

Passalidae (Coleoptera: Scarabaeoidea) from Ilha Grande (Angra dos Reis, RJ) with new diagnosis and distributional records in Brazil

Ingrid Mattos^{1,2*} and José Ricardo M. Mermudes^{1,2}

1 Universidade Federal do Rio de Janeiro, Departamento de Zoologia, Laboratório de Entomologia, Caixa Postal: 68044. CEP 21941-971. Rio de Janeiro, RJ, Brazil.

2 Programa de Pós-Graduação em Biociências, Universidade do Estado do Rio de Janeiro. Rio de Janeiro, RJ, Brazil.

* Corresponding author, E-mail: ingridmattos@gmail.com

ABSTRACT: A survey of the Passalidae species recorded to the Ilha Grande (Angra dos Reis, Rio de Janeiro, Brazil) is presented, with illustrations for each species and a key with diagnosis for genera. *Passalus* (P.) *denticollis* Kaup, 1869 and *Veturius* (V.) *transversus* Dalman, 1817 was the relative abundance most dominate, representing almost 50% of relative abundance of species in each genus respectively. The study included material collected between January and December of 2008 and it results in 13 species included in four genera and two tribes (Passalini and Proculini). Passalini comprised ten species (*Passalus*, *Spasalus* and *Paxillus*), representing 71.42% of all species. Proculini with three species belong only *Veturius*, representing 28.57%. Among the 13 species, 12 are registered by first time from Ilha Grande. *Veturius* (*Veturius*) *sinuatus* was the unique species with distribution confirmed and *Spasalus cristinae* known only São Paulo had the distribution extended to Rio de Janeiro.

INTRODUCTION

The family Passalidae is assigned to the Scarabaeoid beetles with about 930 species, essentially Pantropical, and over 50% species recorded in the Americas. Passalidae comprises two subfamilies (Passalinae and Aulacocyclinae) and seven tribes (Aulacocyclini Kaup, 1868, Ceracupedini Boucher, 2006; Passalini Leach, 1815; Proculini Kaup, 1868, Solenocyclini Kaup, 1871; Leptaulacini Kaup, 1871; and Macrolinini Kaup, 1871), which are endemic of continental landmass and reflect the history of tectonics since the Jurassic (Fonseca and Reyes-Castillo 2004, Boucher 2006, Bouchard *et al.* 2011).

The species play an important role as primary decomposers related to the volume of nutrients in tropical rainforests, with a possible bioindicators to enumerate priority conservation areas (Schuster 1985, Schuster *et al.* 2000; Fonseca and Reyes-Castillo 2004).

The passalids are morphologically homogeneous group that inhabits decaying trunks, preferably angiosperms, while gymnosperms are rarely colonized, only some species of Aulacocyclinae and Passalinae, especially Proculini (Boucher 2006).

All passalids have subsocial behavior among all members of the colony involving complex acoustic communication among adults and larvae (Reyes-Castillo and Jarman 1980 and 1983, Schuster 1983, Reyes-Castillo and Halffter 1984), highlighting Schuster (1975, 1985), who developed more detailed studies involving sound analysis and behavioral categories.

There are few systematic studies for the family, which that stand out Kaup (1871), Gravely (1918), Luederwaldt (1931) and Reyes-Castillo (1970). Recently, a phylogenetic study published by Boucher (2006) presented an extensive discussion of the systematic and a review of

the terminology to the Neotropical tribe Proculini. On the other hand, the group is little studied in Brazil, which has only one researcher.

The Atlantic Forest biome is one of the richest in endemic species (based on data from vertebrates and plants), which is localized on the east coast of Brazil. This area is a renowned hotspot by its biodiversity, conservation priority, remaining only about 7.5% of its original forest area (Myers *et al.* 2000).

Based on a recent list of species for Brazil (Fonseca and Reyes-Castillo 2004), the fauna of Passalidae in the State of Rio de Janeiro includes 29 species in a unique subfamily (Passalinae) and two tribes (Passalini and Proculini), which represent about 63% of the species occurring in the Atlantic Forest.

The Ilha Grande is in the Environmental Protection Area of Tamoios for preservation of Atlantic Forest, it belongs to municipality of Angra dos Reis, Rio de Janeiro State. This area is subdivided in Ilha Grande State Park, Marine State Park of Adventureiro and Biological Reserve of Praia do Sul. The non-marine invertebrate fauna was listed by Santos *et al.* (2010), and specifically to the Order Coleoptera, by Rodrigues *et al.* (2010) with Cerambycidae fauna and by Corrêa *et al.* (2011) with Elateridae fauna.

Now, our goal is to diagnose the diversity of Passalidae fauna from Ilha Grande through systematics studies with the material obtained in the Atlantic Forest biome. We added a pictorial key, list of species and new data on the geographical distribution of these, resulting in 12 new records for Ilha Grande and new one for the Rio de Janeiro State.

MATERIALS AND METHODS

Seven samples were conducted between January and

December 2008, in the following trails of Vila Dois Rios, 23°11'5" S e 44°11'27" W – (Ilha Grande, Angra dos Reis, RJ): 1) Cavalinho; 2) Caxadaço; 3) Jararaca; 4) Parnaioca; and 5) urban perimeter of the Village. The insects were collect manually through accurate examine of fallen trunks in the trails during the Project Diversity and faunistic analysis of Coleoptera in Atlantic Forest (Angra dos Reis - RJ, Ilha Grande, Vila Dois Rios), coordinated by the junior author. The data collect effort included four people with active search bear knives and tweezers for better investigation of decayed wood.

Material examined is listed for all species. When additional material indicated a new record, this is provided in the item distribution. The study also included additional specimens obtained by other collects or donation of the following localities in Rio de Janeiro State: Cachoeiras de Macacu, Casimiro de Abreu, Itaipu, Itatiaia, Mendes, Muriqui, Piabetá, Rio de Janeiro, Silva Jardim, São Gonçalo and Teresópolis.

Acronyms of institutions mentioned in the text: Museu Nacional, Universidade Federal do Rio de Janeiro (MNRJ); Coleção Entomológica Prof. José Alfredo Pinheiro Dutra, Departamento de Zoologia, Universidade Federal do Rio de Janeiro (DZRJ); Museu de Zoologia da Universidade de São Paulo (MZSP); Coleção Pe. Jesus Santiago Moure, Departamento de Zoologia da Universidade Federal do Paraná, Curitiba (DZUP); Museu de Ciências Naturais da Fundação Zoobotânica do Rio Grande do Sul, Porto Alegre (MCZN); and Museu Anchieta de Ciências Naturais do Colégio Anchieta, Porto Alegre (MAPA).

List of species names is presented in alphabetical order of tribe, genus and species, with original citation and the recent catalogue for the species from Brazil (Fonseca and Reyes-Castillo 2004). The tribe Proculini included citation of recent revision realized by Boucher (2006). The terminology follows Boucher (*op. cit.*) and Mattos and Mermudes, (2013). Illustrations were made with the aid of a Leica MZ 7.5 stereomicroscope fitted with a drawing tube.

RESULTS

Passalinae Leach, 1815

Pictorial Key of Genera of Passalidae from Ilha Grande (Figures 1 and 2)

Passalini Leach, 1815

Passalus Fabricius, 1792

Type species: *Scarabaeus interruptus* Linnaeus, 1758.

Passalus Fabricius, 1792: 240; Fonseca & Reyes-Castillo, 2004: 13 (cat.).

