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Description of one new species of the genus *Gymnogryllus* (Orthoptera, Gryllidae, Gryllinae) from Cameroon with a key for African species

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Abstract

During a Gryllidae survey in the Southern Cameroonian Plateau, one new species of the genus *Gymnogryllus* (Orthoptera, Gryllidae, Gryllinae) was discovered and described, namely *Gymnogryllus bilongi* Um Nyobe & Kekeunou **sp. nov.** This finding extends the number of species known of this genus in Cameroon at two and proposes a key for African species.

Key words: Cameroon, Ensifera, *Gymnogryllus*, Orthoptera, Taxonomy

Introduction

Cricket is a large group of Orthoptera, with approximately 6000 species (Cigliano *et al.* 2023). The genus *Gymnogryllus* Saussure, 1877 belongs to the family Gryllidae Laicharting, 1781 with has thirty-nine species world-wide and thirteen species in Africa (Chintauan-Marquier *et al.* 2016; Cigliano *et al.* 2023). This genus belongs to a group of closely related genera containing the largest crickets in the world (Gorochov 2022), which have species with convergent similarity in the male genital structures (Desutter-Grandcolas *et al.* 2016; Gorochov 2001, 2019). This leads to a very not elaborated classification of these species. However, the descriptions of new taxa from these genera are also rather usual (Gorochov 2022). Distinguishing this genus from other genera is often based on the following characteristics: a pronotum very feebly, if at all, widening in front; anterior and middle tibiae abundantly pubescent; anterior metatarsi long; ovipositor of variable length, never rudimentary (Vasanth 1993). The present study is devoted to the description of one new species of the genus *Gymnogryllus* from Cameroon with a key for African species.

Materials and Methods

The sampling was carried out in three localities of the southern Cameroonian plateau: Zamakoe, Ongot, and Ngutadjap characterized by two types of vegetation: closed (forests) and open environments (fallows). The characteristics of each study locality and a map can be found in the publication of Um Nyobe *et al.* (2021). In these habitats, crickets were captured from March 2014 to September 2015 using pitfalls and quadrats, according to the methodology described in Um Nyobe *et al.* (2021). The methodology used for the identification based on internal and external morphology is the one presented in the publication of Um Nyobe *et al.* (2022). All the specimens studied are stored in pillboxes containing 70% ethanol at the zoology laboratory of the University of Yaounde 1 (Cameroon). The photographs of their morphological structures were made with a LCD Digital Microscope connected to a computer via a USB cable. The identifications were done by comparison with original species descriptions (Otte *et al.* 1988) found in the online catalog Orthoptera Species File (Cigliano *et al.* 2023) is here cited as OSF. The measurements were recorded in millimeters (mm) using a NEIKO electronic caliper.

Abbreviations used in morphological identification. General morphology: FI, FII, FIII, fore, mid,

hind femora, respectively; FW, forewing; TI, TII, TIII, fore, mid, hind tibia, respectively.

Terminology of forewing venation follows Desutter-Grandcolas *et al.* (2017) and Schubnel *et al.* (2019): cubital vein, cu.v.; anal vein, a.v. (= postcubital vein, Pcu); median vein, m.v.; radial vein, r.v.; subcostal vein and its branches, sc.v.; oblique vein, o.v.; diagonal vein, d.v.; anal node, a.n.; mirror, m.; harp, h.; cord, c.; anal field, a.f.; apical field, ap.f.; lateral field, l.f.

Abbreviations used in genitalia identification. The terminology used to describe the male genitalia follows Gorochoy (2015) and Otte *et al.* (1988).

Results

Systematic

part

Order Orthoptera Olivier, 1789

Family Gryllidae Laicharting, 1781

Subfamily Gryllinae Laicharting,

1781 Tribe Gryllini Laicharting,

1781

Subtribe Brachytrupina Saussure,

1877 Genus *Gymnogryllus*

Saussure, 1877

Type species: *Gymnogryllus leucostictus* Burmeister, 1838 (= *Gryllus elegans* Guérin-Méneville, 1834).

