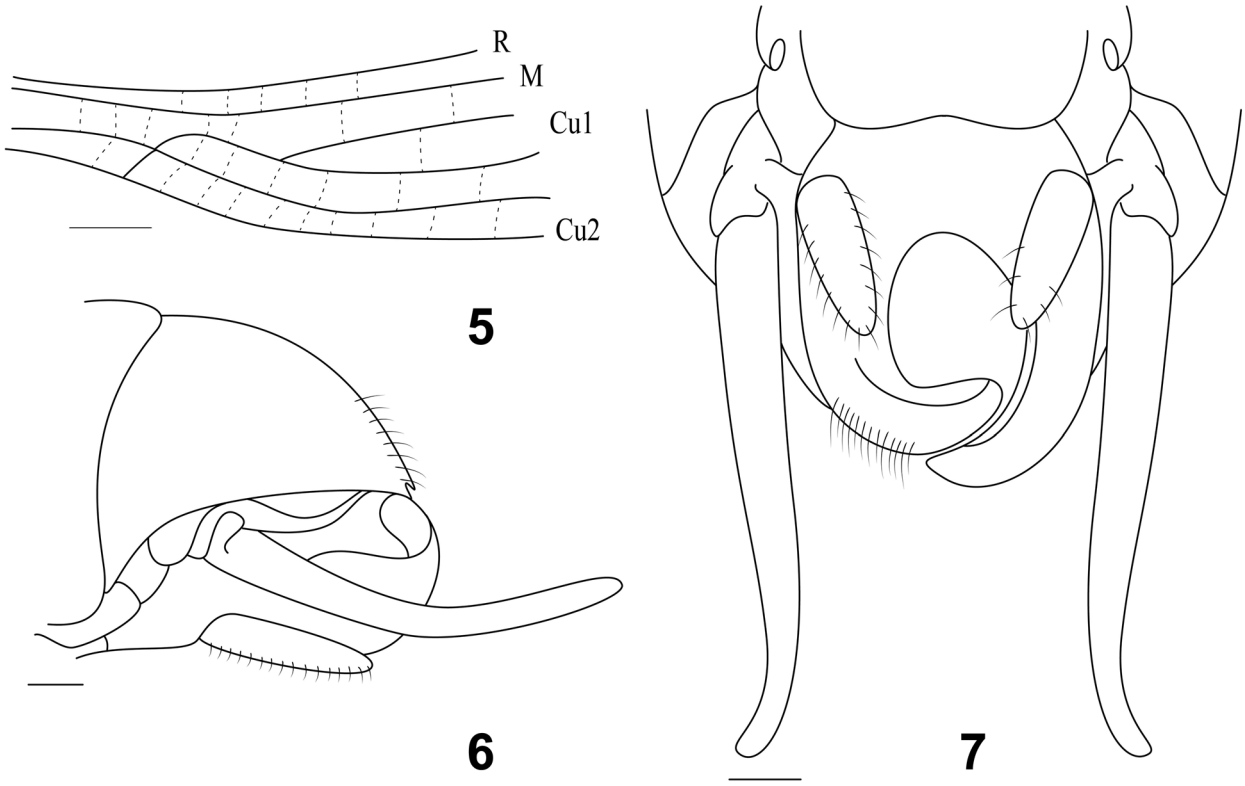
Distribution. China (Yunnan).

3. *Furcilarnaca fractiflexa* sp. nov.
(Figs. 5–7)

Description. Male. Body small sized, slender. Head broadly oval, fastigium of vertex about 2 times as broad as scape. Fore margin of pronotum slightly convex, hind margin straight. Tegmina rather exceeded beyond apex of hind femur; R vein with 4 branches, Rs arising from R vein nearly in the middle, with 3 branches; M vein simple, Cu1 vein with 3 branches (Fig. 5); A vein with 4 branches. Wings slightly extending beyond tegmina. Hind femur with 4–6 inter spines and outer spines on ventral surface; hind tibia on dorsal surface with 5–6 outer spines and 3–5 inter spines. Hind margin of male 10th abdominal tergite bearing 2 spines (Fig. 6), with pairs of spine-like processes on ventral surface. Subgenital plate divided into two lobes, apical half of lobes strongly incurved and hairy, with obtuse apex (Fig. 7). Styli situated in the base of subgenital plate, cylindrical.

Female. Subgenital plate deeply notched, lobes triangular (Fig. 8). Ovipositor straight, with subacute apex.

Coloration. Body pale yellowish-brown, unicolor. Eyes blackish brown.



FIGURES 5–7. *Furcilarnaca fractiflexa* **sp. nov.**. 5. Portion of veins of tegmen, dorsal view; 6. End of male abdominal, lateral view; 7. End of male abdomen, ventral view. Scale bars=1mm.

Measurements. (in mm)

	Body	Pronotum	Tegmina	Hind femora	Ovipositor
♂	14.0	2.8	18.0	8.5	/
♀	16.0	3.0	18.0	8.5	10.0–11.0

Material. Holotype, ♂, Paratype, 4♀♀, China, Yunnan, Xishuangbana, Menglun, Alt. 600m, 2009.VI.1–2, collected by Liu Xian-Wei *et al*.

Distribution. China (Yunnan).