Diagnosis. Lacinia bidentate at apex; hipostomal process elongate and separated from labium; prosternal process rhomboidal; protibiae not wide; meso and metatibiae with apical spines approximately equal in length.

Passalus (Pertinax) Kaup, 1869

Type species: *Passalus convexus* Dalman, 1817.

Passalus (Pertinax) Kaup, 1869: 21; Fonseca & Reyes-

Castillo, 2004: 15 (cat.).

Passalus (Pertinax) convexus Dalman, 1817 (Figure 1)

Passalus (Pertinax) convexus Dalman, 1817: 333; Fonseca & Reyes-Castillo, 2004: 15 (cat.).

Type locality: unknown, probably Rio de Janeiro (Brazil) according to Boucher (1990).

Distribution. Venezuela, Colombia, Ecuador, Peru, Guyana, Surinam, French Guyana Brazil (Amazonas, Amapá, Acre, Pará, Rondônia, Roraima, Bahia, Rio de Janeiro, Minas Gerais, São Paulo, Paraná, Santa Catarina, Rio Grande do Sul), Bolivia and Chile.

A new records assigned in Rio de Janeiro State: Angra dos Reis (Ilha Grande) and Cachoeiras de Macacu.

Material examined. BRAZIL. Amazonas: Benjamin Constant (Rio Javari), 1.viii.1963, Dirings leg. (MZSP). Rio de Janeiro: Angra dos Reis (Ilha Grande, Vila Dois Rios, Trilha do Cavalinho) 3, 12.x.2008, Proj. Coleoptera leg., (Trilha da Jararaca) 1, 12.xii.2008, Proj. Coleoptera leg.; Cachoeiras de Macacu (REGUA, Reserva Ecológica de Guapiaçu, Trilha da Schincariol) 1, 14.v.2011, Mermudes *et al.* leg., fallen trunk "D" (DZRJ).

Passalus (Passalus) Fabricius, 1792

Type species: *Scarabaeus interruptus* Linnaeus, 1758.

Passalus Fabricius, 1792: 240; *Passalus (Passalus)* Fonseca & Reyes-Castillo, 2004: 13 (cat.).

Section Phoroneus Luederwaldt, 1931: 129; Fonseca & Reyes-Castillo, 2004: 17 (cat.).

Passalus (Passalus) denticollis (Kaup, 1869) (Figure 2)

Phoroneus denticollis Kaup, 1869:11; Luederwaldt 1931:125

Passalus alius Kuwert, 1891:191; Luederwaldt, 1931:138; Fonseca & Reyes-Castillo, 2004:17 (cat.); Boucher, 2004: 109 (syn.)

Passalus (Mitrorhinus) denticollis; Fonseca & Reyes-Castillo 2004:17 (cat.)

Passalus (Phoroneus) denticollis; Boucher, 2004: 109.

Type locality: Brazil.

Distribution. Brazil: Bahia, Minas Gerais, Rio de Janeiro, São Paulo, Santa Catarina and Rio Grande do Sul. The new record includes Angra dos Reis (Ilha Grande), Cachoeiras de Macacu and Mendes in Rio de Janeiro State.

Type Material, examined. Holotype, Brésil, Kaup / collection Mniszech / ex. *Musaeo* Van Lansberge / ex. Coll. R. Oberthür (MNH).

Material examined. BRAZIL. Rio de Janeiro: Angra dos Reis (Ilha Grande, Vila Dois Rios, Trilha da Parnaioca) 1, 18.v.2008, 1, 25.i.2008, 1, 26.i.2008, 6, 19.vii.2008, (Trilha do Cavalinho) 6, 12.x.2008, (Trilha do Caxadaço), 1, 20.vii.2008, 1, 13.xii. 2008, 1, 20.vii.2009; (urban perimeter) 1, 12.xii.2008, 1, 26.x.2009, Proj. Coleoptera leg., (Trilha do Leste, Praia da Parnaioca) 2, 7.ii.2012, Mermudes *et al. col.*, (Trilha da cachoeira da Parnaioca, Praia da Parnaioca) 9, 8.ii.2012, Mermudes *et l.* leg.; Cachoeiras de Macacu (REGUA, Reserva Ecológica de Guapiaçu) 1, 23.v.2010, Mermudes & Mattos col., (Trilha amarela) 4, 14.v.2011, Mermudes & Mattos col., (Trilha da Cerca), 1, 23.v.2010, Mermudes & Mattos col., (Trilha da Schincariol) 1, 14.v.2011, Mermudes & Mattos col., (Trilha

São José) 2, 10.xi.2012, Mermudes *et al.* col.; Itatiaia, (Parque Nacional do Itatiaia) 3, 2.xii.2012, Mermudes *et al.* col., (Trilha dos Três Picos) 1, 30.xi.2012, Mermudes *et al.* col., (Trilha Rui Braga) 2, 18.vii.2012, Mermudes *et al.* col.; Mendes (Centro Marista São José das Paineiras) 1, 5–8.v.2010, Nessimian, Takiya *et al.* col.; Petrópolis, (Parque Nacional da Serra dos Órgãos, Trilha dos Poços das Bromélias e Paraíso) 3, 24.xi.2012, Mermudes & Mattos col. (DZRJ). São Paulo, Ubatuba, (PESM, Núcleo Picinguaba) 1, 5.v.2011, Mermudes *et al.* col. (DZRJ).

Passalus (Passalus) ferenudus (Kuwert, 1898) (Figure 3)
Vatinius ferenudus Kuwert, 1898: 204. *Passalus (Passalus) ferenudus*, Luederwaldt, 1931:168; Fonseca & Reyes-Castillo 2004:17 (cat.).

Type locality: Brazil.

Distribution. Mexico, Suriname, Guyana, Brazil (Pará, Espírito Santo, Bahia, Rio de Janeiro, Minas Gerais, São Paulo, Santa Catarina) and Paraguay (Luederwaldt 1931; Fonseca & Reyes-Castillo 2004).

The distribution is assigned in Rio de Janeiro State from Angra dos Reis (Ilha Grande) and São Gonçalo.

Type Material examined. Brasil / *passalus ferenudus* Brasil/ Type/ Ex Coll Kuwert 1894 (MNHN).

Material examined. BRAZIL. Pará: 4 cotypes, 1922, Lima leg. (MZSP). Rio de Janeiro: Angra dos Reis (Ilha Grande, Vila Dois Rios, Trilha do Caxadaço) 6, 19.vii.2008, Proj. Coleoptera leg., 2, 08.vii.2007, Exp. Zool. leg. (1, c. w. t.), (Abrão) 1, viii.2002, Ferreira-Neto col. (light trap); São Gonçalo, 2, viii.2008; 1, 07.VIII.2008, C. Portela leg.; Itatiaia, (Parque Nacional do Itatiaia, Estrada para Agulhas Negras, 22°26'3,3" S, 44°36'25,3" W, 2091m), 1, 20.vii.2012, Mermudes *et al.* col.; Petrópolis, (PARNASO, Trilha dos Poços das Bromélias e Paraíso, 22°27,8'8,9" S, 43°5,3'7,7" W, 1062m) 2, 24.xi.2012, Mermudes *et al.* col. (DZRJ).

Passalus (Passalus) occipitalis Eschscholtz, 1829 (Figure 4)

Passalus occipitalis Eschscholtz, 1829: 21; Fonseca & Reyes-Castillo, 2004: 17 (cat.).

Type locality: Rio de Janeiro (Brazil).

Distribution. Venezuela, Equator, Brazil (Goiás, Minas Gerais, Rio de Janeiro, São Paulo, Santa Catarina e Rio Grande do Sul) and Paraguay.

