Ann. Naturhist. Mus. Wien, B	120	41–58	Wien, Jänner 2018

The type specimens of South American dung beetles, Part II: The species described by the Austrian coleopterist Ludwig Redtenbacher (1814–1876) in the 1868 part of the "Reise der österreichischen Fregatte Novara um die Erde" (Insecta: Coleoptera, Scarabaeidae, Scarabaeinae)

F.Z. Vaz-de-Mello[1] & M. Cupello[1,2]

Abstract

Discussed and illustrated are the type specimens of the nine species names established by REDTENBACHER (1868) for South American dung beetle taxa: *Canthon auricollis*, *C. cyanopterus*, *C. fulgidus*, *C. lamproderes*, *C. ornatus*, *C. puncticollis*, *C. quadripunctatus*, *Choeridium foveicolle*, and *C. platymerum*. Lectotypes are designated for all of them, and the following taxonomic conclusions are presented: firstly, it was seen that the name *Canthon auricollis* was previously misapplied to a species taxon in the *Canthon* subgenus *Peltecanthon*, whereas in fact it represents a species of the subgenus *Canthon* s.str., where it is transferred to; a former junior synonym of it, *C. splendidus* SCHMIDT, 1922, is revalidated to name the species of the subgenus *Peltecanthon* called by former authors "*C. auricollis*". Secondly, *Canthon puncticollis* is transferred to the genus *Canthidium*, with *Canthidium excisipes* BALTHASAR, 1939 its new junior synonym. Finally, *Canthon corpulentus* HAROLD, 1868 is revalidated from its synonymy with *Canthon* (*Francmonrosia*) *lamproderes* REDTENBACHER, 1868 to denote a species in the subgenus *Francmonrosia*, while *C. lamproderes* REDTENBACHER, 1868, is considered a new junior synonym of *Canthon (Francmonrosia) rutilans* CASTELNAU, 1840. Lectotypes are also designated for *C. corpulentus* and *C. rutilans*, and the holotype of *C. excisipes* is illustrated.

Key words: Lectotype designations, *Ateuchus, Canthidium*, *Canthon*, *Choeridium*.

Zusammenfassung

Ludwig REDTENBACHER führte 1868 für neun südamerikanische Mistkäfer-Taxa Artnamen ein. Ihre Typusexemplare werden besprochen und abgebildet: *Canthon auricollis*, *C. cyanopterus*, *C. fulgidus*, *C. lamproderes*, *C. ornatus*, *C. puncticollis*, *C. quadripunctatus*, *Choeridium foveicolle*, und *C. platymerum*. Für alle neun Arten werden Lectotypen designiert und die folgenden taxonomischen Schlussfolgerungen werden präsentiert. Erstens wurde festgestellt, dass der Name *Canthon auricollis* falsch als Taxon im *Canthon*-Subgenus *Peltecanthon* verwendet wurde, während er tatsächlich eine Art im Subgenus *Canthon* s.str. repräsentiert, wohin er auch transferiert wird. Ein ehemaliges jüngeres Synonym, *C. splendidus* SCHMIDT, 1922, wird revalidiert. Es benennt nun im Subgenus *Peltecanthon* die Art, die von früheren Autoren "*C. auricollis*" genannt wurde. Zweitens wird *Canthon puncticollis* in das Genus *Canthidium* transferiert, wodurch *Canthidium excisipes* BALTHASAR, 1939 zu seinem neuen jüngeren Synonym wird. Schließlich wird *Canthon corpulentus* HAROLD, 1868 aus der Synonymie mit *Canthon* (*Francmonrosia*) *lamproderes* REDTENBACHER,

[1] Fernando Z. Vaz-de-Mello, Fellow of the Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq), Universidade Federal de Mato Grosso, Instituto de Biociências, Departamento de Biologia e Zoologia, Av. Fernando Corrêa da Costa, 2367, Boa Esperança, 78060-900 – Cuiabá, MT, Brazil. – vazdemello@gmail.com

[2] Mario Cupello, Departamento de Entomologia, Museu Nacional, Universidade Federal do Rio de Janeiro, UFRJ, Quinta da Boa Vista, São Cristóvão, CEP 20940-040, Rio de Janeiro, RJ, Brazil. – mcupello@hotmail.com – Corresponding author.

1868 revalidiert und bezeichnet nun eine Art im Subgenus *Francmonrosia*. *C. lamproderes* REDTENBACHER, 1868 wird als neues jüngeres Synonym von *Canthon (Francmonrosia) rutilans* CASTELNAU, 1840 betrachtet. Lectotypen für *C. corpulentus* und *C. rutilans* werden designiert. Der Holotypus von *C. excisipes* wird abgebildet.

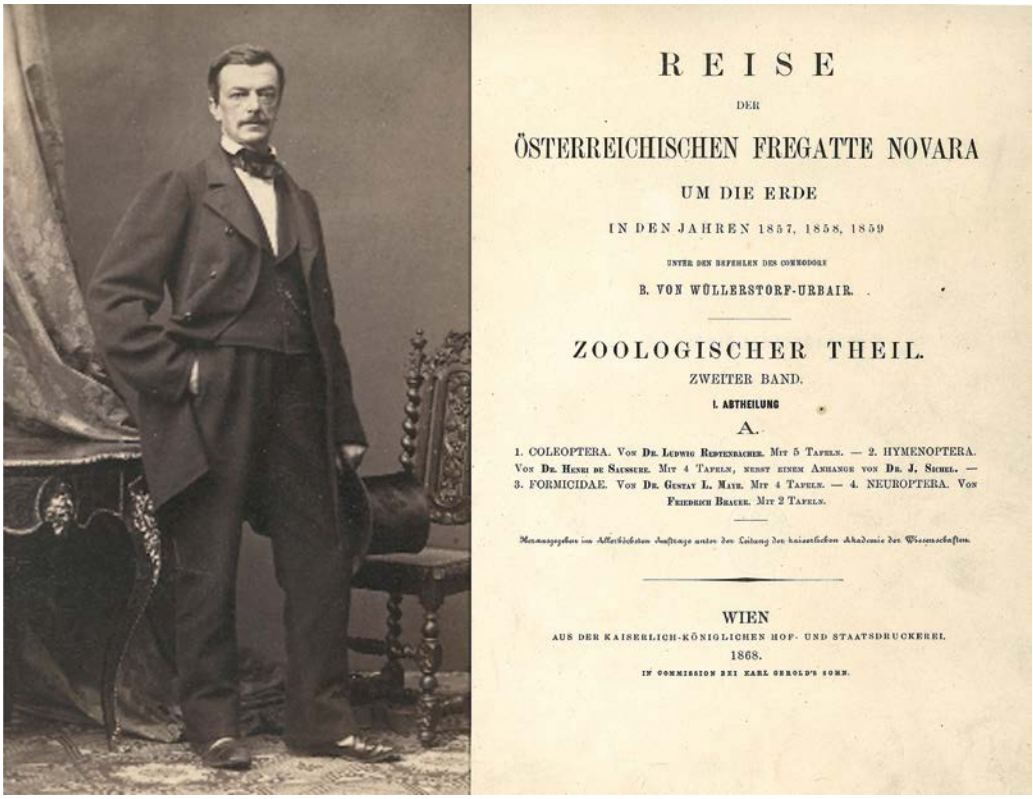
Introduction

This article represents the second part of our series dealing with the type material of South American Scarabaeinae. In the first part, we dealt with the dung beetle species described by the German author Adolf Schmidt (VAZ-DE-MELLO & CUPELLO, in press). In the present paper, we continue to study the work of a German-speaking entomologist and address the South American scarabaeine taxa proposed by the Austrian coleopterist Ludwig Redtenbacher (1814–1876), all of them described in the 1868 Coleoptera portion of the work "Reise der österreichischen Fregatte Novara um die Erde" (1861–1875).

