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Morphological revision of the western Palaearctic species  
of the genus *Copris* Geoffroy, 1762 with three foretibial external teeth  
(Coleoptera: Scarabaeoidea: Scarabaeidae)

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Morphological revision of the western Palaearctic species of the genus *Copris* Geoffroy, 1762 with three foretibial external teeth (Coleoptera: Scarabaeoidea: Scarabaeidae)

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**Abstract.** This revision concerns a small group of Western Palaearctic *Copris* species (Coleoptera: Scarabaeoidea: Scarabaeidae) distinguished by having three lateral teeth on the foretibiae. According to the literature, this group consists of four taxa: *Copris armeniacus* Faldermann, 1835, *C. felschei* Reitter, 1892, *C. pueli* Mollandin de Boissy, 1905 and *C. umbilicatus* Abeille de Perrin, 1901. *Copris armeniacus* is herein deemed a *species inquirenda*, and *C. felschei*, for which a neotype is designated, is deemed valid. *Copris umbilicatus* is recorded for the first time from Turkey. A key to all species of the genus *Copris* known from the Western Palaearctic is provided. Variability of the cephalic and pronotal armature, and morphology of the parameres are illustrated.

**Key Words.** Dung beetle, Coprini, Europe, Middle East, Caucasus, North Africa, nomenclatural acts, neotype designation, *species inquirenda*.

## Introduction

Most species belonging to the large genus *Copris* Geoffroy, 1762, occurring in the Afrotropical, central and southern Palaearctic, Indo-Malayan, southern Nearctic and northern Neotropical regions (Marchisio and Zunino 2012) have foretibiae with four external teeth. Some exceptions occur, one of them being the subgenus *Sinocopris* established by Ochi et al. (2009) for some eastern Palaearctic and Oriental species, which has three foretibial teeth.

A small group of *Copris* with three lateral foretibial teeth, here considered with no phylogenetic implications, is also present in the western Palaearctic. According to the literature (Gillet 1911; Balthasar 1963; Baraud 1985, 1992; Král and Bezděk 2016) this group comprises four species placed in the nominotypical subgenus and distributed in some countries of central and southeastern Europe, Caucasus, eastern Maghreb, Anatolia and Iran. These taxa are:

- *Copris armeniacus* Faldermann, 1835
- *Copris felschei* Reitter, 1892
- *Copris pueli* Mollandin de Boissy, 1905
- *Copris umbilicatus* Abeille de Perrin, 1901

The aim of this paper is to review the morphology of these species and to propose a systematic placement for each taxon.

## Historical Review

*Copris armeniacus* was described by Faldermann in 1835 as *Copris armeniaca* on the basis of an unspecified number of specimens and sex, probably a solitary female (Balthasar 1935), although Faldermann didn't specify the sex. The author also didn't state the type locality. The name given to the species suggests that the specimen(s) came from Armenia. What is known (T. Ghrejian (IZAY), pers. comm.) is that the material studied by Faldermann was collected during two expeditions, the first being that of the botanist Johan Szovitz in 1828, and the second being that of the entomologist Edouard Ménétries in 1829–1830. Neither expedition went beyond the limits of the military fortifications along the border of the Russian Empire, i.e. the territory called “Armenian Oblast” [Armenian province]. That area, known between 1829 and 1914 also as Western Armenia or Russian Armenia, closely corresponds to the modern Republic of Armenia. Therefore, it is reasonable to assume that the type locality of the species is really Armenia, even if some uncertainty remains about the exact locality where the species

was collected. *Copris armeniacus* was subsequently listed in Marseul (1857) and Harold (1869), and also listed as *Copris armeniaca* in Marseul (1866).

In 1892, Reitter described *Copris felschei* based on a single male from Armenia, and stated in a footnote that *C. armeniacus* Faldermann was unknown to him, but that it was clearly different from *C. felschei*, based on the original description. Since then, the systematic events of these two taxa have been closely connected. Both species were included in the catalogues by Reitter (1906), Gillet (1911) and Winkler (1929). Regarding Gillet, it is noteworthy that in a previous article (Gillet 1910) he deemed *C. felschei* a junior synonym of *Copris lunaris* (Linnaeus, 1758). This has been the sole circumstance in which a *Copris* species with four foretibial teeth, *C. lunaris*, entered into the synonymic history of the three-toothed *Copris* group in question.

For many decades, authors had no doubt about the validity of *Copris felschei*, whereas *C. armeniacus* was often considered a somewhat enigmatic taxon. Abeille de Perrin (1901), when describing *Copris umbilicatus*, compared a female of his new species with a female of a supposed *C. felschei* from Moldova without mentioning *C. armeniacus*. Olsoufieff (1918) rather surprisingly included *Copris armeniacus* in the key to the Caucasian species, and *C. felschei* in the text, and was the first who, although tentatively, hypothesized the synonymy of the two names. The same uncertainties were expressed also by Bogacev (1938), who reported *C. armeniacus* as a “mysterious species (...) that aroused a feeling of doubt on its specific independence.” Balthasar (1935), in a footnote, affirmed that the original description of *Copris armeniacus* had unfortunately not provided information on the real identity of the species, and wondered if Faldermann had described a female rather than a male. Some years later, Balthasar (1963), in a key to *Copris* species, put *C. armeniacus* in the same couplet as *C. lunaris*, adding that the species was doubtful. Such systematic uncertainty lasted until Iablokov-Khnzorian (1967), who agreed with Olsoufieff (1918) in that *Copris felschei* Reitter, 1892 was a junior synonym of *Copris armeniacus* Faldermann, 1835. Petrovitz (1968, 1971, 1980) continued to deem *Copris felschei* a valid species, without considering *C. armeniacus*, as did Carpaneto (1977).

After the 1990s, all the authors (Baraud 1992; Carpaneto et al. 2000; Tauzin 2001; Nádai and Vig 2006; Shokhin 2007; Rozner and Rozner 2009; Marchisio and Zunino 2012; Shokhin et al. 2012; Ziani and Sama 2013) followed the synonymy hypothesized by Olsoufieff (1918) and Iablokov-Khnzorian (1967) and deemed *Copris armeniacus* a valid species, with *C. felschei* its junior synonym. Kabakov (2006) followed this synonymy, but asserted to have studied an insufficient number of specimens of *C. armeniacus*. Both editions of the Palaearctic Catalogue (Löbl et al. 2006; Král and Bezděk 2016) regarded *Copris felschei* as a junior synonym of *C. armeniacus*.

Meanwhile, at the beginning of the 20th century, two French entomologists described new *Copris* species with three foretibial teeth: Abeille de Perrin (1901) described *Copris umbilicatus* from south-eastern France, and Mollandin de Boissy (1905) described *Copris pueli* on the basis of 11 specimens from “Kabylie”, northern Algeria. These two species have been accepted by all subsequent authors.

More recently, Maughan and Paulian (2011) hypothesised that *Copris armeniacus* (senior synonym of *C. felschei*), *C. pueli* and *C. umbilicatus* were a monophyletic group, without explaining their assumption. Marchisio and Zunino (2012) regarded *C. umbilicatus* as a *species incertae sedis* and wondered about its possible relationship with *C. pueli* and – also after Kabakov (2006) – with *C. armeniacus*, which, following Iablokov-Khnzorian (1967), they considered a senior synonym of *C. felschei*.

## Materials and Methods

Genus-group systematics follows Král and Bezděk (2016). A total of 204 specimens were examined, including type materials when available. Specimens were obtained from the following collections:

<b>DKCP</b>	David Král collection, Prague (Czech Republic) [deposited in NMPC]
<b>ERCS</b>	Eckehard Rößner private collection, Schwerin (Germany)
<b>GDCG</b>	Giovanni Dellacasa private collection, Genova (Italy)
<b>HNHM</b>	Termesztudományi Múzeum Allattára, Budapest (Hungary)
<b>IZAY</b>	National Academy of Science of Armenia, Institute of Zoology, Yerevan (Armenia)
<b>LNCB</b>	László Nádai private collection, Budapest (Hungary)

<b>LSCM</b>	Lucio Saltini private collection, Modena (Italy)
<b>MHNG</b>	Muséum d'Histoire Naturelle, Geneva (Switzerland)
<b>MNHN</b>	Muséum National d'Histoire Naturelle, Paris (France)
<b>MTD</b>	Staatliches Museum für Tierkunde, Dresden (Germany)
<b>NMPC</b>	National Museum (Natural History), Prague (Czech Republic)
<b>SZCM</b>	Stefano Ziani private collection, Meldola–Forlì (Italy)
<b>ZIN</b>	Russian Academy of Sciences, Zoological Institute, Saint Petersburg (Russia)
<b>ZMUM</b>	Zoological Museum of the Moscow Lomonosov State University, Moscow (Russia)

As in almost all other species of the genus *Copris*, and as in most Scarabaeoidea with an armed head and pronotal horns, the males of *Copris* that have three foretibial teeth exhibit strong intra-sexual polymorphism. Large males usually possess well developed cephalic and pronotal structures, while small males have a minor degree of development, with some being virtually hornless. To a smaller extent, this polymorphism can be seen also in females, although it is very limited and usually concerns only the cephalic horn.