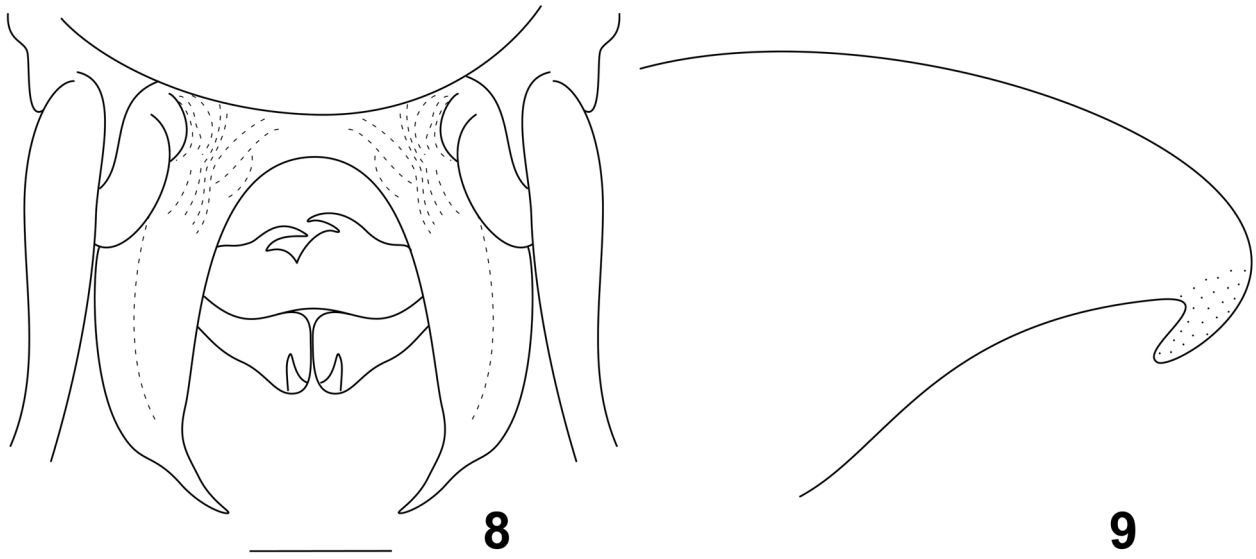
Discussion. This new species is very similar to *F. chirurga* (Bey-Bienko, 1962) and *F. affinis* sp. nov., differs

in the male subgenital plate with strongly incurved apical lobes and the obtuse apex; subgenital plate of female with triangular lobes.

4. *Furcilarnaca chirurga* (Bey-Bienko, 1962)

(Figs. 8–9)

Metriogryllacris chirurga: Bey-Bienko, 1962. Proc. Zool. Inst. Leningrad, 30: 111; Liu *et al.*, 2010. Insec. of Fengyangshan Nation. Nat. Res., 58: 61.
Furcilarnaca chirurga: Gorochov, 2004. En. Rev., 84(8): 908; Bian *et al*, 2013. Far East. En., 268: 4.



FIGURES 8–9. *Furcilarnaca chirurga* (Bey-Bienko, 1962). 8. End of male abdomen, ventral view (according to Bey-Bienko, 1962); 9. Posterior lobe of 9th abdominal tergite, lateral view (according to Gorochov, 2004). Scale bars=1mm.

Measurements. (in mm)

	Body	Pronotum	Tegmina	Hind femora	Ovipositor
♂	11.0–13.0	2.8–2.9	15.5	7.5	/
♀	13.0	3.0	15.0	8.5	9.0

Distribution. China (Yunnan).

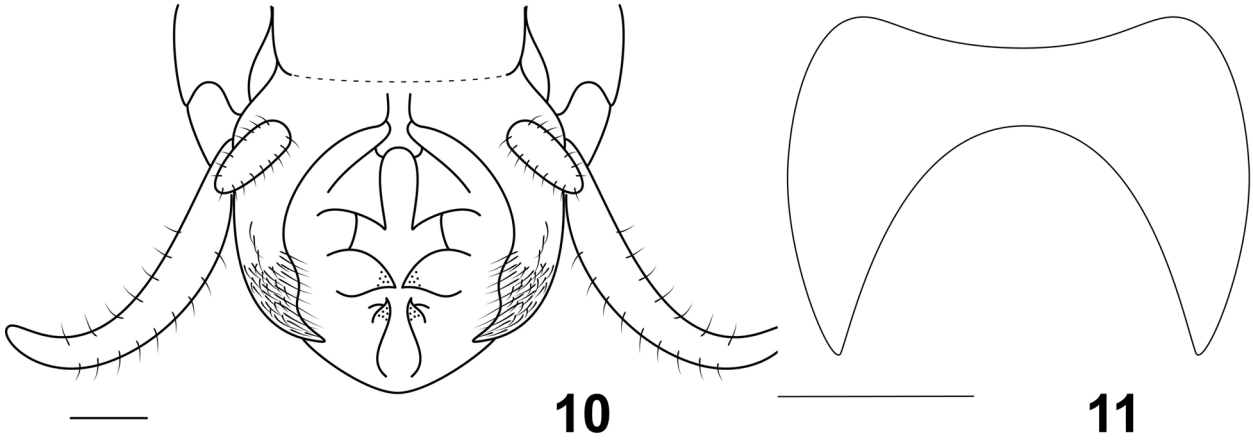
5. *Furcilarnaca hirta* sp. nov.