Born on 10th June 1814 in the small town of Kirchdorf an der Krems, in Upper Austria, Ludwig Redtenbacher (Fig. 1) was one of the main nineteenth-century coleopterists of his country. Having studied medicine at the University of Vienna between 1833 and 1838, he took his doctorate at the same university in 1843 with a thesis titled "Tentamen dispositionis generum et specierum coleopterorum pseudotrimerorum Archiducatus Austriae", in which he addressed the taxonomy of the Endomychidae and Coccinellidae from the Archduchy of Austria (REDTENBACHER 1843a). In 1847, Redtenbacher became an assistant at the insect collection of the Court Cabinet of Natural Objects (from the German "Hof-Naturalienkabinett", predecessor of the present Naturhistorisches Museum Wien), in the Austrian capital, where he had worked earlier as a voluntary assistant between 1834 and 1840. In 1851, he moved to Prague as a professor of zoology at the Prague University, but the following year went back to Vienna to hold the position of first adjunct curator at the "Hof-Naturalienkabinett" under request of the Austrian Emperor Franz Joseph I. After the death of the entomologist Vincenz Kollar (1797–1860), Redtenbacher replaced him as the main curator at the "Hof-Naturalienkabinett" and, in 1867[3], he was appointed its director. In 1870, he was awarded the title of Regierungsrat of the institution. After suffering from deafness in his final years, Redtenbacher died at the age of 61 in Vienna on the 8th of February 1876. Some brief accounts on his life were given by ANONYMOUS (1876a, b, c), WESTWOOD (1876), and SCHÖNMANN (1988).

Although not a particularly prolific author, Redtenbacher published some significant works dealing especially with the beetle fauna of the German-speaking countries of central Europe: besides his above cited doctoral thesis (REDTENBACHER, 1843a), he presented an influential three-edition treatise on the Coleoptera of Austria (REDTENBACHER, 1847–1849, 1856–1858, 1871–1874), and introduced a study of the "German beetles" using what he called a new "analytical method" ("analytische Methode") in entomology (REDTENBACHER, 1845). Redtenbacher was also responsible for studying the insects

[3] The year in which Redtenbacher became the "Hof-Naturalienkabinett's" director is disputed in the literature. While contemporary obituaries such as WESTWOOD (1876) and ANONYMOUS (1876a, b) state that Redtenbacher assumed the directorship of the Court Cabinet in 1860 – with ANONYMOUS (1876b) specifically saying that this occurred upon Kollar's death –, a more modern account by Schönmann (1988) says that in that year he was appointed just as the main curator, becoming the director only seven years later. Since Vincenz Kollar held the position of curator ("Kustos") upon his death in 1860 and not of director (a post that, in fact, he never occupied) (SCHINER, 1860; EVENHUIS, 1997), we believe SCHÖNMANN's (1988) version should be the correct one.



REISE

DER

ÖSTERREICHISCHEN FREGATTE NOVARA

UM DIE ERDE

IN DEN JAHREN 1857, 1858, 1859

UNTER DEN BEFEHLEN DES COMMODORE

B. VON WÜLLERSTORF-URBAIR.

ZOOLOGISCHER THEIL.

ZWEITER BAND.

I. ABTHEILUNG

A.

1. COLEOPTERA. VON DR. LUDWIG REDTENBACHER. MIT 5 TAFELN. — 2. HYMENOPTERA. VON DR. HENRI DE SAUSSURE. MIT 4 TAFELN, NEBST EINEM ANHANGE VON DR. J. SICHEL. — 3. FORMICIDAE. VON DR. GUSTAV L. MAYR. MIT 4 TAFELN. — 4. NEUROPTERA. VON FRIEDRICH BRAUER. MIT 2 TAFELN.

Herausgegeben im Allerhöchsten Auftrage unter der Leitung der kaiserlichen Akademie der Wissenschaften.

WIEN

AUS DER KAISERLICH-KÖNIGLICHEN HOF- UND STAATSDRUCKEREI.

1868.

IN COMMISSION BEI KARL GEROLD'S SOHN.

Fig. 1: The Austrian coleopterist Ludwig Redtenbacher (1814–1876) in 1862, and the title page of his only contribution containing new species of Neotropical dung beetles, the 1868 Coleoptera portion of the "Reise der österreichischen Fregatte Novara um die Erde" (photo by courtesy of Editha Schubert, Senckenberg Deutsches Entomologisches Institut, Müncheberg, Germany; title page NHMW library).

collected by a number of Austrian world exploratory expeditions: In 1843, he published the Coleoptera portion of the geologist Joseph Russeger's (1802–1863) report of his expedition through Greece, Anatolia, Egypt, and Syria (REDTENBACHER 1843b). In collaboration with Vincenz Kollar, he also studied the insects collected by the botanists and explorers Carl von Hügel (1796–1870) in Kashmir and the Himalayas (KOLLAR & REDTENBACHER 1844), and Theodor Kotschy (1813–1866) in Syria (KOLLAR & REDTENBACHER 1849). Nonetheless, his only contribution to Neotropical dung beetles was his study of the Coleoptera material gathered during the circumnavigation of the globe by the Austrian frigate SMS Novara (REDTENBACHER 1868).

Commanded by Kommodore Bernhard von Wüllerstorf-Urbair (1816–1883), and with seven naturalists on board, the Novara voyage lasted from 1857 to 1859 and collected natural history specimens in 18 areas around the world (PAPAVERO 1973). In South America, the expedition put down anchor in two major cities: Rio de Janeiro, from the 5th to the 31st of August 1857, and on the way back to Europe, in Valparaíso, from the 17th of April

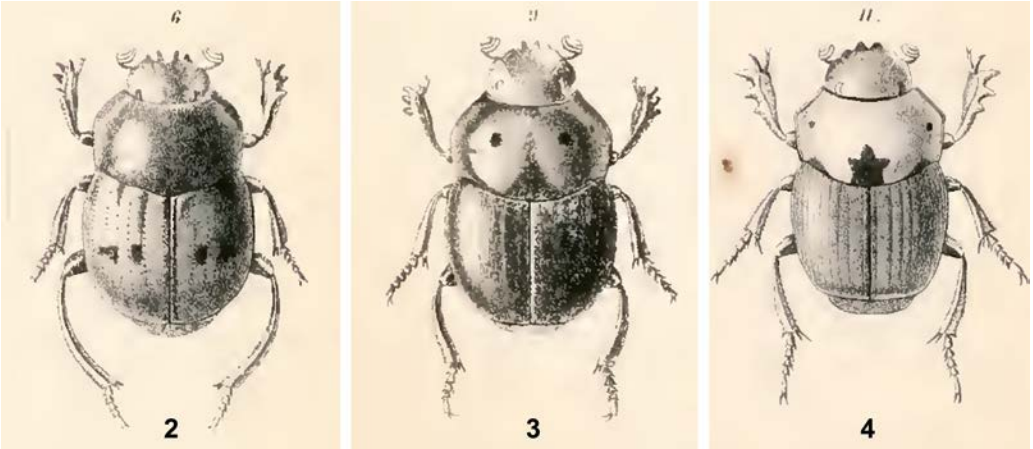
to the 11th of May 1859. From there, they headed directly towards their final destination, Trieste, where they arrived on the 26th of August 1859.

During their 26 days in Brazil, the Novara naturalists collected specimens throughout the city of Rio de Janeiro, including the then-districts of Laranjeiras, Gávea, Andaraí, Tijuca, São Cristóvão, and Boa Vista. They visited areas also in Niterói, on the opposite side of the Guanabara Bay, and in the then-German colony of Petrópolis, in the Serra dos Órgãos mountain range, about 50 km in straight line from Rio. At that time, this entire area was covered by a thick and pristine Atlantic Forest, which greatly impressed the naturalists, as we can see in FRAUENFELD's (1858) narrative of the trip. With Johan Zelebor (1819–1869), Georg von Frauenfeld (1807–1873) was one of the zoologists in the Novara's team of naturalists and, hence, he was one of the most probable collectors of the beetles gathered during the voyage.

