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A taxonomic synopsis of *Limnogeton* Mayr, 1853 (Insecta: Hemiptera: Heteroptera: Belostomatidae)

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Abstract

The Afrotropical Belostomatidae fauna has long proved to be a difficult taxonomic problem, not so much for the overwhelmingly large number of species involved but rather because of a lack of trained specialists. The rarity of some taxa also contributes to confusion, because some species remain poorly described or are known only from one or two specimens. During a visit to the Muséum National d'Histoire Naturelle, Paris, France and the Musée Royal de l'Afrique Centrale, Tervuren, Belgium, it was possible to comprehensively review the *Limnogeton* species based mainly on the specimens housed in the aforementioned collections. An updated key to adults of all species presently included in the genus, particularly based on male genitalia characters studied during the present study, has been provided.

Key words: Aquatic insects, Giant water bugs, taxonomy, male genitalia, Clinal variation

Introduction

The Belostomatidae are an aquatic heteropteran insect family of almost worldwide distribution. This family contains the largest of all Heteroptera (measuring around 150 mm), and its members are often referred to as electric-light bugs in some parts of the world because they are attracted to lights during the night (McGavin 1993). Most species are probably generalist predators (Schuh & Slater 1995), although several species are known to prey on snails during the larval and adult stages (Armúa-de-Reyes & Estévez 2006). Lauck & Menke (1961) recognized three subfamilies comprising nine genera (but currently eleven according to Estévez & Ribeiro 2011) and about 150 species (McGavin 1993; Schuh & Slater 1995), based mainly on the genitalic features.

The genus *Limnogeton* Mayr, 1853 contains the only apparently obligate freshwater snail predators (Voelker 1968) and comprises four extant species (Poisson 1949). The following described species are known to occur in the northern part of Africa, extending westward to Cameroon and southward to Tanganyika and the Republic of Congo (Poisson 1949; Linnavuori 1971): *Limnogeton expansum* Montandon, 1896, *L. hedenborgi* (Stål, 1854), *L. fieberi* Mayr, 1853, and *L. scutellatum* Mayr, 1863. Of these, *L. fieberi* and *L. scutellatum* are also known to occur in the Palaearctic Region (Polhemus *et al.* 1995).

In spite of resembling *Hydrocyrius* in having the phallosoma dorsally bifurcated (see Lauck & Menke 1961; Estévez & Ribeiro 2011), members of *Limnogeton* can be readily distinguished from those of *Hydrocyrius* by the following characteristics: (1) forefemur with a single, flat groove for reception of the tibia; (2) foretarsus with segments 2 and 3 equal in length and twice as long as wide; (3) foretibiae and foretarsi subcylindrical; (4) hind trochanter with a spiniform process directed posterolaterally (J.R.I. Ribeiro unpubl. data); and (5) posterior margin of genital operculum of females completely fringed with hairs.

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with prosternal keel more robust). Pilosity poorly developed, covering almost half of connexivum, slightly constricted between spiracles, not extending posteriorly along genital operculum (as Fig. 3C).

Male genitalia. Parameres symmetrical with apex strongly curved; length of phallotheca about 1.5 times ventral diverticulum in dorsal view; ventral diverticulum not robust; dorsal arms of phallotheca directed laterally, slightly divergent, connected or fused along basal portion, U-shaped, rounded at apex (Fig. 5C); ventral diverticulum with anterior margins not strongly sclerotized, somewhat robust, parallel posteriorly in ventral view (Fig. 5D, MVD).

Taxonomic notes. There is no significant difference in male styli among specimens of *L. expansum* and *L. scutellatum*, but the former species clearly comprises the majority of the largest specimens studied. Poisson (1949) stated that the alleged "differences" in male styli, also stressed and discussed by Linnavuori (1971), are not enough to differentiate these species. Poisson thus considered them as conspecific, with *L. expansum* representing merely large specimens of *L. scutellatum*. Nevertheless, we have found evident male genitalic characteristics distinguishing *L. scutellatum* from *L. expansum*, and these are apparently linked to the differences in growth among these insects (see above). For example, *L. scutellatum* male specimens, the majority of which are smaller than those of *L. expansum*, have the dorsal arms (Fig. 5C, DA) not gradually narrowing at the apex and shorter than in *L. expansum* (Fig. 1D, DA).

Taxonomic key to adults of *Limnogeton* Mayr (partially based on Poisson 1949)

1a. Prosternal keel robust, cylindrical, slightly curved anterad or not, with apex truncated, rounded or acute; dorsal arms of ventral diverticulum of phallotheca long, well developed 2

1b. Prosternal keel slender and spiniform, never robust and truncated at apex; straight (Figs. 2B, 5B); dorsal arms of ventral diverticulum of phallotheca short, poorly developed (Figs. 2C, 5C) 3

2a (1b). Prosternal keel with apex somewhat truncated, irregular, slightly directed posterad (Fig. 1B, PC); pilosity of connexivum large (Fig. 1C, PIL); dorsal arms of ventral diverticulum of male genitalia strongly divergent, narrowing at apex (Fig. 1D, DA); lateral margins of ventral diverticulum without sinuosity. . . . . *L. expansum* Montandon, 1896 (Fig. 1A)

2b. Prosternal keel with apex evidently truncated or acute (Figs. 4B–C, PC), not irregular, slightly directed anterad; pilosity of connexivum slender; dorsal arms of ventral diverticulum of male genitalia slightly divergent, not narrowing gradually at apex (Fig. 3D, DA); lateral margins of ventral diverticulum with evident sinuosity (Figs. 3E–F, LOM). . . . . *L. hedenborgi* Stål, 1853 (Fig. 3A)

3a(1b). Total length of body 2.2–2.3 times its greatest width; dorsal arms of ventral diverticulum not V-shaped, slightly sinuate (Fig. 2C, DA); length of phallotheca almost twice that of ventral diverticulum in dorsal view; ventral diverticulum with anterior margins not strongly sclerotized, narrower, obviously convergent posteriorly in ventral view (Fig. 2D, MVD) . . . . . *L. fieberi* Mayr, 1853 (Fig. 2A)

3b. Total length of body about from 2.0 to 2.2 times its greatest width; dorsal arms of ventral diverticulum V-shaped, rounded at apex, more defined and visible (Fig. 5C, DA); length of phallotheca about 1.5 times that of ventral diverticulum in dorsal view; ventral diverticulum with anterior margins not strongly sclerotized, somewhat robust, parallel posteriorly in ventral view (Fig. 5D, MVD). . . . . *L. scutellatum* Mayr, 1863 (Fig. 5A)

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