Diagnosis: male pronotum very feebly, if at all, widening in front; anterior and middle tibiae abundantly pubescent; anterior metatarsi long; ovipositor of variable length, never rudimentary (Vasanth 1993).

***Gymnogryllus bilongi* Um Nyobe & Kekeunou sp. nov.**

Materials examined. Holotype: male, CAMEROON, Center Region, Zamakoe (3°33'816"N, 11°31'913"E) secondary forest, 19/x/2014; quadrat; Coll. Um Nyobe, Oumarou & Nzoko; deposited in the Zoology Laboratory, of University of Yaoundé 1, Cameroon (ZLUYC).

Paratypes: 1 female, CAMEROON, Center Region, Ongot (3°85'786" N, 11°38'333" E), secondary forest, 26/x/2014, pitfall trap; Coll. Um Nyobe, Oumarou & Nzoko; deposited in the Zoology Laboratory, of University of Yaoundé 1, Cameroon (ZLUYC); 2 females, CAMEROON, South Region; Engout'Adjap (2°42'N, 11°03'E), crops field (11/x/2014, 08/xi/2014); quadrat; Coll. Um Nyobe, Oumarou & Nzoko; deposited in the Zoology Laboratory, of University of Yaoundé 1, Cameroon (ZLUYC).

Etymology. *Gymnogryllus bilongi* Um Nyobe & Kekeunou sp. nov. is a commemorative name, to honor Pr. Charles Felix Bilong Bilong for his great contribution to taxonomic research in animal biology.

Diagnosis. The anterior edge of the pronotum with a V-shaped groove; the posterior edge straight; a triangular-shaped mirror that having no dividing cells and its apical field very short; the epiphallal lobes pointed and curved internally, separated by a large U-shaped space; the ectoparameres long, wide and

rounded at their distal end.

Differential diagnosis

Gymnogryllus bilongi Um Nyobe & Kekeunou sp. nov. is most similar to *Gymnogryllus ebneri* (Chopard, 1927) in the structure of forewings but differs by the genitalia. *G. ebneri* has two epiphallic lobes not pointed and curved internally, separated by a large V-shaped space and the ectoparameres are long and slender. *G. bilongi* is also most similar to one species also found in Cameroon, *Gymnogryllus brevipennis* Chopard, 1934 from which it differs in male genitalia and forewings. For *G. brevipennis*, the epiphallic lobes are not curved internally and it has four veins in the harp.

Description

(Figs. 1A–I; 2A–I; Table 1)