(Figs. 10–11)

Description. Male. Body small sized, slender. Head broadly oval, fastigium of vertex about 2 times as broad as scape. Fore margin of pronotum slightly convex, hind margin straight. Tegmina rather exceeded beyond apex of hind femur; Rs arising from R vein nearly in the middle, bifucated; M vein simple; Cu1 vein with 3 branches; A vein with 3 branches, the last of them united at base. Wings slightly extending beyond tegmina. Hind femur with 8 inner spines and 6 outer spines on ventral surface; hind tibia on dorsal surface with 7 outer spines and 5 inter spines. Hind margin of male 10th abdominal tergite with 2 pairs of hook-like processes. Subgenital plate divided to base, apical part of lobes hairy and with apex pointed (Fig. 10). Styli situated in the near base of subgenital plate, cylindrical.

Female. Hind margin of subgenital plate apex with deep and broad incision, lobes narrowly sharp (Fig. 11). Ovipositor straight, almost as long as hind femur and with subacute apex.

Coloration. Body pale yellowish-brown, unicolor. The color of veins darken than the cells.



FIGURES 10–11. *Furcilarnaca hirta* **sp. nov.**. 10. End of male abdomen, ventral view; 11. Subgenital plate of female, ventral view. Scale bars=1mm.

Measurements. (in mm)

	Body	Pronotum	Tegmina	Hind femora	Ovipositor
♂	11.0	3.0	13.0	7.0	/
♀	17.0	3.5	18.0	9.5	10.0

Material. Holotype, ♂, Paratype, 1♀, China, Yunnan, Jinping, Mengla, Wendang, Alt. 850m, 2009.V.26, collected by Liu Xian-Wei *et al*.

Distribution. China (Yunnan).

Discussion. This new species is related to *F. chirurga* (Bey-Bienko, 1962), but differs from the latter in the subgenital plate of male divided at base and the lobes of male subgenital plate being hirsute.

6. *Furcilarnaca superfurca* Gorochov, 2004

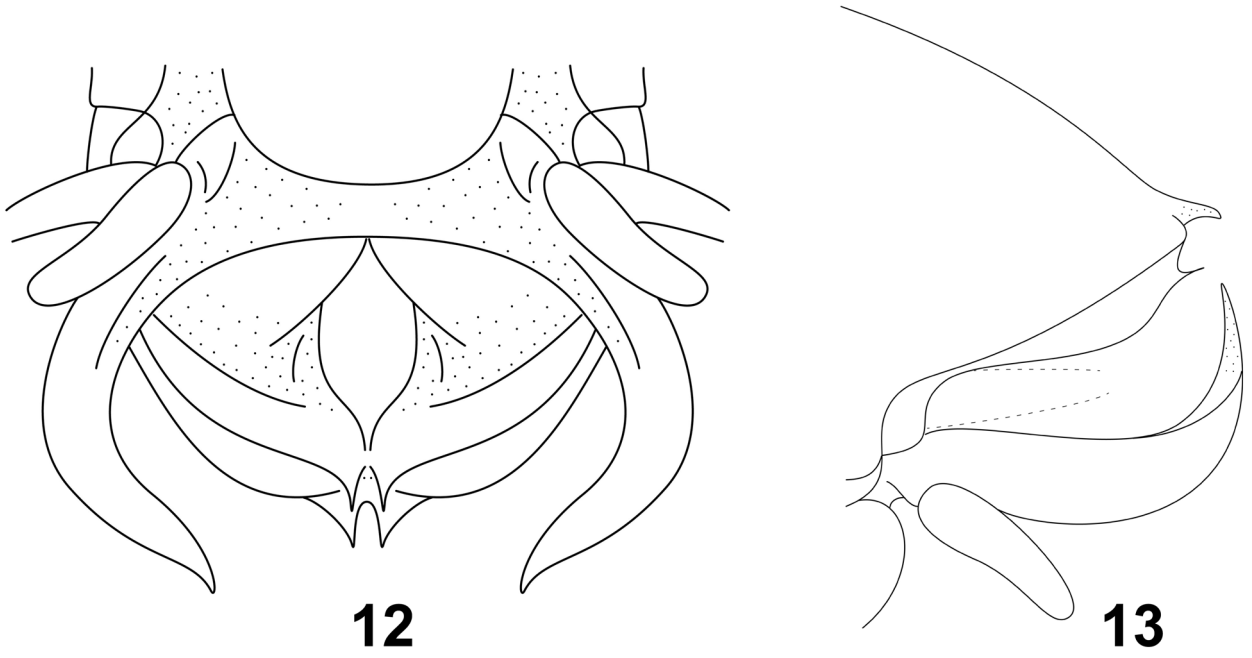
(Figs. 12–13)

Furcilarnaca superfurca: Gorochov, 2004. En. Rev., 84(8): 908–909; Bian *et al*, 2013. Far East. En., 268: 4.

