

Annotated Checklist of Aphodiinae (Coleoptera: Scarabaeidae) from Rio Grande do Sul and Santa Catarina, Brazil

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Abstract. An extensive literature review was performed to determine the list of Aphodiinae species reported in Rio Grande do Sul and Santa Catarina states. A total of 35 Aphodiinae species belonging to two tribes and 12 genera have been recorded in southern Brazil. Twenty-nine species (82.8%) were recorded in Santa Catarina and 16 (45.7%) in Rio Grande do Sul. Only nine species (25.7%) were reported to occur in both states. *Ataenius* Harold, 1867 was the genus with the greatest number of species (20), followed by *Saprosites* Redtenbacher, 1858 with only three species. Other genera were represented by one or two species. New lists should be made for other Brazilian states.

Keywords: Atlantic Forest; Dung beetles; Pampa; Southern Brazil.

Lista dos Aphodiinae (Coleoptera: Scarabaeidae) do Rio Grande do Sul e Santa Catarina, Brasil

Resumo. Uma extensiva revisão da literatura foi realizada para listar as espécies de Aphodiinae dos estados de Santa Catarina e Rio Grande do Sul. Um total de 35 espécies de Aphodiinae pertencentes a duas tribos e 12 gêneros foi registrado para a região estudada. Vinte e nove espécies (82,8%) foram registradas para Santa Catarina e 16 (45,7%) para o Rio Grande do Sul. Apenas nove espécies (25,7%) foram compartilhadas por ambos os estados. *Ataenius* Harold, 1867 foi o gênero com o maior número de espécies (20), seguindo por *Saprosites* Redtenbacher, 1858 com apenas três espécies. Os outros gêneros foram representados por uma ou duas espécies. Novas listas devem ser feitas para outros estados brasileiros.

Palavras-Chave: Escarabédeos; Mata Atlântica; Pampa; Sul do Brasil.

Growing biodiversity extinction rates are a major problem for maintenance of the environmental characteristics and conditions that allow the existence of most living organisms on Earth (MYERS *et al.* 2000). The maintenance of ecological processes related to biodiversity will depend on the development of effective conservation measures (RANDS *et al.* 2010). However, for many species groups there is relatively little data on taxonomy and geographical distribution, conditions called Linnean and Wallacean deficiencies, respectively (WHITTAKER *et al.* 2005). A better understanding of local and regional biodiversity is fundamental to achieving the goals of conservation strategies.

Among the insects, dung beetles (Coleoptera: Scarabaeidae: Aphodiinae and Scarabaeinae) perform several ecological functions, such as decomposition and burial of feces, and natural biological control of parasites developing in cattle dung (HALFFTER & MATTHEWS 1966; FINCHER 1975; RIDSILL-SMITH & HAYLES 1990; HANSKI & CAMBEFORT 1991; AIDAR *et al.* 2000; SIMMONS & RIDSILL-SMITH 2011). By building tunnels and burying feces in the ground, dung beetles contribute to the improvement of soil and pasture characteristics (HAYNES & WILLIAMS 1993) and decrease of the emission of toxic gases to the atmosphere (PENTILÄ *et al.* 2013). These insects are highly diverse and well-distributed throughout the world.

Scarabaeinae beetles have been well studied in southern Brazil (*e.g.* SILVA *et al.* 2008, 2009, 2010, 2011, 2012a, 2012b, 2013; AUDINO *et al.* 2011; SILVA 2011; SILVA & AUDINO 2011; SILVA & DI MARE 2012; CAMPOS & HERNÁNDEZ 2013; SILVA & BOGONI 2014; VIEGAS *et*

al. 2014), yet the Aphodiinae have been neglected (but see AUDINO *et al.* 2007), possibly because of their relationship with livestock environments and cattle feces, and their endocoprid behavior. The paucity of studies is not restricted to southern Brazil; in fact, few studies on Neotropical dung beetle communities have taken Aphodiinae into consideration (CABRERO-SAÑUDO & LOBO 2009). Compared to Scarabaeinae species there are relatively few species in Aphodiinae beetle communities, however they can be very abundant (*e.g.* ANDRESEN 2002; KOLLER *et al.* 2007; RODRIGUES *et al.* 2010, 2013) and can play important ecological roles.

Aphodiinae is one of the most diverse and widely distributed subfamilies of Scarabaeidae (DELLACASA *et al.* 2001; CABRERO-SAÑUDO *et al.* 2010), with more than 200 genera and 3,100 species of small size (0.8 to 16 mm in length). This taxon has endocoprid behavior and generally has coprophagous or saprophagous feeding habits, where larvae and adults can occupy different niches (STEBNICKA 2001a; SMITH & SKELLEY 2007; CABRERO-SAÑUDO & LOBO 2009). Aphodiinae species feed and nest on the ground in various types of feces and/or plant debris (STEBNICKA 2001b). Aphodiinae is the predominant group in Palearctic and Nearctic region dung beetle communities (HANSKI 1991; LOBO 2000; CABRERO-SAÑUDO & LOBO 2009), while Scarabaeinae predominates in Neotropical regions (HALFFTER & MATTHEWS 1966). The objective of this study is to present a list of Aphodiinae species occurring in Rio Grande do Sul and Santa Catarina states in southern Brazil.

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MATERIAL AND METHODS

I performed an extensive review of recent literature, searching specifically for reviews of tribes and genera of Aphodiinae recorded in the Neotropical region, and mainly in Brazil, as highlighted by DELLACASA *et al.* (2001) and SKELLEY *et al.* (2007a). The list is based on extensive search of published records complemented by information from the Scientific Electronic Library Online, Google Scholar and "Portal de Periódicos CAPES". Searches were conducted using combined specific keywords such as: Aphodiinae, Aphodiidae, Rio Grande do Sul, Santa Catarina, southern Brazil, and South of Brazil (and equivalent terms in Portuguese), to find published sources with information on Aphodiinae species in southern Brazil. Reference bibliographies were also used to find additional references. The literature review was conducted between September 2013 and August 2014.