The new records include Angra dos Reis (Ilha Grande) and Itatiaia in Rio de Janeiro State, additionally Minas Gerais State with Lambari and Caxambu municipalities.

Material examined. BRAZIL. Minas Gerais: Lambari, 1, vii. 1916, Azevedo Marques leg.; Caxambu, 1, iii.1915, Carlos Moreira leg. (MNRJ). Rio de Janeiro: Angra dos Reis (Ilha Grande, Vila Dois Rios) 1, 12.x.2008, Proj. Coleoptera leg. (light trap), (Trilha da Parnaioca) 1, 12.xi.2009, PPGB leg. (DZRJ); Itatiaia, 1, xii.1933, R & Cunha leg. (MNRJ).

Passalus (Passalus) quadricollis Eschscholtz, 1829 (Figure 5)

Passalus quadricollis Eschscholtz, 1829: 21

Passalus (Passalus) quadricollis; Fonseca & Reyes-Castillo 2004:18 (cat.).

Type locality: Rio de Janeiro (Brazil).

Distribution. Brazil: Amazonas, Minas Gerais, Rio de

Janeiro, São Paulo, Santa Catarina and Rio Grande do Sul.

Material examined. BRAZIL. Rio de Janeiro: Angra dos Reis (Ilha Grande, Vila Dois Rios, Trilha da Parnaioca) 1, 18.v.2008 Proj. Coleoptera Col. (c.w.t.), (Parque Nacional da Bocaina, Trilha do Ouro, S22°56'13,2" S, 44°36'49,9" W, 114m), 1, 2.ii.2013, Mermudes & Mattos col.; Itatiaia (Parque Nacional do Itatiaia, Trilha Rui Braga, S 22° 27'21,4" S, 44°36'27,2" W, 1223 m.), 2, 18.vii.2012, (Trilha dos Três Picos, S 22°26'18,9" S, 44°36,7'6,8" W, 1035 m) 1, 30.xi.2012 Mermudes *et al.* col.; Mendes, (Centro Marista, São José das Paineiras), 1, 15–18.v.2013, Silveira col.; Petrópolis, (Parque Nacional da Serra dos Órgãos, Trilha dos Poços das Bromélias e Paraíso) 3, 24.xi.2012, Mermudes *et al.* col.; Teresópolis, Alto, 1, 12.xii.2010, Silveira col. (DZRJ).

Passalus (Passalus) toriferus Eschscholtz, 1829 (Figure 6)

Passalus toriferus Eschscholtz, 1829: 17; Fonseca & Reyes-Castillo, 2004: 18 (cat.).

Type locality: Rio de Janeiro (Brazil).

Distribution. Brazil (Espírito Santo, Minas Gerais, Rio de Janeiro (Itatiaia), São Paulo, Santa Catarina and Rio Grande do Sul) and Argentina (Yucatán). New records are assigned to the States: Amazonas (Manaus), Paraná (Curitiba), São Paulo (Rio Claro), and Rio de Janeiro (Angra dos Reis, Ilha Grande).

Material examined. BRAZIL. Amazonas: Manaus, 1, 17.xi.1962, J. Bechyné leg. (MZSP). Espírito Santo: Córrego Ita, 2, x.1954, W. Zikan leg. (MZSP). Linhares, 1, 19.x.1967, Exp. Dep. Zoo. leg. (MZSP). Rio de Janeiro: Angra dos Reis (Ilha Grande, Vila Dois Rios, Trilha da Parnaioca) 1, 15.iii.2008, 1, 16.iii.2008, 1, 18.v.2008, Proj. Coleoptera leg. (DZRJ). São Paulo: Rio Claro, 2, i.1941, 1, vi.1940, Claretiano leg. (MZSP); São Paulo (Água Funda – Instituto Botânico) 3, 3.ix.1974, Exp. MZUSP leg. (MZSP). Paraná: Curitiba, 1, 8.iii. 1940, Claretiano leg. (MZSP). Rio Grande do Sul: 1, ix.[19]26, 2, i.[19]28, Buchi leg.; Marata, 2, i.[19]29, Buchi leg. (MZSP).

Section Neleus Luederwaldt, 1931: 168

Passalus (Passalus) coniferus Eschscholtz, 1829 (Figure 7)

Passalus coniferus Eschscholtz, 1829: 16; Fonseca & Reyes-Castillo, 2004: 19 (cat.).

Type locality: Rio de Janeiro (Brazil).

Distribution. (Hincks & Dibb, 1935; Luederwaldt, 1931; Fonseca & Reyes-Castillo 2004): West Indies (S. Domingo, Haiti), Peru, Ecuador, Bolivia and Brazil (Amazonas, Rondônia, Roraima, Pará, Goiás, Rio de Janeiro, São Paulo, Minas Gerais, Paraná, Santa Catarina and Rio Grande do Sul). Based on material examined, the occurrence in Rio de Janeiro State is assigned by first time in Angra dos Reis (Ilha Grande), Casimiro de Abreu and Mendes.

Material Examined. BRAZIL. Pará: 2, 1922, Lima leg. (MNRJ). Goiás: Goiânia (Campinas) 1, viii.27. P. Forster (MZSP), Rio de Janeiro: Angra dos Reis (Ilha Grande, Vila Dois Rios, Trilha da Jararaca) 2, 17.v.2008, (Trilha da Parnaioca) 1, 19.v.2008, Proj. Coleoptera leg.; Casimiro de Abreu (Reserva Biológica União, Trilha das 3 Pontes)

1, 10–13.vi.2011, Mermudes, Mattos, Rodrigues & Queiroz leg.; Mendes (Centro Marista, São José das Paineiras) 1, 27.iv-01.v.2011, Santos leg. (DZRJ); Teresópolis, 1,1921, v. M.R. Brito leg. (MZSP). Minas Gerais: Pouso Alegre, 2, 1905, Pimenta leg., (MZSP). São Paulo: Jundiá, 2, 1899, M. Bison leg. (MZSP); São Paulo (Bosque Saúde) 8, xi.20.1880, J. Melzer (MZSP). Rio Grande do Sul: iii.1915, without leg. (MZSP).

Passalus (*Passalus*) *punctiger* Lepelletier & Serville, 1825 (Figure 8)

Passalus punctiger Lepelletier & Serville, 1825: 20; Fonseca & Reyes-Castillo, 2004: 20 (cat.).

Type locality: Cayenne (French Guiana).

Distribution. Mexico, Guatemala, Trinidad, Venezuela, Colombia, Guyana, French Guiana, Peru, Brazil (Amazonas, Rondônia, Pará, Amapá, Pernambuco, Goiás, Minas Gerais, Rio de Janeiro, São Paulo, Paraná, Santa Catarina and Rio Grande do Sul), and Paraguay. The distribution in Rio de Janeiro State is extended to Angra dos Reis (Ilha Grande).

Material Examined. BRAZIL, Amazonas: Itacoatiara, 1, ii.1958, Dirings leg. (MZSP), São Gabriel (Rio Negro), 17.viii.1927, J.F.Zikán leg. (MNRJ). Rio de Janeiro: Angra dos Reis (Ilha Grande, Vila Dois Rios) 1, 12.x.2008, (Trilha do Caxadaço) 1, 05.IX.2008, Proj. Coleoptera leg.; Silva Jardim (Bananeiras), 1, 13.x.2007, R. Absalão leg. (DZRJ). São Paulo: Angatuba, iii.1921, Azevedo Marques leg. (MNRJ). Minas Gerais: Passa Quatro, ii.1915, without leg. (MNRJ). Rio grande do Sul: Gloria 6, xi.27; 5, iii.28 Buck. leg.; Nova Petrópolis, 10, i.28; S. Francisco de Paula, 1, xii.23, Buchi. leg. (MZSP).