The internal sac of the aedeagus, epipharynx morphology, and female genitalia do not appear to provide useful taxonomic characters at the species level. Indeed, the inner structures of the endophallus seem to be very constant and undifferentiated in the three species of western Palaearctic *Copris* concerned. The endophallus was everted to look for possible variation in the diverticula, which occurs in other Scarabaeoidea families, e.g. Glaphyridae, but no variation was observed. For these reasons, the morphology of these structures is not discussed in this paper, and only the differences in parameres are dealt with.

Unfortunately, as happens in other groups of the superfamily Scarabaeoidea with an armed head and pronotum, some diagnostic characters used in the key can be employed only for males. Single females coming from interspecific transitional areas are often unidentifiable.

## Systematics

**Diagnostic features of species involved.** *Copris* species of medium/large size (length from 15 to 24 mm), black, elongate, convex, suboval, shining. Ventral pubescence dark yellow to red, pronotal lateral setae from black to dark red. Clypeus broad, margined, clearly notched anteriorly at middle. Pronotum with a median longitudinal sulcus and dense subregular punctures. Pronotal anterior angles broadly rounded. Medial lobe of metasternum with a longitudinal groove, ending posteriorly in a more or less deep and concave, impunctate hollow. Elytral striae crenulated (in one species) or not crenulated (in two species); elytral interstriae convex, more or less shallowly punctate. Pygidium more or less strongly punctate. Foretibiae with three outer teeth. Strong sexual dimorphism: males with a cephalic horn more or less elongate and slender, curved backward, sometimes terminally feebly expanded and slightly bifurcate, or sometimes reduced to a scarcely raised point; and with pronotum usually strongly declivous towards anterior edge, with transverse sinuate ridge on disc and two lateral prominences, sometimes obsolete and female-like, sometimes laminate and directed forward and upward, separated from the central gibbosity by a deep excavation. Females with a short cephalic horn, when developed, slightly transverse and weakly dentate at sides, with a median pronotal prominence in the form of a very feeble transverse carina slightly sinuate at middle, and with the lateral pronotal prominences obsolete. Foretibial spur slender and tapering, of similar shape in both sexes.

### *Copris (Copris) armeniacus* Faldermann, 1835

*Copris armeniacus* Faldermann 1835: 238; Marseul 1866: 51.

*Copris armeniacus*: Marseul 1857: 79; Harold 1869: 1014; Reitter 1892: 216 (footnote); Mollandin de Boissy 1905: 113; Reitter 1906: 730; Gillet 1910: 20; Gillet 1911: 72; Olsoufieff 1918: 39 (key); Winkler 1929: 1027; Balthasar 1935: 69 (footnote); Bogachev 1938: 144; Balthasar 1963: 335; Iablokoff-Khnzorian 1967: 124; Baraud 1992: 325; Carpaneto et al. 2000: 230; Tausin 2001: 115; Kabakov 2006: 95; Löbl et al. 2006: 152; Náday and Vig 2006: 98; Shokhin 2007: 120; Rozner and Rozner

2009: 80; Marchisio and Zunino 2012: 144 and 155 (footnotes); Shokhin et al. 2012: 67; Ziani and Sama 2013: 461; Král and Bezděk 2016: 168.

**Type locality.** Probably Armenia (see “Historical Review”).

**Type material.** Not found (see “Remarks”).

**Distribution.** Armenia, Turkey, Iran (Král and Bezděk, 2016), Azerbaijan (Kabakov 2006), Georgia (Marchisio and Zunino 2012).

**Remarks.** I have not been able to trace the type material of *Copris armeniacus*. It is not in MNHN (teste Antoine Mantilleri), ZIN (teste Andrey Frolov), ZMUM (teste Aleksey Gusakov), or in other important European museums such as Berlin, Budapest, Dresden, Frankfurt, London, Munich, Oxford, Prague and Yerevan. Schaum (1849) claimed to have received all the type specimens of Faldermann’s collection from Choudoir, but he was probably referring to the Cetoniinae species. The location of the types, particularly that of *Copris armeniacus*, is unknown.

Therefore, all the systematic considerations regarding this species are necessarily deduced only from Faldermann’s original description that follows, and on the assertions of the authors who have dealt with the matter.

Faldermann (1835): “221. *Copris Armeniaca* MIHI

*Subcylindrica, nigra; clypeo antice semicirculariter rotundato, profunde sed anguste emarginato, vertice subcornuto; thorace crebre et rude punctato; elytris profunde crenato-striatis.*

Longit. 7 lin. Lat. 4 lin.

Statura *Copridi emarginate* Fabr. affinis, sed duplo minor, et plerumque magis cylindrica; magnum quidem habet similitudinem cum *Copride sulcicollis* Dalm. ex Insula Java, paullo tantum minor, elytrisque minus profunde striatis.

Clypeus magnus, semicircularis, anguste tamen profunde emarginatus, obsolete punctatus, in medio cornu brevi, erecto, obtuso; margine praesertim antico admodum reflexus; subtus rufo-pilosus; oculis griseis, antennis rufis. Thorax brevissimus, basi rotundatus, margine incrassatus, reflexus, angulis rotundatis; lateribus nonnihil rotundatis, reflexis; apice profunde et late emarginatus, ibique angulis latis, valde productis, obtusis, rufo-ciliatis; supra convexus, punctis numerosis, profundis; disco longitudinaliter late canaliculatus, antice in medio tuberculo brevi transversaliter parum elevato; foveola profunda, rotundata, latera versus utrinque; apice et lateribus antice rufo-ciliatus. Elytra basi thoracis vix angustiora, in medio nonnihil dilatata, apice obtuse rotundata; supra valde convexa, regulariter profunde crenato-striata, interstitiis laevissimis, parum elevatis. Corpus subtus piceum, rude punctatum, cum pedibus rufo-pilosum.”

[221. *Copris armeniacus* MIHI. Sub-cylindrical, black. Clypeus round anteriorly, clearly even if finely emarginated, vertex sub-horned; prothorax densely deeply punctate; elytra deeply crenate-striate. [length and width: see below]. Length one-half that of *Copris emarginatus* Fabr. and, besides, more cylindrical; it is very similar to *Copris sulcicollis* Dalm. from Java Island, only a bit smaller and with elytra less deeply striate. Clypeus wide, semicircular, with a narrow but deep emargination, shallowly punctate, with a short erect and blunt horn at middle; particularly the edge reflexed anteriorly; ventral pubescence red; eyes yellowish grey, antennae red. Prothorax very short, rounded basally, with edge thicker and reflexed, angles round; sides slightly round and reflexed; apex deep and widely emarginated, and angles broad, very visible, blunt, with red hairs; convex dorsally, densely and deeply punctate; disc usually with a longitudinal furrow, anteriorly with a slightly transverse and elevated tubercle at middle; furrow deep, rounded toward both sides; apically and anteriorly at sides with red hairs. Elytra slightly narrower than pronotal base, broader at middle and rounded apically; very convex, usually deeply crenate-striate, interstriae very smooth, scarcely raised. Black ventrally, roughly punctate, legs with red hairs.]

As noticed to some extent by Reitter (1892), and explicitly by Balthasar (1935, 1963), the original description of *C. armeniacus* does not give information on the real identity of the species. In particular,

Faldermann failed to specify the number of specimens on which he based the description, its (their) sex, and the most meaningful character, i.e. the presence of only three foretibial teeth.

There are also other uncertain aspects of the description. Faldermann specified that the new species was “7 lines” long and “4 lines” wide. Unfortunately, the line was a unit of length equivalent to 1/10, 1/12, 1/16 or 1/40 of an inch depending on the country; therefore we cannot know the size used by Faldermann. He only specified that his new species was half as long as *Copris emarginata* Fabricius, 1801 [= *Copris emarginatus* Olivier, 1789], presently a junior synonym of *Copris lunaris* (Linnaeus, 1758). According to Baraud (1992), *C. lunaris* is 15–20 mm long. I know of specimens up to 25 mm in length. Hence, the length of *C. armeniacus* should be 7,5–12,5 mm, a small size indeed. Faldermann also compared his new species to “*Copride sulcicolle* Dalm. ex Insula Java”, but I am not aware of any species described by Dalman as *Copris sulcicollis*. For all I know, *C. sulcicollis* Dalman was listed as a synonym of *Copris indica* Dejean (Dejean 1833, 1836). Both *Copris sulcicollis* Dalman and *Copris indica* Dejean are probably *nomina nuda*. Lansberge (1886) described a *Copris sulcicollis*, presently a junior synonym of *C. sinicus* Hope, 1842, from the Sunda Islands and Malay Peninsula, stating that the species was known, probably *in litteris* and by the same name, for a long time. Hence it could also be the *Copris sulcicollis* Dalman cited by Faldermann. In any case, from the descriptions of *C. sulcicollis* by Lansberge (1886), and *C. sinicus* by Hope (1842), it is not possible to make any possible morphological connection between that species and *C. armeniacus*.

Reitter (1892), in a footnote on page 95, asserted that, from the original description, *Copris armeniacus* was definitely different from *C. felschei* Reitter, 1892. Faldermann’s description of *C. armeniacus* did not convince Balthasar (1935). He wrote that such a description did not give real information on the species, and later (Balthasar 1963) stated that it was not possible to find a single statement in the description supporting the separation of the specimen from a small *Copris lunaris*. Kabakov (2006), although he accepted the synonymy of *C. armeniacus* and *C. felschei*, pointed out that he had examined an insufficient number of specimens (3 males) to have a clear taxonomic idea of the species.

