

Checklist and Notes on Behavior of Horse Flies (Diptera: Tabanidae) from Marambaia Island, Rio de Janeiro, Brazil, with New Records for the State

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Abstract. During two periods of studies (1980-1981 and 2012-2013), 31 species of tabanids were identified belonging to 16 genera on Marambaia Island, Rio de Janeiro, Brazil. *Esenbeckia lugubris* (Macquart), *Phaotabanus cajennensis* (Fabricius), *Tabanus claripennis* (Bigot), *Tabanus discus* Wiedemann and *Tabanus pungens* Wiedemann are recorded for the first time in Rio de Janeiro state. Geographical and behavior data of the recorded species are also presented.

Keywords: Atlantic island; Biodiversity, Brazilian coast; Insect vector; Public health.

Inventário e Notas Sobre o Comportamento de Mutucas (Diptera: Tabanidae) na Ilha da Marambaia, Rio de Janeiro, com Novos Registros para o Estado

Resumo: Durante dois períodos de estudos (1980-1981 e 2012-2013), foram identificadas 31 espécies de tabanídeos pertencentes a 16 gêneros na Ilha da Marambaia, Rio de Janeiro, Brasil. *Esenbeckia lugubris* (Macquart), *Phaotabanus cajennensis* (Fabricius), *Tabanus claripennis* (Bigot), *Tabanus discus* Wiedemann e *Tabanus pungens* Wiedemann são registrados pela primeira vez no estado do Rio de Janeiro. São apresentados também dados geográficos e de comportamento das espécies registradas.

Palavras-Chave: Costa brasileira; Biodiversidade; Ilha atlântica; Inseto vetor; Saúde pública.

The family Tabanidae Latreille consists of more than 4,400 described species, of which 1,205 are present in the Neotropics (HENRIQUES *et al.* 2012). Repeatedly, they attack humans, domestic and wild animals, including primates, equines, bovines, rodents, alligators, snakes, turtles and birds, especially during the warm seasons (KRINSKY 1976; PECHUMAN & TESKEY 1981; FOIL 1989; FOIL & ISSEL 1991; HENRIQUES *et al.* 2000; FERREIRA *et al.* 2002; TURCATEL *et al.* 2007). They are known worldwide for its painful sting and by being mechanical and biological vector of various helminthes, viruses, bacteria and protozoan, which are etiologic agents of diseases that can affect humans and wild and domestic animals (KRINSKY 1976; FOIL 1989).

Between the years 1905 and 1914, Adolpho Lutz conducted several studies in Neotropical tabanids, mainly in Brazilian states of Minas Gerais, Espírito Santo, Rio de Janeiro and São Paulo, describing 144 new species (LUTZ 1905, 1909a, 1909b, 1910, 1911, 1913, 1914; LUTZ & NEIVA 1909, 1914), of which 72 are still valid (BENCHIMOL & SÁ 2005). Since the last studies by A. Lutz, about 100 years ago, no additional studies has been published on tabanids from the state of Rio de Janeiro.

This study aims to record the tabanids species occurring on Marambaia Island, and contributes to the knowledge of tabanid fauna of the state of Rio de Janeiro, Brazil.

Study area. Marambaia Island is 42 km long and has an area of ca. 81 km². It is located in Mangaratiba county, southern of the state Rio de Janeiro, at the entrance of Sepetiba Bay, between S 23°00' and 23°06' and W 43°45' and 44°01'. (Figures 1a and 1b). The island belongs to Atlantic Forest biome, and has large areas of primary preserved rain forest, sandbank vegetation and mangroves. The island is administered by the Centro de Avaliação da Ilha da Marambaia (CADIM), of the Brazilian Navy, and native residents belong to a "quilombola" community, i.e., descendants of slaves brought from Africa to Brazil.

Specimens collection. Sporadic collections were made on Marambaia Island during 1980-1982; during 2012-2013 the collections were made twice a month. During both periods, four Manitoba-modified canopy traps and insect hand net were used in an ecotone area between the Atlantic forest and dunes, named "Armação", a place near a beach (S 23°02'53" and W 043°57'07") (Figures 2a and 2b). In October, November and December 2013, tabanid specimens were also collected in another place on the island, named "Vacaria Velha" (S 23°03'47", W 43°59'13"), using an equine as bait and insect hand net. It is a place near rainforest and a marsh, with a small pasture area where a tied equine spent the day (Figures 2c and 2d). These collections were made from the twilight and throughout the day until 20:00 h. Collections were authorized by IBAMA-SISBIO n° 333821.