Measurements. (in mm)

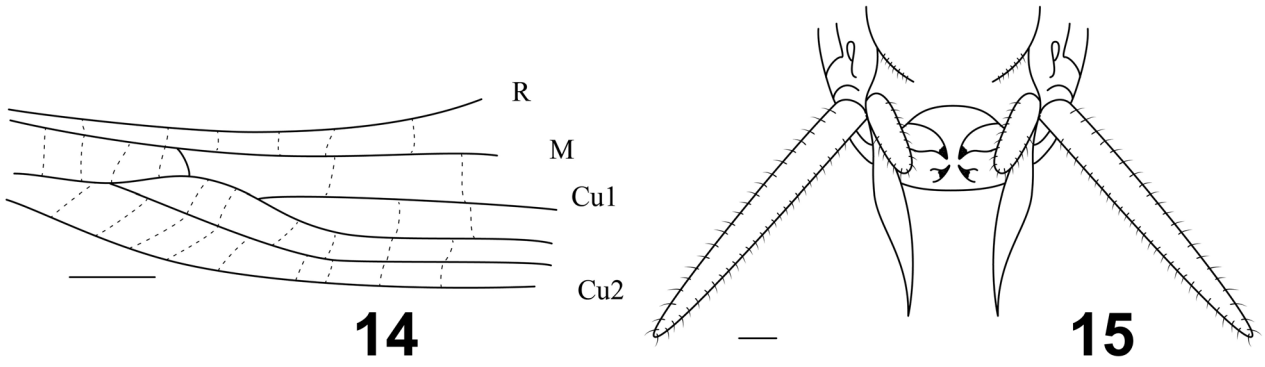
	Body	Pronotum	Tegmina	Hind femora	Ovipositor
♂	14.5–15.5	2.9–3.0	19.5–20.0	8.0–8.5	/
♀	15.5–18.5	3.4–3.6	20.5–21.5	9.0–10.0	10.0–11.0

Distribution. China (Yunnan).



FIGURES 12–13. *Furcilarnaca superfurca* Gorochov, 2004. 12. End of male abdomen, ventral view; 13. End of male abdominal, lateral view (according to Gorochov, 2004).

7. *Furcilarnaca affinis* sp. nov.
(Figs. 14–15)



FIGURES 14–15. *Furcilarnaca affinis* **sp. nov.**. 14. Portion of veins of tegmen, dorsal view; 15. End of male abdomen, ventral view. Scale bars=1mm.

Description. Male. Body small sized, slender. Head broadly oval, fastigium of vertex about 2 times as broad as scape. Fore margin of pronotum slightly convex, hind margin straight. Tegmina extending beyond apex of hind femur; Rs arising from R vein before middle, with 3 branches; posterior branch of M united with the anterior branch of Cu1 in base (Fig. 14); A vein with 4 branches, the last of them united at base. Wings slightly extending beyond tegmina. Hind femur with 7–8 inter spines and outer spines on ventral surface; hind tibia on dorsal surface with 5–6 outer spines and inter spines. Hind margin of male 10th abdominal tergite bearing 2 spines, with pairs of hook-like processes on ventral surface. Subgenital plate divided into two lobes, lobes long and narrow, apical part spine-like and curved externally (Fig. 15). Styli situated in the base of subgenital plate, longer, cylindrical.

Female. Unknown.

Coloration. Body pale yellowish-brown, unicolor. Eyes blackish brown.

Measurements. (in mm)

	Body	Pronotum	Tegmina	Hind femora	Ovipositor
♂	12.0	3.0	19.0	8.5	/

Material. Holotype, ♂, China, Yunnan, Mengla, Alt. 600m, 2009.VI.4–6, collected by Liu Xian-Wei *et al*.

Distribution. China (Yunnan).

Discussion. This new species distinguishable from *F. superfurca* Gorochov, 2004 in lobes of male subgenital plate straight, apical half not curved upwards.

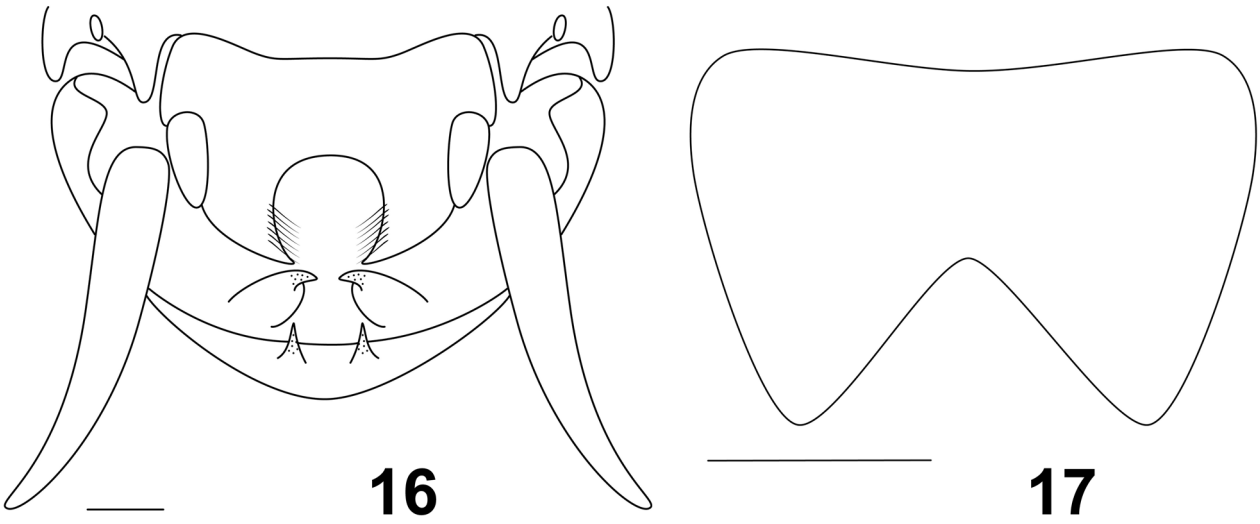
8. *Furcilarnaca brachyptera* sp. nov.