Paxillus MacLeay, 1819

Paxillus MacLeay, 1819: 105; Fonseca & Reyes-Castillo, 2004: 12 (cat.); Mattos & Mermudes, 2013: 328.

Type species. *Paxillus leachi* MacLeay, 1819, subsequently designated by Gravely (1918: 48).

Paxillus leachi MacLeay, 1819 were recently redescribed by Mattos & Mermudes (2013), which assigned Angra dos Reis (Ilha Grande) in Rio de Janeiro based on material collected in Vila Dois Rios. This species has a wide distribution, occurring from Mexico to Argentina.

Spasalus Kaup, 1869

Spasalus Kaup, 1869: 27; Fonseca & Reyes-Castillo, 2004:13 (cat.).

Type species: *Paxillus crenatus* MacLeay, 1819 posteriorly designed by Hincks & Dibb, 1935:34.

Diagnosis. Passalini with short length, maximum length = 30 mm. Frontal area punctate; central tubercle with weak central ridge. Mandibles tridentate at apex. Lacinia unidentate. Prosternal process rhomboidal, after the procoxae (never pentagonal), moderately wide, strongly convergent at sides to apex; this narrow from rounded to truncated. Profemora with a marginal groove on the ventral face, near the anterior margin. Disk of metasternum only marked posteriorly.

Spasalus cristinae Santos-Silva, 2000 (Figure 9)

Spasalus cristinae Santos-Silva, 2000: 111; Fonseca & Reyes-Castillo, 2004:13 (cat.).

Type locality: Cubatão, São Paulo State (Brazil).

Distribution. Brazil: São Paulo and Rio de Janeiro (present paper). The new localities assigned include (Ilha Grande and Casimiro de Abreu).

Type material examined: Brasil, São Paulo: HOLOTYPE, male, Cubatão, 12.VII.1998, A Santos-Silva col. (MZSP).

Material examined. BRAZIL, Rio de Janeiro: Angra dos Reis: (Ilha Grande, Vila Dois Rios, Trilha do Caxadaço) 3, 16.iii.2008, Proj. Coleoptera leg.; 1, 25.vii.2009, Exp. zoo. leg.; Casimiro de Abreu (Reserva Biológica União, Trilha das três Pontes, S 22° 24' 37,2" W 42° 01' 59,4") 10–13.vi.2011, Mermudes *et al* leg., fallen trunk "C", (DZRJ). Teresópolis (Paque Nacional da Serra dos Órgãos, PARNASO, Trilha do Sino, S22°27'4,8" W43°00'8,7" W, 1141 m) 1, 23.ix.2011, Mermudes & Mattos leg. (DZRJ).

Spasalus robustus (Percheron, 1835) (Figure 10)

Spasalus robustus Percheron 1835: 35. *Spasalus robustus*: Fonseca & Reyes-Castillo, 2004:13 (cat.).

Type locality: unknown, Percheron (1835: 36) said he cannot say for sure, but cited as part Chevrolat's collection.

Distribution. Brazil (Goiás, Bahia, Espírito Santo, Rio de Janeiro, São Paulo, Paraná Santa Catarina, Rio Grande do Sul), Paraguay and Argentina. The new distributional records assigned herein including Angra dos Reis (Ilha Grande), Cachoeiras de Macacu, Casimiro de Abreu, Itatiaia and Niterói in the Rio de Janeiro State.

Material examined. FRENCH GUIANA. 3 without others data (MNHN). BRAZIL. Espírito Santo: Santa Tereza, 2, vii.1964, Elias leg. (DZUP). Minas Gerais: Araxá, 3, 7.x.[19]68, Elias col. (DZUP); Ibiá, 1, 11.x. 1965, Elias leg. (DZUP); Patrocínio, 1, 5.x.1965, Elias leg. (DZUP). Rio de Janeiro: Angra dos Reis (Ilha Grande, Vila Dois Rios, Trilha da Jararaca), 1, 17.v.2008; 1, 12.xii.2008, (Trilha da Parnaioca) 1, 13.xii.2008, 1, 12.x.2008, Proj. Coleoptera leg. (DZRJ), Parnaioca 4, 7–11.ii.2011, Mermudes & Mattos leg. (DZRJ), (Trilha do Caxadaço) 3, 25.vii.2009, Exp. Zoo. leg. (DZRJ); Cachoeiras de Macacu (Reserva Ecológica de Guapiaçu, Trilha da Pedra D'água), 2, 22.v.2010, Mattos, I leg. (DZRJ); 1, 20–23.v.2011, Mermudes *et al* leg. (DZRJ); Casimiro de Abreu (Reserva Biológica União, trilha das três pontes) 1, 10.vi.2011, Mermudes *et al* leg., fallen trunk "A" (DZRJ); Itatiaia (Serrinha) 1, 26.xii.1996, T. Gibertone leg. (DZRJ); Niterói (Itaipu, Parque Estadual da Serra Tiririca) 5, 28.xi.2009, Pimenta A.L. leg. (DZRJ); Rio de Janeiro (Floresta da Tijuca) 1, 28.vi.1968, Moura & Seabra leg. (DZUP), 1, vii.1957, M. Alvarenga leg. (DZUP), (Jardim Botânico) 1, 21.xi.1982, R.C. Vasconcellos leg. (DZRJ), (Morro da Urca) 1, 25.viii.1970, P. Sérgio leg. (DZRJ), (Represa Rio Grande) 1, 30.iv.1967, Oliveira col. (DZUP). São Paulo: Ubatuba (PESM, Núcleo Picinguaba) 2, 26–30.v.2011, 3, 1–5.vi.2011, 3, xi.2011, Mermudes *et al* leg. (DZRJ), São Bernardo, 7, vi.[19]28, R. Spitz leg., Coll. R. Spitz (MCNZ). Paraná: Ponta Grossa, 2, xii.[19]56, ex-collection Justus (DZUP).

Tribe Proculini Kaup, 1868

Veturius Kaup, 1871

Veturius Kaup, 1871:110; Boucher, 2006: 393

Type species: *Passalus heydeni* Kaup, 1868 posteriorly designed by Gravely, 1918.

Veturius (Veturius) Kaup, 1871

Veturius (Veturius) Kaup, 1871:110; Boucher 2006: 396.

Diagnosis. Lateral posterior tubercles elongated, directed forward. Pronotum with anterior margin distinctly bilobated. Pubescence infra pronotal and legs very distinct. Anterior and lateral marginal groove of pronotum marked.

The genus *Veturius* was recently studied by Boucher (2006). Three species were found on the Ilha Grande, two of which are recorded by first time.

Group cephalotes (*sensu* Boucher, 2006)***Veturius (Veturius) sinuatus* (Eschscholtz, 1829)**

(Figure 11)

Passalus sinuatus Eschscholtz, 1829: 455; *Veturius (Veturius) sinuatus*: Boucher, 2006: 455.

Type locality: Rio de Janeiro (Brazil).

Distribution. BRAZIL: Mato Grosso, Mato Grosso do Sul, Bahia, Goiás, Espírito Santo, Minas Gerais, Rio de Janeiro (included Ilha Grande), São Paulo (included Ilha de São Sebastião), Paraná, Santa Catarina, Rio Grande do Sul. Guiana, Suriname, Paraguay and Argentina (Boucher, 2006). The distribution to Ilha Grande was confirmed, and extends to Piabetá and Cachoeiras de Macacu in Rio de Janeiro State.

