

Case 3699***Thorectes* Mulsant, 1842 (Insecta, Coleoptera, SCARABAEOIDEA):
proposed conservation of usage**

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Abstract. The purpose of this application, under Articles 70.3, 74.7 and 81.1 of the Code, is to conserve the current usage of the beetle genus *Thorectes* Mulsant, 1842 (Insecta, Coleoptera, SCARABAEOIDEA, GEOTRUPIDAE) by confirmation of its type species *Scarabaeus laevigatus* Fabricius, 1798. This action will also stabilise the predominant usage of another genus, *Jekelius* López-Colón, 1989, for a phylogenetically relatively distant clade of species whose ecological importance in Mediterranean *Quercus* forests is currently under study. A lectotype is designated for *Scarabaeus laevigatus* Fabricius, 1798.

Keywords. Nomenclature; taxonomy; Insecta, Coleoptera; SCARABAEOIDEA; GEOTRUPIDAE; *Thorectes*; *Scarabaeus laevigatus*; geotrupid beetles; Palaearctica.

1. The genus *Thorectes*, a group of flightless lamellicorn beetles belonging to the family GEOTRUPIDAE (Insecta, Coleoptera, SCARABAEOIDEA), was described by Mulsant (1842, p. 367) and two nominal species were included as valid: *Thorectes laevigatus* (Fabricius, 1798, p. 23) (originally in *Scarabaeus*), the only one considered to be a French species and, in the observations on this species, also *Thorectes hemisphaericus* (Olivier, 1789) (sub *Thorectes haemisphericus*, sic). This latter species is a primary homonym of *Scarabaeus hemisphaericus* Pallas, 1781. *Thorectes laevigatus* had five new varieties described (*lineicollis*, *desjardinii*, *subgeminalis*, *subrugulosus*, *simplicidens*), which can hardly be considered available subspecific names, since they had no different type localities and relate to small individual variations; they are not

mentioned further here, as they are deemed to be infrasubspecific. Later authors have always treated this genus as having a single originally included species, which is wrong.

2. It is clear from Mulsant's text that *Thorectes laevigatus* was a misidentified species, because Fabricius (1798) described his species stating 'Habitat in Tangier. D. Schousboe. Mus. Dom. de Sehestedt'. The Fabrician species has been always correctly identified later apparently, since we do not know of any author having studied its type material. François (1904), who revised systematic and nomenclatural issues related to the genus *Thorectes*, did not check these types himself, and relied on a comparison with some of his specimens made by Frederik V.A. Meinert, who was not a specialist in Coleoptera. Its present distribution includes Morocco and Algeria (Baraud, 1985; Löbl et al., 2006). Bedel (1903) recognized Mulsant's misidentification for the first time, and used instead as the valid name for Mulsant's species *Thorectes intermedius* (O.G. Costa, 1839), originally described in *Scarabaeus*. This species was described from Otranto (Italy) (Costa, 1839) and is distributed in Italy, Sicily, South France, Corsica, Sardinia, the Balearic Islands, Croatia, Algeria and Tunisia (López-Colón, 1996; Löbl et al., 2006).

3. The other species mentioned by Mulsant, *Thorectes hemisphaericus*, is now considered to be a synonym of *Jekelius* (*Rudolfpetrovitzia*) *marginatus* (Poiret, 1787) (López-Colón, 1996; Löbl et al., 2006). It is distributed in the Maghreb countries and Sicily. *T. hemisphaericus* was originally described from '... la côte de Barbarie' (Olivier, 1789), which fits closely. François (1904) considered *T. laevigatus* (Fabricius) to be a valid species, different from *T. marginatus*, and he recognised as correct the statements made before by Bedel (1903) in relation to the identity and nomenclature of *T. laevigatus* sensu Mulsant and of authors.

4. Previous designations or mentions of type species for *Thorectes* have failed to recognise two facts: that there were two *originally* included species, so that any type species designation must be considered a subsequent designation, and that the species usually mentioned as the type of the genus, namely *Scarabaeus laevigatus*, was misidentified by Mulsant.

5. In this line, Jekel (1866, p. 523) mentions as type species *Geotrupes laevigatus* attributing it to Fabricius, unaware of the misidentification. This has been considered the type species of this genus until Bedel's (1903) article. However, Jekel's concept of this species could be a mixed one or correspond to Mulsant's.

