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New taxa of Mirolliini from South East Asia and evidence for an abdominal gland in male Phaneropterinae (Orthoptera: Tettigoniidae)

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Abstract

Identification of various unworked museum specimens and newly received material from Sabah, Peninsular Malaysia, Singapore, North Thailand, and North East India resulted in the discovery of new taxa of Mirolliini. Two genera and twelve species are described as new: *Amirollia* gen. n. (type species *A. furcata* sp. n.), *Hemimirollia* gen. n. (type species *Mirollia gracilis* Karny, 1925); *Amirollia furcata* sp. n.; *Deflorita marginata* sp. n., *D. protecta* sp. n., *Hueikaeana andreji* sp. n., *H. quadrimaculata* sp. n., *Mirollia forcipata* sp. n., *M. malaya* sp. n., *M. paralata* sp. n., *M. rumidi* sp. n., *M. secunda* sp. n., *M. spinulosa* sp. n., and *M. tawai* sp. n. Four new combinations are proposed: *Mirollia gracilis* Karny, 1925 and *M. luteipennis* Karny, 1925 are combined with *Hemimirollia*; *Mirollia ulla* Gorochov, 2008 is combined with *Amirollia*; *Hueikaeana decora* Gorochov, 2008 is combined with *Deflorita* and the male described for the first time. The females of

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Deflorita bella Gorochov, 2008 and *Mirollia longipinna* Ingrisch & Shishodia, 1998 are described for the first time. Stridulation of *M. secunda* sp. n. is reported. The study also revealed formerly unreported modifications of the anterior abdominal tergites in males of all species under study, which are interpreted as abdominal glands.

Key words. Orthoptera, Phaneropterinae, Mirolliini, abdominal gland, new genera, new species, Sabah, Peninsular Malaysia, Singapore, North Thailand, North East India, stridulation

Introduction

The Mirolliini were established as group Mirolliae by Brunner von Wattenwyl (1878) for two genera of rather small sized Phaneropterinae from the Oriental region with together two species (*Mirollia carinata* (Haan, 1842) and *Exora deflorita* Brunner, 1878 (now *Deflorita deflorita*). Brunner (1891) added *Exora dohrni*, which is now in *Hueikaeana*. The species number in historical times remained low. After descriptions by Karny (1925, 1926), Hebard (1922) and Shiraki (1930) the number of species raised to twelve species. Bey-Bienko (1957, 1962) added another three species. A new interest in the tribe started with Ingrisch (1998), when it was shown that internal and external male genitalia can differ markedly between otherwise morphologically extremely similar species of *Mirollia* and a third genus, *Hueikaeana*, was described in the group. Since then, several new species were discovered from various parts of South East Asia (Gorochov 1999, 2003, 2004, 2005a, b, 2008, Gorochov & Kang 2004, Ingrisch 1990, Ingrisch & Shishodia 1998, 2000, Mu et al. 1998, Shi & Chang 2004, Shi et al. 2005, Wang et al. 2010). Currently the tribe contains 35 *Mirollia*, 14 *Deflorita* and 7 *Hueikaeana* species (Eades et al. 2011).

The Mirolliini are small to medium sized Phaneropterinae, often with widened fore wings of green colour and thus well hidden in the vegetation. Other species are colourful showing brown flecks, white spots or red strokes on a green general colour. This may contribute to somatolysis in a varied vegetation. Possibly several species live in the canopy, others were found on the underside of leaves. As a result, few specimens were usually found and often they had been attracted to the light.

The present paper deals with a number of specimens of Mirolliini from Sabah, Peninsular Malaysia, Singapore, North Thailand, and North East India. The study is based on unworked classical specimens found in the Natural History Museum London and new material collected during studies of the canopy fauna in the Kinabalu area of Sabah (e.g. Floren & Linsenmair 2001) and deposited in the Museum Koenig Bonn, from specimens in the Senckenberg Museum Frankfurt/M from the same area, and from own investigations in North Thailand. Two new genera are proposed that are similar to *Mirollia* but missing the complex phallus sclerites of that genus. Thus there are now five genera in Mirolliini. The genera *Deflorita* and *Hueikaeana* are probably not monophyletic. But as long as the male of the type species of *Hueikaeana* is unknown, I abstain from further division.

Modifications of the male anterior abdominal tergites were found in all species of all five genera studied. They are also described and discussed.

Materials and methods

Specimens were studied in the museums or on loan. Photographic images were done with a digital camera mounted to a microscope; tegmina were photographed without microscope. A variety of equipment was used according to the facilities in the different institutions. Scales given with the images are approximates as the images taken with different equipment had to be adapted in scale.

Measurements of details of the stridulatory apparatus were done under a microscope. As the size of the teeth on the stridulatory file can greatly vary from base to apex, the densities of the teeth for the whole length and for the central area of the file were determined.

Geographic coordinates are given with most localities. When they stand without brackets they are original information from the collector or label data. Coordinates in square brackets indicate approximate data derived from Google Maps.

Recordings of stridulation were done with a digital recorder. Sound analysis was done on computer using the software Amadeus Pro.