



## ***Onthophagus (Palaeonthophagus) medius* (Kugelann, 1792)—a good western palaeartic species in the *Onthophagus vacca* complex (Coleoptera: Scarabaeidae: Scarabaeinae: Onthophagini)**

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### **Abstract**

Based on a morphological taxonomic revision of available species, and supported by a separate molecular phylogenetic study, we identified *Onthophagus (Palaeonthophagus) medius* (Kugelann, 1792) as a good western palaeartic species and a sibling species of *O. vacca* (Linnaeus, 1767). In this paper we diagnose and illustrate the key morphological features and distribution of both species. A neotype is designated for *Copris medius* Kugelann, 1792.

**Key words:** Dung beetles, Europe, sibling species, distribution, integrative taxonomy

### **Introduction**

The *Onthophagus vacca* (Linnaeus, 1767) species complex was previously thought to include a single species in Europe, which was described based on just female specimens from southern France ("Gallia australi") and northern Poland/Germany ('Prussia' = "Borussia" in Linnaeus 1767). However, subsequently to its original description several additional forms (= taxa) were established, partly due to ignorance of the identity of the true *O. vacca* (e.g. Fourcroy 1785) or due to apparent distinctive patterns of variation in several external features such as the pronotum and elytra or the different shapes of the carinae on the head and horns (Kugelann 1792, Panzer 1796, Schrank 1798, Sturm 1800, Mulsant 1842, Fischer von Waldheim 1844, Gistel 1857, Motschulsky 1845, Seabra 1907). Erichson (1848) distinguished two taxa, *O. vacca* and *O. medius* (Kugelann, 1792) (from Prussia), based on a comparison of the two species that revealed clear differences between them. However, he was uncertain because of the wide variation of external morphology and colour. Since then, *O. medius* has been treated as a synonym of *O. vacca* by all subsequent authors (e.g. Horion 1958; Balthasar 1963; Baraud 1985, 1992; Stebnicka 1983; Martin-Piera & López-Colón 2000; Kabakov 2006). For example, Horion (1958) argued that *O. medius* is often treated as 'variation' and merely an insignificant colour aberration. Even intensive comparative morphological studies by Zunino (1979), who designated *O. vacca* as type species of the new subgenus *Palaeonthophagus*, and by Kabakov (2006), who illustrated two forms of genitalia for *O. vacca* without more detailed explanations, could not definitively resolve the 'uncertainty' within this species complex. After a series of preliminary morphological investigations by one of us (E.R.), we had some 'intuitive' reason to reassess Erichson's (1948) treatment of this complex as two different species. In a separate study that will be reported elsewhere, we performed a phylogenetic analysis of mitochondrial DNA (*cox1*) of a number of specimens of the *O. vacca* complex available from a selection of European localities within the complete range of the species. Genetic results are also consistent with a morphometric analysis (being prepared by Ahrens and colleagues) confirming the existence of at least two separate species in the *O. vacca* complex. Based on these results, we present here the results of the study of dry material from