Nevertheless, the two species are currently considered synonyms. In my opinion this is a clear case of “copy and paste” synonymy. Iablokov-Khnzorian (1967), on the basis of a justification insignificant from a systematic point of view – the improbability of the presence of two closely related species of the same genus, endemic to Armenia – confirmed the synonymy between *C. armeniacus* and *C. felschei*, but without a real nomenclatural act, only citing Olsoufieff (1918). This latter author, without seeing the type material, assumed that *C. felschei* could perhaps be the species called *C. armeniacus* by Faldermann, but only if Reitter’s description of *C. felschei* referred to a damaged specimen. All this is not enough to have a systematic concept of *C. armeniacus*, and therefore to establish a plausible synonymy. Supposing that the species really belongs to the genus *Copris*, in my opinion it is not possible to ascertain or even hypothesize whether *C. armeniacus* is indeed a good species, senior synonym of *C. felschei*, or rather a junior synonym of one of the other two species recorded from the Caucasus, i.e. *Copris hispanus* ssp. *cavolini* (Petagna, 1792) and *Copris lunaris* (Linnaeus, 1758).

In summation, this synonymy is objectively impossible to accept for the following reasons:

- The type material of *C. armeniacus* is untraceable and probably lost.
- No author is known to have examined the type material.
- The original description does not enable an understanding of what species Faldermann had before him, and therefore does not allow for designation of a neotype.
- The original description does not specify the sex, the number and the exact type locality of the specimen(s) described.
- Neither Olsoufieff (1918) nor Iablokov-Khnzorian (1967) ever justified, in a convincing and legitimate way, the reasons for the synonymy of *C. armeniacus* and *C. felschei*.
- Authors such as Balthasar (1935, 1963) have expressed strong doubts about the validity of the species.

*Copris armeniacus* Faldermann, 1835, a species of doubtful identity and status that requires further investigation, is here deemed a *species inquirenda*. All the records reported in the literature under this name should be associated with the name of the following species, herein regarded as valid.

***Copris (Copris) felschei* Reitter, 1892**

(Fig. 1–7)

*Copris felschei* Reitter, 1892: 216; Abeille de Perrin 1901: 69; Mollandin de Boissy 1905: 113; Reitter 1906: 730; Gillet 1910: 23 (as junior synonym of *C. lunaris*); Gillet 1911: 74; Olsoufieff 1918: 79; Mancini 1926: 94; Winkler 1929: 1027; Balthasar 1935: 69; Balthasar 1963: 334; Iablokoff-Khinzorian 1967: 124 (as junior synonym of *C. armeniacus*); Petrovitz 1968: 465; Zaharieva-Stoilova 1970: 40; Petrovitz 1971: 565; Carpaneto 1977: 17; Petrovitz 1980: 599; Baraud 1992: 325 (as junior synonym of *C. armeniacus*); Carpaneto et al. 2000: 230 (as junior synonym of *C. armeniacus*); Tauzin 2001: 115 (as junior synonym of *C. armeniacus*); Kabakov 2006: 95 (as junior synonym of *C. armeniacus*); Löbl et al. 2006: 152 (as junior synonym of *C. armeniacus*); Maughan and Paulian 2011: 436 (as junior synonym of *C. armeniacus*); Marchisio and Zunino 2012: 145 and 155 (footnotes, as junior synonym of *C. armeniacus*); Ziani and Sama 2013: 461 (as junior synonym of *C. armeniacus*); Král and Bezděk 2016: 168 (as junior synonym of *C. armeniacus*).

**Type locality.** “Armenia, Sevan” [Sevan, Gegharkunik prov., Armenia].

**Type material.** Not found (see “Remarks”). Neotype, a male, herein designated, in NMPC.

**Distribution.** Armenia, Turkey, Iran (Král and Bezděk 2016; as *C. armeniacus*), Azerbaijan (Kabakov 2006; as *C. armeniacus*), Georgia (Marchisio and Zunino 2012; as *C. armeniacus*).

**Material examined.** **TURKEY:** Ağrı prov., Tahir Mts., 2100 m, 1.v.1999, G. Fábíán & L. Nádai leg. 1 ♂ (LNCB); Ağrı prov., Tahir Geç., 2200 m, 12.v.2000, Hentschel & Szabó leg. 1 ♀ (LNCB); Ağrı prov., İshak Paşa Sarayı, 44°07'57"E 39°31'10"N, 1960 m, 22-23.iv.1997, D. Král leg. 2 ♂♂ (DKCP); Erzurum prov., Kayaboğaz, 1.vi.1989, A. & I. Rozner leg. 2 ♀♀ (LNCB); Hakkâri prov., Bajirgi [presently Esendere], 25.v.1966, 1 ♂ (MHNG); Van prov., Kayabogaz, 1.vi.1989, A. & I. Rozner leg. 1 ♀ (LNCB); Muş prov., Buglan geç., 1650 m, G. Sama leg. 1 ♀ (SZCM). **ARMENIA:** Gegharkunik prov., Sevan, 2100-2400 m, 10.vi.1959, Kr. Pospíšil leg. 1 ♂ (neotype, NMPC); Aragatzotn prov., road to Karilich 2500 m, 28.vi.2001, S. Ziani leg. 1 ♀ (SZCM). **IRAN:** Āzarbāijān-e Gharbi prov., Choplu, 46°48'E 36°32'N, 2000/2200 m, 30-31.v.1999, L. Padovani e M. Malmusi leg. 1 ♂ (SZCM); Āzarbāijān-e Sharqi prov., 43 km SW of Tabriz, 1 ♂ (MHNG); Mazandaran prov., Polour, Alborz Mts., R. Petrovitz leg. 1 ♀ (MHNG); “Plateau Persan Occid. / de Zendjan a Ardébil / (alt. moy. 1300 m.)” [Zenyān and Ardabil provinces], 1904, J. De Morgan leg. 1 ♂ (MNHN); Mazandaran prov., 6 km W of Reine, 2600 m, 20.iv.1999, L. Nádai leg. 1 ♂ (LNCB); Mazandaran prov., Alborz Mts., Minokh, Balade, Resteh-ye-Elborz, 2400 m., 51°36'381"E 36°13'409"N, 18.vi.2007, L. Nádai leg. 1 ♂ and 1 ♀ (LNCB); Mazandaran prov., Alborz Mts., 15 km E Lar-e Polur, 2580 m, 52°06'10"E 35°52'28"N, 12-13.v.2001, G. Fábíán & K. Vig leg. 2 ♂♂ and 1 ♀ (LNCB); Mazandaran prov., Alborz Mts., 5 km W Pel, 2480 m, 51°36'22"E 36°13'23"N, 14.v.2001, at light, G. Fábíán & K. Vig leg. 1 ♀ (LNCB); Zanjan prov., 25 km N Zanjan, Kuh-e-Sendan Dagh, 2200 m, 17.vi.2006, L. Nádai leg. at light 1 ♀ (LNCB); Esfahān prov., Mts. Zagros, Fereydūnshahr, 2705 m, 50°06'641"E 32°55'255"N, 4-5.v.2008, T. Háczy, K. Székely & K. Vig leg. at light 1 ♂ and 1 ♀ (LNCB).

**Variability of cephalic and pronotal armament.** More developed males (Fig. 3) bear a clypeal horn subperpendicular to the basal plane of the head in its proximal half (Fig. 5), as long as the interocular distance, situated in the middle of the head. Its apex is clearly dilated and bifurcate/bilobate, and slightly curved backward. Pronotum has a nearly vertical anterior declivity, the upper edge of which bears two blunt, sometimes transverse prominences located close together, separated by the length of one of them, and a vertical feeble crest on each side.

In less developed males (Fig. 4) the cephalic horn is shorter, but always bilobate apically, till to be a slightly elevated point, and the pronotum is almost declivitous anteriorly, with only two anteromedian vestigial gibbositities.

Females (Fig. 2) have a short, transverse, slightly elevated clypeal carina truncate at its summit and feebly acuminate on each side, sometimes reduced to a low crest, and a weak, straight, transverse carina just behind the pronotal front margin.



**Aedeagus.** Parameres slender, apically rounded in dorsal view (Fig. 6), in lateral view not evenly tapering, more or less enlarged and flat at the top (Fig. 7). Ventral side hairless apically.

**Remarks.** Reitter (1892) described *Copris felschei* on the basis of a single male. The original description follows:

“ 2' Vorderrand des Halsschildes in der Mitte nicht ausgerandet; Unterseite des Halsschildes ohne deutliche Fühlergruben. Halsschild einfach, zum Theile rugulos punktirt.

(...)

3' Vorderschienen am Aussenrande nur mit drei Zähnen. Kopfhorn hinten nahe der Basis ohne Gibbosität.