Several reviews on Aphodiinae genera in Neotropical regions were used in the literature review to compose the species list presented in this study (*e.g.* DELLACASA *et al.* 1998, 2001a, 2001b, 2002, 2003, 2004, 2007a, 2007b, 2007c, 2007d, 2008, 2009, 2010, 2011, 2012; STEBNICKA 1998, 2000a, 2000b, 2001a, 2001b, 2001c, 2002a, 2002b, 2003a, 2003b, 2003c, 2003d, 2004, 2005, 2006, 2007c, 2008, 2009, 2011; DELLACASA & DELLACASA 2000a, 2000b, 2003, 2005; DELLACASA & STEBNICKA 2001; STEBNICKA *et al.* 2003; STEBNICKA & SKELLEY 2005, 2009a, 2009b; SKELLEY 2006, 2007a, 2007b; STEBNICKA & LAGO 2005; STEBNICKA & GALANTE 2007; BORDAT 2009; SKELLEY *et al.* 2009; RAKOVIC & MENCL 2013). The list of tribes, subtribes, genera and species was prepared following the nomenclature described in GORDON & SKELLEY (2007), SKELLEY *et al.* (2007), CABRERO-SAÑUDO *et al.* (2010) and BOUCHARD *et al.* (2011). Published works on Coleoptera or soil insects conducted in Rio Grande do Sul and Santa Catarina including Aphodiinae species were also reviewed and included.

The species list is arranged in alphabetical order of tribes, genera and species, with indication of references in which the species were reported to occur in southern Brazil, and with known species geographical distributions (including distribution in the Rio Grande do Sul and Santa Catarina) highlighted. Additional information on species biology can be found within the references cited.

RESULTS AND DISCUSSION

A total of 35 Aphodiinae species belonging to two tribes and 12 genera were recorded for Rio Grande do Sul and Santa Catarina. Twenty-nine (82.8%) species were recorded for Santa Catarina and 16 (45.7%) for Rio Grande do Sul. Only nine species (25.7%) were shared between states. *Ataenius* Harold, 1867 was the genus with the greatest number of species (20), followed by *Saprosites* Redtenbacher, 1858 with only three species. *Aidophus* Balthasar, 1963, *Arupaia* Stebnicka, 1999, *Blackburneus* Schmidt, 1913, *Labarrus* Mulsant & Rey, 1870, *Lomanoxia* Martínez, 1951, *Parataenius* Balthasar, 1961 and *Passaliolla* Balthasar, 1945 were represented by two species each. *Auperia* Chevrolat, 1864, *Iarupea* Martínez, 1953 and *Paraplesiataenius* Chalumeau, 1992 were represented by only two species each. The genus *Ataenius* has about 300 Neotropical and Nearctic species, being one of the largest and most diverse genera of the subfamily Aphodiinae, and was revised by STEBNICKA (2001c, 2002b, 2003d, 2004, 2005, 2006, 2007c) and STEBNICKA & LAGO (2005). *Saprosites* has about 130 species, 17 of which occur in the New World (STEBNICKA 2001a).

I found no lists of Aphodiinae species for other locations or Brazilian states, and it seems that this study is the first of its kind conducted in Brazil. However, SMITH & SKELLEY (2007) reported 27 species of Aphodiinae in southern South America, including southern regions of Argentina and Chile (including the Central Chilean, Patagonian and Subantarctic biogeographical provinces) (MORRONE 2006). The larger number of species found in southern

Brazil (*i.e.*, compared to southern regions of Argentina and Chile) may be related to differences in climate and/or vegetation, or perhaps differences in Aphodiinae faunal origin due to the occurrence of distinct historical events.

In Brazil, several studies have reported Aphodiinae in Mato Grosso do Sul state (*e.g.* FLECHTMANN *et al.* 1995a, 1995b, 1995c; AIDAR *et al.* 2000; KOLLER *et al.* 1999, 2007; RODRIGUES *et al.* 2010, 2013; ABOT *et al.* 2012), although many have not been identified to species level. In conducting this review I was able to verify that many new Aphodiinae species (and genera) have been described with material collected in Mato Grosso do Sul. This fact reinforces the need for greater sampling effort and collection of this fauna in other Brazilian states. Aphodiinae are sampled using pitfall traps baited with fresh cattle feces (KOLLER *et al.* 2007; RODRIGUES *et al.* 2013), flight interception traps (RODRIGUES *et al.* 2010), and light traps (FLECHTMANN *et al.* 1995a, 1995b, 1995c; RONQUI & LOPES 2006; ABOT *et al.* 2012). Some Brazilian Aphodiinae can be attracted to carrion (MEDRI & LOPES 2001). Dissection of fecal masses is also viable option (FLECHTMANN *et al.* 1995a, 1995b, 1995c), depending on the objective of the study.

The next step for Aphodiinae researchers, in addition to performing new inventories of this fauna, will be to consult and update the Brazilian entomological collections, to accommodate changes in nomenclature and better describe new genera and species. This update may increase the number of Aphodiinae species on the list presented here. I invite other researchers to compile lists of Aphodiinae species from other Brazilian states or regions, as this information is fundamental to our knowledge of faunal distribution and conservation strategies that may be needed in the near future.

Checklist of Aphodiinae from Rio Grande do Sul and Santa Catarina, Brazil

Aphodiinae Leach, 1815

Aphodiini Leach, 1815

Aphodiina Leach, 1815

Blackburneus Schmidt, 1913

Blackburneus caracaensis (Petrovitz, 1970)

Geographical distribution: Argentina, Brazil, Paraguay. In Santa Catarina: Seara (formerly called Nova Teutônia) (DELLACASA *et al.* 2011). Brazilian biome: Atlantic Forest.

Labarrus Mulsant & Rey, 1870

Labarrus pseudolividus (Balthasar, 1941)

Geographical distribution: North, Central and South America, Australia, Oceania, Central and Southern Africa. In Santa Catarina: Jaraguá do Sul (FLECHTMANN & RODRIGUES 1995). Brazilian biome: Atlantic Forest.

Didactyliina Pittino, 1985

Aidophus Balthasar, 1963

Aidophus infuscatopennis (Schmidt, 1909)

Geographical distribution: Argentina, Bolivia, Brazil, Paraguay, Peru, Uruguay. In Rio Grande do Sul: unknown (DELLACASA *et al.* 2001b). Brazilian biome: unknown.

Eupariini Schmidt, 1910

Auperia Chevrolat, 1864

Auperia denominata Chevrolat, 1864

Geographical distribution: Americas. In Santa Catarina: Seara (formerly called Nova Teutônia) (STEBNICKA 2002a). Brazilian biome: Atlantic Forest.

