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Systematic study of the genera *Phryno* Robineau-Desvoidy and *Botria* Rondani in the Palearctic Region, with discussions of their phylogenetic positions (Diptera, Tachinidae)

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Abstract

Six species of *Phryno* Robineau-Desvoidy and three species of *Botria* Rondani are revised, including four new species: *P. brevicornis* **sp. nov.**, *P. koreana* **sp. nov.**, *P. nepalensis* **sp. nov.** and *P. tenuiforceps* **sp. nov.** A key to the species of these genera is provided. A phylogenetic analysis was performed using morphological characters to investigate the placement of genera in the *Zenillia* group (*sensu* Tschorsnig 1985). The inferred trees indicate that *Phryno* is closely related to *Botria*, but monophyly of *Phryno* is unclear. Based on the results of the analysis, the *Zenillia* group is redefined to include *Allophorocera* Hendel, *Botria*, *Ceromasia* Rondani, *Calozenillia* Townsend (new placement), *Cyzenis* Robineau-Desvoidy, *Erycilla* Mesnil, *Phryno*, *Rhacodinella* Mesnil, *Sericozenillia* Mesnil (new placement) and *Zenillia* Robineau-Desvoidy.

Key words: Exoristinae, Goniini, microtype egg, morphology, parasitoid, phylogeny

Introduction

Phryno Robineau-Desvoidy and *Botria* Rondani belong to the tribe Goniini of the subfamily Exoristinae. Within this tribe Tschorsnig (1985) recognized four genus groups based on his morphological analysis. One of the groups is the *Zenillia* group that comprises *Allophorocera* Hendel, *Botria*, *Ceromasia* Rondani, *Cyzenis* Robineau-Desvoidy, *Erycilla* Mesnil, *Phryno*, *Rhacodinella* Mesnil and *Zenillia* Robineau-Desvoidy. Recently, molecular data has also shown that *Botria*, *Phryno* and *Zenillia* form a clade supported by high reliabilities together with *Calozenillia* Townsend and *Pexopsis* Brauer and Bergenstamm (Tachi & Shima 2010). It is thus quite appropriate to treat *Botria* and *Phryno* as members of the *Zenillia* group (*sensu* Tschorsnig). However, the phylogenetic relationships among the genera of the *Zenillia* group have not yet been clearly resolved.

Females of the Goniini lay microtype eggs (micro-ovolarviparity) on foliage and these eggs are subsequently ingested by their hosts while they feed (Herting 1960; Wood 1987). As an adaptation to this unusual form of parasitism, the microtype eggs are small, 0.1–0.4 mm in length, compared to the larger macrotype eggs of the members of other tachinid tribes. The dorsal chorion of a microtype egg is generally thick and brown to black in color. The chorion of these eggs is thought to prevent the eggs from desiccating while they sit on plants for a few weeks (Tschorsnig & Richter 1998). Salkeld (1980) examined the chorionic structure of 21 species in the Goniini using a scanning electron microscope (SEM), and found that the dorsal surface is usually ornamented (reticulated or punctated) and the ventral surface is flat or slightly convex. She suggested that similarities and differences in these morphological features (e.g., size, shape and configuration of the dorsal chorion) are useful for taxonomic studies.

In this paper most of the Palearctic species of *Phryno* and *Botria* are revised. Thirteen species are recognized, four of which are described as new. A key to the known species of both genera is provided. However, the characteristics of four Chinese species, *P. jilinensis* (Sun), *P. tibialis* (Sun), *P. yichengica* Chao & Liu and *B. clarinigra* Chao & Liu, are only briefly cited from the original descriptions because specimens of these species were unavailable. The dorsal structures of microtype eggs are described, based mainly on members of the *Zenillia*