Of the nine South American dung beetle species described by REDTENBACHER (1868), two – *Choeridium foveicolle* and *C. platymerum* – were expressly cited as coming from Rio de Janeiro, and so they were probably collected during the Novara's stay in that city. The other seven species, on the other hand, had only the very vague "Brasilien" location mentioned as their place of origin; as Rio de Janeiro was the only Brazilian locality explored by the *Novara*'s naturalists, one could assume the material upon which those species were based was also collected by them in Rio. Nonetheless, we now know that some of those dung beetles – e.g. *Canthon fulgidus* – do not occur in southeastern Brazil, but rather in the Amazon rainforest, an area never explored by those naturalists.

Therefore, it seems that not all the South American species described by REDTENBACHER (1868) were in fact collected by the Novara expedition. Indeed, REDTENBACHER (1868) himself made it clear in his introduction that a great proportion of the species he described – specifically those from East India, Ambon Island, Borneo, and New Caledonia, places never visited by the Novara – were based on material gathered by others than the Novara's naturalists ("Die von Ost-Indien, Amboina, Borneo und Neu-Caledonien, welche Länder die Fregatte nicht besuchte, aufgeführten Arten wurden den Naturforschern grösstentheils von freundlichen Gebern mitgetheilt", REDTENBACHER 1868, p. IV). Although Brazil was not in REDTENBACHER's (1868) list, we believe that at least some of the specimens studied by him were not collected during the Novara voyage and, consequently, might have originated from anywhere in Brazil and not only from Rio de Janeiro.

Redtenbacher's study of the Novara Coleoptera material was part of the eight-section multi-authored natural history report of the Novara voyage. As described by BOUSQUET (2016), the report's zoology section consists of two "Bände" (volumes) issued between 1864 and 1875. Redtenbacher's contribution was part of division A of the first "Abtheilung" (section) of Band 2, which was probably issued in 1868 (HIGGINS 1963; BOUSQUET 2016), the year its title page is dated from (Fig. 1). Therefore, catalogues citing 1867 as the publication year of Redtenbacher's South American species are incorrect (e.g., BLACKWELDER 1944; VULCANO & PEREIRA 1964; VAZ-DE-MELLO 2000). REDTENBACHER (1868) also presented five figure plates illustrating species studied by him. Published among them were three of his new South American dung beetle species – *Canthon quadripunctatus*, *C. cyanopteru*, and *C. ornatus* –, all depicted on his plate II (Figs. 2–4). These and his other six species described from Brazil are addressed on the following pages based on our study of the type material.



Figs. 2–4: REDTENBACHER's (1868) original illustrations of three of the nine Neotropical dung beetles described by him: (2) *Canthon quadripunctatus*, (3) *C. cyanopterus*, (4) *C. ornatus* (from REDTENBACHER's [1868] plate II).

Material and Methods

The Novara expedition insect material, as well as Redtenbacher's type specimens, are deposited at the Naturhistorisches Museum Wien (NHMW) in Vienna, Austria (HORN & KAHLE 1936; HORN & al. 1990b; according to these authors, part of the Novara specimens are also deposited at the Natural History Museum, London, but we found no Redtenbacher dung beetle type material there). During the first author's year-long stay at the Museum national d'Histoire naturelle, Paris (see VAZ-DE-MELLO & CUPELLO, in press, for more details), he received a loan from the NHMW's terrestrial Coleoptera curator, Dr. Harald Schillhammer, containing all the Neotropical dung beetle syntypes described by Redtenbacher that could be traced at his institution's collection. These syntypes can be easily recognized as such thanks to the presence of Redtenbacher's handwritten labels attached to them (see Fig. 20 for an example; HORN & al. 1990b). Based on this material, and with the aim to stabilize nomenclature by fixing each species name to a single specimen, we designate lectotypes for every species name proposed by REDTENBACHER (1868) for his putative new South American Scarabaeinae. For general nomenclatural principles followed by us, which are in accordance with the International Code of Zoological Nomenclature (ICZN 1999), see VAZ-DE-MELLO & CUPELLO (in press).

Results

Type material of the species names established by REDTENBACHER (1868)

1- *Canthon auricollis* REDTENBACHER, 1868: 53. (Figs. 5–6)

Type material: Lectotype: here designated, unsexed ("*Auricollis* / Brasilien Redt." [Redtenbacher's handwriting], "*auricollis* / det. Schönf. 93", "TYPUS", "LECTOTYPE / *Canthon* / *auricollis* / des. F.Z.Vaz-de-Mello, 2013"), **NHMW**. **Paralectotypes:** unknown to us.

Type locality: Brazil. Cited by REDTENBACHER (1868) as "Brasilien".

Current status: Valid species as *Canthon* (*Canthon*) *auricollis* (see below).

Taxonomic comments: The true identity of *Canthon auricollis* was a mystery to scarabaeidologists since its description. In SCHMIDT's (1922) and BALTHASAR's (1939a) reviews of *Canthon*, *C. auricollis* was placed among the species names whose correct application to species taxa was unknown to them. Then, HALFFTER & MARTÍNEZ (1977), based on an ordinary specimen bearing this name at the Museum national d'Histoire naturelle, Paris, included *C. auricollis* in the subgenus *Canthon* (*Peltecanthon*) PEREIRA, 1953 along with *C. staigi* PEREIRA, 1953 and *C. sulcatus* CASTELNAU, 1840. HALFFTER & MARTÍNEZ (1977) also stated that *C. splendidus* SCHMIDT, 1922 was a junior synonym of *C. auricollis*, since "both names clearly correspond to the same species" ("[…] por corresponder ambos nombres claramente a la misma especie."). In no moment of their work did they mention the examination of the type specimens of both *C. auricollis* and *C. splendidus*.

After our analysis of the type specimens of both names (see the first part of this series – VAZ-DE-MELLO & CUPELLO, in press – for more details on *C. splendidus* type series), we concluded that they are not synonyms, but in fact they belong to different subgenera of *Canthon* HOFFMANNSEGG, 1817: *C. splendidus* is a valid species in the subgenus *Peltecanthon*, while *C. auricollis* is a good species in the subgenus *Canthon s. str*., closely related to *C. lividus* BLANCHARD, 1846 (a syntype of which we have also examined and that will be addressed in an upcoming paper). *Canthon auricollis* and *C. lividus* are different mainly by pronotal sculpturing (much smoother and without small shiny patches in *C. auricollis*) and by colour; nonetheless, a revision of *Canthon s. str*. is still needed for a better understanding of the limits of these two species and their relationship with other members of the subgenus. *Canthon splendidus*, on the other hand, represents the *Peltecanthon* species from southeastern Brazil so far miscited as *C. auricollis* in both publications (e.g., HALFFTER & MARTÍNEZ 1977) and collections. The subgenus *Peltecanthon* is now under revision by Gabriel Nunes, Rafael Nunes, and FZVM, who will treat *C. splendidus* in further detail.

2- *Canthon cyanopterus* REDTENBACHER, 1868: 53, pl. II, fig. 9. (Figs. 3, 7–8)

Type material: **Lectotype: here designated**, unsexed ("Natterer", "*Cyanopterus* / Bras. Redt." [Redtenbacher's handwriting], "LECTOTYPE / *Canthon* / *cyanopterus* / Redtenb. / des. F.Z.Vaz-de-Mello, 2013"), **NHMW**. **Paralectotypes:** unknown to us.

Type locality: Brazil. Cited by REDTENBACHER (1868) as "Eben daher [Brasilien]".