Dem *C. lunaris* sehr ähulich, aber der Absturz der grossen Mittelerhabenheit des Halsschildes seitlich ohne Höcker beim ♂, dagegen mit einer feinen, erhabenen Längslinie in der Mitte, die Oberfläche desselben ist überall deutlich punktirt, nur in den Gruben glatt, die Flügeldecken sind deutlich länger, sehr fein lederartig gerunzelt, daher matter, die Streifen tiefer, die Zwischenräume leicht gewölbt. Long 23 mm. – Armenien – Mir liegt ein ♂ aus der Sammlung des Herrn Felsche vor. \*)

\*) *C. armeniacus* Falderm., Fn Transc. I. 238 ebenfalls aus Armenien, ist mir unbekannt. Der Beschreibung nach ist er von *Felschei* gewiss verschieden.”

[Anterior margin of pronotum not sinuate at middle; ventral side of pronotum without antennal hollows. Pronotal punctures simple, sometimes rugose. (...) 3' Anterior tibiae tridentate externally. Cephalic horn with no gibbosity posteriorly, at base.

Very close to *C. lunaris*, but pronotum, lateral to the medial prominence, without tubercles in ♂, only with a longitudinal line slightly elevated at middle, its superior area distinctly punctate, smooth only in the hollow, elytra clearly longer, very slightly wrinkled, therefore more dull, striae deeper impressed, interstriae weakly convex. Length 23 mm. – Armenia – I have had a ♂ from the collection of Mr. Felsche. \*)

\*) *C. armeniacus* Falderm., Fn Transc. I. 238 also from Armenia, is unknown to me. From the description it is definitely different from *Felschei*].

According to Balthasar (1963), the type specimen of *C. felschei* was “supposed” to be in Felsche’s collection (MTD). Balthasar examined the presumed type and doubted that it could really be the specimen seen and described by Reitter, since it bears a label “Ganglbauer det.”, in addition to “*C. felschei* Reitt. – Typus”. That specimen seems to no longer be in MTD. According to Balthasar (1963), the specimen was *Copris lunaris*.

The HNHM collection does not contain the specimen described by Reitter (O. Merkl, pers. comm.), it only has a single male with a sharp anterolateral tooth separated by a deep hollow from the dorsal prominence. This specimen, even if collected in Armenia and belonging to Reitter’s collection, does not match the original description of *C. felschei*, so it likely does not bear type labels. MTD houses a male with the labels “Bulghar / Maden”; “*Copris / felschei / Falderman?*”; “coll. C. Felsche / Kauf [purchase] 20.1918”, but this specimen also has two obvious anterolateral laminate prominences and, furthermore, bears a label with a locality placed in the Central Anatolia Region; it cannot be the specimen described by Reitter as *Copris felschei*.

The name-bearing type specimen of Reitter’s species seems untraceable. I have unsuccessfully looked for it in several museums, namely Berlin, Dresden and Paris, apart from Budapest, where Reitter’s material is supposed to be preserved. The type seems to be lost or destroyed. To define the taxon objectively, clarifying its taxonomic status and also for potential synonymic problems, I think it is necessary to designate a neotype. To satisfy article 75.3.6 of the International Code of Zoological Nomenclature (ICZN 1999), the neotype has to come as nearly as practicable from the original type locality, namely Armenia in this case. For this purpose, I have chosen a specimen studied by Balthasar (1963), collected in Armenia. The specimen, a male, is in NMPC and bears the following labels:

- 1) White, with black square frame, handwritten in black: “*Copris / felschei* Rtrr.”;
- 2) White, printed in black on both sides; upper side: “USSR Armenia / Sevan 2100-2400m / Kr. Pospíšil lgt.”; underside: “10.6.59”;

- 3) White, printed in black: “ex coll. V. Balthasar / National Museum / Prague, Czech Republic”;  
 4) Red, printed in black: “Neotype / *Copris felschei* Reitter, 1892 / S. Ziani des., 2017”.

The specimen is consistent with the original description, and in particular has foretibiae with three lateral teeth. Furthermore, the taxon can be differentiated from the western Palaearctic species with three foretibial teeth by lacking the two strong pronotal anterolateral prominences and by the male cephalic horn dilated at apex and somewhat bifurcate.

***Copris (Copris) pueli* Mollandin de Boissy, 1905**  
 (Fig. 8–13)

*Copris pueli* Mollandin de Boissy, 1905: 110; Bedel 1911: 42 (footnote); Gillet 1910: 28; 1911: 77; Winkler 1929: 1027; Balthasar 1929: 107; Schatzmayr 1930: 111; Porta 1932: 413; Balthasar 1935: 70; Normand 1936: 192; Paulian 1941: 59; Mackauer 1958: 49; Schaefer 1958: 46; Paulian 1959: 74; Balthasar 1963: 334; Dellacasa 1968: 139 (footnote); Zaharieva-Stoilova 1970: 42; Petrovitz 1971: 565; Baraud 1977: 29; Paulian and Baraud 1982: 241; Baraud 1985: 256; Kabakov 2006: 88; Löbl et al. 2006: 152; Maughan and Paulian 2011: 436; Král and Bezděk 2016: 169; Tonelli et al. 2016: ii.

**Type locality.** “Bou-Berak (Kabylie)” [Algeria].

**Type material.** Eleven syntypes, 10 ♂♂ and 1 ♀, by original designation. Four probable syntypes were examined from the MNHN: 3 ♂♂ and 1 ♀.

**Distribution.** Algeria, Tunisia (Král and Bezděk 2016).

**Material examined. ALGERIA:** “Bou Berak / Kabjlie L. Puel”, 4 ♂♂ and 1 ♀ (syntypes, MNHN); “Bou Berak / Kabjlie L. Puel”, 2 ♂♂ and 1 ♀ (MNHN); “Bou Berak / Kabjlie L. Puel”, 3 ♂♂ and 6 ♀♀ (MNHN); “Bou Berak / Kabjlie L. Puel”, 1 ♂ (MHNG); “Bou Berak”, 1 ♂ and 1 ♀ (MHNG); “Algeria / Reitter”; “*Copris / pueli*”; “coll. C. Felsche / Kauf 20.1918”, 2 ♂♂ (MTD); “Massif des Mouzaïa”, 2 ♂♂ and 2 ♀♀ (MNHN); “les Mouzaïa”, 1 ♂ and 1 ♀ (MNHN); “Mouzaïa”, 1 ♀ (MHNG); “Algerie / Mt. Edough”, 50 ♂♂ and 1 ♀ (MNHN); “Algeria / Reitter”, 1 ♂ (MNHN); “Gde Kabylie / Forêt d’Akdadou, 9 km W / Adekar, 1300 m”, 17.v.1988, Besuchet, Löbl and Burckh. leg. 2 ♂♂ (MHNG); “Gde Kabylie / Forêt d’Akdadou, 22 km E / Yakouren, 1050 m”, 16.v.1988, Besuchet, Löbl and Burckh. leg. 1 ♂ (MHNG); Ben Atala, vi.1985, 1 ♀ (SZCM); Tizi Ouzou prov., Akfadou forest, 1000/1400 m, 2.vi.1986, G. Sama leg. 1 ♂ and 1 ♀ (SZCM). **TUNISIA:** Jendouba prov., Ain Draham, 7.vi.1982, Sláma leg. 1 ♀ (SZCM); Jendouba prov., Ain Draham, 9.iv.1995, S. and R. Ziani leg. 3 ♂♂ and 1 ♀ (SZCM); Jendouba prov., Ain Essobh, 5.xi.2013, W. Ben Aba leg. 1 ♂ (SZCM).

Furthermore, thanks to the Internet discussion site FEI (Italian Entomologists Forum), I learned of the following unpublished Algerian record: Mila province, Hamala, ii.1985, 1 ♂ and 1 ♀.

I have also examined 1 ♂ and 1 ♀ without locality labels, both in the MNHN.

**Variability of cephalic and pronotal armament.** More developed males (Fig. 8) bear a very long, tapering, slightly backward-curved clypeal horn situated forward of the middle of the head and as long as the maximum head width. Anteromedian pronotal prominence is transversely truncated, with upper edge of the declivity rather narrow but a little dilated at its front margin which forms a straight carina interrupted in the middle by a longitudinal groove, 1/5 the width of the whole carina in dorsal view. On each side of the dorsal elevation there is a deep groove, the outer margin produced obliquely upward and forward as a pyramidal prominence (Fig. 10).

The few less-developed males examined (Fig. 11) have a shorter horn, as long as the interocular distance but never female-like, and pronotum with the same structures but less pronounced, although always clearly visible.

Females (Fig. 9) have a more or less elevated, transverse clypeal carina truncate at its summit and feebly bicuspid, and a slight, straight, transverse pronotal carina just behind the front margin, with two very low and vague tumescences on either side. In less developed females these tumescences are obliterated.

**Aedeagus.** Parameres in lateral view slender (Fig. 13). Apex blunt, truncate in dorsal view, and ventrally with some short hairs (Fig. 12).

**Remarks.** Mollandin de Boissy (1905) in the original description of *C. pueli* stated: “Les onze individus (10 ♂, 1 ♀, Collections Puel, J. Clermont, Delfieu et de Boissy) que j’ai eus sous les yeux proviennent tous de Bou-Berak (Kabylie), où ils ont été pris par M. Louis Puel (de Béziers)” [The eleven specimens (10 ♂, 1 ♀, Puel, J. Clermont, Delfieu et de Boissy collections) that I have had under my eyes are all from Bou-Berak (Kabylie), where they were collected by Mr. Louis Puel (de Béziers)].