***Auperia teutoniae* Stebnicka, 2002**

Reference: STEBNICKA (2002a). Geographical distribution: Brazil. In Santa Catarina: Seara (formerly called Nova Teutônia) (STEBNICKA 2002a). Brazilian biome: Atlantic Forest.

***Arupaia* Stebnicka, 1999**

***Arupaia friedenreichi* (Harold, 1870)**

Geographical distribution: Brazil. In Santa Catarina: Seara (formerly called Nova Teutônia) (STEBNICKA 1999b). Brazilian biome: Atlantic Forest.

***Ataenius* Harold, 1867**

***Ataenius blapoides* Balthasar, 1947**

Geographical distribution: South America. In Rio Grande do Sul: Canela (Parque do Caracol) (STEBNICKA 2001c). Brazilian biome: Atlantic Forest.

***Ataenius canoasus* Stebnicka, 2007**

Geographical distribution: South America. In Rio Grande do Sul: Capão da Canoa (STEBNICKA 2007c). Brazilian biome: Atlantic Forest.

***Ataenius catarinaensis* Stebnicka, 2007**

Geographical distribution: South America. In Santa Catarina: Seara (formerly called Nova Teutônia) (STEBNICKA 2007c; FAVRETTO *et al.* 2013). Brazilian biome: Atlantic Forest.

***Ataenius clitellarius* Petrovitz, 1973**

Geographical distribution: Central South America. In Santa Catarina: Seara (formerly called Nova Teutônia) (STEBNICKA 2005, 2007b; FAVRETTO *et al.* 2013). Brazilian biome: Atlantic Forest.

***Ataenius columbicus* Harold, 1880**

Geographical distribution: South America. In Rio Grande do Sul: Pelotas. In Santa Catarina: Águas Mornas (formerly called Theresópolis), Seara (formerly called Nova Teutônia) (STEBNICKA 2004; FAVRETTO *et al.* 2013). Brazilian biome: Atlantic Forest and Pampa.

***Ataenius crenulatus* Schmidt, 1910**

Geographical distribution: Central and South America, West Indies. In Rio Grande do Sul: Pelotas. In Santa Catarina: Seara (formerly called Nova Teutônia) (GALANTE *et al.* 2003; STEBNICKA 2006, 2007b). Brazilian biome: Atlantic Forest and Pampa.

***Ataenius forsteri* Balthasar, 1960**

Geographical distribution: South America. In Santa Catarina: Seara (formerly called Nova Teutônia) (STEBNICKA 2006). Brazilian biome: Atlantic Forest.

***Ataenius impiger* Schmidt, 1916**

Geographical distribution: South America. In Santa Catarina: Seara (formerly called Nova Teutônia) (STEBNICKA & LAGO 2005). Brazilian biome: Atlantic Forest.

***Ataenius lenkoi* Petrovitz, 1973**

Geographical distribution: Brazil. In Santa Catarina: Seara (formerly called Nova Teutônia) (STEBNICKA 2005; FAVRETTO *et al.* 2013). Brazilian biome: Atlantic Forest.

***Ataenius londrinae* Stebnicka, 2007**

Geographical distribution: South America. In Rio Grande do Sul: [Rio] Pardiniho, [Barra do] Rio Azul. In Santa Catarina: Seara (formerly called Nova Teutônia) (STEBNICKA 2007c; FAVRETTO *et al.* 2013). Brazilian biome: Atlantic Forest.

***Ataenius longiclavus* Petrovitz, 1970**

Geographical distribution: Brazil. In Rio Grande do Sul: Porto Alegre (STEBNICKA 2005). Brazilian biome: Pampa.

***Ataenius opatrinus* Harold, 1867**

Geographical distribution: Central and South America. In Rio Grande do Sul: Porto Alegre. In Santa Catarina: Seara (formerly called Nova Teutônia) (STEBNICKA 2001c). Brazilian biome: Atlantic Forest and Pampa.

***Ataenius picinus* Harold, 1868**

Geographical distribution: Americas. In Rio Grande do Sul: Cachoeira [do Sul]. In Santa Catarina: Seara (formerly called Nova Teutônia) (STEBNICKA 2004). Brazilian biome: Atlantic Forest and Pampa.

***Ataenius platensis* (Blanchard, 1846)**

Geographical distribution: Americas, West Indies. In Santa Catarina: Seara (formerly called Nova Teutônia) (STEBNICKA 2005). Brazilian biome: Atlantic Forest.

***Ataenius plaumanni* Petrovitz, 1973**

Geographical distribution: South America. In Santa Catarina: Seara (formerly called Nova Teutônia) (STEBNICKA 2005; FAVRETTO *et al.* 2013). Brazilian biome: Atlantic Forest.

***Ataenius purator* Harold, 1868**

Geographical distribution: South America. In Rio Grande do Sul: Pelotas (STEBNICKA 1998; STEBNICKA & LAGO 2005). Brazilian biome: Pampa.

***Ataenius schmidti* Stebnicka, 2003**

Geographical distribution: South America. In Rio Grande do Sul: unknown (STEBNICKA 2003d). Brazilian biome: unknown.

***Ataenius sculptilis* Harold, 1868**

Geographical distribution: South America, West Indies. In Santa Catarina: Guaramirim, Jaraguá do Sul (STEBNICKA 2006). Brazilian biome: Atlantic Forest.

***Ataenius stercorator* (Fabricius, 1775)**

Geographical distribution: South America. In Rio Grande do Sul: Pelotas, Porto Alegre. In Santa Catarina: Guaramirim (STEBNICKA 2003d). Brazilian biome: Atlantic Forest and Pampa.

***Ataenius strigicaudus* Bates, 1887**

Geographical distribution: Central and South America, West Indies. In Santa Catarina: Seara (formerly called Nova Teutônia) (STEBNICKA 2004). Brazilian biome: Atlantic Forest.

***Iarupea* Martínez, 1953**

***Iarupea attenuata* (Harold, 1870)**

Geographical distribution: Brazil. In Santa Catarina: Seara (formerly called Nova Teutônia) (STEBNICKA 2007a). Brazilian biome: Atlantic Forest.