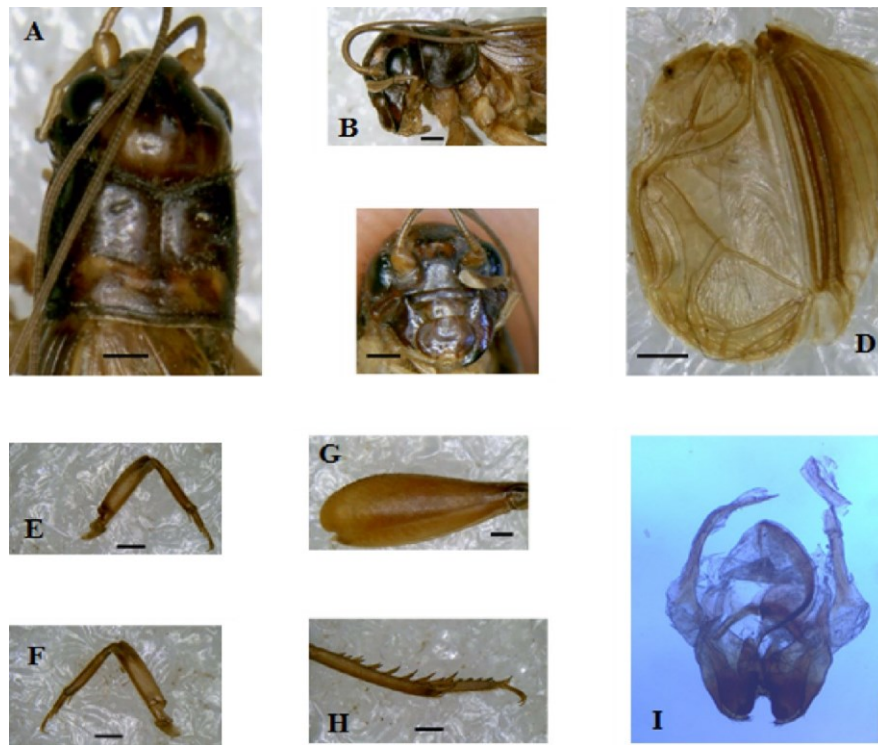


FIGURE 1. *Gymnogryllus bilongi* sp. nov. Holotype (male). **A.** Head and pronotum in dorsal view; **B.** Head and pronotum in lateral view; **C.** Head in ventral view; **D.** Forewing; **E.** External face of the anterior tibia with an oval and elongated tympanum; **F.** Internal face of the anterior tibia with a short and round tympanum; **G.** External face of orange-brown femora; **H.** Posterior brown tibia; **I.** Genitalia. Scale bars: A, 8 mm; B, G, H, 4 mm; C, 6 mm; D, 9 mm; E, F, 5 mm; I, 500 μ m.

Male. The specimen studied is medium in size; his body is covered with short and fine pubescence. **Head:** dark brown; occiput with weakly marked brown stripes (Figure 1 A); cheeks completely black (Figure 1 B); fronto-clypeal suture slightly arched; face and labrum dark brown; head and pronotum equal in width (Figure 1 C). **Pronotum:** anterior edge with a V-shaped groove; posterior edge straight; front wider than rear; disc dark brown on two-thirds of its front part and dark brown with brownish spots on the third of its lower part (Figure 1 A); lateral lobes completely dark brown; posterior and anterior margins of pronotum with bristles. (Figure 1 B). **Wings:** forewings reaching the middle of the abdomen with two oblique veins in the harp; triangular mirror devoid of division cells with a very short apical field (Figure 1 D); hindwings absent. **Abdomen:** dorsum variegated brown and ivory-colored, with a median row of dark marks, and on either side of this row a pale band; venter light brown; subgenital plate dark brown with two spots black near the base; cerci dark brown, but very pale at the base. **Legs:** fore- and middle tibiae lightly ciliated with long hairs, orange-brown turning brown in basal and distal extremities, with 3 and 4 apical spurs respectively; tympanal openings on both sides of foretibiae, the outer one twice as large as the inner (Figure 1 E, F); hind legs orange-brown (Figure 1 G); hind femora with faint brown stripes on the outer face; hind tibia with 6 inner and 7 outer subapical spurs (Figure 1 H). **Male genitalia:** epiphallus

with two pointed lobes curved internally, separated by a large U-shaped space; ectoparameres long, wide and rounded at their distal end; virga very long and thin (Figure 1 I).

Females. They look morphologically like males although their anterior wings are micropterous with rounded ends (Figure 2). In addition, they appear larger and have a different number of subapical spurs: 4 inner and 5 outer (Table 1).



FIGURE 2. *Gymnogryllus bilongi* sp. nov. Paratype (female). **A.** Head and pronotum in dorsal view; **B.** Head and pronotum in lateral view; **C.** Head in ventral view; **D.** Forewing; **E.** Internal face of the anterior tibia with a short and round tympanum; **F.** External face of the anterior tibia with an oval and elongated tympanum; **G.** External face of orange-brown femora; **H.** Posterior brown tibia; **I.** Abdomen in dorsal view; **J.** Abdomen in ventral view; **K.** Ovipositor. Scale bars: A, 9 mm; B, C, 6 mm; D, 8 mm; E, F, K, 5 mm; G, H, 4 mm; I, J, 7 mm.

