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## Classification of Omalidae based on molecular data and morphology, with description of Paradrilinae subfam. nov. (Coleoptera: Elateroidea)

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### Abstract

Omalidae, a species-poor family of elateroid beetles, are distributed mostly in the Mediterranean region. The morphology of females is modified due to neotenic development and the males share some traits with other neotenic lineages in Elateroidea, namely Drilini (Elateridae: Agrypninae) and Lyropaeinae (Lycidae). A molecular phylogeny was inferred from six omalid species representing four genera and the previously published dataset of Elateroidea. The DNA based phylogeny suggests that small-bodied males, reduced pronotal carinae and missing elytral costae evolved independently in multiple elateroid lineages. The limits of Omalidae are redefined and seven genera, *i.e.*, *Omalisus* Geoffroy, 1762, *Phaeopterus* Costa, 1857, *Thilmanus* Gemminger, 1869, *Euanoma* Reitter, 1889, *Pseudeuanoma* Pic, 1901, *Paradrilus* Kiesenwetter, 1865 and *Cimbrion* Kazantsev, 2010, are currently placed in the family. Thilmaninae Kazantsev, 2005 and *Paradrilus* Kiesenwetter, 1865 are transferred from Drilini (Elateridae: Agrypninae) to Omalidae and the Paradrilinae subfam. nov. is proposed. *Paradrilus* differs from other Omalidae in prolonged cranium, wide robust prosternum with two apical processes and absent sharp edge of the pronotum. The morphology of *Paradrilus* is described in detail, illustrated and all taxa currently classified in Omalidae are listed.

**Key words:** Drilini, Elateroidea, molecular phylogeny, morphology, new subfamily, *Paradrilus*, *Phaeopterus*, taxonomy

### Introduction

The Elateroidea represent a morphologically diverse lineage of both well sclerotized and soft-bodied beetles (Lawrence 1988, Bocakova *et al.* 2007). Major families, such as click beetles (Elateridae), fireflies (Lampyridae), soldier beetles (Cantharidae), and net-winged beetles (Lycidae), each with thousands of extant species, are well defined by morphological synapomorphies (Crowson 1972, Leschen *et al.* 2010). On the other hand, relationships, limits and status of Omalidae have been subject of contradictory views (Crowson 1972, Kazantsev 2010, Kundrata & Bocak 2011a). Omalidae kept either family rank or were included as a subfamily in Lycidae (*e.g.*, Bourgeois 1882, Kleine 1933, Crowson 1972). Altogether seven genera have been placed in Omalidae since the family was erected, but only a type genus *Omalisus* Geoffroy, *Phaeopterus* Costa and *Cimbrion* Kazantsev have always been classified within the family (Tab. 1). *Thilmanus* Gemminger was placed in Lycidae or Drilidae and *Euanoma* Reitter, *Pseudeuanoma* Pic and *Paradrilus* Kiesenwetter in Drilidae (Tab. 1). These genera share similar weakly sclerotized, usually small-bodied males and incompletely metamorphosed females (*e.g.*, Crowson 1972, Kundrata & Bocak 2007, 2011a).

The molecular data suggested phylogenetic hypotheses in conflict with previous views: (1) refuted relationships of Omalidae + Lycidae, (2) proposed the Phengodidae + Rhagophthalmidae + Omalidae + Elateridae clade, and (3) recovered drilids as a terminal clade within Elateridae: Agrypninae. However, in the past molecular analyses, the number of included omalid genera was limited to *Omalisus* and later *Pseudeuanoma* due to the rareness of these beetles (Bocakova *et al.* 2007, Kundrata & Bocak 2011a, Bocak *et al.* 2014, Kundrata *et al.* 2014).

- 3.....*Omalisus*
- Parameres with simple apices, membranous apically, body length 3.1–3.8 mm, lateral pronotal keels very sharp in whole length, reaching frontal margin of pronotum, costa 6 prominent in humeral half, antennomere 4 about as long as combined length of antennomeres 2 and 3. .... *Phaeopterus*
  - 4. Prosternum with long slender process as in *Omalisus* ..... *Cimbrion*
  - Prosternum without slender median process..... 5
  - 5. Body slender, elytra about 6 times longer than width at humeri, dark brown to black colored, legs and antennae uniformly dark colored, small bodied, 1.9–4.9 mm long..... 6
  - Body robust, about 5 times longer than width at humeri, elytra variably colored, with light humeri, brown or testaceous; when elytra and pronotum dark colored at least some antennomeres and legs light brown to testaceous, body medium-sized, 4.3–6.8 mm long. .... *Euanoma*
  - 6. Apical part of parameres slender, sometimes pointed ..... *Thilmanus*
  - Apical part of parameres robust, widely rounded ..... *Pseudeuanoma*

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