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## An illustrated key to and diagnoses of the species of Staphylinidae (Coleoptera) associated with decaying carcasses in Argentina

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### Abstract

A key to 24 Staphylinidae species associated with decaying carcasses in Argentina is presented, including diagnoses, illustrations, distributional and bionomical data for these species. This article provides a table of all species associated with carcasses, detailing the substrate from which they were collected and geographical distribution by province. All 24 Staphylinidae species recorded are grouped into three subfamilies: Aleocharinae (three species of *Aleochara* Gravenhorst and one species of *Atheta* Thomson), Oxytelinae (one species of *Anotylus* Thomson) and Staphylininae (18 species, two belonging to the tribe Xantholinini and 16 species belonging to the tribe Staphylinini). A discussion is presented on the potential forensic importance of some species collected on human and pig carcasses.

**Key words:** Key, Staphylinidae, Aleocharinae, Oxytelinae, Staphylininae, forensic, carcasses, Argentina

### Introduction

Beetles are one of the most diverse components of carrion substrates and their forensic importance has been well documented (e.g., Smith 1986; Benecke 1988; Matuszewski *et al.* 2008; Midgley *et al.* 2010; Villet 2011). Despite the high diversity of beetles found in carcasses, most forensic studies have been focused on Diptera due to the fact that they colonize the body from the beginning of the decomposition process (Goff 1993). However, Diptera have little usefulness after several weeks or months, when the body is in advanced stages of decomposition. Beetles have been found to be the main entomological evidence present in a corpse in advanced decomposition stages and their usefulness to estimate the minimum Post Mortem Interval (PMIm) has been emphasised (Kulshrestha & Satpathy 2001; Midgley *et al.* 2010; Matuszewski 2012; Prado e Castro *et al.* 2013). The correct identification of insects and knowledge of their life history as well as the duration of each stage of development leads to accurately establishing the PMI (Turchetto & Vanin 2004). Families of beetles of forensic importance are Dermestidae, Cleridae, Histeridae, Staphylinidae, Nitidulidae, Scarabaeidae, Silphidae, Tenebrionidae, and Trogidae (Mise *et al.* 2007; Almeida & Mise 2009; Byrd & Castner 2009; Özdermir & Sert 2009; Battán Horenstein & Linhares 2011). Members of these families may play different roles in the community depending on the feeding behaviour of their adults or their immature stages. Beetles can feed on cadaveric tissues (necrophagous) or on other insects in the body, such as larvae of Diptera or other Coleoptera species (necrophilous) (Smith 1986).

The beetle family Staphylinidae, including the recently added Scydmaeninae, has become the largest in Coleoptera and in the whole of the Animal Kingdom, with over 56,000 described species (Grebennikov & Newton 2009) currently organized in 32 subfamilies (Bouchard *et al.* 2011). The overall classification, phylogeny, world distribution, morphology and biology were reviewed most recently by Thayer (2005).

Staphylinidae have been frequently cited as the most diverse coleopterous group found on carcasses. These

dipteran puparia (Klimaszewski 1984). The females lay their eggs in sites infested with fly larvae, and the newly emerged first-instar larvae hunt for dipteran pupae, feeding on them until pupation takes place, either in the soil or within host puparia (Klimaszewski & Jansen 1993). Species of this genus have been reported of great importance to determine the PMI (Mise *et al.* 2007; Lin & Shiao 2013). *Creophilus maxillosus* is a common fly predator associated with decomposing cadavers and carcasses and it is one of the most cited species in the forensic literature, due to its utility for the estimation of both the PMI and the PAI (e.g., Battán Horenstein *et al.* 2012; Matuszewski 2012; Matuszewski & Szafalowicz 2013). *Philonthus* species have been also repeatedly found in association with carcasses (e.g., Matuszewski *et al.* 2010; Fernández *et al.* 2010; Aballay *et al.* 2008, 2012; Matuszewski & Szafalowicz 2013), but their potential as forensic indicators has been much less assessed as well as that of species belonging to other Staphylininae genera cited in the present study.

Further research is needed to determine the specific time period in the cadaver succession for which other species studied herein could be used to estimate PMI indicators based on succession patterns. Additionally, immature stages may also be useful in forensic entomology because they are reared within the body and were collected in advanced stages of decomposition (Aballay pers. obs.). We expect that this key will contribute to further studies on the potential role of carrion-frequenting Staphylinidae as PMI indicators.

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