Key to African species of *Gymnogryllus* based on males

In this key we do not include *Gymnogryllus castaneus* Bolivar, 1910 since the only known specimen is a female.

- | | | |
|---|---|---|
| 1 | Long apical field | 2 |
| - | Short apical field | 9 |
| 2 | Harp with three veins | 3 |
| - | Harp with four veins..... | 7 |
| 3 | Epiphallus with a V-shaped notch and large ectoparameres..... | 4 |
| - | Epiphallus with a U-shaped and narrow ectoparameres | <i>Gymnogryllus lucens</i> (Walker, 1869) |
| 4 | Body and lateral lobes of same color..... | 5 |
| - | Body and lateral lobes of different color | 6 |
| 5 | Body color blackish; lateral lobes of pronotum black | <i>Gymnogryllus amani</i> Otte et al., 1988 |
| 6 | Body color reddish brown; lateral lobes blackish in posterior two-thirds, pale brown in lower anterior quarter | <i>Gymnogryllus karenii</i> Otte et al., 1988 |
| 7 | Mirror divided into two cells..... | <i>Gymnogryllus caviceps</i> (Karsch, 1893) |
| - | Mirror divided into three cells..... | 8 |
| 8 | Body color dark reddish brown to black; lateral lobes dark reddish brown or black, lightest in lower anterior quarter. | <i>Gymnogryllus compactus</i> (Walker, 1869) |
| - | Body color pale yellowish brown; lateral lobes mostly pale but with dark markings intruding from disc | <i>Gymnogryllus joburgensis</i> Otte et al., 1988 |
| 9 | Harp with two oblique veins..... | 10 |
| - | Harp with more than two oblique veins..... | 12 |

10	Median ocellus obsolete	<i>Gymnogryllus ebneri</i> (Chopard, 1927)
-	Median ocellus not obsolete	11
11	Lateral lobes dark brown in dorsal area, lower margin ivory-colored; a thin pale band intrudes dorsally onto disc along anterior margin; mirror divided	<i>Gymnogryllus vicinus</i> (Chopard, 1955)
-	Lateral lobes completely dark brown; mirror non-divided	<i>Gymnogryllus bilongi</i> Um Nyobe & Kekeunou sp. nov.
12	Harp with three veins; foretibiae with only an outer tympanum	13
-	Harp with four veins; foretibiae with two tympana	14
13	Pronotum shiny.	<i>Gymnogryllus capensis</i> Otte et al., 1988
-	Pronotum very finely rugose, not shiny	<i>Gymnogryllus cylindricollis</i> (Bolivar, 1910)
14	Lateral lobes reddish brown; legs all uniformly orange to reddish brown	<i>Gymnogryllus brevipennis</i> Chopard, 1934

TABLE 1. measurements (in millimeters) of *Gymnogryllus bilongi* Um Nyobe & Kekeunou sp. nov.

Specimen	Male (holotype)	Female 1	Female 2	Female 3
BL	16,35	18,26	15,51	20,74
abL	8,36	9,81	8,25	10,26
PL	2,97	3,12	2,70	3,47
PW	3,75	4,27	3,79	4,60
FWL	6,37	2,84	2,52	2,82
HWL	/	/	/	/
CL	6,81	7,72	9,14	8,71
FL	10,63	11,73	11,69	6,99
FW	3,42	3,63	3,72	3,44
TL	7,04	8,16	8,47	9,52
OL	/	9,64	10,34	10,21
Left out/in subapical spurs	7/6	7/6	5/4	5/5
Right out/in subapical spurs	6/6	/	5/4	5/4

Legend: BL, body length; abL, abdomen length; PL, pronotal length; PW, pronotal width; FWL, forewing length; HWL, hindwings length; CL, cercal length; FL, hind femora length; FW, hind femora width; TL, hind tibia length; OL, ovipositor length; out/in subapical spurs, outer/inner subapical spurs.

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