6. Bedel (1903) pointed out the mistake in Mulsant's identification of *Thorectes laevigatus* and replaced Mulsant's misidentified species with a valid name, *Thorectes intermedius* (O.G. Costa).

7. Boucomont (1904, p. 216), in a key to the subgenera of the genus *Geotrupes* Latreille, 1797 s.l., and apparently following Bedel, mentioned for *Thorectes*: 'type: *G. intermedius* Costa = *laevigatus* auct.' This type species designation is invalid, since *Scarabaeus intermedius* O.G. Costa, 1839 was not an originally included species and *G. laevigatus* auct. is a misidentified name, excluding Fabricius as author, and thence it is unavailable, not having type specimens to support such a 'nominal species'. Anyway, Article 70.3. cannot be applied to Boucomont's designation, since he did not mention Jekel as the author of the designation, while selecting the taxonomic species actually involved, and did not cite Article 70.3.2, as requested by this Article, since it did not exist at that time.

8. López-Colón (1989) proposed a division of the genus *Thorectes* s.l. based on genitalic characters. He mentioned as type species of *Thorectes* the species *Scarabaeus laevigatus* Fabricius. He described two further subgenera: *Jekelius* López-Colón (p. 72) with type species *Geotrupes intermedius* (O.G. Costa) and *Zuninoeus* López-Colón (p. 74) with type species *Geotrupes hoppei* (Sturm & Hagenbach, 1825). He included 7 species in *Thorectes* s.str., 14 in *Jekelius* and one in *Zuninoeus*.

9. López-Colón (1996) revised the genus *Thorectes* s.l., raising *Zuninoeus* and *Jekelius* to genera, and proposing a new genus *Baraudia* López-Colón (p. 358). He also proposed several subgenera in the genera *Thorectes* s.str. and *Jekelius*.

10. Palmer & Cambefort (1997) performed a phylogenetic analysis of morphological characters under a cladistic approach. They recovered the groups proposed by López-Colón, establishing that the separation of the genera *Thorectes* and *Jekelius* probably occurred during the Eocene, before 35 myBP. These two phylogenetic lineages are thus clearly recognized and delimited.

11. Branco & Ziani (2006, pp. 28–29) selected *Scarabaeus laevigatus* sensu Mulsant, 1842 (non Fabricius, 1798) as the type species of *Thorectes* by monotypy (incorrectly) without mentioning Articles 70.3 and 70.3.2 of the Code, and confirmed its synonymy with *Scarabaeus intermedius* O.G. Costa, 1839. Since the latter is the type species of *Jekelius* López-Colón, 1989, they proposed the synonymy of the latter genus with *Thorectes* Mulsant, 1842. This action left the group considered to be *Thorectes* sensu López-Colón without a name, but they did not propose a replacement name because they synonymized all the taxa proposed by the latter author under a very widely understood genus *Thorectes*, obviating the criteria for such an action and not taking into consideration Palmer & Cambefort's findings.

12. López-Colón & Alonso-Zarazaga (2006) corrected the nomenclatural errors in Branco & Ziani (2006), revealing the fact, hitherto overlooked, that the original description included two species in the genus *Thorectes* (see para. 1 above). They mentioned as well that, since there is no monotypy, a subsequent designation was made for the first time by Jekel (see para 5. above) on *Scarabaeus laevigatus* Fabricius, 1798 (a point omitted by Branco & Ziani). They also pointed out that the type species selection of *Thorectes laevigatus* sensu Mulsant made by Branco & Ziani (2006) would cause instability and confusion, departing from the current use since the inception of the genus *Thorectes*. To avoid this, López-Colón & Alonso-Zarazaga formalized Jekel's selection under Articles 70.3 and 70.3.2 of the Code, and selected again *Scarabaeus laevigatus* Fabricius, 1798.

13. Branco & Ziani (2007) challenged the corrections made by López-Colón & Alonso-Zarazaga (2006) and maintained their 2006 position, this time arguing that Jekel's (1866) concept of *S. laevigatus* was a mixture and that Boucomont (1905) had already settled the problem with his choice of *G. intermedius* as the type species (but see para. 7 above). However, they also stated: '...if *Jekelius* has been as widely used as López-Colón & Alonso-Zarazaga (2006) claim, it could be conserved as a valid name... We would not oppose such a proposal to the Commission...'.

