

On nomenclature and identity of *Scarabaeus aeruginosus* Linnaeus, *S. aeruginosus* Drury and *S. speciosissimus* Scopoli (Coleoptera: Scarabaeoidea: Cetoniinae and Rutelinae)

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On nomenclature and identity of *Scarabaeus aeruginosus* Linnaeus, *S. aeruginosus* Drury and *S. speciosissimus* Scopoli (Coleoptera: Scarabaeoidea: Cetoniinae and Rutelinae). - The valid name for the largest European species of Cetoniinae is *Protaetia speciosissima* (Scopoli, 1786), with *Protaetia aeruginosa* (Medvedev, 1964) as a junior synonym. The specimen illustrated by Scopoli in the original description is designated as the lectotype of *Scarabaeus speciosissimus* Scopoli, 1786. Since the lectotype is lost, a neotype from Piedmont, Italy, is designated and deposited in the Museo Civico di Storia Naturale Carmagnola, Italy. The name *Scarabaeus aeruginosus* Drury, 1773 is unavailable since Drury did not describe a new species but misidentified *Scarabaeus aeruginosus* Linné, 1767. A specimen figured by Gronovius in 1764 and cited by Linné is designated as the lectotype of *Scarabaeus aeruginosus* Linné, 1767. This species remains dubious, but it can be assigned to the ruteline subtribe Anticheirina.

Keywords: Revision - taxonomy - lectotype - beetles - Linnaeus.

INTRODUCTION

For the largest European flower chafer (Cetoniinae) species two specific names are currently in use, the prevailing *aeruginosa* assigned to the authors Drury, 1770 (or 1773) or Linné, 1767 and, less often, *speciosissima* Scopoli, 1786 (Ádám 1994, 2003; Tezcan & Pehlivan 2001; Chimisliu 2002 [incorrect spelling *speciosisima*]; Istrate & Chimisliu 2004; Enyedi 2004, Ballerio *et al.* 2010). These specific names are combined with the genus names *Potosia* Mulsant & Rey, 1871 (e.g. Rataj 1998, Mitter 2000, Tezcan & Pehlivan 2001, rarely in newer literature), *Cetonischema* Reitter, 1899 (e.g. Baraud 1992, Tauzin 1992, Ádám 1994, 2003, Micó & Galante 2002, Negrobov 2009),

or *Protaetia* Burmeister with *Cetonischema* as subgenus (Mikšić 1987, Krell & Fery 1992, Nádai & Víg 2006, Smetana 2006, Tausin 2008, Ballerio *et al.* 2010, Brelih *et al.* 2010, Chimişliu & Mogoşanu 2011). The combination with *Protaetia* has become predominant in recent years. *Cetonischema* Reitter, 1899 was recently found to be a junior synonym of *Potosia* Mulsant & Rey, 1871 (Branco 2007).

The simultaneous usage of two specific names and three genus-group names, one of them being a junior synonym, for a well-known and magnificent species demands a resolution. Here we clarify the identity and nomenclatural status of the names involved (*Scarabaeus aeruginosus* Linnaeus, *S. aeruginosus* Drury, *S. speciosissimus* Scopoli, and *Cetonischema* Reitter) and present a solution by strictly applying the International Code of Zoological Nomenclature (ICZN 1999).

***Scarabaeus aeruginosus* Linné, 1767 (Rutelinae: Anticheirina), nomen dubium, lectotype designation**

In the twelfth edition of *Systema Naturae*, Linné (1767: 558) described *Scarabaeus aeruginosus* from Tunisia ("in regno Tunetano"). He refers to Gronovius (1764: 144, no. 424) without giving any unequivocal indication of additional specimens. The reference to a Tunisian origin might either indicate a clerical error or Tunisian specimens that Linnaeus had seen. Schaum (1847) could not find a labeled specimen in Linné's collection. He considers Linné's description to be applicable to only one specimen in the collection: a specimen of the Indonesian *Anomala viridis* (Fabricius, 1775) with a label "viridulus" of Linné's hand. This specimen is still present in Linné's collection in London (Fig. 1) and might be the specimen that Burmeister (1844) had called a few years earlier "Original exemplar der Linnéschen Sammlung, welche sich gegenwärtig im Besitz der Linnéschen Gesellschaft zu London befindet". Burmeister did not explain why he considered it "original". He identified it as *Pelidnota glauca* (Oliv.), but the specimen in Linné's collection has a typical Anomalini sternum and a membraneous border at the lateral and apical margin of the elytra, hence does not belong to *Pelidnota*.