Current status: Junior synonym of *Canthon quinquemaculatus* CASTELNAU, 1840 (synonymized by HAROLD (1869, p. 93)), species classified as incertae sedis in *Canthon* by HALFFTER & MARTÍNEZ (1977, p. 71).

Comments: One of the lectotype's labels shows the handwritten information "Natterer", which clearly refers to the Austrian naturalist and explorer Johann Natterer (1787–1843). Part of the imperial commission accompanying the Austrian Archduchess Leopoldina on her way to Rio de Janeiro to marry the then Portuguese crown prince Dom Pedro de Alcântara in 1817, Natterer separated from this group upon his arrival in Rio and spent

Figs. 5–10: (5–6) Lectotypes of *Canthon auricollis* REDTENBACHER, 1868, (7–8) *Canthon cyanopterus* REDTENBACHER, 1868, and (9–10) *Canthon fulgidus* REDTENBACHER, 1868.

the next 18 years exploring the Brazilian territory in some of its most remote corners. PAPAVERO (1971) gives a detailed account of Natterer's travels through Brazil, which included areas of Atlantic Forest, Cerrado, and the Amazon forest. After his return to Austria in 1835, Natterer's specimens were deposited at the today's NHMW.

As discussed in the introduction, the now-lectotype of *Canthon cyanopterus* seems to be part of those specimens studied by REDTENBACHER (1868) that were not collected by the Novara expedition. In fact, Natterer had no connection with the Novara, since he died 14 years before its departure from Trieste in 1857. Besides, the species complex the lectotype belongs to (the synonymy with *C. quinquemaculatus* is certainly wrong) does not occur in Rio de Janeiro, the city visited by the *Novara*'s naturalists. Instead, it is distributed all over the Amazon basin, an area extensively collected by Natterer between 1829 and 1835 (PAPAVERO 1971). Therefore, this specimen was almost certainly collected by Natterer in Amazonia and, although not part of the Novara material, it was among the species studied by REDTENBACHER (1868).

Last taxonomic treatment: HALFFTER & MARTÍNEZ (1977). Under revision by FZVM and Gabriel Nunes (Universidade Federal de Mato Grosso, Brazil).

3- *Canthon fulgidus* REDTENBACHER, 1868: 51. (Figs. 9–10)

Type material: **Lectotype:** **here designated**, unsexed ("Natt. / 12", "*fulgidus* / det. Schönf. 93", "*fulgidus* / Redtb", "*Fulgidus* / Brasil Redt." [Redtenbacher's handwriting], "TYPUS", "LECTOTYPE / *Canthon* / *fulgidus* / Redtenb. / des. F.Z.Vaz-de-Mello, 2013"), **NHMW**. **Paralectotypes:** unknown to us.

Type locality: Brazil. Cited by REDTENBARCHER (1868) as "Brasilien".

Current status: Valid species as *Canthon* (*Goniocanthon*) *fulgidus* (placed in *Goniocanthon* PEREIRA & MARTÍNEZ, 1956 by PEREIRA & MARTÍNEZ (1956, p. 111)).

Last taxonomic treatment: PEREIRA & MARTÍNEZ (1956), HALFFTER & MARTÍNEZ (1977). Under revision by FZVM, Gabriel Nunes and Rafael Nunes (Universidade Federal de Mato Grosso, Brazil).

4- *Canthon lamproderes* REDTENBACHER, 1868: 51. (Figs. 11–12)

Type material: **Lectotype:** **here designated**, unsexed ("LECTOTYPE / *Canthon* / *lamproderes* / Redtenb. / des. F.Z.Vaz-de-Mello, 20*13*", "*Lamproderes* / Bras. Redt." [Redtenbacher's handwriting], "N. C. / y."), **NHMW**. **Paralectotypes:** unknown to us.

Type locality: Brazil. Cited by REDTENBACHER (1868) as "Brasilien".

Current status: New junior subjective synonym of *Canthon* (*Francmonrosia*) *rutilans* CASTELNAU, 1840 (placed in *Francmonrosia* PEREIRA & MARTÍNEZ, 1959 by VULCANO & PEREIRA (1964, p. 600)).

Comments: After examination of the type specimens of *Canthon rutilans* CASTELNAU, 1840, *C. lamproderes* REDTENBACHER, 1868, and *C. corpulentus* HAROLD, 1868, we come to the following conclusions: firstly, the synonymy between *C. lamproderes* and *C. corpulentus*, which was first established by HAROLD (1869), is deemed incorrect by us and *C. corpulentus* is here **revalidated** to denote a species in the subgenus *Francmonrosia* PEREIRA & MARTÍNEZ, 1959. We also conclude that *C. lamproderes* REDTENBACHER, 1868 represents the same species as *C. rutilans* CASTELNAU, 1840, and, therefore, it is a **new junior synonym** of the latter.

The species *C. rutilans* (= *C. lamproderes*) and *C. corpulentus*, both belonging to the subgenus *Francmonrosia* of *Canthon*, differ mainly by the profemur: while in *C. rutilans* it has a row of denticles on its anterior edge, in *C. corpulentus* it bears a long, tapering tooth. Further information on these species – including geographical distribution and intra- and interspecific colour variation – will be addressed in an upcoming revision of *Francmonrosia*. See detailed information on the type material of *C. rutilans* and *C. corpulentus* at the end of this list.

The taxonomic and nomenclatural history of these three names – *C. rutilans*, *C. lamproderes*, and *C. corpulentus* – is quite convoluted: In his fairly general description of *C. rutilans*, CASTELNAU (1840) listed only colour, general aspect of elytral striae, and number of protibial teeth. As with other names established by CASTELNAU (1840), this brevity would eventually lead to great nomenclatural confusion.

When describing his putative new species *C. lamproderes*, REDTENBACHER (1868) stated that it was close to *C. rutilans*, but differences in size, colour, and general body shape would distinguish both species. HAROLD (1868a), on the other hand, differentiated *C. rutilans* from the new species *C. corpulentus* in his key on protibial morphology: while the first name would represent specimens with an angular internal margin, the latter would denote individuals with a straight margin. However, as Redtenbacher's and Harold's works were published in the same year, both authors were probably unaware of each other's work and, consequently, did not cite their respective species.

Figs. 11–14: Lectotypes of (11–12) *Canthon lamproderes* REDTENBACHER, 1868, and (13–14) *Canthon ornatus* REDTENBACHER, 1868.

It was only in the following year that HAROLD (1869), now aware of Redtenbacher's description, established the synonymy between *C. lamproderes* and *C. corpulentus*, considering the latter name valid. SCHMIDT (1920), however, believing that Redtenbacher's book appeared in 1867 – thus a year earlier than HAROLD's (1868a) –, stated that *C. lamproderes* would have priority over *C. corpulentus* and, thus, had to be deemed valid. SCHMIDT's (1920) opinion was followed by all subsequent catalogues and revisions (e.g., BALTHASAR 1939; BLACKWELDER 1944; PEREIRA 1944; HALFFTER & MARTÍNEZ 1977; VAZ-DE-MELLO 2000) and has remained so till now. Nevertheless, now that *C. lamproderes* and *C. corpulentus* are not considered synonyms anymore, the question of which work appeared first – Redtenbacher's or Harold's – has little practical effect[4].

5- *Canthon ornatus* REDTENBACHER, 1868: 53, pl. II, fig. 11. (Figs. 4, 13–14)

Type material: **Lectotype: here designated**, unsexed ("Helmr.", "*Ornatus* / Am. mer. Redt." [Redtenbacher's handwriting], "LECTOTYPE / *Canthon* / *ornatus* / Redtenb. / des. F.Z.Vaz-de-Mello, 2013"), **NHMW**. **Paralectotypes:** unknown to us.

Type locality: South America. Cited by Redtenbacher (1868) as "Süd-Amerika".