Specimens identification. The late G.B. Fairchild (1906-1994), formerly from Florida State Collection of Arthropods,

MATERIAL AND METHODS

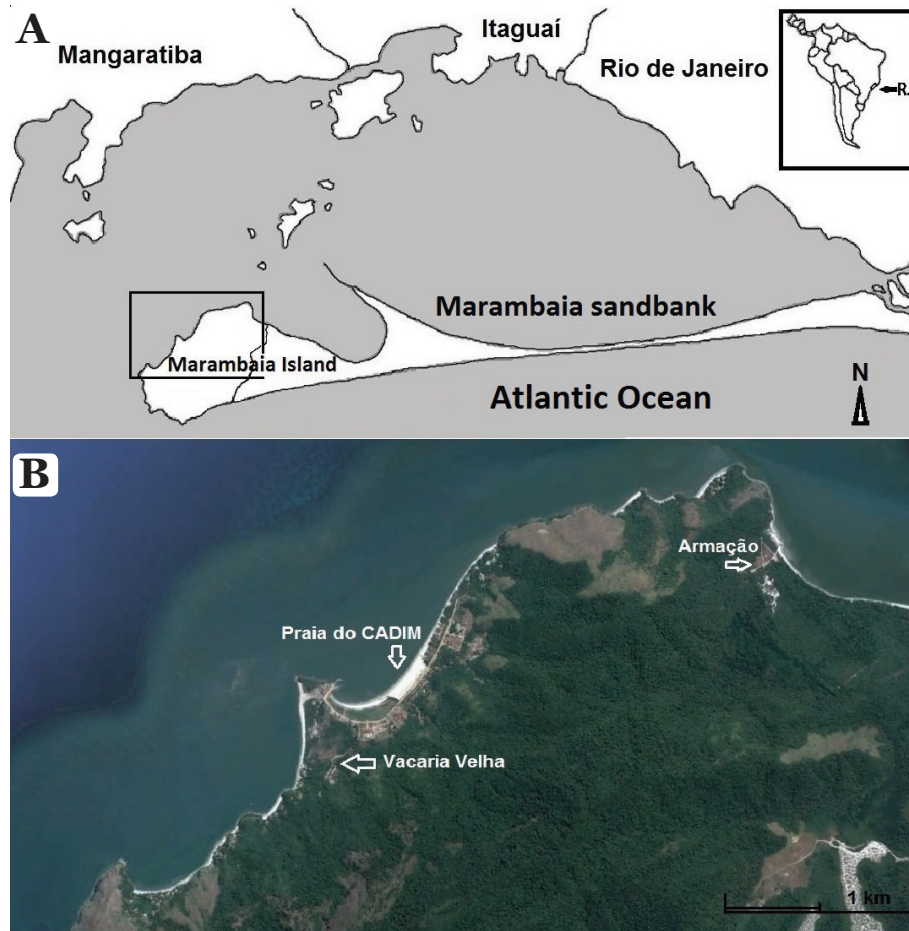


Figure 1. Geographical location (a) and collection sites (b) at Marambaia Island, Mangaratiba County, Rio de Janeiro State, Brazil. Sources: (a) - Scielo. Available on: <<http://www.scielo.br/img/revistas/abb/v21n1/o6f1.gif>>. [Accessed in: 12.iii.2014]. (b) - GoogleMaps. Available on: <www.google.com.br/maps/@23.0316476,43.9261133,19073m/data=!3m1!1e3?hl=pt-BR>. [Accessed in: 12.ii.2014].