Type material: Neotype of Brazil, Rio de Janeiro, Distrito of São Fidélis, designed by Boucher (2006: 455) and deposited in MZUM (not examined).

Material Examined. BRAZIL. Rio de Janeiro: Angra dos Reis (Ilha Grande, Vila Dois Rios, Trilha do Caxadaço) 1, 16.iii.2008; 2, 17.v.2008; 2, 19.vii.2008; 2, 25.vii.2009, (Trilha da Parnaioca) 2, 26.i.2008; 3, 18.v.2008; 1, 18.vii.2008; 2, 19.vii.2008; 1, 13.xii.2008, Proj. Coleoptera leg., (Praia da Parnaioca) 1, 7–11.ii.2011, Mermudes & Mattos leg. (DZRJ); Piabetá, 1, 19.i.2008, Mourão, J. leg. (DZRJ); Cachoeiras de Macacu, (Reserva Ecológica de Guapiaçu, REGUA, Trilha da Cerca) 1, 23.v.2010, Mattos & Mermudes leg; Itatiaia, 1, 25–29.xi.2010, Mermudes leg., 1, 1–4.x.2009, Mermudes leg. Teresópolis, Alto, 1, 12.xii.2010. Silveira leg. São Paulo: Ubatuba (Picinguaba), 1, xi.2010, Mattos leg., 1, 3–7.xi.2010. Mattos & Mermudes leg. (DZRJ).

Group transversus (*sensu* Boucher, 2006)***Veturius (Veturius) simillimus* Kuwert, 1891 (Figure 12)**

Veturius simillimus Kuwert, 1891:173; *Veturius (Veturius) simillimus*: Boucher, 2006: 493

Type locality. Boucher (2006: 494) designed Lectotype from Bahia (Brazil), which was cited by Kuwert (1898).

Distribution. Species endemic to Brazil, restricted to the Atlantic Rainforest, in Minas Gerais, Espírito Santo, Rio de Janeiro, São Paulo, Paraná, Santa Catarina (Boucher 2006). We confirmed this species also to Rio de Janeiro State, now assigning Angra dos Reis (Ilha Grande), Casimiro de Abreu (Rebio União) and Cachoeiras de Macacu (REGUA).

Material Examined. BRAZIL. Rio de Janeiro: Angra dos Reis (Ilha Grande, Vila Dois Rios, Trilha do Cavalinho) 2, 12.x.2008; 2, 13.xii.2008, (Trilha da Parnaioca) 1, 12.vii.2008, 1, 18.vii.2008 (det. Boucher 2013), 1,

13.xii.2008, Proj. Coleoptera leg.; (Praia da Parnaioca, Trilha T16, 23°11'16,7" S, 44°15'4,3" W, 120 m) 2, 9.ii.2012, Mermudes *et al.* col.; (Trilha do leste, 23°115,3" S, 44°1548,4" W, 75 m) 2, 7.ii.2012, Mermudes *et al.* col. (DZRJ); Rio de Janeiro (Morro da Urca) 2, 7.xii.2009, Corelli, A. leg. (DZRJ), (Estrada das Paineiras) 1, 17.xi.1996, A.D. Pimenta leg. (DZRJ); Itatiaia, ((Marimbondo, Vale das Cruzes, 22°20'19,8" S, 44°35'20,4" W, 1249 m) 1, 28.i.2012, Mermudes & Mattos col.; Magé, (Citrolândia, Campo escoteiro), 2, 3.v.2008, wihtout leg., 1, 3.v.2008, T. Toste leg.; Mendes, (Centro Marista, São José das Paineiras, 13-19.iv.2009, dePaula leg.; Teresópolis, (PARNASO), 21-23.iii.2012, Mermudes & Mattos col. São Paulo: Ubatuba, (PESM, Núcleo Picinguaba), 1, 26-30.x.2011, Mermudes col.; 1, 26-30.v.2011, Mermudes *et al.* col. (DZRJ).

***Veturius (Veturius) transversus* (Dalman, 1817)**

(Figure 13)

Passalus transversus Dalman, 1817: 143.

Veturius (Veturius) transversus; Boucher 2006: 480.

Type locality: Rio de Janeiro.

Distribution. Boucher (2006) cited Brazil (Pernambuco, Bahia, Goiás, Minas Gerais, Espírito Santo, Rio de Janeiro, São Paulo, Paraná, Santa Catarina, Rio Grande do Sul), Paraguay and Argentina. This species has distribution confirmed in Rio de Janeiro State, from Angra dos Reis (Ilha Grande).

Type Material. Deposited in NHRS, not examined.

Material Examined. BRAZIL. Bahia: Lençóis (*F. Cordeiro*, 400m), 1, i.1993, without leg. (MZSP). Rio de Janeiro: Angra dos Reis (Ilha Grande, Vila Dois Rios, Trilha do Caxadaço) 1, 7. ix.2008, 2, 19.vii.2008, 1, 19.vii.2008, 15, 20.vii.2008, Proj. Coleoptera leg (1 det Boucher 2013); Cachoeiras de Macacu, (REGUA, Trilha Verde, 22°24'16,8" S, 42°44'6,4" W, 306 m), 1, 11.xi.2012, (Trilha Verde 22°24'28" S, 42°44'13,9" W, 310 m), 1, 11.xi.2012, Mermudes *et al.* col; Casimiro de Abreu (ReBio União, Trilha do Cardoso), 1, 10–13.vi.2011, Mermudes, Mattos, Rodrigues & Queiroz col. (DZRJ); Itatiaia, 1, I.1967, Dirings leg. (MZSP), (Parque Nacional do Itatiaia, 750 m) 11–14.i.2008, Monné, ML, Mermudes, Monné, HL, Monné MA col., (Trilha dos Três Picos, 22°26'47" S, 44°36,8'7,7" W, 1050 m) 1, 2.xii.2012, Mermudes *et al.* col. (DZRJ). São Paulo: Garça (680 m) 2, i.1950 (MZSP); São Vicente, 1, x.1949 (MZSP).

DISCUSSION

Thirty-six species are assigned in the Atlantic Forest from Rio de Janeiro State (Table 1), of which 71.42% belong to *Passalus*, 17.14% *Veturius*, and the remaining 11.44% belong to the genera *Popilius*, *Paxillus* and *Spasalus* according to Fonseca & Reyes-Castillo (2004) and Boucher (2006). Thirteen species were recognized in inventory of Passalidae Fauna from Ilha Grande, included in four genera, two tribes, and a subfamily, which represent about 40% of the species occurring in Rio de Janeiro State. *Spasalus cristinae* Santos-Silva, 2000 known only from São Paulo has the distributional record extend to Rio de Janeiro State.

The genus *Popilius* Kaup, 1871, with a single species from southeast (*Popilius refugicornis* Bührnheim, 1962) was not found, it is known for the states of Espírito Santo,

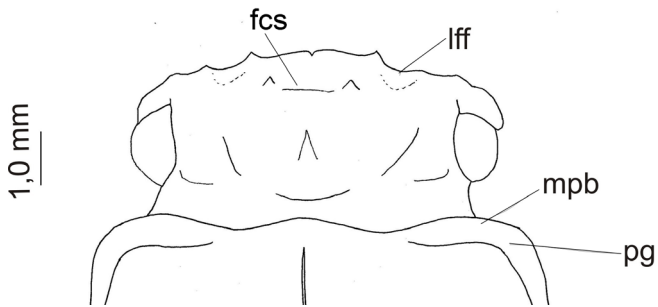
Rio de Janeiro and São Paulo (Fonseca & Reyes-Castillo 2004). *Passalus* was the most diverse genus in Ilha Grande with seven species, in agreement with the diversity of this genus on the entire Atlantic Forest of Rio de Janeiro, about 25 species (Fonseca & Reyes-Castillo 2004).