Current status: Valid species as *Canthon* (*Canthon*) *ornatus*.

[4] According to EVENHUIS (2015), the volume of Berliner Entomologische Zeitschrift in which Harold's revision of *Canthon* appeared – vol. 1, pp. 1–144 – was published in May 1868, with no specified day. Therefore, following Article 21.3.1. of the Code, the last day of the specified month should be adopted as the publication date of *C. corpulentus*: the 31st of May 1868. The publication date of Redtenbacher's work, in turn, is even less clear: while HIGGINS (1963) claimed it had already appeared by the 22nd of May 1868, BOUSQUET (2016) was more conservative and limited himself to saying that "[it] was apparently not issued before 1868". If BOUSQUET's more "sceptical" position were accepted, we would have to follow Article 21.3.2 of the Code and consider the 31st of December 1868 as the publication date of *C. lamproderes*. It is noteworthy that Harold's revision of the genus *Choeridium*, which was also published in 1868, contrary to his *Canthon* work, cited Redtenbacher's names, which clearly shows that Redtenbacher's work was published before HAROLD's (1868b) *Choeridium* revision. Being so, dating this latter work may prove useful in resolving the question over the publication date of Redtenbacher's book.

Comments: The handwritten label "Helmr." almost certainly refers to the Austrian mining engineer Virgil von Helmreichen zu Brunnfeld (1805–1852), who, from 1836 on, worked for an English-Brazilian mining company in the state of Minas Gerais, Brazil (ANONYMOUS 1959). While with that company, he undertook researches especially along the Serra do Grão Mogol and Serra do Espinhaço mountain ranges, both in Minas Gerais (OTRUBA 1969; PAPAVERO 1973). Later in his life, he joined a geological expedition through central South America, starting in 1846 in Rio de Janeiro and crossing the then-provinces of Minas Gerais, Goiás, and Mato Grosso, in central Brazil. From Cuiabá, in Mato Grosso, Helmreichen went to Asunción, in Paraguay, and, after spending some time there studying the geology of the country, in 1848 he headed back towards Cuiabá. Nonetheless, after contracting yellow fever, he could not reach his destination. After reaching Porto Alegre, in southern Brazil, in 1851, he died from smallpox in the following year in Rio de Janeiro (OTRUBA 1969). Although the part of his collection left in Cuiabá was subsequently lost, specimens collected by him can still be found at the NHMW (OTRUBA 1969). The now-lectotype of *Canthon ornatus* is one example of them and, therefore, it is part of those specimens studied by REDTENBACHER (1868) that were not collected by the Novara expedition, as explained in the introduction. Its exact place of origin is, however, unknown to us, since *C. ornatus* (as currently delimited) is distributed in much of the region explored by Helmreichen; the most likely localities are the state of Goiás and the Espinhaço and Grão Mogol mountain ranges.

Last taxonomic treatment: HALFFTER & MARTÍNEZ (1977).

6- *Canthon puncticollis* REDTENBACHER, 1868: 52. (Figs. 15–16)

Type material: **Lectotype:** **here designated**, unsexed ("= *Canthidium* / *crythropterum* / Lucas, 1859 / det, F.Vaz-de-Mello, 2013", "LECTOTYPE / *Canthon* / *puncticollis* / Redtenb. / des. F.Z.Vaz-de-Mello, 2013", "*Puncticollis* / Bras. Redt." [Redtenbacher's handwriting], "N. c. / M."), **NHMW**. **Paralectotypes:** unknown to us.

Type locality: Brazil. Cited by REDTENBACHER (1868) as "Eben daher [Brasilien]".

Current status: Permanently invalid by being a junior primary homonym of *Canthon puncticollis* LECONTE, 1866; species known by its replacement name *Canthidium punctatum* (SCHMIDT, 1922) **n. comb.** (see discussion below).

Comments: *Canthon puncticollis* REDTENBACHER, 1868 is a junior primary homonym of *Canthon puncticollis* LECONTE, 1866 (now placed in the subgenus *Boreocanthon* HALFFTER, 1858 of *Canthon*) and, therefore, although available, it is permanently invalid. SCHMIDT (1922) was the first author to realize this homonymy and proposed the replacement name *Canthon punctatus* SCHMIDT, 1922 for Redtenbacher's name.

As also occurred with *C. auricollis*, the correct identity of *C. puncticollis* was mysterious to entomologists for more than 150 years since its description. Neither SCHMIDT (1922), BALTHASAR (1939a), nor HALFFTER & MARTÍNEZ (1977) were able to examine Redtenbacher's type specimens and so they included *C. puncticollis* (cited by its replacement name *C. punctatus*) among the names of unknown application. Our study of the now-lectotype of *C. puncticollis* shows, however, that this species does not belong to *Canthon*, but rather to the very distantly related genus *Canthidium* ERICHSON, 1847 under the **new combination** *Canthidium* (*Canthidium*) *punctatum* (SCHMIDT, 1922) and

Figs. 15–18: (15–16) Lectotypes of *Canthon puncticollis* REDTENBACHER, 1868, and (17–18) *Canthon quadripunctatus* REDTENBACHER, 1868.

as **a new senior synonym** of *Canthidium excisipes* BALTHASAR, 1939. The holotype of *C. excisipes* was found by us at the National Museum (Natural History), Prague, Czech Republic, and detailed information on it can be found at the end of this list. Following Article 72.7 of the Code, as the name *Canthon punctatus* SCHMIDT, 1922 was expressly proposed as a replacement name for *C. puncticollis* REDTENBACHER, 1868, both names share the same name-bearing type and, therefore, they are objective synonyms, with the younger name being the valid one.

7- *Canthon quadripunctatus* REDTENBACHER, 1868: 52, pl. II, fig. 6. (Figs. 2, 17–18)

Type material: **Lectotype:** **here designated**, unsexed ("LECTOTYPE / *Canthon* / *quadripunctatus* / Redtenb. / des. F.Z.Vaz-de-Mello, 2013", "*Quadripunctatus* / Bras. Redt." [Redtenbacher's handwriting], "N. 8. / ytar."), **NHMW**. **Paralectotypes:** unknown to us.

Type locality: Brazil. Cited by REDTENBACHER (1868) as "Eben daher [Brasilien]".

Current status: Valid species as *Canthon* (*Canthon*) *quadripunctatus*.

Comments: This species occurs throughout the pampas grasslands in southern Brazil (Rio Grande do Sul state) and at higher altitudes in some mountain ranges in southern Minas Gerais, Paraná and Santa Catarina states (FZVM, personal observation). Therefore, the type material of *C. quadripunctatus* was almost certainly not collected by the Novara's naturalists.

Last taxonomic treatment: HALFFTER & MARTÍNEZ (1977).

8- *Choeridium foveicolle* REDTENBACHER, 1868: 54. (Figs. 19–20)

Type material: **Lectotype:** **here designated**, female ("LECTOTYPE / *Choeridium* / *foveicolle* / Redtenb. / des. F.Z.Vaz-de-Mello, 2013", "*Foveicollis* / Brasilia. Redt." [Redtenbacher's handwriting]), **NHMW**. **Paralectotypes:** unknown to us.

Type locality: Brazil: Rio de Janeiro. Cited by REDTENBACHER (1868) as "Rio-Janeiro".

Figs. 19–22: (19–20) Lectotypes of *Choeridium foveicolle* REDTENBACHER, 1868, and (21–22) *Choeridium platymerum* REDTENBACHER, 1868. Arrow indicates label with Redtenbacher's handwriting.

Current status: Junior synonym of *Ateuchus squalidus* (FABRICIUS, 1775) (synonymized by HAROLD (1868b, p. 62)).

Last taxonomic treatment: BALTHASAR (1939b).

