



## Morphology and terminology of dung beetles (Coleoptera: Scarabaeidae: Scarabaeinae) male genitalia

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### Abstract

The external and internal male genitalia of 327 species of 11 tribes of the subfamily Scarabaeinae, including species of Deltachilini, Scarabaeini, Gymnopleurini, Ateuchini, and Coprini, among others, were examined. Descriptions of the variations in the genital segment, the aedeagus, the internal sac, and its sclerites and raspules are presented. An exhaustive comparison of structures, names, and terminology used in literature for Scarabaeinae male genitalia are discussed. The internal sac of the aedeagus is divided in areas for an easier comparison of its internal structures; basal, submedial, medial, and apical areas are described in detail and compared. The variation of apical and medial sclerites, as well as the raspules of the submedial area, are described and compared in detail among all the taxa studied.

**Key words:** Scarabaeinae, male genitalia, aedeagus, internal sac, sclerites

### Resumen

Se examinó la genitalia externa e interna de machos de 327 especies de 11 tribus de la subfamilia Scarabaeinae incluyendo especies de Deltachilini, Scarabaeini, Gymnopleurini, Ateuchini, y Coprini, entre otras. Descripciones de la variación del segmento genital, el edeago, el saco interno, sus escleritos y raspulas, son presentadas. Una comparación exhaustiva de las estructuras del órgano genital masculino de los Scarabaeinae, sus nombres y terminología usada en la literatura es expuesta. El saco interno es dividido en áreas para facilitar la comparación de sus estructuras; se describen y comparan detalladamente el área basal, submedial, medial y apical. La variación de los escleritos apicales y mediales, así como las raspulas del área submedial son descritas y comparadas en detalle entre todos los taxones estudiados.

### Introduction

In Coleoptera, the internal male genitalia have been poorly studied, and the functioning of internal male structures is not yet well understood. However, morphological structures within male genitalia have been widely used for taxonomic and systematics purposes. Genitalia provide, in many cases, taxonomically useful characters for distinguishing organisms at the species level, usually where no other morphological traits will suffice. Therefore, in differentiating species, genitalia of beetles have been widely documented. Using the technique of inflating the internal sac, the internal structures have been studied in Carabidae: Cicindelinae (Matalin 1998, 1999), Chrysomelidae (Berti & Mariau 1999), and Cerambycidae (Rubenyan 2002, Anichtchenko & Verdugo 2004). In groups such as Carabidae (Matalin 1999, Roig-Junent 2000), Staphylinidae (Márquez 2001), and Curculionidae (Thompson 1988), among others, external and internal male genitalia have important structures that have been used to define taxonomic groups and to produce phylogenetic hypothesis of the evolution of the taxa.