Veturius (Veturius) sinuatus (Eschscholtz, 1829) was confirmed in Ilha Grande and 12 species are assigned

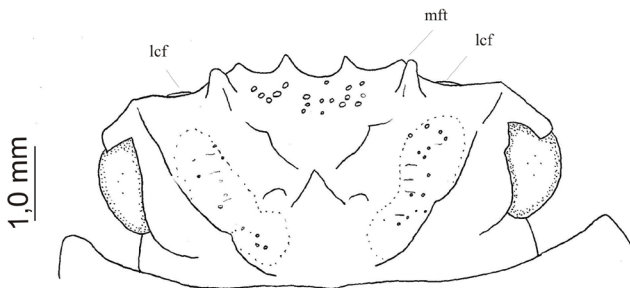
as new records. Passalini with 10 species and three genera (*Passalus* Fabricius, 1792, *Paxillus* MacLeay, 1819 and *Spasalus* Kaup, 1869) represented 71.42% of total species from Ilha Grande, being the richest tribe in number of species. Proculini with one genus (*Veturius* Kaup, 1871) and three species represented 28.57% of total.

PICTORICAL KEY OF GENERA OF PASSALIDAE FROM ILHA GRA

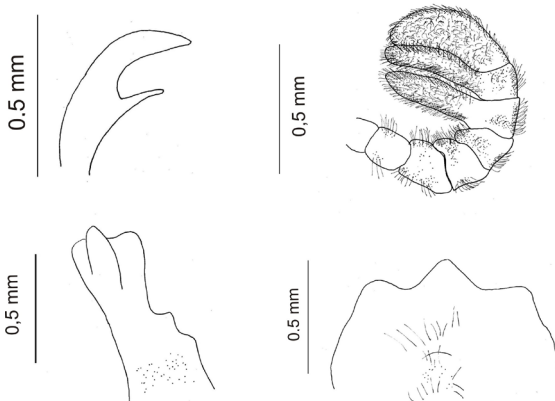
1a. Clypeus visible dorsally, separated the frontal area by frontal clypeal suture (fcs), often vestigial, without lateral clipeal fossae. Neotropical. Tribe Proculini Kaup 1868. Anterior margin of pronotun bilobed (mpb), pronotal groove deep and wide to the sides (pg), left mandible with internal teeth bifid, lateral frontal fossae (lff). *Veturius (Veturius)* Kaup.



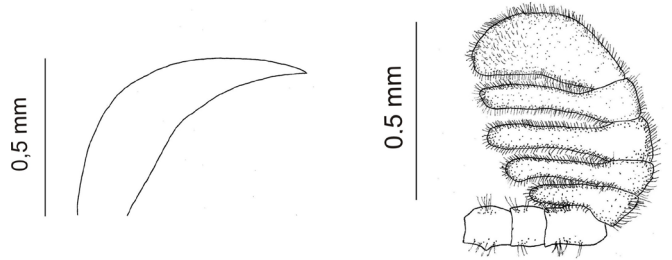
1b. Clypeus hidden below the frontal area, never visible dorsally, with lateral clypeal fossae (lcf) sharp, located on each side of the medial frontal tubercles (mft). Pantropical. Tribe Passalini Reyes-Castillo 1970. 2



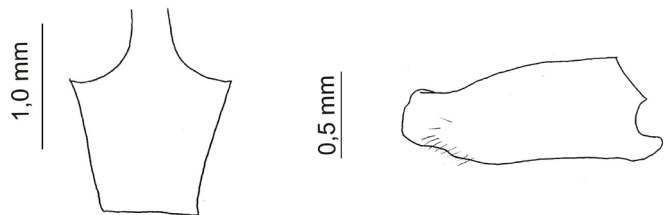
2a. Maxilla with lacinia bidentate in apical third. Antennae with three lamellae in club, often four or five. Mandibles tridentate at the apex. Apex da ligule tridentate. (Mexico, Central America, South America and West Indies). *Passalus* Fabricius.



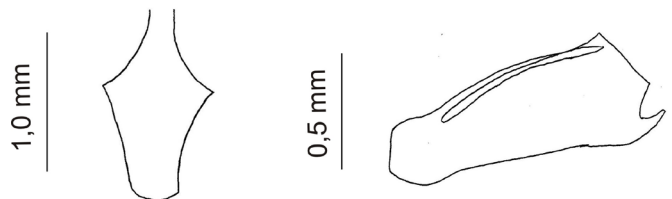
2b. Maxilla with lacinia unidentate in apical third. Antennae always with five lamellae in club. 3