***Iarupea serratipennis* (Petrovitz, 1973)**

Geographical distribution: South America. In Santa Catarina: Seara (formerly called Nova Teutônia) (STEBNICKA 1999, 2007a). Brazilian biome: Atlantic Forest.

Lomanoxia* Martínez, 1951**Lomanoxia costulata* (Harold, 1867)**

Geographical distribution: South America. In Santa Catarina: Seara (formerly called Nova Teutônia) (STEBNICKA 1999a). Brazilian biome: Atlantic Forest.

Paraplesiataenius* Chalumeau, 1992**Paraplesiataenius catarinaensis* Stebnicka, 2003**

Geographical distribution: Brazil. In Rio Grande do Sul: Porto Alegre. In Santa Catarina: Seara (formerly called Nova Teutônia) (STEBNICKA 2003b). Brazilian biome: Atlantic Forest and Pampa.

***Paraplesiataenius genieri* Stebnicka, 2003**

Geographical distribution: Brazil. In Santa Catarina: Seara (formerly called Nova Teutônia) (STEBNICKA 2003b). Brazilian biome: Atlantic Forest.

Parataenius* Balthasar, 1961**Parataenius simulator* (Harold, 1868)**

Geographical distribution: Neotropical Region, southeastern United States; introduced to Australia, New Zealand, Africa and Europe (Portugal). In Rio Grande do Sul: Capão da Canoa, Pelotas (STEBNICKA & SKELLEY 2009). Brazilian biome: Atlantic Forest and Pampa.

Passaliolla* Balthasar, 1945**Passaliolla eugastrica* (Harold, 1869)**

Geographical distribution: South America. In Santa Catarina: Seara (formerly called Nova Teutônia) (STEBNICKA 2000b). Brazilian biome: Atlantic Forest.

Saprosites* Redtenbacher, 1858**Saprosites brevisculus* Harold, 1867**

Geographical distribution: South America. In Rio Grande do Sul: Porto Alegre. In Santa Catarina: Seara (formerly called Nova Teutônia). (STEBNICKA 2001a). Brazilian biome: Atlantic Forest and Pampa.

***Saprosites dentipes* Harold, 1867**

Geographical distribution: South America. In Rio Grande do Sul: Porto Alegre. In Santa Catarina: Jaraguá do Sul, Seara (formerly called Nova Teutônia) (STEBNICKA 2001a). Brazilian biome: Atlantic Forest and Pampa.

***Saprosites puncticollis* Harold, 1867**

Geographical distribution: Brazil. In Santa Catarina: Águas Mornas (formerly called Theresópolis) (STEBNICKA 2001a). Brazilian biome: Atlantic Forest.

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REFERENCES

- Abot, A.R., A. Puker, T.L. Taira, S.R. Rodrigues, V. Korasaki & H.N. Oliveira, 2012. Abundance and diversity of coprophagous beetles (Coleoptera: Scarabaeidae) caught with a light trap in a pasture area of the Brazilian Cerrado. *Studies on Neotropical Fauna and Environment*, 47: 53-60.
- Aidar, T., W.W. Koller, S.R. Rodrigues, A.M. Corrêa, J.C.C. Silva, O.S. Balta, J.M. Oliveira & V.L. Oliveira, 2000. Besouros coprófagos (Coleoptera: Scarabaeidae) coletados em Aquidauana, MS, Brasil. *Anais da Sociedade Entomológica do Brasil*, 29: 817-820.
- Andresen, E., 2002. Dung beetles in a Central Amazonian rainforest and their ecological role as secondary seed dispersers. *Ecological Entomology*, 27: 257-270.
- Audino, L.D., J.M. Nogueira, P.G. Silva, M.Z. Neske, A.H.B. Ramos, L.P. Moraes & M.F.S. Borba, 2007. Identificação dos coleópteros (Insecta: Coleoptera) das regiões de Palmas (município de Bagé) e Santa Barbinha (município de Caçapava do Sul), RS. Bagé, Embrapa Pecuária Sul, 92p.
- Audino, L.D., P.G. Silva, J.M. Nogueira, L.P. Moraes & F.Z. Vaz-de-Mello, 2011. Scarabaeinae (Coleoptera, Scarabaeidae) de um bosque de eucalipto introduzido em uma região originalmente campestre. *Iheringia, Série Zoologia*, 101: 121-126.
- Bordat, P., 2009. Nouveaux taxons afrotropicaux dans la famille Aphodiidae. *Nouvelle Revue d'Entomologie*, 25: 123-144.
- Bouchard, P., Y. Bousquet, A.E. Davies, M.A. Alonso-Zarazaga, J.F. Lawrence, C.H.C. Lyal, A.F. Newton, C.A.M. Reid, M. Schmitt, A. Slipinski & A.B.T. Smith, 2011. Family-group names in Coleoptera (Insecta). *ZooKeys*, 88: 1-972.
- Cabrero-Sañudo, F.J. & J.M. Lobo, 2009. Biogeography of Aphodiinae dung beetles based on the regional composition and distribution patterns of genera. *Journal of Biogeography*, 36: 1474-1492.
- Cabrero-Sañudo, F.J., M. Dellacasa, I. Martínez, J.M. Lobo & G. Dellacasa, 2010. Distribution of Aphodiinae species (Coleoptera, Scarabaeoidea, Aphodiidae) in Mexico. *Acta Zoológica Mexicana*, 26: 323-399.
- Campos, R.C. & M.I.M. Hernández, 2013. Dung beetle assemblages (Coleoptera, Scarabaeinae) in Atlantic forest fragments in southern Brazil. *Revista Brasileira de Entomologia*, 57: 47-54.
- Dellacasa, G., P. Bordat & M. Dellacasa, 2001a. A revisional essay of world genus-group taxa of Aphodiinae (Coleoptera Aphodiidae). *Memorie della Società Entomologica Italiana*, 79: 1-482.
- Dellacasa, M. & G. Dellacasa, 2000a. Systematic revision of the genera *Euheptaulacus* G. Dellacasa, 1983 and *Heptaulacus* Mulsant, 1842 with description of the new genus *Pseudoheptaulacus* (Coleoptera: Scarabaeoidea: Aphodiidae). *Elytron*, 14: 3-37.
- Dellacasa, M. & G. Dellacasa, 2000b. Systematic revision of the genus *Erytus* Mulsant and Rey, 1870, and description of the new genus *Sahlbergianus* (Coleoptera: Aphodiidae). *Frustula Entomologica*, 23: 109-130.
- Dellacasa, M. & G. Dellacasa, 2003. Review of the genus *Aphodius* (Coleoptera: Aphodiidae). *Folia Heyrovskyana*, 11: 173-202.
- Dellacasa, M. & G. Dellacasa, 2005. Comments on some systematic and nomenclatural questions in Aphodiinae with descriptions of new genera and on Italian taxa (Coleoptera Aphodiidae). *Memorie della Società Entomologica Italiana*, 84: 45-101.
- Dellacasa, M. & Z. Stebnicka, 2001. A new genus for *Oxyomus morosus* Harold, 1869 (Eupariini) and redefinition of *Oxyomus setosopunctatus* A. Schmidt, 1911 (Aphodiini) (Coleoptera Scarabaeidae: Aphodiinae). *Acta Zoológica Mexicana*, 83: 29-34.
- Dellacasa, M., G. Dellacasa & P. Bordat, 2002. Systematic redefinition of taxa belonging to the genera *Ahermodontus* Báguena, 1930 and *Ammoecius* Mulsant, 1842, with