Burmeister either misidentified this specimen, or studied another specimen that currently cannot be traced. No specimen labeled *S. aeruginosa* exists in the Linnaean collection in the Zoological Museum of Uppsala University (Wallin 1993). With specimens labeled as *aeruginosa* missing in Linné's collections, the type series consists only of the specimens referred to in the literature references that Linné gave which comprise only Gronovius (1764).

It is unclear whether Gronovius had a series of syntypes or just one specimen which then could be considered the holotype. Because of this irresolvable uncertainty we herewith **designate** the specimen illustrated by Gronovius (1764) on plate 15, fig. 7, as the **lectotype** of *Scarabaeus aeruginosus* Linné, 1767 (Fig. 2). Contrary to Schaum's (1847) opinion, Gronovius's figured specimen and the specimen labeled "viridulus" in Linné's collection do belong to different species, the former having a long scutellum (Fig. 2) whereas the latter having a short one (Fig. 1).

Research for Gronovius's original specimen was unsuccessful. Gronovius received this specimen from Daniel Luycx Massis with the origin "Habitat in Indiis".



FIG. 1

"*Scarabaeus aeruginosus*" (LINN 3471) from Linné's collection at the Linnean Society London, published with permission of the Linnean Society of London. (A) Dorsal view. (B) Ventral view. (C) Lateral view. (D) Labels.

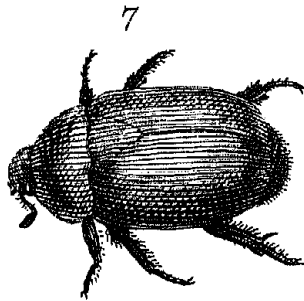


FIG. 2

Lectotype of *Scarabaeus aeruginosus* Linné, 1767, figured by Gronovius (1764).

This material cannot be traced (Smit *et al.* 1986; Horn *et al.* 1990). Luycx Massis was a Dutch merchant in Middelburg and a board member of the West-Indische Compagnie. He had a collection of West-Indian naturalia (Smit *et al.* 1986; Zuidervaart 2002) indicating that "in Indiis" refers to the Caribbean. Neither Luycx Massis material nor any other beetles are preserved in the collections of the Koninklijk Zeeuwsch Genootschap der Wetenschappen in Middelburg (K. Heyning in litt. 2011). Likewise,

the Nationaal Natuurhistorisch Museum Naturalis, Leiden does not own specimens that could be type material of *S. aeruginosus* from Gronovius's or Luycx Massis's collections (E. Gassó i Miracle in litt. 2011). Having studied early Zeeland collectors of natural history specimens, H Zuidervaard (in litt. 2011) could not determine the whereabouts of Luycx Massis's or Gronovius's material. Giovanni Antonio Scopoli received at least one specimen from Gronovius (Scopoli 1772: 84), but Scopoli's collection is considered lost (Evenhuis 1997). Therefore the lectotype of *Scarabaeus aeruginosus* Linné, 1767 is to be considered lost. These circumstances provide the opportunity to designate a neotype which might rather be done by the next reviser of this group, if considered useful or necessary.