I have examined 18 specimens with a label “Bou Berak / Kabylie L. Puel”, 17 in MNHN and 1 in MHNG. It is not possible, however, to deem all these specimens as included in the type series, because unfortunately their number and sex (13 ♂♂ and 5 ♀♀) do not coincide with number and sex (10 ♂♂ and 1 ♀) of the specimens used by Mollandin de Boissy to describe the species. This notwithstanding, among these 18 specimens I noticed four critical specimens belonging to the Puel collection and preserved in the MNHN, that according to the labels could be part of the type series.

The first specimen, a male, bears the following labels:

- 1) White, with black square frame, printed in black “Bou Berak / Kabilie L. Puel”;
- 2) White, printed in black “Coll. Puel”;
- 3) Red, with black double square frame, printed in black “Co-Typus” [letters “Co” are handwritten];
- 4) White, printed in black “MUSÉUM PARIS / 1936 / COLL. A. BOUCOMONT”.

The second specimen, a male, bears the following labels:

- 1) White, with black square frame, printed in black “Bou Berak / Kabilie L. Puel”;
- 2) White, handwritten in black “Pueli”;
- 3) White, printed in black “Coll. Puel”;
- 4) Red, with black double square frame, printed in black “Typus”;
- 5) White, printed in black “MUSÉUM PARIS / 1936 / COLL. A. BOUCOMONT”.

The third specimen, a male, bears the following labels:

- 1) White, with black square frame, printed in black “Bou Berak / Kabilie L. Puel”;
- 2) Red, with black double square frame, printed in black “Typus”;
- 3) White, handwritten in black “Copriss / Pueli / de Boissy”;
- 4) White, printed in black “Coll. Puel”;
- 5) White, printed in black “MUSÉUM PARIS / 1936 / COLL. A. BOUCOMONT”.

The fourth specimen, a female, bears the following labels:

- 1) White, with black square frame, printed in black “Bou Berak / Kabilie L. Puel”;
- 2) White, handwritten in black “Copriss / Pueli / ♀”;
- 3) White, printed in black “Coll. Puel”;
- 4) Red, with black double square frame, printed in black “Typus”;
- 5) White, printed in black “MUSÉUM PARIS / 1936 / COLL. A. BOUCOMONT”.

On the basis of these labels, I believe that these four specimens can collectively constitute the name-bearing type of the taxon, therefore they can be considered syntypes, part of the material seen by Mollandin de Boissy. I added to every specimen a red label printed in black: “Syntype / *Copriss pueli* / Mollandin de Boissy, 1905 / S. Ziani vidit, 2017”. In my opinion there is no need to designate a lectotype, the taxonomic status of the species is well known and the nomenclature does not run the risk of instability.

In the collections of the MNHN there are also 52 specimens, 51 ♂♂ and 1 ♀, of *C. pueli* collected in Algeria, at Edough Mountain (Djebel Edough, Province of Annaba and Skikda). One male is very

different from all the others, with the anterolateral pronotal teeth very weak, the upper ridge of the anteromedian declivity that bears two small and blunt prominences separated at middle by a hollow equal to their diameter, and the cephalic horn slightly dilated and feebly but clearly bifurcate at the extremity, all characters shared by males of *C. felschei*. On the other hand, the specimen has elytral striae very crenulated and parameres subquadrate and ciliate at the top, as in *C. pueli*. However, the abdomen was deliberately glued to the prothorax and the pubescence on the inner base of the pronotum and elytra is clearly of two different shades of dark yellow, which is why it is reasonable to suspect that the prothorax and the abdomen belong to two different species.

Schatzmayer (1930) assumed that this species was present in the mountains of Sicily, but this assumption has never been confirmed.

### ***Copris (Copris) umbilicatus* Abeille de Perrin, 1901**

(Fig. 14–20)

*Copris umbilicatus* Abeille de Perrin, 1901: 68; Mollandin de Boissy 1905: 112; Reitter 1906: 730; Bedel 1911: 42; Gillet 1910: 31; Gillet 1911: 79; Monnot et al. 1912: 148; Mancini 1926: 94; Luigioni 1929: 394; Winkler 1929: 1027; Schatzmayer 1930: 112; Porta 1932: 413; Faggioli 1933: (7-24); Balthasar 1935: 70; Paulian 1941: 58; Porta 1949: 346; Mikšić 1956: 61; Schaefer 1958: 45; Mikšić 1959: 4; Paulian 1959: 73; Balthasar and Hrubant 1960: 148; Balthasar 1963: 333; Papini 1964: 35; Papini 1965a: 39; Papini 1965b: 43; Dellacasa 1968: 139; Zaharieva-Stoilova 1970: 39; Petrovitz 1971: 565; Baraud 1977: 29; Paulian and Baraud 1982: 241; Perazzini 1983: 286; Angelini 1986: 92; Král and Souček 1987: 17; Lumaret and Kirk 1987: 8; Koch 1991: 353; Lumaret and Kirk 1991: 101; Krell and Fery 1992: 205; Ádám 1993: 166; Král 1993: 68; Carpaneto et al. 1994: 308; Ádám 1994: 15; Carpaneto and Piattella 1995: 10; Ziani 1995: 174; Bunalski 1999: 10; Carpaneto et al. 1999: 114; Nádaï and Merkl 1999: 216; Bunalski 2001: 169; Pesarini 2004: 76; Colacurcio 2005: 33; Kabakov 2006: 88; Löbl et al. 2006: 153; Maughan 2006: 20; Bellucci et al. 2008: 128; Juřena and Týr 2008: 10; Juřena et al. 2008: 78; Guéorguiev et al. 2011: 248; Maughan and Paulian 2011: 436; Marchisio and Zunino 2012: 144; Montreuil 2014: 386; Dellacasa et al. 2015: 163; Král 2015: 12; Král and Bezděk 2016: 170; Tonelli et al. 2016: ii.

**Type locality.** “Basses-Alp.: N. -D. de Lure; Var.: Sainte-Baume; Bouches du-Rh., Canal du Verdon à Aix en Provence” [Provence-Alpes-Côte d’Azur region, France].

**Type material.** Species described on a not precise number of specimens. Seven probable syntypes examined (MNHN).

**Distribution.** France, Italy, Slovakia, Hungary, Romania, Bulgaria, Croatia, Albania, Greece (Král and Bezděk 2016), Corsica (Dellacasa et al. 2015), Turkey (new country record).

**Material examined.** FRANCE: “M. de Lure”, 1 ♂ (MNHN); “S. Baume”, 2 ♂♂ (MNHN); “la S<sup>te</sup> Baume / Var”, 1 ♂ (MNHN); “S. Baume”, 2 ♀♀ (MNHN); “S<sup>te</sup> Baume / Abeille”, 1 ♂ (MNHN); “M. de Lure”, 3 ♂♂ (MNHN); “France / Var, S<sup>te</sup> Baume” (MNHN); “France mérid. / Boyer de Fonscolombe / 1834”, 1 ♂ (MNHN); “S<sup>te</sup> Baume”, 25.v.1902, 1 ♀ (MNHN); “S<sup>te</sup> Baume (A. M.)”, 30.iv.1961, 1 ♀ (MNHN); “Alpes Mmes / Saint-Barnabé”, v. 1976, Y. Cambefort leg. 1 ♀ (MNHN); Corse, Propiano, 28.iv.1996, B. Kofler leg. 1 ♂ (GDCG). ITALY: Umbria (PG), (Nocera Umbra) Nocera, vi.1918, G. E. Rasetti leg. 1 ♂ and 1 ♀ (GDCG); Friuli-Venezia Giulia (UD), Planez - boschetti, 25.v.1941, G. Pilleri leg. 1 ♂ (GDCG); Liguria (SV), Monte San Giorgio, 21.x.1963, G. Dellacasa leg. 1 ♀ (GDCG); *ibidem*, 10.v.1964, G. Dellacasa leg. 1 ♂ (GDCG); *ibidem*, 14.v.1964, G. Dellacasa leg. 1 ♀ (MHNG); Piemonte (AL), Laghi del Gorzente, 19.vii.1964, S. Riese leg. 1 ♀ (GDCG); Calabria (RC), Aspromonte, Port. Zagaria, 10.v.1970, G. Dellacasa leg. 1 ♂ and 1 ♀ (GDCG); Calabria (RC), Aspromonte, Casa Cantoniera Romeo Bagaladi, 1200 m, 20.v.1970, G. Dellacasa leg. 1 ♂ (MNHN); Calabria (RC), Aspromonte, Portella Zagaria, 19.iv.1971, G. Dellacasa leg. 1 ♀ (GDCG); Calabria (RC), Aspromonte, Piano Vaccarizzo, 12.v.1971, G. Dellacasa leg. 1 ♂ (GDCG); Toscana (FI), Vallombrosa, 10.vi.1967, G. Dellacasa leg. 1 ♀ (GDCG); Toscana (AR),