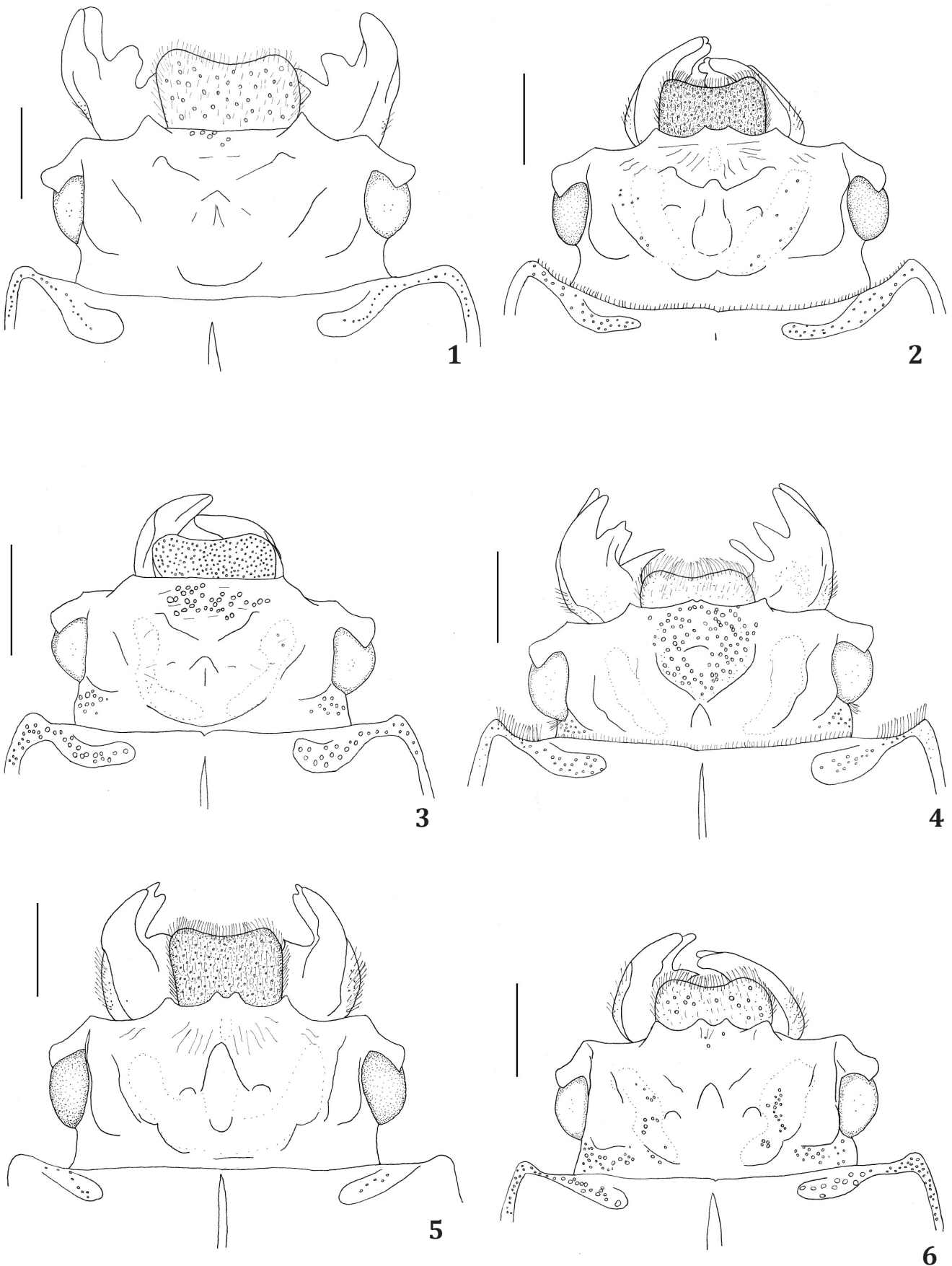


3a. Prosternal process pentagonal with posterior apex wide. Profemur without marginal groove in anterior margin in ventral view. (Mexico, Central America, West Indies and South America). *Paxillus* MacLeay.

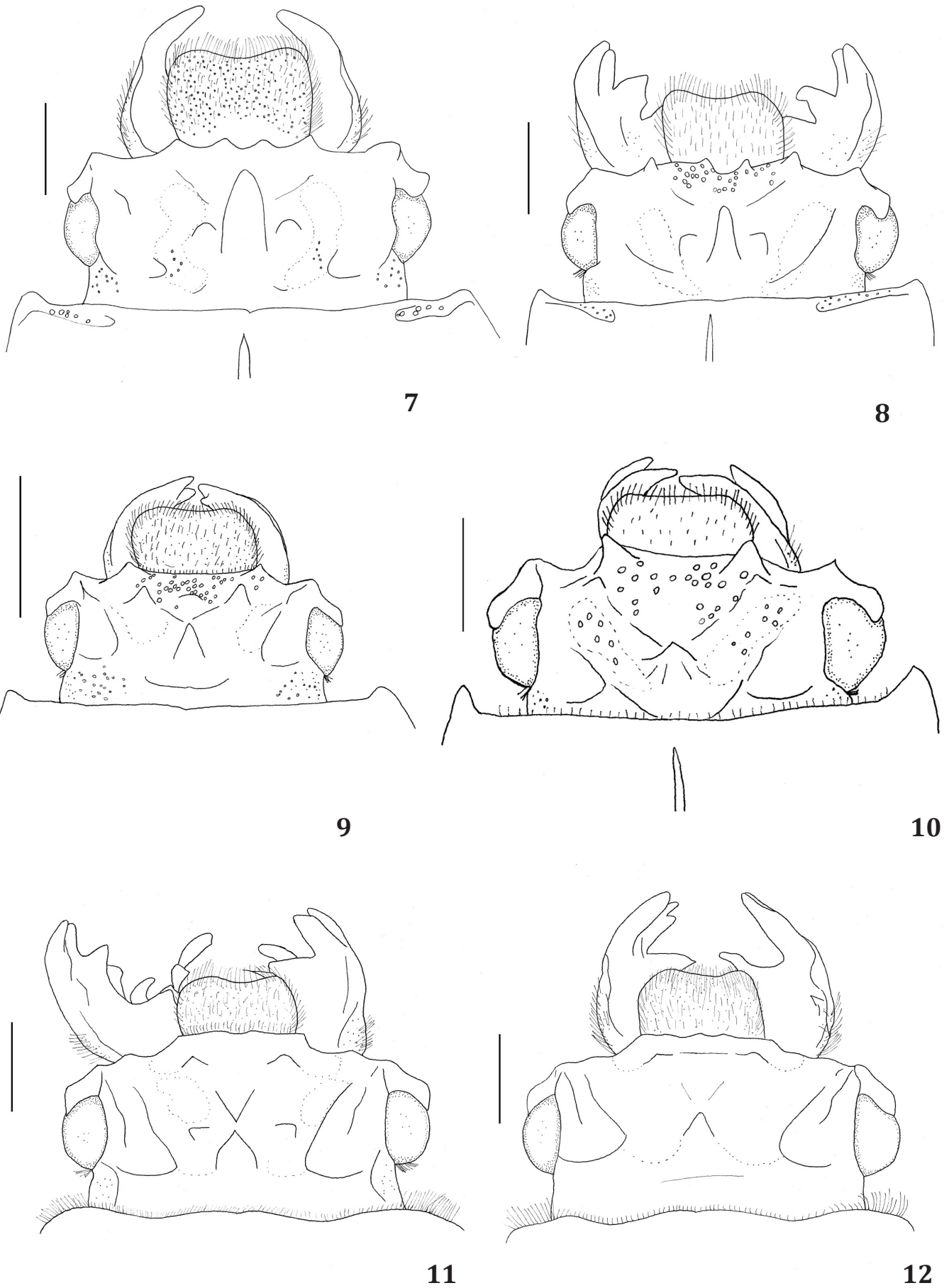


4b. Prosternal process romboidal, posterior margin narrowed. Profemur with marginal groove in anterior margin in ventral view. (West Indies and South America). ... *Spasalus* Kaup.

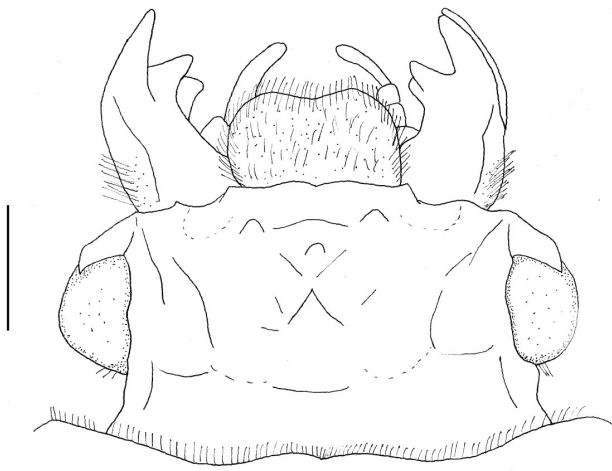




Figures 1–6. *Passalus* species, head dorsal view: (1) *Passalus* (*Pertinax*) *convexus* Dalman, 1817. (2) *Passalus* (*Passalus*) *denticollis* Kaup, 1869. (3) *Passalus* (*Passalus*) *ferenudus*. (4) *Passalus* (*Passalus*) *occipitalis*. (5) *Passalus* (*Passalus*) *quadricollis*. (6) *Passalus* (*Passalus*) *toriferus*.



Figures 7–12. *Passalus* species, head dorsal view: (7) *Passalus (Passalus) coniferus*. (8) *Passalus (Passalus) punctiger*. *Spasalus* species, head dorsal view (9) *Spasalus cristinae*. (10) *Spasalus robustus*. *Veturius* species, head dorsal view (11) *Veturius (Veturius) sinuatus*. (12) *Veturius (Veturius) simillimus*.