Scarabaeus aeruginosus was transferred to the genus *Pelidnota* MacLeay, 1833 by Hope (1837: 17, in the wrong spelling *Æruginosa*) where it has remained since despite several authors having stated its dubious identity (Schaum 1847; Bates 1904: 258; Soula 2009). The lectotype, i.e. the specimen on fig. 7 on plate 15 in Gronovius (1764), has the overall shape of a species of *Pelidnota*, but has a larger scutellum. The scutellum of the lectotype is just under a third as long as the elytra, a pattern that resembles several genera in the subtribe Anticheirina, but not any *Pelidnota* species. Schönherr (1817: 157) had already placed Gronovius's species between two *Anticheirina* species. Burmeister (1844: 402) doubted Schönherr's classification and assumed it to belong to Cetoniinae, but Gronovius's figure disproves Burmeister's unexplained opinion. The only *Anticheirina* known to occur in the Caribbean islands are *Chlorota tristis* Arrow, *Macraspis tetradactyla* (L.), and *M. tristis* Castelnau (Chalumeau 1984), none of them having the green color described by Gronovius. Several *Anticheirina* species from South and Central America resemble Gronovius's species (cf. Soula 2002, 2003) and could have been considered to occur "in Indiis".

The name *Pelidnota aeruginosa* has rarely been used in the primary literature (e.g., Ohaus 1900: 185; Ohaus 1908: 250; Ohaus 1934: 13; Azevedo de Freitas *et al.* 2002; Bernardi *et al.* 2010), but has continuously been used in catalogues as valid species (Ohaus 1934: 79; Blackwelder 1944; Machatschke 1972: 21; Krajcik 2007 [with question mark]). In his revision of "Pelidnotinae", Bates (1904: 258) considered *P. aeruginosa* a nomen dubium ("bewildering form"). Considering Soula's (2009) revision of *Pelidnota*, the specimens referred to as *Pelidnota aeruginosa* in the literature might belong to either *Pelidnota alliacea* (Germar, 1824), *P. arnaudi* Soula, 2009, or *P. semiaurata* Burmeister, 1844. Either of those could turn out to be a junior synonym of *Pelidnota glauca* (Olivier, 1789), *P. americana* (Herbst, 1790), or *P. prasina* (Germar, 1824) (see Soula 2009), if their type specimens are rediscovered, but the name *Scarabaeus aeruginosus* cannot be applied with any certainty to any of them.

Currently, *Scarabaeus aeruginosus* Linné, 1767, is to be considered a **nomen dubium** for the time being, but the name does not refer to a species of Cetoniinae. Drury's (1773) interpretation of Linné's name is a misidentification.

***Scarabaeus aeruginosus* Drury, 1773, unavailable**

In the first volume of his *Illustrations of Natural History*, Drury (1770: 72) described a species from Smyrna (= İzmir, Turkey) that he refers to "Lin., Syst. page 558.

No 80. (Æruginosus.) Gron. Mus. 424. tab. 15. fig. 7." In the Index to the *Illustrations*, which is the only nomenclaturally available part of Drury's work and dated 1773 (ICZN 1957), Drury called the species "Æruginosus, Linn. P. 558. N. 80. Scar." These references make clear that Drury did not introduce a new species, but simply referred to Linné's *Scarabaeus aeruginosus* which he misinterpreted. According to Art. 49 (ICZN 1999) "*Scarabaeus aeruginosus* Drury" is not an available name as already stated by Bedel (1909). It correctly is not included in Hayek's (1985) list of species described by Drury.

Drury's (1770) description and colour illustration (figure 4 on plate 33) clearly refer to a species of the former flower chafer subgenus *Cetonischema* that contained two species: *Protaetia speciosa* (Adams, 1817) and *P. aeruginosa* sensu Drury that we will be calling *P. speciosissima*. In the Aegean coastal region of İzmir, both species are likely to occur. *Protaetia speciosa venusta* (Ménétriès, 1836) was recorded from İzmir by Tausin (1992). İren & Ahmed (1973) list *P. aeruginosa* as a fruit pest from the Aegean region of Turkey. Tezcan & Pehlivan (2001) record *P. speciosissima* from the Manisa Province (38°39'N, 27°20'E), eastwardly adjacent to the İzmir Province. However, according to Legrand (1991) *P. speciosissima* and *P. speciosa venusta* are reliably distinguishable by genital examination only.

Original Drury material is difficult to recognize and partly lost (Hayek 1985), but since Drury did not describe a new species, it is unnecessary to exactly determine the species he called *Scarabaeus aeruginosus* L.