14. Cunha et al. (2011) performed a phylogenetic study based on molecular characters. They showed support for a more ancient origin of the lineage splitting, dating it back to the Cretaceous-Tertiary boundary (65.5 myBP). This implied that the Iberian lineages are most likely paleoendemics surviving from the Tertiary in this refugial area and that the proposed genera of López-Colón represent independent

lineages appeared at a time similar to other well-established GEOTRUPIDAE genera, thus supporting López-Colón's division into monophyletic clades. Lobo et al., (2015) widened the scope of the molecular analysis and obtained further support. It is thus important to fix the name for each implied clade.

15. There is no effective type specimen designation for *Scarabaeus laevigatus*. As mentioned in para. 2, François (1904) relied upon a mention made by F. Meinert of a certain specimen in the Sehestedt-Lund collection being 'the type', but this is not described or otherwise identified, and the existence of syntypes is not mentioned, thus not fulfilling the requisites of Article 74.5. At our request, the Museum of Zoology of the University of Copenhagen has communicated five specimens, two coming from the Sehestedt-Lund collection (the so called 'Copenhagen collection') and three coming from the J.C. Fabricius collection (the so called 'Kiel collection'). The last three are not syntypes, because only the Sehestedt collection is mentioned as the source for the uncertain number of specimens constituting the syntypes. This number is not mentioned in the original description. Of the two specimens of the Sehestedt-Lund collection, one is a male with a handwritten label 'Tanger. / Schousboe. / Mus. de Sehestedt / Scarabaeus / laevigatus. / F.', a printed label 'ZMUC / 00513752' and a red printed label 'TYPE'. This specimen corresponds to the usual concept of *Thorectes laevigatus* (Fabricius, 1798). The other specimen is a male with a handwritten label 'Thor. / trituber / lat. Reitt.' and a printed label 'ZMUC / 00513753'. It belongs to the species *Thorectes trituberculatus* (Reitter, 1893). It seems evident that the red label 'TYPE' pinned under the first specimen corresponds to the concept used by François via Meinert. It is also probable that François via Meinert added this label. We formally designate here this specimen as the lectotype of *Scarabaeus laevigatus* Fabricius, 1798, adding an appropriate label.

16. Since López-Colón (1989, 1996) and Branco & Ziani (2006), authors have been using one or the other nomenclatural proposal in their works from 1990 on. A list of these publications has been placed with the Commission Secretariat, which includes 46 works following López-Colón's proposal and 13 following Branco & Ziani's. This situation is confusing and destabilizing, and needs to be fixed, also as consequence of recent important discoveries about the ecology and physiology of *Thorectes* species (sensu López-Colón). The species of the subgenus *Thorectes* are capable of eating and burying the acorns of *Quercus* species (Pérez Ramos et al., 2007; Verdú et al., 2011) acting as effective seed dispersers for these plant species (Pérez Ramos et al., 2013). Furthermore, this surprising dietary shift for a dung beetle species improves the resistance to low temperatures and the ovarian development (Verdú et al., 2010), as well as the immune response of these beetles (Verdú et al., 2013). These ecophysiological advantages seem to be specific of the *Thorectes* species belonging to the subgenus *Thorectes* that inhabit both the Iberian Peninsula and North Africa (unpublished data). As this probable coevolutionary process may mean an important future source of research and it seems to be phylogenetically constrained to the species of a subgenus not recognized by Branco & Ziani's (2006) nomenclatural proposal, we consider that it would be advisable to remove the uncertainty affecting the nomenclature of the taxonomical categories proposed by López-Colón.

17. The International Commission on Zoological Nomenclature is accordingly asked:

- (1) to use its plenary power to set aside all fixations of type species for the nominal genus *Thorectes* Mulsant, 1842 prior to the designation of *Scarabaeus laevigatus* Fabricius, 1798 by López-Colón & Alonso-Zarazaga (2006) as the type species;
- (2) to place on the Official List of Generic Names in Zoology the following names:
 - (a) *Thorectes* Mulsant, 1842 (gender: masculine), type species by subsequent designation by López-Colón & Alonso-Zarazaga (2006) *Scarabaeus laevigatus* Fabricius, 1798, as ruled in (1) above;
 - (b) *Jekelius* López-Colón, 1989 (gender: masculine), type species by original designation *Scarabaeus intermedius* O.G. Costa, 1839.

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