(Figs. 16–17)

Description. Male. Body small sized, slender form. Head broadly oval, fastigium of vertex about 2 times as broad as scape. Anterior margin of pronotum slightly convex, hind margin straight. Tegmina not extending beyond apex of hind femur; R vein with 4 branches, Rs arising from R vein nearly in the middle; M vein simple; Cu1 vein with 2 branches; A vein with 4 branches. Wings slightly extending beyond tegmina. Hind femur with 3–4 inter spines and 5–7 outer spines on ventral surface; hind tibia on dorsal surface with 3–5 outer spines and 5–6 inter spines. Hind margin of male 10th abdominal tergite with 2 pairs of spine-like processes. Subgenital plate divided to lobes, lobes triangular and hairy in the inside (Fig. 16). Styli situated at the base of subgenital plate, cylindrical.

Female. Subgenital plate broadly long, hind margin with triangular incision, lobes corniform (Fig. 17). Ovipositor straight, with subacute apex.

Coloration. Body pale yellowish-brown, unicolor. Eyes blackish brown.



FIGURES 16–17. *Furcilarnaca brachyptera* **sp. nov.**. 16. End of male abdomen, ventral view; 17. Subgenital plate of female, ventral view. Scale bars=1mm.

Measurements. (in mm)

	Body	Pronotum	Tegmina	Hind femora	Ovipositor
♂	11.5–12.0	2.5	7.0–8.0	6.5–7.0	/
♀	15.0	3.0	8.0	7.0	9.0

Material. Holotype, ♂, Paratype, 1♀, China, Yunnan, Shaotong, Huanghua, 2007.VII.2, collector unknown; 1♀, China, Yunnan, Shaotong, Huanghua, 2010.VIII collected by Zhang Ding-Jie.

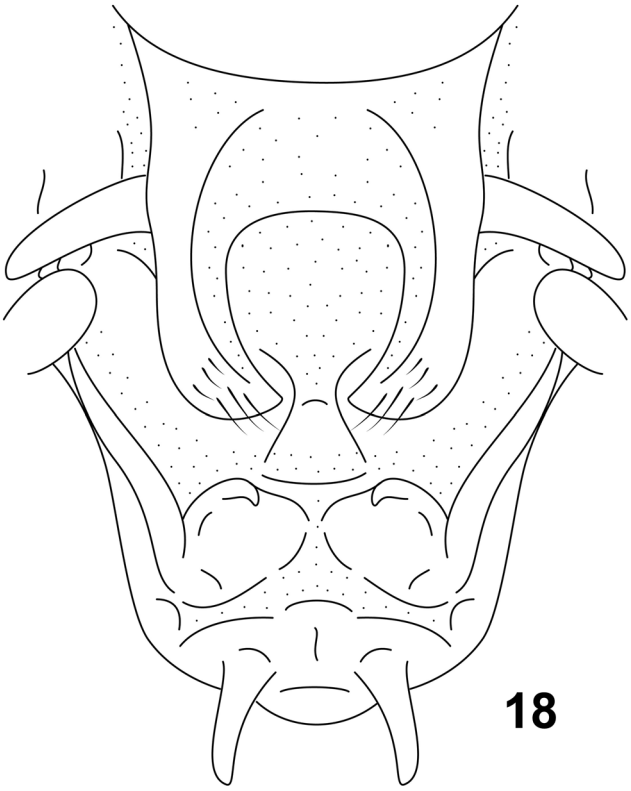
Distribution. China (Yunnan).

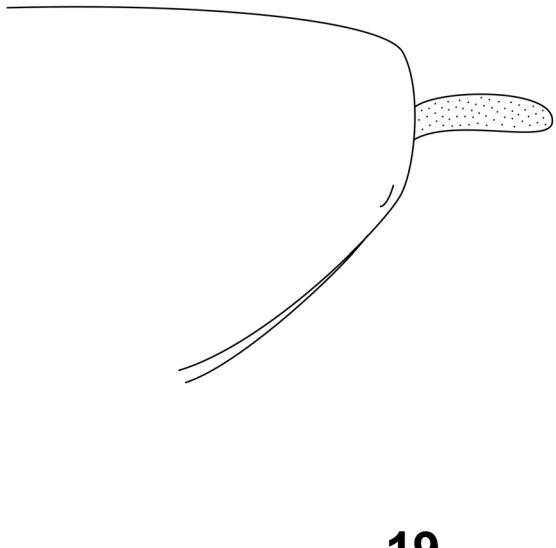
Discussion. This new species with short tegmina and not reaching the apex of abdominal; the shape of end of male abdominal distinguishable from *F. wufengensis* Bian *et al.*, 2013.