9- *Choeridium platymerum* REDTENBACHER, 1868: 54. (Figs. 21–22)

Type material: **Lectotype:** **here designated**, male ("LECTOTYPE / *Choeridium* / *platymerum* / Redtenb. /des. F.Z.Vaz-de-Mello, 2013", "*Platymerum* / Bras Redt." [Redtenbacher's handwriting]), **NHMW**. **Paralectotypes:** unknown to us.

Type locality: Brazil: Rio de Janeiro. Cited by REDTENBACHER (1868) as "Rio-Janeiro".

Current status: Junior synonym of *Ateuchus squalidus* (FABRICIUS, 1775) (synonymized by HAROLD (1868b, p. 62)).

Last taxonomic treatment: BALTHASAR (1939b).

Type material of other species names addressed in this work

The following collections are cited in this section (curator in parentheses):

ISNB – Institut royal des Sciences naturelles de Belgique, Brussels, Belgium (Alain Drumont);

MNHN – Muséum national d'Histoire naturelle, Paris, France (Olivier Montreuil and Antoine Mantilleri);

NMPC – National Museum (National History), Prague, Czech Republic (Jiří Hájek);

OUMNH – Hope Entomological Collections, Oxford University Museum of Natural History, Oxford, United Kingdom (Darren Mann);

ZMHB – Museum für Naturkunde der Humboldt-Universität, Berlin, Germany (Johannes Frisch and Joachim Willers).

1- *Canthidium excisipes* BALTHASAR, 1939c: 123. (Figs. 23–24)

Type material: **Holotype:** unsexed ("HOLOTYPE", "*excisipes* / m", "*C. excisipes* / n. sp. / Dr. V. Balthasar det.", "Minas geraes / Mar d Espanha / J Zikan S.", "TYPUS", "60 61 / 14 57"), **NMPC**.

Type locality: Brazil: Minas Gerais: Mar de Espanha. Cited by BALTHASAR (1939c) as "Brasilia, Minas Geraes".

Current status: New junior synonym of *Canthidium* (*Canthidium*) *punctatum* (SCHMIDT, 1922), **new combination**.

Comments: BALTHASAR (1939c) stated that his putative new species was described based upon a single specimen deposited in his personal collection ("Typus in meiner Sammlung"), which is now housed at the NMPC (HORN & al. 1990a).

2- *Canthon corpulentus* HAROLD, 1868b: 15, 107. (Figs. 25–26)

Type material: **Lectotype:** **here designated**, male ("LECTOTYPE ♂ / *Canthon* / *corpulentus* / Harold / des. F.Z.Vaz-de-Mello, 2014", "*corpulentus* / Harold*", "*corpulentus* / Har. / Bras.", "26314"), **ZMHB**.

Paralectotypes: **1.** Male ("Brasilia", "*corpulentus* / Har.", "Ex Musæo / E. Harold", "Museum Paris / ex Coll. / R. Oberthur", "PARALECTOTYPE / ♂ / *Canthon* / *corpulentus* / Harold / des. F.Z.Vaz-de-Mello, 20*14*"), **MNHN**. **2.** Male ("Museum Paris / ex Coll. / R. Oberthur", "PARALECTOTYPE / ♂ / *Canthon* / *corpulentus* / Harold / des. F.Z.Vaz-de-Mello, 2014"), **MNHN**. **3.** Female ("PARALECTOTYPE / ♀ / *Canthon* / *corpulentus* / Harold / des. F.Z.Vaz-de-Mello, 2014", "*Canthon* / *lamproderes* / Redt.", "[illegible]", "26314"), **ZMHB**. **4.** Female ("PARALECTOTYPE / ♀ / *Canthon* / *corpulentus* / Harold / des. F.Z.Vaz-de-Mello, 2014", "*corpulentus* / Hrld / Brasilia", "H. rid.", "Brasil / Reich"), **ZMHN**.

Type locality: Brazil. Cited by HAROLD (1868b) as "Brasilien".

Current status: Valid species (**here revalidated**) as *Canthon* (*Francmonrosia*) *corpulentus*.

3- *Canthon rutilans* CASTELNAU, 1840: 69. (Figs. 27–28)

Type material: **Lectotype:** **here** designated, male ("*Coprobius* / *Rutilans* Klug / DeLaporte anim. Art. p. 69 *Canthon* nº 12 / Brasilia Dr Klug", "*G.*", "A.Gory coll. / purchased 1849–1850 / From H.L.Gory", "standing over: / Coprobius rutilans / Klug, Brasilia / OX. UNI. MUS. NAT. / HIST. (OUMNH)", "LECTOTYPE ♂ / *Canthon* / *rutilans* Cast. / des. F.Z.Vaz-de-Mello, 2013"), **OUMNH**.

Paralectotypes: **1.** Male ("*Rutilans* / Klug / Brésil mer", "*rutilans* / Cast.", "J.J. Gillet det., vend.: / *Canthon* / *rutilans* Cast. / R.M.H.N. Belg. 10.640", "PARALECTOTYPE / ♂ / *Canthon* / *rutilans* / Castelnau / des. F.Z.Vaz-de-Mello, 2014"), **ISNB**. **2.** Female ("standing over: / Coprobius rutilans / Klug, Brasilia / OX. UNI. MUS. NAT. / HIST. (OUMNH)", "A.Gory coll. / purchased 1849–1850 / From H.L.Gory", "*Canthon* / *rutilans* / Cast / Klug", "PARALECTOTYPE / ♀ / *Canthon* / *rutilans* Cast / des. F.Z.Vaz-de-Mello, 2013"), **OUMNH**.

Type locality: Brazil. Cited by CASTELNAU (1840) as "Brésil".

Current status: Valid species as *Canthon* (*Francmonrosia*) *rutilans* (first placed in *Francmonrosia* by VULCANO & PEREIRA (1967, p. 600)).

Comments: The whereabouts of Castelnau's dung beetle type specimens is highly controversial, as discussed by MALDANER & al. (2017) in their revision of the *Megaphanaeus* D'OLSOUFIEFF, 1924 type material. Castelnau's first personal collection was donated to

Figs. 23–28: (23–24) Holotype of *Canthidium excisipes* BALTHASAR, 1939, (25–26) lectotypes of *Canthon corpulentus* HAROLD, 1868, and (27–28) *Canthon rutilans* CASTELNAU, 1840.

the forerunner of the today's Smithsonian Institution, United States, in 1841, where it arrived in the following year (EVENHUIS 2012). Since *C. rutilans* was described in 1840, it would be reasonable to suppose that its type material was sent to Washington, D.C., with the rest of Castelnau's collection. Unfortunately, however, Castelnau specimens were destroyed by a great fire at the Smithsonian main hall in 1865 and no traces of his collection remain at that American institution. As argued by MALDANER & al. (2017), Castelnau beetle specimens found nowadays in European museums come mostly from his second collection formed after the donation of the first one and, consequently, they cannot be part of the type series of the species described in 1840. Likewise, specimens deposited in Castelnau's third and final collection in Melbourne, Australia (which are nowadays housed at the National Museum of Victoria), were gathered probably after Castelnau's depart from France in 1848 to serve overseas as a diplomat for the French government (MALDANER & al. 2017). Therefore, recognizing type specimens of species names established by CASTELNAU (1840) is in no way a trivial task.

During his type specimen quest in Europe between 2013 and 2014 (see VAZ-DE-MELLO & CUPELLO, in press), the first author of this paper recognized a number of Castelnau 1840 types deposited in a few museums. According to the first author's hypothesis, Castelnau worked closely with several nineteenth-century French entomologists such as Comte de Dejean (1780–1845) and Hippolyte Louis Gory (1800–1852) and, consequently, Castelnau probably examined specimens from those entomologists' collections for his 1840 descriptions. Since Dejean and Gory collections were scattered throughout Europe after their owners' deaths (MALDANER & al. 2017), Castelnau's 1840 types could

be found anywhere in Europe. FZVM found specimens identified as *C. rutilans* from Gory and Gillet collections at OUMNH and ISNB, respectively, and following his above explained hypothesis, he tentatively recognized those specimens as part of *C. rutilans* type series.