- description of the new genus *Vladimirellus* (Coleoptera, Aphodiidae). *Acta Zoologica Academiae Scientiarum Hungaricae*, 48: 269-316.
- Dellacasa, M., G. Dellacasa & P.E. Skelley, 2010. *Neotrichaphodioides*, new genus of Neotropical Aphodiini, with description of a new species from Peru (Scarabaeoidea: Scarabaeidae: Aphodiinae). *Insecta Mundi*, 0133: 1-12.
- Dellacasa, M., G. Dellacasa & R.D. Gordon, 2007a. Systematic revision of the genus *Cephalocyclus* with description of eight new species from Mexico. *Acta Zoológica Mexicana*, 23: 89-128.
- Dellacasa, M., G. Dellacasa & R.D. Gordon, 2007b. *Ferrerianus*, new genus for *Aphodius biimpressus* Schmidt A., 1909 (Scarabaeoidea: Aphodiidae). *Insecta Mundi*, 11: 1-4.
- Dellacasa, M., G. Dellacasa & R.D. Gordon, 2008. *Agrilinellus*, new genus and four new species of Mexican Aphodiini (Scarabaeoidea: Scarabaeidae: Aphodiinae). *Insecta Mundi*, 53: 1-16.
- Dellacasa, M., G. Dellacasa & R.D. Gordon, 2009. Systematic revision of the genus *Coelotrachelus* Schmidt, 1913 (Scarabaeoidea: Scarabaeidae: Aphodiinae). *Insecta Mundi*, 86: 1-13.
- Dellacasa, M., G. Dellacasa & R.D. Gordon, 2012. Systematic revision of *Gonaphodiellus* taxa, with description of two new genera and fourteen new species (Coleoptera: Scarabaeidae: Aphodiinae). *Insecta Mundi*, 0230: 1-41.
- Dellacasa, M., R.D. Gordon & G. Dellacasa, 1998. The types of *Aphodius* species described by Harold from Mexico with description of a new genus (Coleoptera Scarabaeoidea: Aphodiidae). *Acta Zoológica Mexicana*, 74: 139-162.
- Dellacasa, M., R.D. Gordon & G. Dellacasa, 2003. *Jalisco plumipes*, new genus and new species of Mexican Aphodiini (Scarabaeoidea: Aphodiidae). *Insecta Mundi*, 17: 69-71.
- Dellacasa, M., R.D. Gordon & G. Dellacasa, 2004. *Neotrichonotulus*, a new genus for three Mexican Aphodiini (Scarabaeoidea, Aphodiidae). *Acta Zoológica Mexicana*, 20: 1-7.
- Dellacasa, M., R.D. Gordon & G. Dellacasa, 2007c. Systematic review to the genus *Liothorax* (Coleoptera: Scarabaeoidea: Scarabaeidae: Aphodiinae). *Zootaxa*, 1407: 23-42.
- Dellacasa, M., R.D. Gordon & G. Dellacasa, 2007d. *Pseudogonaphodiellus zdzislawae*, new genus and new species of Mexican Aphodiini (Scarabaeoidea: Aphodiidae). *Acta Zoologica Cracoviensia*, 50: 139-142.
- Dellacasa, M., R.D. Gordon & G. Dellacasa, 2011. Systematic revision of the American taxa belonging to the genera *Alloblackburneus* Bordat, 2009, and *Blackburneus* Schmidt, 1913, with description of seven new species (Coleoptera: Scarabaeidae: Aphodiinae). *Insecta Mundi*, 0204: 1-52.
- Dellacasa, M., R.D. Gordon, P.J. Harpootlian, Z. Stebnicka & G. Dellacasa, 2001b. Systematic redefinition of the New World Didactyliini (Coleoptera: Scarabaeidae: Aphodiinae) with descriptions of two new species of *Aidophus* Balthasar. *Insecta Mundi*, 15: 193-216.
- Favretto, M.A., E.B. Santos & C.J. Geuster, 2013. Entomofauna do oeste do estado de Santa Catarina, Sul do Brasil. *EntomoBrasilis*, 6: 42-63.
- Fincher, G.T., 1975. Effects of dung beetle activity on the number of nematode parasites acquired by grazing cattle. *The Journal of Parasitology*, 61: 759-762.
- Flechtmann, C.A.H. & S.R. Rodrigues, 1995. Insetos fimícolas associados a fezes bovinas em Jaraguá do Sul/SC. 1. Besouros coprófagos (Coleoptera, Scarabaeidae). *Revista Brasileira de Entomologia*, 39: 303-309.
- Flechtmann, C.A.H., S.R. Rodrigues & C.L. Gaspareto, 1995a. Controle biológico da mosca-dos-chifres (*Haematobia irritans irritans*) em Selvíria, Mato Grosso do Sul. 5. Seleção de besouros coprófagos. *Revista Brasileira de Entomologia*, 39: 277-286.
- Flechtmann, C.A.H., S.R. Rodrigues & H.T.Z. Couto, 1995b. Controle biológico da mosca-dos-chifres (*Haematobia irritans irritans*) em Selvíria, Mato Grosso do Sul. 4. Comparação entre métodos de coleta de besouros coprófagos (Scarabaeidae). *Revista Brasileira de Entomologia*, 39: 259-276.
- Flechtmann, C.A.H., S.R. Rodrigues & M.C.Z. Seno, 1995c. Controle biológico da mosca-dos-chifres (*Haematobia irritans irritans*) em Selvíria, Mato Grosso do Sul. 3. Levantamento de espécies fimícolas associadas à mosca. *Revista Brasileira de Entomologia*, 39: 249-258.
- Galante, E., Z. Stebnicka & J.R. Verdú, 2003. The Aphodiinae and Rhyparinae (Coleoptera: Scarabaeidae) in southern states of Mexico (Chiapas, Oaxaca, Puebla and Veracruz). *Acta Zoologica Cracoviensia*, 46: 283-312.
- Gordon, R.D. & P. Skelley, 2007. A monograph of the Aphodiini inhabiting the United States and Canada. *Memoirs of the American Entomological Institute*, 79: 1-580.
- Halffter, G. & E.G. Matthews, 1966. The natural history of dung beetles of the subfamily Scarabaeinae (Coleoptera: Scarabaeidae). *Folia Entomológica Mexicana*, 12/14: 1-312.
- Hanski, I. & Y. Cambefort, 1991. Competition in dung beetles, p. 305-329. *In*: Hanski, I. & Y. Cambefort (Eds.). *Dung beetle ecology*. Princeton, Princeton University Press, 482p.
- Hanski, I., 1991. North temperate dung beetles, p. 75-96. *In*: Hanski, I. & Y. Cambefort (Eds.). *Dung beetle ecology*. Princeton, Princeton University Press, 482p.
- Haynes, R.J. & P.H. Williams, 1993. Nutrient cycling and soil fertility in the grazed pasture ecosystem. *Advances in Agronomy*, 49: 119-199.
- Koller, W.W., A. Gomes, S.R. Rodrigues & P.F.I. Goiozo, 2007. Scarabaeidae e Aphodiidae coprófagos em pastagens cultivadas em área do cerrado sul-mato-grossense. *Revista Brasileira de Zootecias*, 9: 81-93.
- Koller, W.W., A. Gomes, S.R. Rodrigues & R.G.O. Alves, 1999. Besouros coprófagos (Coleoptera: Scarabaeidae) coletados em Campo Grande, MS, Brasil. *Anais da Sociedade Entomológica do Brasil*, 28: 403-412.
- Lobo, J.M., 2000. Species diversity and composition of dung beetle (Coleoptera: Scarabaeoidea) assemblages in North America. *The Canadian Entomologist*, 132: 307-321.
- Medri, I.M. & J. Lopes, 2001. Scarabaeidae (Coleoptera) do Parque Estadual Mata dos Godoy e de área de pastagem, no norte do Paraná, Brasil. *Revista Brasileira de Zoologia*, 18: 135-141.
- Morrone, J.J., 2006. Biogeographic areas and transition zones of Latin America and the Caribbean Islands based on panbiogeographic and cladistic analyses of the entomofauna. *Annual Review of Entomology*, 51: 467-94.
- Myers, N., R.A. Mittermeier, C.G. Mittermeier, G.A.B. Fonseca & J. Kent, 2000. Biodiversity hotspot for conservation priorities. *Nature*, 403: 853-845.
- Penttilä, A., E.M. Slade, A. Simojoki, T. Riutta, K. Minkkinen & T. Roslin, 2013. Quantifying beetle-mediated effects on gas fluxes from dung pats. *PLoS ONE*, 8: e71454.
- Rakovic, M. & L. Mencl, 2013. A second species of the genus *Trichiopsammobius* Petrovitz, 1963 (Coleoptera: Scarabaeidae: Aphodiinae: Psammodiini: Psammodiina). *Studies and Reports Taxonomical Series*, 9: 517-524.
- Rands, M.R.W., W.N. Adams, L. Bennun, S.H.M. Butchart, A. Clements, D. Coomes, A. Entwistle, I. Hodge, V. Kapos, J.P.W. Scharlemann, W.J. Sutherland & B. Vira, 2010. Biodiversity conservation: challenges beyond 2010. *Science*, 329: 1298-1303.
- Ridsdill-Smith, T.J. & L. Hayles, 1990. Stages of bush fly, *Musca vetustissima* (Diptera: Muscidae), killed by scarabaeine dung beetles (Coleoptera: Scarabaeidae) in unfavourable cattle dung. *Bulletin of Entomological Research*, 80: 473-478.
- Rodrigues, S.R., A.T.M. Barros, A. Puker & T.L. Taira, 2010. Diversidade de besouros coprófagos (Coleoptera, Scarabaeidae) coletados com armadilha de interceptação de voo no Pantanal Sul-Mato-Grossense, Brasil. *Biota Neotropica*, 10: 123-127.