Since Medvedev (1964) fixed "*Scarabaeus aeruginosus* Drury" as type species of the genus *Cetonischema* Reitter, according to Art. 11.10. (ICZN 1999), the species name is available from this act as *Potosia (Cetonischema) aeruginosa* Medvedev, 1964. Since Medvedev also mentioned *P. speciosa* and its subspecies and figured their genitalia, the identity of *P. aeruginosa* Medvedev is clear, the species name being a synonym of what we call *Protaetia speciosissima* (Scopoli).

Scarabaeus speciosissimus* Scopoli, 1786, valid name, currently in *Protaetia

With Drury's name being unavailable, according to current synonymy lists (Dutto 2005, Smetana 2006) the oldest names for this species are *Scarabaeus viridis germanus* Voet, "1778", *Scarabaeus auratus* Füebly, 1782, *Scarabaeus viridis* Füebly, 1786 and *Scarabaeus speciosissimus* Scopoli, 1786.

Scarabaeus viridis germanus was published in a work that is not consistently binominal (Voet 1766-1778), being unavailable for nomenclatural purposes (cf. Krell, in press).

According to Art. 49 (ICZN 1999) *Scarabaeus auratus* Füebly, 1782 is not an available name since Füebly did not propose a new species but just referred to "*Scarabæus auratus* [...] Linn. Syst. Nat. ed. XII. pag. 557. 78", i.e. *Cetonia aurata* (Linnaeus, 1758) which he misinterpreted.

Scarabaeus viridis Füebly, 1786 is available by indication, referring to references listed under *Scarabaeus auratus* by Füebly (1782). By simply adopting Voet's (1766-1778) name Füebly makes it available under his own authorship. Under his *Scarabaeus valgus*, Linné (1764: 15) cites a "*Scarabaeus marianus viridis*" with the

reference of "Pet. gaz. t. 27. f. 8" (Petiver 1704) which was re-published in Petiver (1764). This work is not consistently binominal, hence not fulfilling the requirements of Art. 11.4 for nomenclaturally available works. *Scarabaeus viridis* F \ddot{u} ebly, 1786 is not threatened by an older homonym.

In the same year F \ddot{u} ebly's name was published, Scopoli (1786: 48) introduced the name *Scarabaeus speciosissimus* Scopoli, 1786. According to Evenhuis (1997) this work appeared between January and June 1786. Based on this information, the date of publication according to Art. 21.3.1. (ICZN 1999) is 31 June 1786. We could not find unequivocal information whether *S. speciosissimus* or *S. viridis* were published earlier. The only indication for a later publication of *S. viridis* we found in Anonymous (1793: no. X.1588) where the year 1787 is given for the first part of volume 3 of F \ddot{u} ebly's *Neues Magazin*. Since all other sources we know give 1786 as year of publication, we consider, in lack of any more detailed dating, a publication date of 31 December 1786 (according to Art. 21.3.2., ICZN 1999). Hence, *Scarabaeus speciosissimus* Scopoli, 1786 has precedence over *Scarabaeus viridis* F \ddot{u} ebly, 1786. As Bedel formally stated in 1909, Scopoli's name is the valid name for the species that Drury called *Scarabaeus aeruginosus*.

S. speciosissima was described from Insubria (Duchy of Milan) based on "In Museo Ill. comitis Castiglioni." This most likely refers to the collection of the Count Luigi Castiglioni who studied under Scopoli at the University of Pavia (Marraro 1950). It is unclear whether Scopoli had a series of syntypes or just one specimen which then could be considered the holotype. Because of this irresolvable uncertainty we herewith designate the specimen illustrated by Scopoli (1786) on plate 21, fig. A, as the **lectotype** of *Scarabaeus speciosissimus* Scopoli, 1786 (Fig. 3).

Castiglioni material does not exist in the Museo Civico di Storia Naturale di Milano (F. Rigato, in litt. 2011). Castiglioni and its collection are neither mentioned in Goidanich (1975), Horn *et al.* (1990) nor in Poggi & Conci (1996). Scopoli's early collections were presumably destroyed around 1766; later material is not mentioned by Horn *et al.* (1990) and is likely to be untraceable or lost (Poggi & Conci 1996; Evenhuis 1997; Violani in litt. 2011). A lost lectotype provides the opportunity to designate a neotype.