13

Figure 13. *Veturius (Veturius) transversus*, head dorsal view,

Table 1. Species of Passalinae from the Rio de Janeiro and Ilha Grande.

Genera	species in Brazil	species in RJ State
<i>Popilius</i>	4	1
<i>Veturius</i>	7	6
<i>Paxillus</i>	11	2
<i>Spasalus</i>	6	2
<i>Passalus</i>	64	25
Total	92	36

ACKNOWLEDGMENTS: We are grateful the Centro de Estudos Ambientais e Desenvolvimento Sustentável (CEADS) of the Universidade do Estado do Rio de Janeiro for logistical support. We would like to thank Pedro Reyes-Castillo from Instituto de Ecología (Mexico) for help with literature and S. Boucher (MNHN) to help with identification of all species and for hosting us in MNHN. We thank the Instituto Chico Mendes and Fundação Instituto Estadual de Florestas e do Ambiente (INEA) for the authorizations for scientific research and collecting permits (respectively, proc. 10710- 1; 10663, 22156-1, 26861-1 and INEA002/2008). This study was supported by FAPERJ (process 101.476/2010, 100.927/2011) and CNPq (process 470980/2011-7).

LITERATURE CITED

Bouchard, P. Y. Bouquet, A.E.Davis, M.A. Alonso-Zarazaga, J.F.Lawrence, H.C. Lyal, A.F. Newton, C.A.M. Reid, M. Schmitt, S.A. Slipinski and A.B.T. Smith. 2011. Family-group names in Coleoptera (Insecta). *ZooKeys*. 88: 1-972.

Boucher, S. 1990. Note systématique, chorologique et eco-altitudinale sur quelques *Pertinax* Kaup: *convexus* Dalman (*sulcifrons* Kuwert, reval.), *radiatus* Kuwert et *pseudoconvexus* n. sp. (Coleoptera, Passalidae). *Nouvelle Revue d'Entomologie* (N. S.). 7: 349-367.

Bouher, S. 2004. The species of Passalidae (Insecta: Coleoptera) described by Johann Jakob Kaup: Historical overview and critical catalogue, with the description of four new species *Kaupia* Darstadt 1399-121

Boucher, S. 2006. Evolution et phylogénie des Coléoptères Passalidae (Scarabaeoidea). *Annales de la Société Entomologique de France* (n. S.). 41 (3-4): 239-604.

Correa, V.A., S.A. Casari and J.R.M. Mermudes. 2011. Inventário de Elateridae (Coleoptera) de Vila Dois Rios, Ilha Grande, Angra Dos Reis, Rio de Janeiro. *Biota Neotropica*. 11(4): 291-297

Fonseca, C.R.V. and P. Reyes-Castillo. 2004. Synopsis on Passalidae family (Coleoptera: Scarabaeoidea) of Brazil with description of a new species of *Veturius* Kaup, 1871. *Zootaxa*. 789: 1-26.

Gravely, F.H. 1918. A contribution towards the revision of the Passalidae of the World. *Memoirs of the Indian Museum*. 7: 1-144.

Hammer, O., Harper, D.A.T. and Ryan, P.D. 2001. *PAST: Palaeontological Statistic Software Package for Education and Data Analysis*. *Palaeontological Electronica* 4(1): 1-9.

Jiménez-Ferbans, L. and G. Amat-García. 2011. Avaliação da diversidade alfa de Passalidae (Coleoptera: Scarabaeoidea) na Amazônia Colombiana (Parque Nacional Natural La Paya, Putumayo). *Acta Amazônica*. 41(3): 409-414.

Kaup, J. 1871. Monographie der Passaliden. *Berliner Entomologische Zeitschrift*. 15: 1-125.

Luederwaldt, H. 1931. Monographia dos passalideos do Brasil. *Revista do Museu Paulista*. XVII (1): 1-262.

Mattos, I. and J.R.M. Mermudes. 2013. Synopsis of *Paxillus* MacLeay, 1819 (Coleoptera: Passalidae): distributional records and descriptions of four new species from Brazil. *Zootaxa*. 3652(3): 327-342.

Myers, N., R.A. Mittermeier, C.G. Mittermeier, G.A.B. Fonseca and J. Kent. 2000. Biodiversity hotspots for conservation priorities. *Nature*. 403: 853-845.

Reyes-Castillo, P. 1970. Coleoptera, Passalidae: Morfología y división en grandes grupos; géneros americanos. *Folia Entomologica Mexicana*. (20-22): 1-240.

Reyes-Castillo, P. 1973. Passalidae de la Guayana Francesa (Coleoptera, Lamellicornia) *Bulletin du Museum national d'Histoire Naturelle, Zoologie, Paris*, sér. 3, 197: 1541-1587.

Reyes-Castillo, P. 1975. El comportamiento social de los Passalidae (Coleoptera: Lamellicornia). *Folia Entomologica Mexicana*. (33): 74-75.

Reyes-Castillo, P. and M. Jarman. 1980. Some notes on larval stridulation in neotropical Passalidae (Coleoptera: Lamellicornia). *Coleopterists Bulletin* 34: 263-270.

Reyes-Castillo, P. and M. Jarman. 1983. Disturbance sounds of adult passalid beetles (Coleoptera: Passalidae): structural and functional aspects. *Annals of the entomological Society of Americana*. 76: 6-22.

Reyes-Castillo, P. and G. Halffter. 1984. La estructura social de los Passalidae (Coleoptera: Lamellicornia). *Folia Entomologica Mexicana*. 61: 49-72.

Reyes-Castillo, P. and C.R.V. Fonseca. 1992. Contribución al conocimiento de *Paxillus* MacLeay, con la descripción de una nueva especie Amazonica (Coleoptera: Lamellicornia). *Folia Entomologica Mexicana*. (84): 15-33

Rodrigues, J.M.S, M.A. Monné and J.R.M. Mermudes. 2010. Inventário das espécies de Cerambycidae (Coleoptera) de Vila Dois Rios (Ilha Grande, Angra dos Reis, Rio de Janeiro, Brasil). *Biota Neotropica*. 10(3): 311-321.

Santos, S.B., C.L. Rodrigues, G.K.M. Nunes, A.B. Barbosa, L.E.M. Lacerda, I.C. Miyahira, T.A. Viana, J.L. Oliveira, F.C. Fonseca and P.S.C. Silva. 2010. Estado do conhecimento da fauna de invertebrados não-marinhos da Ilha Grande (Angra dos Reis, RJ). *Oecologia Australis*. 14(2): 504-549.

Schuster, J.C. 1975. *Comparative Behavior, Acoustical Signals, and Ecology of New World Passalidae (Coleoptera)*. PhD Thesis. Gainesville: University of Florida. 127 pp.

Schuster, J.C. 1983. Acoustical signals of passalid beetles: Complex repertoires. *Florida Entomologist*. 66: 486-496.

Schuster, J.C. 1985. Pasálidos como organismos indicadores de áreas bióticas para el establecimiento de reservas biológicas. *Memorias del Primer Congreso Nacional de Biología. Guatemala 1984*. Universidad de San Carlos de Guatemala 161-169.

Schuster, J.C., E. Cano and C. Cardona. 2000. Un método sencillo para priorizar La conservación de los bosques nubosos de Guatemala, usando Passalidae (Coleoptera) como organismos indicadores. *Acta Zoológica Mexicana* (nueva serie). 80: 197-09.

RECEIVED: October 2013

ACCEPTED: March 2014

PUBLISHED ONLINE: May 2014

EDITORIAL RESPONSIBILITY: Ricardo Ribeiro de Castro Solar