- Rodrigues, S.R., M.A. Uchôa & S. Ide, 2013. Dung beetles (Coleoptera: Scarabaeoidea) in three landscapes in Mato Grosso do Sul, Brazil. *Brazilian Journal of Biology*, 73: 211-220.
- Ronqui, D.C. & J. Lopes, 2006. Composição e diversidade de Scarabaeoidea (Coleoptera) atraídos por armadilha de luz em área rural no norte do Paraná, Brasil. *Iheringia, Série Zoologia*, 96: 103-108.
- Silva, P.G. & J.A. Bogoni, 2014. Dung beetles (Coleoptera: Scarabaeidae: Scarabaeinae) attracted to rotten eggs in the Atlantic Forest in subtropical Southern Brazil. *The Coleopterists Bulletin*, 68: 339-342.
- Silva, P.G. & L.D. Audino, 2011. Escarabeíneos (Coleoptera: Scarabaeidae) atraídos a diferentes iscas em campo nativo de Bagé, Rio Grande do Sul, Brasil. *Revista Brasileira de Zootecias*, 13: 241-247.
- Silva, P.G. & R.A. Di Mare, 2012. Escarabeíneos copro-necrófagos (Coleoptera, Scarabaeidae, Scarabaeinae) de fragmentos de Mata Atlântica em Silveira Martins, Rio Grande do Sul, Brasil. *Iheringia, Série Zoologia*, 102: 197-205.
- Silva, P.G., 2011. Dung beetles (Coleoptera: Scarabaeidae: Scarabaeinae) of two non-native Habitats in Bagé, Rio Grande do Sul, Brazil. *Zoological Studies*, 50: 546-559.
- Silva, P.G., F.C.G. Silva, M.A.R. Garcia, E.B. Coelho & L.A. Martins, 2010. Espécies de Canthonini (Coleoptera: Scarabaeidae: Scarabaeinae) coletadas com armadilhas de queda em campo nativo no município de Bagé, RS. *Revista Congrega URCAMP*, 1: 1-10.
- Silva, P.G., F.Z. Vaz-de-Mello & R.A. Di Mare, 2011. Guia de identificação das espécies de Scarabaeinae (Coleoptera: Scarabaeidae) do município de Santa Maria, Rio Grande do Sul, Brasil. *Biota Neotropica*, 11: 329-345.
- Silva, P.G., F.Z. Vaz-de-Mello & R.A. Di Mare, 2012a. Attractiveness of different bait to the Scarabaeinae (Coleoptera: Scarabaeidae) in forest fragments in extreme southern Brazil. *Zoological Studies*, 51: 429-441.
- Silva, P.G., F.Z. Vaz-de-Mello & R.A. Di Mare, 2013. Diversity and seasonality of Scarabaeinae (Coleoptera: Scarabaeidae) in forest fragments in Santa Maria, Rio Grande do Sul, Brazil. *Anais da Academia Brasileira de Ciências*, 85: 679-697.
- Silva, P.G., L.D. Audino, J.M. Nogueira, L.P. Moraes & F.Z. Vaz-de-Mello, 2012b. Escarabeíneos (Coleoptera: Scarabaeidae: Scarabaeinae) de uma área de campo nativo no bioma Pampa, Rio Grande do Sul, Brasil. *Biota Neotropica*, 12: 246-253.
- Silva, P.G., M.A.R. Garcia & M.B. Vidal, 2008. Besouros copro-necrófagos (Coleoptera: Scarabaeidae *stricto sensu*) coletados em ecótono natural de campo e mata em Bagé, RS. *Ciência e Natura*, 30: 71-91.
- Silva, P.G., M.A.R. Garcia & M.B. Vidal, 2009. Besouros copro-necrófagos (Coleoptera: Scarabaeidae *sensu stricto*) do município de Bagé, RS (bioma Campos Sulinos). *Biociências*, 17: 33-43.
- Simmons, L.W. & T.J. Ridsdill-Smith, 2011. Reproductive competition and its impact on the evolution and ecology of dung beetles, p. 1-20. *In*: Simmons, L.W. & T.J. Ridsdill-Smith (Eds.). *Ecology and evolution of dung beetles*. Oxford, Blackwell Publishing, 368p.
- Skelley, P.E., 2006. A revision of the genus *Geopsammodius* Gordon and Pittino, 1992 (Scarabaeidae: Aphodiinae: Psammodiini). *Insecta Mundi*, 20: 101-112.
- Skelley, P.E., 2007a. Generic limits of the Rhyparini with respect to the genus *Termitodius* Wasmann, 1894 (Coleoptera: Scarabaeidae: Aphodiinae). *Insecta Mundi*, 0009: 1-9.
- Skelley, P.E., 2007b. New South American taxa of Odontolochini Stebnicka and Howden (Coleoptera: Scarabaeidae: Aphodiinae). *Insecta Mundi*, 0022: 1-15.
- Skelley, P.E., M. Dellacasa & G. Dellacasa, 2009. *Gordonius rhinocerillus*, a new genus and species of Colombian Aphodiini (Coleoptera: Scarabaeidae: Aphodiinae). *Insecta Mundi*, 0067: 1-4.