Last taxonomic treatment: HALFFTER & MARTÍNEZ (1977).

Acknowledgements

We would like to extend our gratitude to Harald Schillhammer (NHMW) for loaning and sending Redtenbacher's type specimens under his care; to Editha Schubert (Senckenberg, Deutsches Entomologisches Institut, Müncheberg, Germany) for kindly allowing us to publish the portrait of Ludwig Redtenbacher present in this paper; to Neal Evenhuis (Bishop Museum, Hawaii, United States) for the information regarding the publication date of the Berliner entomologische Zeitschrift volumes; to Jiri Zídek (Prague, Czech Republic) and Harald Schillhammer for their very attentive review of the manuscript; and to the curators who received us in their institutions: Alain Drumont (ISNB), Olivier Montreuil and Antoine Mantilleri (MNHN), Jiří Hájek (NMPC), Darren Mann (OUMNH), and Johannes Frisch and Joachim Willers (ZMHB). FZVM was supported by Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq 302997/2013-0, 304925/2010-1, 484035/2013-4, 440604/2015-0, 248299/2012-3), Synthesys BE-TAF-3985, ISYEB, UMR 7205 CNRS/MNHN, and the Brazilian Programa de Pesquisa em Biodiversidade (PPBio).

References

ANONYMOUS, 1876a: Nekrolog. – Entomologische Nachrichten 2: 46.

ANONYMOUS, 1876b: [Obituary of Ludwig] Redtenbacher. – Entomologische Zeitung 37: 205.

ANONYMOUS, 1876c: Obituary. – The Entomologist's Monthly Magazine, 12: 238.

BALTHASAR V., 1939a: Eine Vorstudie zur Monographie der Gattung *Canthon* Hffsg. – Folia Zoologica et Hydrobiologica 9 (2): 179–238.

BALTHASAR V., 1939b: Neue *Choeridium*-Arten (Ins. Col.). 6. Beitrag zur Kenntnis der Scarabaeiden der neotropischen Region. – Senckenbergiana, 21 (1–2): 44–66.

BALTHASAR V., 1939c: Neue *Canthidium*-Arten. (8. Beitrag zur Kenntnis der *Scarabaeiden* der neotrop. Region). – Entomologische Nachrichten 13 (3–4): 111–140.

BLACKWELDER R.E., 1944: Checklist of the coleopterous insects of Mexico, Central America, West Indies and South America. Part 2. – United States National Museum Bulletin 185: 189–341.

BLANCHARD E., 1946 [pp. 105–222]. – In: BLANCHARD E. & BRULLÉ G.A., 1837–1846: Voyage dans L'Amérique Méridionale (le Brésil, la République orientale de L'Uruguay, la République Argentine, la Patagone, la République du Chili, la République de Bolivia, la République du Pérou), exécuté pendant les années 1826, 1827, 1828, 1829, 1830, 1831, 1832 et 1833, par Alcide D'Orbigny. Tome Sixième. 2.e partie: insectes. – Paris: P. Bertrand & Strasbourg:Ve. Lerrault, 222 pp.

BOUQUEST Y., 2016: Litteratura Coleopterologica (1758–1900): a guide to selected books related to the taxonomy of Coleoptera with publication dates and notes. – Zookeys 583: 1–776.

CASTELNAU F.L.N.C. LE COMTE DE, 1840: Histoire naturelle des Insectes Coléoptères. Avec une introduction renfermantel l'anatomie et la physiologie des animaux articulés, par M. Brullé; ouvrage accompagné de 155 planches gravées sur acier représentant plus de 800 sujets. Tome deuxième. – Paris: P. Duménil, 563 p. + 38 pls.

ERICHSON W.F., 1847. Conspectus insectorum coleopterorum quae in Republica Peruana observata sunt. – Archiv für Naturgeschichte 13: 67–185.

EVENHUIS N.L., 1997: Litteratura taxonomica dipterorum (1758–1930). Volume I. A–K. – Leiden: Backhuys, pp. 1–426.

EVENHUIS N.L., 2012: François-Louis Comte de Castelnau (1802–1880) and the mysterious disappearance of his original insect collection. – Zootaxa 3168: 53–63.

EVENHUIS N.L., 2015: Natural History Journal Dating: Berliner Entomologische Zeitschrift (1857–1876). – Available online at: http://hbs.bishopmuseum.org/dating/berlentzeit.html (Last accessed on the 16th of February 2017).

FRAUENFELD G., 1858: Mein Aufenthalt in Rio de Janeiro. – Verhandlungen der Kaiserlich-Königlichen Zoologisch-Botanischen Gesellschaft in Wien 1858: 253–262.

HALFFTER G., 1958: Dos nuevos géneros de Canthonini. – Ciencia, Revista Hispano-Americana de Ciencias Puras y Aplicadas 17 (10–12): 207–212.

HALFFTER G. & MARTÍNEZ A., 1977: Revisión monográfica de los Canthonina americanos, IV parte. Clave para géneros y subgéneros. – Folia Entomológica Mexicana 38: 29–107.

HAROLD E., 1868a: Monographie der Gattung *Canthon*. – Berliner entomologische Zeitschrift 12: 1–144.

HAROLD E. [signed as the "HERAUSGEBER"] 1868b: Die Arten der Gattung *Choeridium*. – Coleopterologische Hefte 4: 32–76.

HAROLD E., 1869: Catalogus coleopterorum. Hucusque descriptorum, synonymicus et systematicus. Tom. IV. Scarabaeidae. – Munich: Sumptu E. H. Gummi, pp. 979–1346.

HIGGINS L.G., 1963: Dates of publication of the Novara Reise. – Journal of the Society for the Bibliography of Natural History 4(3): 153–159.

HOFFMANNSEGG J.C. GRAF VON, 1817: Entomologische Bemerkungen bei Gelegenheit der Abhandlungen über amerikanische Insecten, in der vierten bis sechsten Lieferung von den recueils d'observations de zoologie et d'anotomie comparée, oder dem 2ten Theile der Reise, der Herren Al. v. Humboldt und A. Bonpland, nemlich: No. IX. in Livr. 4. p. 197–283. und No. XI. XII. in Livr. 5. 6. p. 294–397. – Zoologisches Magazin 1 (1): 8–56.

HORN W. & KAHLE I., 1936: Über entomologische Sammlungen (Ein Beitrag zur Geschichte der Entomo-Museologie). – Entomologische Beihefte aus Berlin-Dahlem 3: 161–296, pl. XVII–XXVI.

HORN W., KAHLE I., FRIESE G. & GAEDIKE R., 1990a: Collectiones entomologicae. Ein Kompendium über den Verbleib entomologischer Sammlungen der Welt bis 1960. Teil I: A bis K. – Berlin: Akademie der Landwirtschaftswissenschaften der Deutschen Demokratischen Republik, 220 pp.

HORN W., KAHLE I., FRIESE G. & GAEDIKE R., 1990b: Collectiones entomologicae. Ein Kompendium über den Verbleib entomologischer Sammlungen der Welt bis 1960. Teil II: L bis Z. – Berlin: Akademie der Landwirtschaftswissenschaften der Deutschen Demokratischen Republik, p. 221–573.

ICZN (INTERNATIONAL COMMISSION ON ZOOLOGICAL NOMENCLATURE) 1999: International code of zoological nomenclature. Fourth edition adopted by the International Union of Biological Sciences. – London: International Trust for Zoological Nomenclature 306 p.