Castelfranco, loc. Odina, 600 m, 15.iv.1994, R. Papi leg. 1 ♂ (SZCM); *ibidem*, 25.ix.1993, R. Papi leg. 1 ♂ and 1 ♀ (SZCM); Toscana (AR), Loro Ciuffenna, 400 m, 1.v.1999, R. Papi leg. 2 ♂♂ (SZCM); Toscana (FI), M. Calvana, 25.x.1987, I. R. Scali leg. 1 ♂ and 1 ♀ (SZCM); *ibidem*, 15.v.1988, M. Masciello leg. 2 ♀♀ (SZCM); *ibidem*, 30.x.1988, I. R. Scali leg. 2 ♂♂ and 2 ♀♀ (SZCM); Toscana (FI), M. Calvana-Prato Vernio, 24.iv.1989, R. Lisa leg. 1 ♀ (SZCM); Toscana (FI), M. Calvana-Montecuccoli, 25.iv.1989, S. Ziani leg. 6 ♂♂ and 7 ♀♀ (SZCM); Toscana, M.ti della Calvana, 600 m, 30.iii.1991, Faggi leg. 2 ♂♂ (SZCM); *ibidem*, 1.xi.1991, Faggi leg. 1 ♂ and 1 ♀ (SZCM); Toscana (AR), Loc. Millepini, 20.ix.1993, 1 ♀ (GDCG); Toscana (FI), M.ti Calvana, loc. Casa Rossa, 454 m, 14.v.2015, I. R. Scali leg. 1 ♂ (SZCM); Toscana (LU), Lucchio-Croce a Veglia, 23.iv.2014, 1 ♂ and 1 ♀ (SZCM); Toscana (PO), Cantagallo, rif. Pacini, 1000 m., 21.xi.2015, F. Fabbricioni leg. 1 ♂ and 1 ♀ (SZCM); Toscana (PO), Alpe di Cavarzano, rif. Poggio di Petto, 1150 m, 2.iv.2016, F. Fabbricioni leg. 1 ♂ and 1 ♀ (SZCM); Toscana (PO), Cantagallo, Cascina di Spedaletto, 881 m, 20.v.2016, I. R. Scali leg. 1 ♂ and 1 ♀ (SZCM); Abruzzo (AQ), Parco Nazionale d'Abruzzo, La Cicerana, m 1500, 18.vi.1968, A. Parenti leg. 1 ♂ (GDCG); Abruzzo (AQ), Roio Piano, 3.v.1978, M. Capaldi leg. 1 ♂ (SZCM). **SLOVAKIA**: "Slovakia m. or. / Hrov", 6.x.1979, D. Král leg. 2 ♂♂ (MNHN). **CROATIA**: Lika-Senj prov., Velebit mountain range, Karlobag env., Susanj, 2.v.1997, L. Saltini leg. 1 ♀ (LSCM). **ALBANIA**: "Pashtrik", 4-14.vii.1918, 1 ♂ (MNHN). **GREECE**: Epirus, Metsovo, 1400 m, 27.vi.1992, S. and R. Ziani leg. 1 ♂ (SZCM). **TURKEY**: Bolu prov., Abant lake, 22.vi.1987, G. W. Pagliacci leg. 1 ♂ (SZCM); Sivas prov., Levent, 30 km W Malatya, 1350 m, 37°18' E 38°41'N, G. Fábíán & L. Náday leg. 1 ♀ (LNCB); Uşak prov., Tazlar (W of Afyon), 7.v.2002, T. Janu leg. 1 ♀ (DKCP); Malatya prov., Nohutlu, 90 km S-E Malatya, 1700 m, 5-9.vi.1993, A. Schröder leg. 3 ♂♂ (ERCS); Hatay prov., İslahiye, 12.iv.1962, R. Petrovitz & R. Ressler leg. 1 ♂ (MHNG); Hatay prov., Nurdag-Tepesi, Amanus, C. Holzschuh leg. 1 ♂ and 3 ♀♀ (MHNG).

Furthermore, thanks to the FEI (Italian Entomologists Forum), I learned of the following unpublished Italian records: Marche (MC), Sefro, 24.iv.2010, G. Giovagnoli leg. 1 ♂; Toscana (PO), S. Ippolito di Vernio, ix.2015, A. Marata leg. 1 ♂; Toscana (LU), Pescaglia (Monte Matanna) 1100 m, 26.iv.2015, M. Ratti leg. 1 ♂ and 2 ♀♀; Abruzzo (AQ), Monte San Franco, 1200 m, R. Mignani leg. 1 ♂ and 1 ♀; Calabria (CS), Sila, S. Giovanni in Fiore, 1335 m, 17.v.1972, C. Belcastro leg. 1 ♂; and of the following unpublished French records: Hérault, La Canourgue (Larzac), 29.v.1995, 1 ♂ and 1 ♀; Alpes de Haute Provence, Saint Michel, 26.v.1954, 1 ♀.

**Variability of cephalic and pronotal armament.** More developed males (Fig. 14) bear a clypeal horn inclined forward in its proximal half (Fig. 18), shorter than the interocular distance, situated forward of the head midlength. Its apex is clearly round, sometimes with a groove in its ventral side, and slightly curved backward. The pronotum has a nearly vertical anterior declivity with the upper edge bent downward at sides, that bears two blunt, sometimes transverse prominences close together, separated by the length of one of them or more, and a vertical very feeble crest on each side (Fig. 16).

In specimens with minor development (Fig. 17), the cephalic horn is shorter, female-like, and the pronotum is almost declivitous anteriorly, with the two anteromedian gibbosities vestigial.

Females (Fig. 15) have a more or less short, transverse, slightly elevated clypeal carina truncate at its summit and feebly pointed on each side, and a slight, straight, transverse carina just behind the pronotal front margin, which sometimes shows trace of median prominences.

**Aedeagus.** Parameres in lateral view slender (Fig. 20), gradually tapering toward apex, which is round in dorsal view (Fig. 19). Ventral side is apically hairless.

**Remarks.** The species was based on an undetermined number of specimens. It seems that Abeille de Perrin saw at least five specimens from three localities deposited in four collections, namely: from "Basses-Alp.: N.-D. de Lure", in Rizaucourt's collection; from "Var: Sainte-Baume", in Sietti's, de Boissy's and Abeille de Perrin's collections; from "Bouches-du-Rh., Canal du Verdon à Aix en Provence", in Abeille de Perrin's collection.

I was able to examine seven critical specimens in the MNHN, where Abeille de Perrin's collection is preserved, according to Horn & Kahle (1935).

The first specimen, a male, bears the following labels:

- 1) White, printed in black "M. de Lure";
- 2) White, printed in black "♂";
- 3) White, handwritten in black "Coprís / umbilicatus / Ab. typ.";
- 4) White, handwritten in black: "C. umbilicatus / Ab." and printed in brown "TYPE";
- 5) Red, printed in black: "TYPE".

The second and the third specimens, two males, bear the following labels:

- 1) White, printed in black "M. de Lure";
- 2) White, printed in black "♂";
- 3) White, printed in black "MUSÉUM PARIS / 1919 / COLL. A. DE PERRIN".

The fourth specimen, a male, bears the following labels:

- 1) White, printed in black "S. Baume";
- 2) Red, with black double square frame, printed in black "TYPUS";
- 3) White, printed in black "ex museo / F. ANCEY";
- 4) White, printed in black "MUSÉUM PARIS / 1936 / COLL. A. BOUCOMONT".

The fifth specimen, a male, bears the following labels:

- 1) White, printed in black "S. Baume";
- 2) Red, with black double square frame, printed in black "TYPUS";
- 3) White, printed in black "ex museo / F. ANCEY";
- 4) White, printed in black "MUSÉUM PARIS / 1936 / COLL. A. BOUCOMONT";
- 5) White, handwritten in black "Coprís / umbilicatus / Abeille Var".

The sixth specimen, a female, bears the following labels:

- 1) White, printed in black "S. Baume";
- 2) White, printed in black "MUSÉUM PARIS / 1936 / COLL. A. BOUCOMONT";
- 3) White, printed in black "ex museo / F. ANCEY";
- 4) White, handwritten and printed in black "Coprís / umbilicatus Ab. / David Král det. 1980".

And the seventh specimen, a male, bears the following labels:

- 1) White, handwritten in black "la S<sup>te</sup> Baume / Var / Abeille";
- 2) White, handwritten in black "C. umbilicatus / Ab. / co-types".

On the basis of these labels I believe the seven specimens belong to the type series of *C. umbilicatus* and can be considered syntypes, i.e. part of the material seen by Abeille de Perrin. I added to every specimen a red label with black text: "Syntype / *Coprís umbilicatus* / Abeille de Perrin, 1901 / S. Ziani vidit, 2017".

In this case, I believe the designation of a lectotype is not necessary, as the species is well known and well represented by these seven syntypes.

## Discussion

Almost all the characters used in the literature for discriminating the "tridentate" *Coprís* species are very weak, most of them within the infraspecific variability. Most likely this is due to the very limited number of specimens that authors have examined. Regardless of that, however, separating the species concerned is not an easy task. Of the internal structures, only the parameres and their apices are taxonomically important.

*Coprís pueli* can be distinguished from *C. umbilicatus* (and *C. felschei*) by the character of the elytral striae proposed in this work and given in the key. Furthermore, males of *C. pueli* (Fig. 8) have pronotal outgrowths with the lateral teeth very developed and the upper edge of the anterior declivity with a high ridge, very close to those of *C. lunaris*, as reported by Mollandin de Boissy (1905), Schatzmayr

(1930) and Balthasar (1963). In addition, as mentioned previously, males of *C. pueli* differ from males of *C. umbilicatus* and *C. felschei* in the apex of parameres being blunt and shortly ciliate in the former (Fig. 12–13), and slender and hairless in the latter (Fig. 6–7, 19–20).