- Skelley, P.E., M. Dellacasa, G. Dellacasa & R.D. Gordon, 2007. Checklist of the Aphodiini of Mexico, Central and South America (Coleoptera: Scarabaeidae: Aphodiinae). *Insecta Mundi*, 14: 1-14.
- Smith, A.B.T. & P.E. Skelley, 2007. A review of the Aphodiinae (Coleoptera: Scarabaeidae) of southern South America. *Zootaxa*, 1458: 1-80.
- Stebnicka Z.T. & P.E. Skelley, 2009b. Taxonomic redefinition of the genera *Parataenius* Balthasar and *Pseudataenius* Brown, with descriptions of three new species (Scarabaeidae: Aphodiinae: Eupariini). *Insecta Mundi*, 0066: 1-18.
- Stebnicka, Z.T. & E. Galante, 2007. New Neotropical taxa, synonymical clarifications and phylogeny of Odontolochini on the world basis (Coleoptera: Scarabaeidae: Aphodiinae). *Acta Zoologica Cracoviensia*, 50: 129-138.
- Stebnicka, Z.T. & P.E. Skelley, 2005. Review of some New World aphodiine genera and descriptions of new species (Coleoptera: Scarabaeidae: Aphodiinae). *Acta Zoologica Cracoviensia*, 48: 23-42.
- Stebnicka, Z.T. & P.E. Skelley, 2009a. A revision of the genus *Haroldiataenius* Chalumeau (Scarabaeidae: Aphodiinae: Eupariini). *Insecta Mundi*, 0062: 1-16.
- Stebnicka, Z.T. & P.K. Lago, 2005. The New World species of *Ataenius* Harold, 1867. V. Revision of the *A. strigatus* group (Scarabaeidae: Aphodiinae: Eupariini). *Insecta Mundi*, 19: 55-83.
- Stebnicka, Z.T., 1998. Lectotype designations, new synonymies and distribution records of the Neotropical Eupariini (Coleoptera: Scarabaeoidea: Aphodiinae). *Acta Zoologica Cracoviensia*, 41: 199-205.
- Stebnicka, Z.T., 1999a. *Lomanoxia* Martínez, 1951, and a new tribe Lomanoxiini with notes on comparative morphology (Coleoptera: Scarabaeoidea: Aphodiinae). *Acta Zoologica Cracoviensia*, 42: 279-286.
- Stebnicka, Z.T., 1999b. Neotropical Eupariini: New and little known genera and species (Coleoptera: Scarabaeoidea: Aphodiinae). *Revue Suisse de Zoologie*, 106: 285-300.
- Stebnicka, Z.T., 2000a. A new genus for Nearctic *Pleurophorus ventralis* Horn, 1887, with phylogenetic inferences (Coleoptera: Scarabaeidae: Aphodiinae: Aphodiini). *Acta Zoologica Cracoviensia*, 43: 287-291.
- Stebnicka, Z.T., 2000b. The genus *Passaliolla* Balthasar, 1845 in Central and South America (Coleoptera: Scarabaeidae: Aphodiinae: Eupariini). *Acta Zoologica Cracoviensia*, 43: 233-239.
- Stebnicka, Z.T., 2001a. A revision of the Neotropical species of *Saprosites* Redtenbacher, 1858 (Insecta: Coleoptera: Scarabaeidae: Aphodiinae: Eupariini). *Entomologische Abhandlungen und Berichte aus dem Staatlichen Museum für Tierkunde in Dresden*, 59: 221-242.
- Stebnicka, Z.T., 2001b. Aphodiinae (Insecta: Coleoptera: Scarabaeidae). *Fauna of New Zealand*, 42: 1-59.
- Stebnicka, Z.T., 2001c. The New World species of *Ataenius* Harold, 1867. I. Revision of the *A. crenator*-group, *A. rugator*-group and *A. perforatus*-group (Coleoptera: Scarabaeidae: Aphodiinae: Eupariini). *Acta Zoologica Cracoviensia*, 44: 253-283.
- Stebnicka, Z.T., 2002a. The New World Eupariini: Revision of the genus *Auperia* Chevrolat, 1864 (= *Phalangochaeta* Martínez, 1952) (Coleoptera: Scarabaeidae: Aphodiinae). *Revue Suisse de Zoologie*, 109: 741-775.
- Stebnicka, Z.T., 2002b. The New World species of *Ataenius* Harold, 1867. II. Revision of the West Indian *A. terminalis*-group (Coleoptera: Scarabaeidae: Aphodiinae: Eupariini). *Acta Zoologica Cracoviensia*, 45: 259-281.
- Stebnicka, Z.T., 2003a. Revision and hypothetical phylogenetic analysis of the species of the New World genus *Ataeniopsis* (Coleoptera: Aphodiinae: Eupariini). *European Journal of Entomology*, 100: 101-113.
- Stebnicka, Z.T., 2003b. The genus *Paraplesiataenius* Chalumeau, with descriptions of two new species from Brazil (Coleoptera: Scarabaeidae: Eupariini). *The Coleopterists Bulletin*, 57: 444-