KOLLAR V. & REDTENBACHER L., 1844: Aufzählung und Beschreibung der von Freiherrn Carl v. Hügel auf seiner Reise durch Kaschmir und das Himaleyagebirge gesammelten Insecten. Mit 28 Steindruck-Tafeln. – In: HÜGEL C.A.A. VON (ed.): Kaschmir und das Reich der Siek, von Carl Freiherrn von Hügel. In vier Bänden. Vierter Band. Zweite Abtheilung: pp. 395–564. – Stuttgart: Hallberger.

KOLLAR V. & REDTENBACHER L., 1849: Ueber den Charakter der Insecten-Fauna von Süd-Persien. – Denkschriften der kaiserlichen Akademie der Wissenschaften (mathematisch-naturwissenschaftliche Classe) 1: 42–53.

LECONTE J.L., 1866: Additions to the coleopterous fauna of the United States. No. 1. – Proceedings of the Academy of Natural Sciences of Philadelphia (Series 2) 10: 361–394.

MALDANER M.E., CUPELLO M., FERREIRA D.C. & VAZ-DE-MELLO F.Z., 2017: Type specimens and names assigned to *Coprophanaeus* (*Megaphanaeus*) d'Olsoufieff, 1924, the largest New World dung beetles (Coleoptera: Scarabaeidae: Phanaeini). – Zootaxa 4272 (1): 83–102.

D'OLSOUFIEFF G., 1924: Les Phanaeides (Coleoptera – Lamellicornia), Famille Scarabaeidae – Tr. Coprini. – Insecta 13: 4–201.

OTRUBA G., 1969: [Entry on] Helmreichen von Brunnfeld, Virgil. – In: ANONYMOUS (ed.): Neue Deutsche Biographie 8, S. 504. – Available online at: https://www.deutsche-biographie.de/gnd123365953.html#ndbcontent (Last accessed on the 12th of February 2017).

PAPAVERO N., 1971: Essays on the history of Neotropical dipterology, with special reference to collectors (1750–1905). Vol. I. – São Paulo: Museu de Zoologia, Universidade de São Paulo, 216 pp.

PAPAVERO N., 1973: Essays on the history of Neotropical dipterology, with special reference to collectors (1750–1905). Vol. II. – São Paulo: Museu de Zoologia, Universidade de São Paulo, pp. 217–446.

PEREIRA F.S., 1953: Notas sinonímicas (Col. Scarabaeidae). – Dusenia 4 (5–6): 387–402.

PEREIRA F.S., 1944: Lucanidae, Passalidae e Scarabaeidae de Monte Alegre. – Papéis Avulsos do Departamento de Zoologia 6(8): 81–92.

PEREIRA F.S. & MARTÍNEZ A., 1956: Os gêneros de Canthonini americanos (Col. Scarabaeidae). – Revista Brasileira de Entomologia 6: 91–192.

PEREIRA F.S. & MARTÍNEZ A., 1959: Tres nuevos géneros de "Canthonini" americanos (Coleoptera, Scarabaeidae). – Acta Zoológica Lilloana 17: 164–184.

REDTENBACHER L., 1843a: Tentamen dispositionis generum et specierum coleopterorum pseudotrimerorum Archiducatus Austriae. Dissertatio inauguralis. – Vienna [Vindobonae]: Caroli Ueberreuter, 32 pp.

REDTENBACHER L., 1843b: Zoologie. Entomologie. – In: Reise in Griechenland, Unteregypten, im nördlichen Syrien und südöstlichen Kleinasien, mit besonderer Rücksicht auf die naturwissenschaftlichen Verhältnisse der betreffenden Länder, unternommen in dem Jahre 1836, von Joseph Russegger. Zweiter Theil. Mit 2 Karten vom Taurus, 1 Blatt mit Gebirgs-Durchschnitten, 20 botanischen und 15 zoologischen Tafeln: pp. 971–990. – Stuttgart: Schweizerbart.

REDTENBACHER L., 1845: Die Gattungen der deutschen Kaefer-Fauna nach der analytischen Methode bearbeitet, nebst einem kurz gefassten Leitfaden, zum Studium dieses Zweiges der Entomologie. (Mit zwei Kupfertafeln). – Vienna: Carl Ueberreuter, [12] + 177 pp. + 2 pls.

REDTENBACHER L., 1847–1849: Fauna Austriaca. Die Käfer. Nach der analytischen Methode. – Vienna: Carl Gerold, xxvii + 883 pp. + 2 pls.

REDTENBACHER L., 1856–1858: Fauna Austriaca. Die Käfer. Nach der analytischen Methode. Zweite, gänzlich umgearbeitete, mit mehreren Hunderten von Arten und mit der Charakteristik sämmtlicher europäischen Käfergattungen vermehrte Auflage. Mit zwei Kupfertafeln. – Vienna: Carl Gerold's Sohn, cxxxvii + 1017 pp. + 2 pls.

REDTENBACHER L., 1868: Reise der österreichischen Fregatte Novara um die Erde in den Jahren 1857, 1858, 1859 unter den Befehlen des Commodore B. von Wüllerstorf-Urbair. Zoologischer Theil. Zweiter Band. Coleopteren. Mit 5 Tafeln. – Vienna: Karl Gerold's Sohn, iv + 249 pp. + 5 pls.

REDTENBACHER L., 1871–1874: Fauna Austriaca. Die Käfer, nach der analytischen Methode. Dritte, gänzlich umgearbeitete und bedeutend vermehrte Auflage. – Vienna: Carl Gerold's Sohn, Erster Band: 564 pp. + Zweiter Band: cliii + 571 pp. + 2 pls.

SCHINER J.R., 1860: [Obituary of] Vincenz Kollar. – Wiener Entomologische Monatschrift 4: 222–224.

SCHMIDT A., 1920: Beitrag zur Kenntnis der Gattungen *Canthon* Hoffsg., *Sybax* Boh., *Aphodius* Ill., *Simogenius* Har., *Ataenius* Har. – Archiv für Naturgeschichte 86A.9: 114–147.

SCHMIDT A., 1922: 1. Bestimmungstabelle der mir bekannten *Canthon*-Arten. 2. Verbreitungsgebiete der *Canthon*-Arten. 3. Neubeschreibungen von *Canthon*, *Saprositis*, *Mendidius*, *Euparia* und *Ataenius*. – Archiv für Naturgeschichte, Abteilung A, 88 (3): 61–103.

SCHÖNMANN H., 1988: [Entry on] Redtenbacher, Ludwig, Zoologe. – In: ANONYMOUS (ed.): Österreichisches Biographisches Lexikon 1815–1950. Band 9: pp. 14–15. – Vienna: Österreichische Akademie der Wissenschaften.

VAZ-DE-MELLO F.Z., 2000: Estado atual de conhecimentos dos Scarabaeidae *s. str.* (Coleoptera: Scarabaeoidea) do Brasil. – In: MARTÍN-PIERA F., MORRONE J.J. & MELIC A. (ed.): Hacia un proyecto CYTED para el inventario y estimación de la diversidad entomológica en Iberoamérica: PRIBES-2000, pp. 183–195. – Zaragoza: m3m, Monografías Tercer Milenio, Sociedad Entomológica Aragonesa (SEA).

VAZ-DE-MELLO F.Z. & CUPELLO M., in press: The type specimens of South American dung beetles, Part I: On the species described in the genus *Canthon* Hoffmannsegg, 1817 (Coleoptera: Scarabaeidae: Scarabaeinae) by the German entomologist Adolf Schmidt (1856–1923). – Spixiana.

VULCANO M.A. & PEREIRA F.S., 1964: Catalogue of the Canthonini (Col. Scarab.) inhabiting the Western Hemisphere. –Entomologische Arbeiten aus dem Museum G. Frey 15 (2): 570–685.

WESTWOOD J.O., 1876: [Obituary of Ludwig Redtenbacher]. – Transactions of the Entomological Society of London, no number [year 1876]: XLIII–XLIV.