Other characters given by some authors, such as a different colour tonality of ventral pubescence and antennae (Mollandin de Boissy 1905; Schatzmayr 1930), punctation of ventral surface of the middle and hind tibiae (Mollandin de Boissy 1905; Schaefer 1958), and punctation of the metasternum between the middle femora (Schatzmayr 1930; Porta 1932), have no taxonomic significance if checked in large series of specimens.

Things are more complicated for discriminating *C. umbilicatus* from *C. felschei*, and the literature seems to be of little help. For instance, Abeille de Perrin (1901) sent a male and a female of his presumed new species *C. umbilicatus* to Edmund Reitter for a comparison, and after receiving a response that the specimens belonged to *C. felschei*, he tried to compare a female of *C. umbilicatus* with a presumed female of *C. felschei* from Moldavia, Vauloger's collection. He stated that *C. umbilicatus* was more oval than *C. felschei*, with the anterior edge of the pronotum strongly sinuate (straight in *C. felschei*), pronotal anterior declivity weakly inclined forward (strongly inclined), pygidium with small and weak punctures (large punctures), pronotal epipleural emargination with a straight carina (with a clearly sinuate carina), foretibiae triangular-shaped, enlarged apically (subparallel at sides, narrow apically), middle tibiae densely punctate on outer face (smooth externally), all hind tarsomeres strongly and completely carinate (only the first two hind tarsomeres with a single narrow line), metasternum posteriorly with a deep, smooth hollow (metasternum without hollow, only with a simple groove), and elytral edge wrinkled and subpunctate (edge smooth). All these characteristics are within the limits of individual variability and do not clarify whether the two females compared by Abeille de Perrin did belong to different species or more likely were both *C. umbilicatus*.

Gloss versus dullness of elytral interstriae can distinguish the two species according to Balthasar (1963), but this is due to degree of wear rather than due to elytral punctation.

Petrovitz (1971) described the female of *C. felschei* and concluded that females of *C. felschei* and *C. umbilicatus* are indistinguishable.

Baraud (1992) pointed out that *C. umbilicatus* has a deep hollow posteriorly in the metasternum and elytral interstriae very slightly punctate, whereas *C. felschei*, as *C. armeniacus*, has only a groove without hollow, and elytral interstriae finely but clearly punctate. Unfortunately, these characteristics are not helpful, since all the three species of *Copris* with three teeth externally on the foretibiae have a more or less deep metasternal hollow, and the punctation of elytral interstriae cannot always be appreciate for certain.

More recently, Kabakov (2006) reported a different size of eyes – larger in *C. umbilicatus* and smaller in *C. felschei* (as *C. armeniacus*), and a different shape and size of genae. After the study of numerous specimens, these differences have not been observed, at least not in a constant way.

Actually, as also stated by Petrovitz (1971), females of the two species appear to be indistinguishable from each other. A correct systematic placement of isolated females is often impossible, although locality information can be used to make tentative identifications. A distinction between males is also not easy; it concerns morphology and placement of the cephalic horn (Fig. 3–5, 16–18), as proposed in the key below, and, more subtly, parameres of the aedeagus, which in lateral view are slightly convex and evenly tapering in *C. umbilicatus* (Fig. 13), and flat, slightly widened and clearly round in *C. felschei* (Fig. 20).

As with most Scarabaeoidea, variation in the horn apex is not diagnostic, but rather a result of infraspecific polymorphic variability. A bifurcate horn in males is not a very common feature in the species of the genus *Copris*, whereas females often have a more or less corniform and bicuspid crest. According to Cambefort and Nghuen-Phung (1996), there are no species with such feature in the Afrotropical fauna. Arrow (1931), in the fauna of British India, quoted only two species with a bifurcate cephalic horn, *Copris indicus* Gillet, 1910 with a short, erect horn only feebly bicuspid at the extremity, and *Copris ramosiceps* Gillet, 1921 with a horn that bifurcates very near the base, the two branches curving upward and backward. Males of some American species have a horn that is slightly dilated apically, but in none of them it is bifurcate (Matthews 1961).

During the current study 36 males of *C. umbilicatus* were examined, and none of them had a horn that is bilobate at the apex. In contrast, of the examined 13 males of *C. felschei*, excluding two female-

like specimens, all 11 have an apically enlarged horn, at least bilobate but mainly bifurcate. Even less-developed specimens with shorter horns have this characteristic, although it is less visible.

Thus, the shape of the apical portion of the male horn, which is simply tapering in one species and enlarged and bilobate/bifurcate in the other, is here deemed a diagnostic character and as such included in the key.

**Unresolved issue.** During the study, I came across three males of “tridentate” *Copris* that appear to have the same external morphological features as *C. pueli*, but have been collected in localities very far from the known distribution of *C. pueli*. They came from Turkey, Armenia, and Iran, and bear, respectively, the following labels:

- 1) “Bulghar / Maden” [presently Bulgar Dag, Taurus Mountains, southern Turkey, Niğde and Mersin provinces]; “*Copris / felschei* / Faldermann?”; “Coll. C. Felsche / Kauf 20, 1918”; “Museum für Tierkunde / Dresden (MTD)”.
- 2) “Armenia / Reitter.”; “*Copris / Felschei* Reitt. / Coll. Reitter“. [HNHM].
- 3) “Iran / Polur [presently Polour, Mazandaran province] / 19.VI.73 / M. Rاپilly”; “Museum Paris / 1993 / Coll. J. Baraud”. [MNHN].

At first glance, these three specimens are externally indistinguishable from males of *C. pueli*. Particularly, pronotal lateral outgrowths, projecting upward and forward as a pyramidal prominence, place these three males very close to the Maghrebi species. The specimen from Iran, moreover, has a quite different shape of the paramere tip.

It is currently unclear whether the distribution of *C. pueli* is farther eastward than previously thought, or if we are dealing with a new taxon, or both. In order to determine this, we must obtain further material with the same features from the Middle East and Caucasus.

### Key to Western Palaearctic *Copris*

1. Pronotal anterior angles acutely produced outwards. Length from 20 to 30 mm. Central and southern Europe; Middle East, Central Asia; North Africa ..... ***C. hispanus* (Linnaeus)**  
— Pronotal anterior angles broadly rounded. Length from 15 to 25 mm ..... **2**
2. Foretibiae with four lateral teeth. Medial lobe of metasternum with a longitudinal groove, never ending posteriorly in a deep hollow. Male cephalic horn with two tubercles posteriorly at base. Male pronotal anterior declivity with two small teeth. Length from 15 to 25 mm. Europe; Turkey, Iran, Central Asia, western China ..... ***C. lunaris* (Linnaeus)**  
— Foretibiae with three lateral teeth. Medial lobe of metasternum with a longitudinal groove, ending posteriorly in a more or less deep and concave, impunctate hollow. Male cephalic horn without tubercles posteriorly at base. Male pronotal anterior declivity smooth, without teeth ..... **3**
3. Elytral striae crenulated, especially near base. Male upper edge of anterior declivity with a high ridge interrupted at middle by a hollow, smaller than 1/5 of length of ridge; pronotum on each side with a deep excavation whose outer margin is produced obliquely forward as a pointed, pyramidal process; sides of elytra subparallel. Length from 15 to 23 mm. Algeria, Tunisia; Armenia (?); Turkey (?), Iran (?) ..... ***C. pueli* Mollandin de Boissy**  
— Elytral striae not crenulated. Male upper edge of anterior declivity with a carina formed by two blunt prominences, separated at middle by a hollow as wide as one of them; pronotum on each side without a deep excavation, lateral gibbosity from obsolete to absent; elytra slightly round at sides ..... **4**
4. Male cephalic horn with tip dilated and bifurcate, placed approximately at head midlength and in lateral view subperpendicular. Length from 18 to 24 mm. Georgia, Armenia, Azerbaijan; eastern Turkey, Iran ..... ***C. felschei* Reitter**



- Male cephalic horn with tip normally thin and round, placed forward of head midlength and in lateral view curved forward. Length from 15 to 22 mm. Southeastern Europe; western and central Turkey ..... *C. umbilicatus* Abeille de Perrin

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**Figures 1–4.** *Copris felschei* Reitter, 1892. **1)** Habitus of male (IR-Esfahān prov., Fereydūnshahr). **2)** Habitus of female (IR-Esfahān prov., Fereydūnshahr). **3)** Head and pronotum of more developed male, posterolateral view (IR-Esfahān prov., Fereydūnshahr). **4)** Head and pronotum of less developed male, posterolateral view (IR-Mazandaran prov., 6 km W of Reine, 2600 m). Photographs by A. Degiovanni.