9. *Furcilarnaca beybienkoi* Gorochov, 2004

(Figs. 18–19)

Furcilarnaca beybienkoi: Gorochov, 2004. En. Rev., 84(8): 829, figs 70, 71





FIGURES 18–19. *Furcilarnaca beybienkoi* Gorochov, 2004. 18. End of male abdomen, ventral view; 19. Posterior lobe of 9th abdominal tergite, lateral view (according to Gorochov, 2004).

Measurements. (in mm)

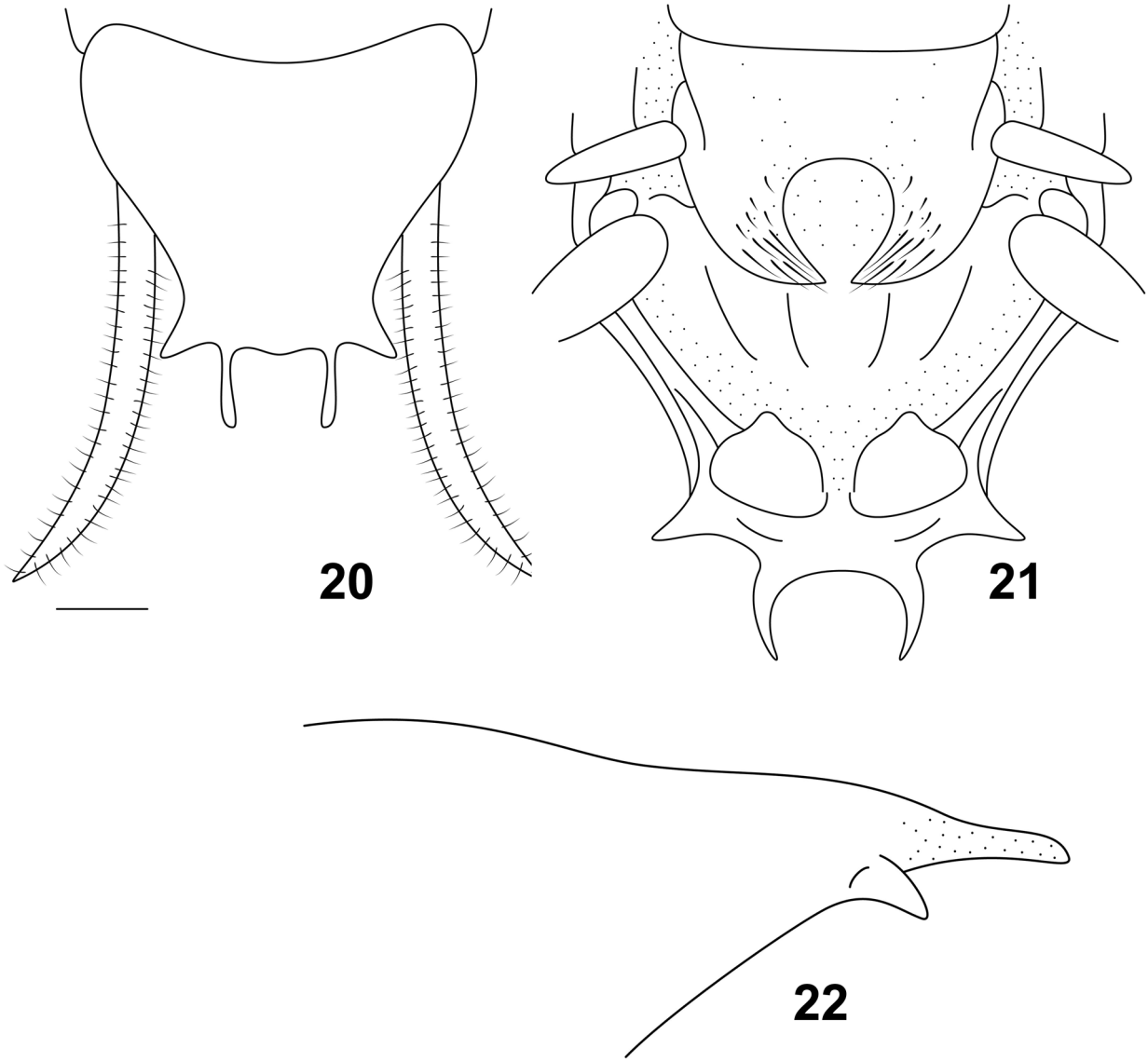
	Body	Pronotum	Tegmina	Hind femora	Ovipositor
♂	12.0	2.4	10.5	6	/

Distribution. China (Yunnan).

10. *Furcilarnaca armata* (Bey-Bienko, 1957)

(Figs. 20–22)

Metriogryllacris armata: Bey-Bienko,1957. Ent. Obozr., 36: 402.
Furcilarnaca armata: Gorochov, 2004. En. Rev., 84(8): 909, figs 72, 73; Bian *et al*, 2013. Far East. En., 268: 4.



FIGURES 20–22. *Furcilarnaca armata* (Bey-Bienko,1957). 20. end of male abdomen, dorsal view (according to Bey-Bienko, 1957); 21. End of male abdomen, ventral view; 22. Posterior lobe of 9th abdominal tergite, lateral view (according to Gorochov, 2004). Scale bars=1mm.