Dutto (2005: 111) indicated that Estefania Micó had designated a neotype for *Scarabaeus speciosissimus* Scopoli, a specimen deposited in the Museo Civico di Storia Naturale Carmagnola, Italy. Since this designation has never been published fulfilling the qualifying conditions of Code Art. 75.3 (ICZN 1999), no neotype currently exists.

We herewith **designate** this specimen as the **neotype** of *Scarabaeus speciosissimus* Scopoli, 1786 to clarify the taxonomic identity of Scopoli's nominal species once and for all, and to back up its subjective synonymy with *Potosia aeruginosa* Medvedev.

The male specimen bears the labels "VALLE TICINO / BELLINZAGO / VI-86. brughiera / Ig Pescarolo", red label: "NEOTYPE / *Cetonischema* / *speciosissimum* (Scop.) / Det.: E. Micó 2001", "*Scarabaeus* / *speciosissimus* / Scop, 1786 / NEOTYPUS / des. Krell, Rey, Mico & Dutto 2011". The locus typicus Bellinzago Novarese is in the Province of Novara, Piedmont, 45°34'N 8°38'E, an area that belonged to the former Duchy of Milan (Insubria), the locus typicus of the lost lectotype.

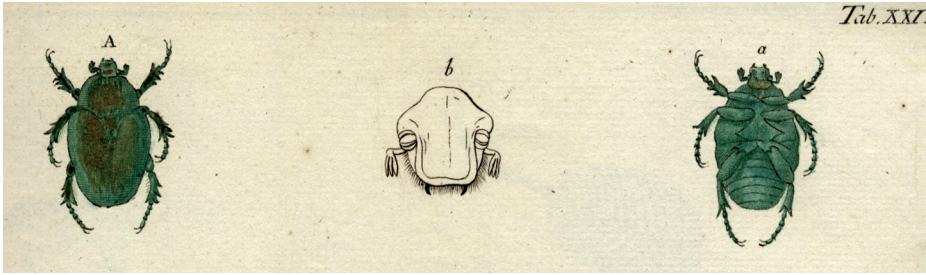


FIG. 3

Lectotype of *Scarabaeus speciosissimus* Scopoli, 1786, figured by Scopoli (1786).

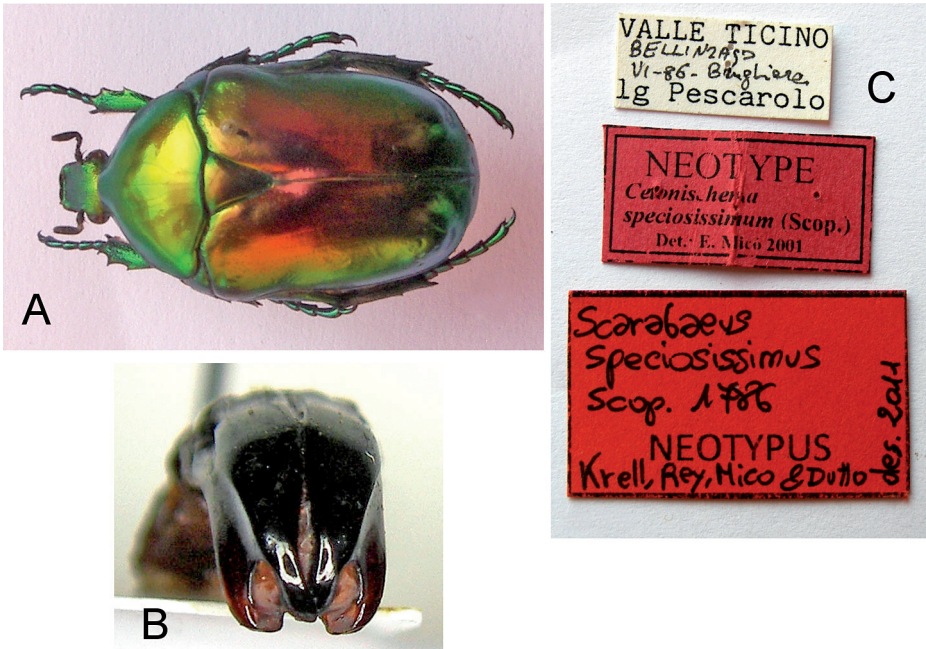


FIG. 4

Neotype of *Scarabaeus speciosissimus* Scopoli, 1786. (A) Dorsal view. (B) Parameres from dorsal. (C) Labels.