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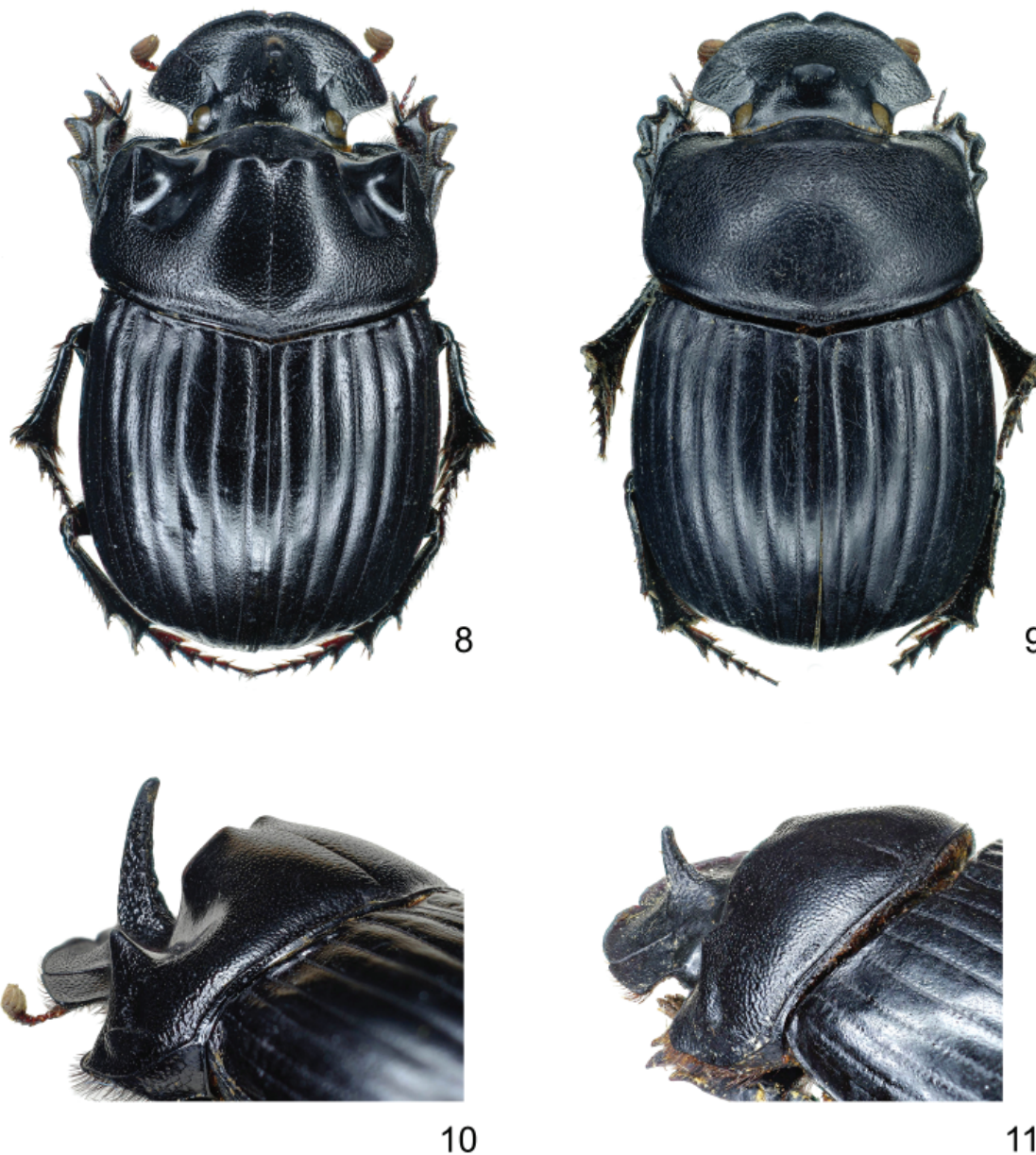


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**Figures 5–7.** *Copris felschei* Reitter, 1892. **5)** Head of male, lateral view (IR-Esfahān prov., Fereydūnshahr). **6)** Parameres, dorsal view (IR-Esfahān prov., Fereydūnshahr). **7)** Parameres, lateral view (IR-Esfahān prov., Fereydūnshahr). Photographs by A. Degiovanni.



**Figures 8–11.** *Copris pueli* Molland de Boissy, 1905. **8)** Habitus of male (TN-Jendouba prov., Ain Draham). **9)** Habitus of female (TN-Jendouba prov., Ain Draham). **10)** Head and pronotum of more developed male, posterolateral view (TN-Jendouba prov., Ain Draham). **11)** Head and pronotum of less developed male, posterolateral view (syntype, DZ- Kabylie). Photographs by A. Degiovanni.





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**Figures 12–13.** *Copris pueli* Molland de Boissy, 1905. **12)** Parameres, dorsal view (DZ-Mt. Edough). **13)** Parameres, lateral view (DZ-Mt. Edough). Photographs by A. Degiovanni.



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**Figures 14–17.** *Copris umbilicatus* Abeille de Perrin, 1901. **14)** Habitus of male (I-Toscana, FI, Calvana-Montecuccoli). **15)** Habitus of female (I-Toscana, FI, Calvana-Montecuccoli). **16)** Head and pronotum of more developed male, posterolateral view (I-Toscana, FI, Calvana-Montecuccoli). **17)** Head and pronotum of less developed male, posterolateral view (syntype, F-Montagne de Lure). Photographs by A. Degiovanni.



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**Figures 18–20.** *Copris umbilicatus* Abeille de Perrin, 1901. **18)** Head of male, lateral view (I-Toscana, FI, Calvana-Montecuccoli). **19)** Parameres, dorsal view (I-Toscana, PO, Cantagallo, rif. Pacini, 1000 m). **20)** Parameres, lateral view (I-Toscana, PO, Cantagallo, rif. Pacini, 1000 m). Photographs by A. Degiovanni.

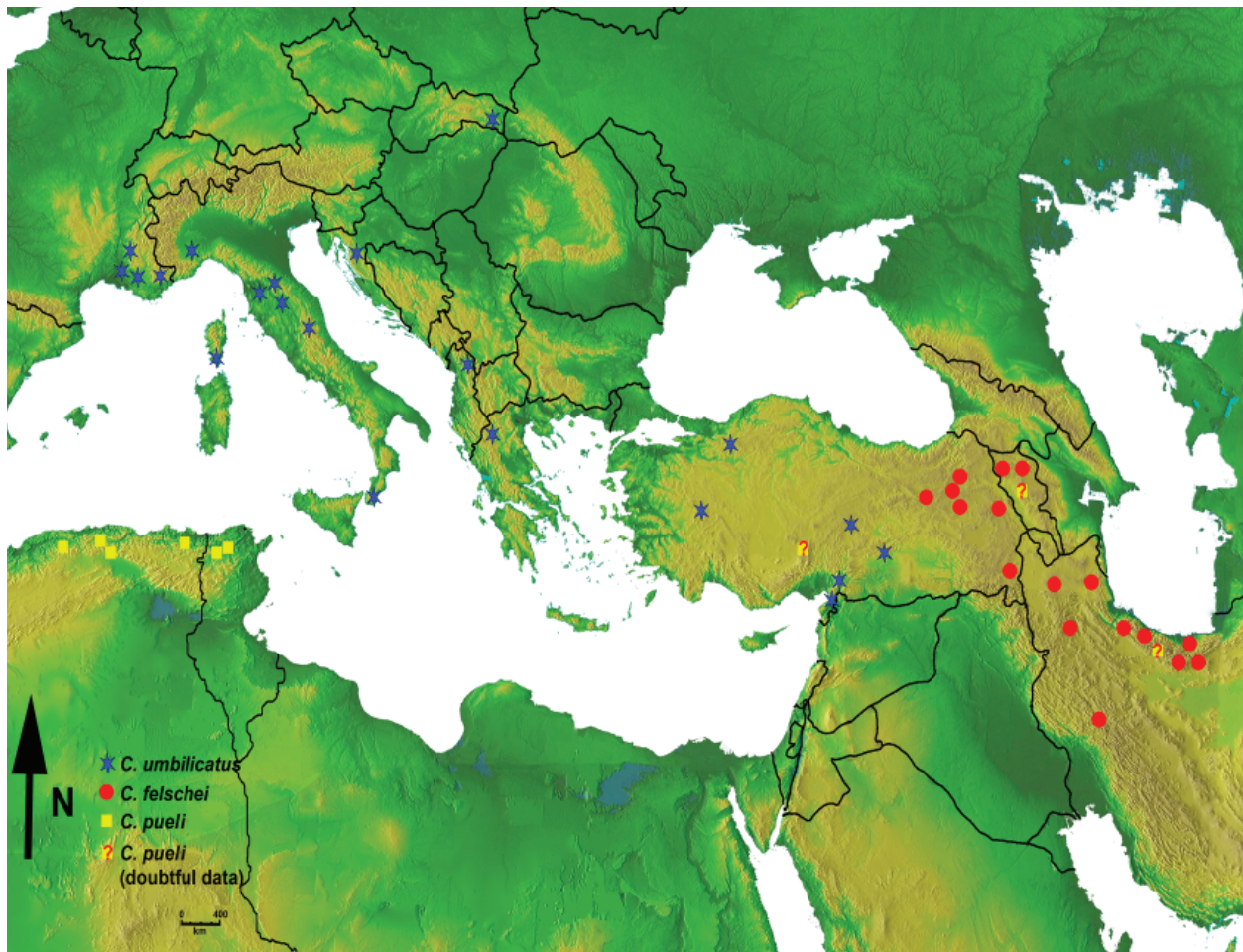


Figure 21. Revised distributions of the western Palearctic *Copris* with three foretibial external teeth.