Measurements. (in mm)

	Body	Pronotum	Tegmina	Hind femora	Ovipositor
♂	15.5	2.9	11.7	7.5	/

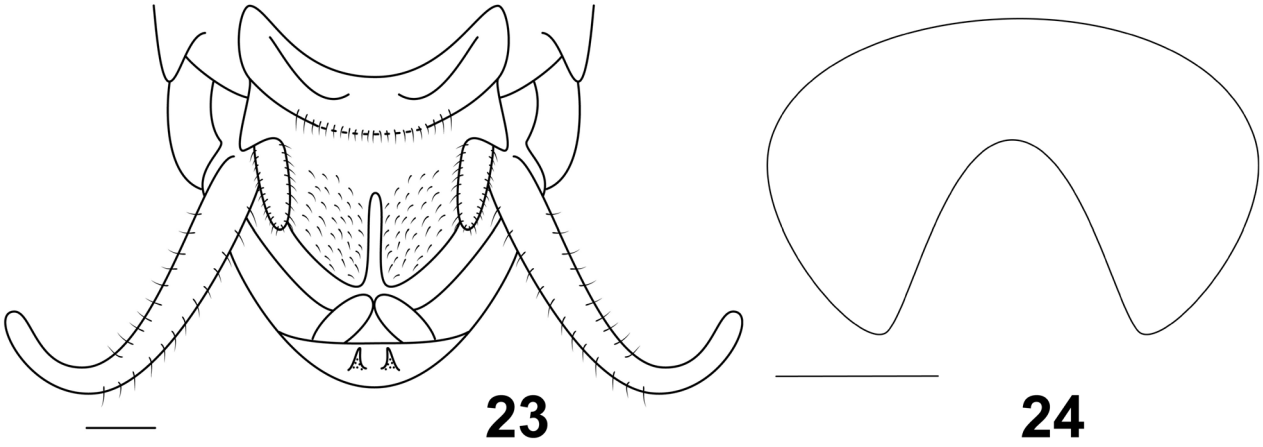
Distribution. China (Yunnan).

11. *Furcilarnaca pulex* (Karny, 1928) comb. nov.

(Figs. 23–24)

Gryllacris pulex: Karny, 1928. Stett. Ent. Zeit., 89: 283.

Metriogryllacris pulex: Karny, 1937. Gene. Insect., 206: 108; Jin *et* Xia, 1994. J. Orth. Res., 3: 17.
Furcilarnaca pulex: Gorochov, 2004. En. Rev., 84(8): 908; Bian *et al*, 2013. Far East. En., 268: 4.



FIGURES 23–24. *Furcilarnaca pulex* (Karny, 1928) comb. nov.. 23. End of male abdomen, ventral view; 24. Subgenital plate of female, ventral view. Scale bars=1mm.

Measurements. (in mm)

	Body	Pronotum	Tegmina	Hind femora	Ovipositor
♂	9.6–11.0	2.3–3.0	10.5–12.0	6.8–8.0	/
♀	12.0–15.0	2.5–3.0	10.0–11.5	7.5–8.0	8.5–9.0

Material. 1♀, China, Guizhou, Leigongshan, Xiaodanjiang, Alt. 860–1300m, 2005.V.31–VI.1, collected by Song Yue-Hua; 1♀, China, Guizhou, Leigongshan, Fangyang, Alt. 900m, 2005.VI.1, collected by Cao Ling-Zhen; 1♂, China, Guizhou, Leigongshan, Xiaodanjiang, Alt. 900–970m, 2005.VI.3, collected by Xu Fang-Ling and Cao Ling-Zhen; 1♀, China, Guizhou, Leigongshan, Xiaodanjiang, Alt. 800–900m, 2005.VI.1–5, collected by Tang Yi; 1♀, China, Guizhou, Yanhe, Lijiaba, Alt. 700m, 2007.VI.8–12, collected by Tang Liang; 1♂, Guangxi, Tianlin, Langping, 1982.VI.29, collected by Yang Ji-Kun (China Agricultural University). 1♂, Guangxi, Huaping, Hongtan, 1963.VI.11, collected by Yang Ji-Kun (China Agricultural University).

Distribution. China (Guizhou, Guangxi).

Discussion. This new combination is distinguished from the species of *Metriogryllacris* by apex of subgenital plate of male being divided into two acute lobes.