The specimen shows the following characters of the former subgenus *Cetonischema*: Elytra without juxtasutural depression, finely punctuated, without toment spots; front end of pronotum bulgy in the middle; mesometasternal process subtriangular and smooth; pronotum with fine and dispersed punctures, being almost absent on the disc; body length: 28.9 mm.

The following species-diagnostic characters distinguish it from *Protaetia speciosa*, the only other species in the former subgenus *Cetonischema*: Dorsally uniformly metallic green with slight reddish reflexes; parameres completely shiny, distal part not velvety (Fig. 5).

In northern Italy, only this one species of the former subgenus *Cetonischema* is present.

***Cetonischema*, *Potosia* or *Protaetia*?**

Reitter (1899) introduced the subgenus *Cetonischema* "nom.nov." for *Potosia aeruginosa* Drury and *P. speciosa* Adams. Since he mentioned that Dr. Schoch had created the "Genus *Cetonia*" for *speciosissima*, but this was already given to the *aurata*-like species, it looks as if Reitter introduced a replacement name. However, in this paper Reitter used the abbreviation "nom.nov." for all new genera he described. Moreover, Schoch had never created a genus *Cetonia*, but had used *Cetonia* F. for *aurata*-like species and *Potosia* for *P. speciosissima* (Schoch 1897). *Cetonischema* was described by Reitter (1899) as a new subgenus of *Potosia* without fixing a type species. The first author to fix a type species, "*Scarabaeus aeruginosus* Drury (1770)", was Medvedev (1964: 197) in the Fauna SSSR. However, as Branco (2007) brought to our attention, Arrow (1910: 136) had already fixed "*Cetonia speciosissima*, Scop." (= *Scarabaeus speciosissimus* Scopoli, 1786) as type species for *Potosia* Mulsant & Rey, 1871 resulting in the confusing situation that two lately well distinguished subgenera or genera, *Cetonischema* Reitter, 1899 and *Potosia* Mulsant & Rey, 1871, become synonyms. Löbl & Smetana (2007: 26) took the necessary steps and used *Potosia* as valid name for *Cetonischema* and transferred all former species of the subgenus *Potosia* to the subgenus *Netocia* Costa, 1852. Without the discovery of an older type species fixation for *Potosia* or a Case presented to the ICZN, we cannot use *Cetonischema* as valid genus-group name. Therefore, we suggest to follow Mikšić (1987) and Smetana (2006) by using the genus name *Protaetia* Burmeister for the former *Cetonischema* species. If mentioning a subgenus name is deemed necessary, *Potosia* Mulsant & Rey needs to be used. However, the transfer of the name *Potosia* to the taxon formerly known as *Cetonischema* might be quite confusing.

Synonymy

As it stands we cannot but confirm the following genus-group level synonymy:
Potosia Mulsant & Rey, 1871

(type species by subsequent designation by Arrow (1910): *Scarabaeus speciosissimus* Scopoli, 1786)

= *Cetonischema* Reitter, 1899 (type species by subsequent designation by Medvedev (1964): *Potosia (Cetonischema) aeruginosa* Medvedev, 1964), syn.

Since this synonymy with its transfer of *Potosia* from one established to another well-known subgenus undoubtedly causes confusion, a Case to be submitted to the International Commission on Zoological Nomenclature might be considered. This Case would apply for setting aside Arrow's (1910) type species designation. A type species designation in accordance with the common use would need to be determined.

We propose the following synonymy at species level:

Protaetia speciosissima (Scopoli, 1786)

= *aeruginosa* (Medvedev, 1964), nec (Linné, 1767), nec (Drury, 1773)

Protaetia speciosissima (Scopoli, 1786) is the valid name for Europe's largest flower chafer species.

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