- 450.
- Stebnicka, Z.T., 2003c. The genus *Saprositellus* Balthasar, with descriptions of three new Neotropical species (Coleoptera: Scarabaeidae: Odontolochini). *The Coleopterists Bulletin*, 57: 451-457.
- Stebnicka, Z.T., 2003d. The New World species of *Ataenius* Harold, 1867. III. Revision of the *A. imbricatus*-group *sensu lato* (Coleoptera: Scarabaeidae: Aphodiinae: Eupariini). *Acta Zoologica Cracoviensia*, 46: 219-249.
- Stebnicka, Z.T., 2004. The New World species of *Ataenius* Harold, 1867. IV. Revision of the *A. strigicauda*-group (Coleoptera: Scarabaeidae: Aphodiinae: Eupariini). *Acta Zoologica Cracoviensia*, 47: 211-228.
- Stebnicka, Z.T., 2005. The New World species of *Ataenius* Harold, 1867. VI. Revision of the *A. aequalis-platensis*-group (Coleoptera: Scarabaeidae: Aphodiinae: Eupariini). *Acta Zoologica Cracoviensia*, 48: 99-138.
- Stebnicka, Z.T., 2006. The New World species of *Ataenius* Harold, 1867. VII. Revision of the *A. complicatus*-group (Scarabaeidae: Aphodiinae: Eupariini). *Acta Zoologica Cracoviensia*, 49: 89-114.
- Stebnicka, Z.T., 2007a. New species of *Iarupea* Martínez and morphological specializations among related taxa associated with ants and termites (Coleoptera: Scarabaeidae: Eupariini). *Revue Suisse de Zoologie*, 114: 573-590.
- Stebnicka, Z.T., 2007b. The genus *Ataenius* Harold, 1867 (Coleoptera: Scarabaeidae) of New World. *Iconography*. Kraków, Institute of Systematics and Evolution of Animals Polish Academy of Sciences, 155p.
- Stebnicka, Z.T., 2007c. The New World species of *Ataenius* Harold, 1867. VIII. Revision of the *A. scutellaris*-group and diagnosis of the *A. texanus-carinator* group with descriptions of new species (Coleoptera: Scarabaeidae: Aphodiinae: Eupariini). *Acta Zoologica Cracoviensia*, 50: 45-81.
- Stebnicka, Z.T., 2008. Revision of the Genus *Setylaides* Stebnicka with Description of a New Species from Thailand (Coleoptera: Scarabaeidae: Aphodiinae: Eupariini). *Annales Zoologici*, 58: 573-577.
- Stebnicka, Z.T., 2009. The tribe Eupariini of New World. *Iconography II*. Kraków, Institute of Systematics and Evolution of Animals Polish Academy of Sciences, 135p.
- Stebnicka, Z.T., 2011. *Aegialiini* and *Eremazini* of the World (Coleoptera: Scarabaeidae). *Iconography*. Kraków, Institute of Systematics and Evolution of Animals Polish Academy of Sciences, 92p.
- Stebnicka, Z.T., M. Dellacasa & P.E. Skelley, 2003. Review of New World *Aegialiini* (Coleoptera: Scarabaeidae: Aphodiinae), with descriptions of two new genera from South America. *Insecta Mundi*, 17: 73-83.
- Viegas, G., C. Stenert, U.H. Schulz & L. Maltchik, 2014. Dung beetle communities as biological indicators of riparian forestwidths in southern Brazil. *Ecological Indicators*, 36: 703-710.
- Whittaker, R.J., M.B. Araújo, P. Jepson, R.J. Ladle, J.E.M. Watson & K.J. Willis, 2005. Conservation Biogeography: assessment and prospect. *Diversity and Distributions*, 11: 3-23.

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