12. *Furcilarnaca huangi* Gorochov, 2004

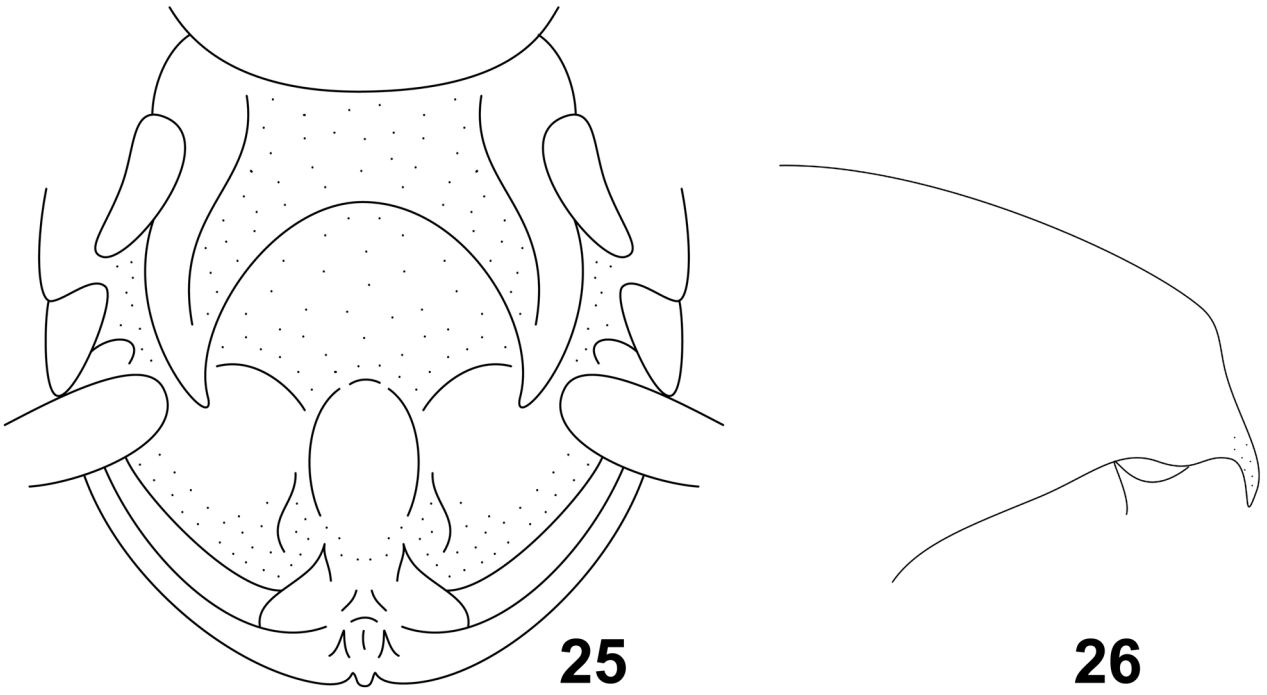
(Figs. 25–26)

Furcilarnaca huangi: Gorochov, 2004: En. Rev., 84(8): 828, figs 68, 69; Bian *et al*, 2013. Far East. En., 268: 5.

Measurements. (in mm)

	Body	Pronotum	Tegmina	Hind femora	Ovipositor
♂	12.5	2.8	13	7.0	/
♀	15.0	3.1	13	7.7	9.0

Distribution. China (Guangxi, Guizhou).

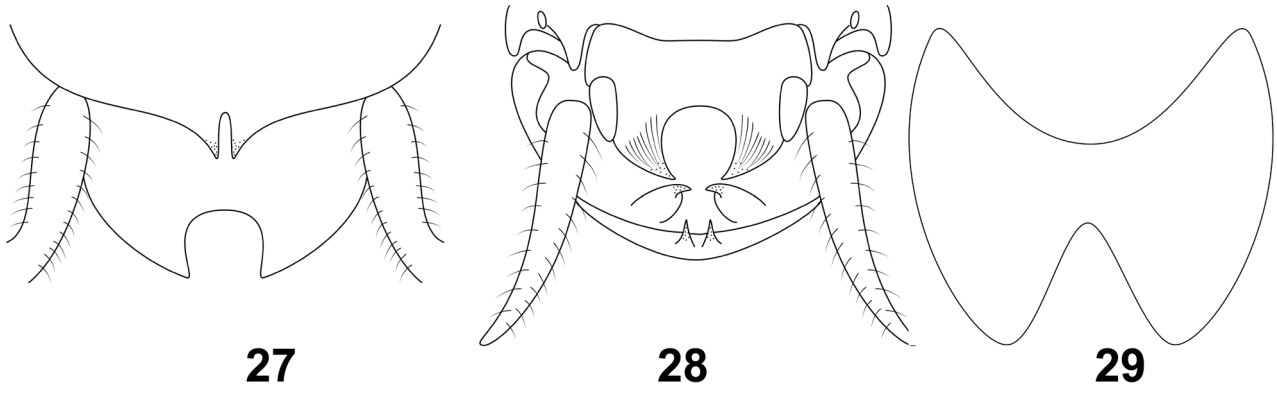


FIGURES 25–26. *Furcilarnaca huangi* Gorochov, 2004. 25. End of male abdomen, ventral view; 26. Posterior lobe of 9th abdominal tergite, lateral view (according to Gorochov, 2004). Scale bars=1mm.

13. *Furcilarnaca wufengensis* Bian *et al*., 2013

(Figs. 27–29**)**

Furcilarnaca wufengensis: Bian *et al*, 2013. Far East. En., 268: 5.



FIGURES 27–29. *Furcilarnaca wufengensis* Bian *et al.*, 2013. 27. End of male abdomen, dorsal view; 28. End of male abdomen, ventral view; 29. Subgenital plate of female, ventral view (according to Bian *et al*, 2013). Scale bars=1mm.

Measurements. (in mm)

	Body	Pronotum	Tegmina	Hind femora	Ovipositor
♂	12.9	3.4	11.5	7.1	/
♀	13.7–14.2	/	9.9–11.6	7.7–7.7	10.0–11.8

Distribution. China (Hubei).

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