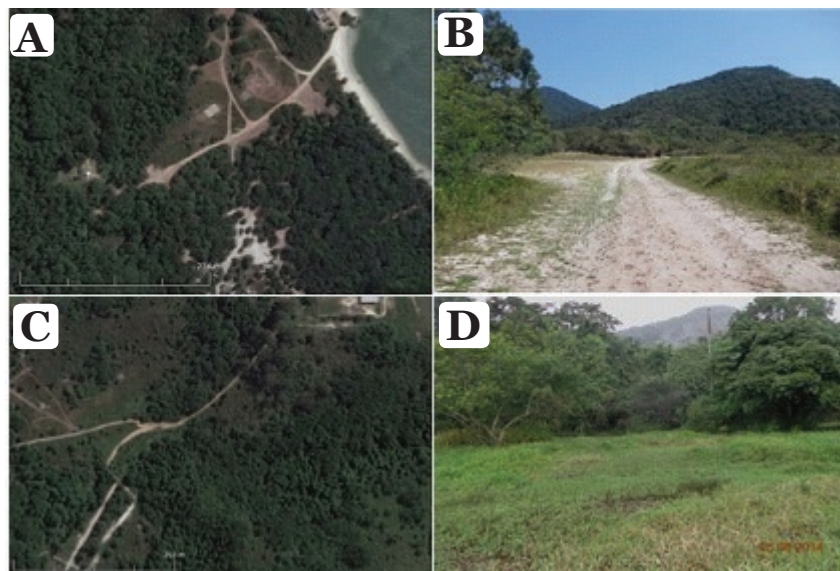


Figure 2. Site tabanids collections in Marambaia Islands. Aerial view of Armação (a) and Vacaria Velha (b); Landscapes of Armação (c) and Vacaria Velha (d). Sources: (a) and (c) - GoogleMaps. Available on: www.google.com.br/maps/@23.0316476,43.9261133,19073m/data=!3m1!1e3?hl=pt-BR. [Accessed in: 12.ii. 2014]; (b) and (d) - Author's photos.

USA, identified the tabanids specimens collected until 1982. A.L. Henriques, from Instituto Nacional de Pesquisas da Amazônia (INPA), Manaus, Amazonas, Brazil, I.S. Gorayeb from Museu Paraense Emilio Goeldi (MPEG), Belém, Pará, Brazil, and R.R. Guimarães from Escola Nacional de Saúde Pública (ENSP, IOC), Rio de Janeiro, Brazil, identified the specimens collected during 2012-2013. Guimarães used keys, original descriptions, taxonomic reviews and comparisons with voucher specimens (BARRETTO 1946; FAIRCHILD & PHILIP 1960; FAIRCHILD 1961a, 1972, 1976, 1983, 1984, 1985; COSCARÓN & FAIRCHILD 1976; FAIRCHILD & WILKERSON 1981, 1986; HENRIQUES & RAFAEL 1995; COSCARÓN

& PAPAVERO 2009a, 2009b; KROLOW & HENRIQUES 2010). Most specimens collected during the study periods are deposited in the Entomological Collection of Centro de Educação e Pesquisas em Medicina Ambiental (CEMA - RG IBAMA N° 3199320), Rio de Janeiro, Brazil. Voucher specimens, here designated as "Examined material", are also deposited in Entomological Collections of the Instituto Oswaldo Cruz (CEIOC), Rio de Janeiro, Brazil, Museu Nacional/Universidade Federal do Rio de Janeiro (MNRJ), Rio de Janeiro, Brazil, and Museu Paraense Emilio Goeldi (MPEG).

RESULTS

During the two study periods, 31 species of tabanids were collected, which were distributed in the three subfamilies, six tribes and 16 genera; 25 species had already been previously recorded for Rio de Janeiro State (COSCARÓN & PAPAVERO 2009b). Five species are recorded for the first time for this state: *Esenbeckia lugubris* (Macquart), *Phaotabanus cajennensis* (Fabricius), *Tabanus claripennis* (Bigot), *Tabanus discus* Wiedemann, and *Tabanus pungens* Wiedemann.

Subfamily Chrysopsina; Tribe Chrysopsini

Chrysops varians Wiedemann

Comments: This species occurs in Panama, Trinidad, Colombia, Venezuela, Guyana, Ecuador, Peru, Brazil (type locality is Amapá to Rio Grande do Sul), Argentina and Paraguay (FAIRCHILD 1971; COSCARÓN & PAPAVERO 2009b; KROLOW *et al.* 2007). These flies approach horse and human silently (BASSI *et al.* 2000). On Marambaia Island, it was observed that they prefer to land on human heads, and eventually curl the hair. Despite *C. varians* is a common species occurring in forested areas of sandbanks, on Marambaia sandbanks it has been seldom collected.

Examined material: Brazil, Rio de Janeiro, Mangaratiba, Ilha da Marambaia, Armação, vii.1981, R.R. Guimarães col., G.B. Fairchild det., 1 ♀ (CEMA). *idem*, R.R. Guimarães col. and det., 6.x.2012, 1 ♀ (CEMA); *idem*, 27.x.2012, 1 ♀ (CEMA); *idem*, ii.2013, 3 ♀ (CEMA); *idem* ix.2013, 2 ♀ (CEMA); *idem*, Vacaria Velha, 20-21.xii.2013, 1 ♀ (CEMA).

Chrysops variegatus (De Geer)

Comments: This species occurs from Mexico to Argentina and in Brazil has been recorded from the states of Amapá, Roraima, Amazonas, Paraná and Rio Grande do Sul (FAIRCHILD 1961b, 1971; COSCARÓN & PAPAVERO 2009b). *C. variegatus* occurs in dense forest, open areas and campinarana, but can also be collected by light trap up to 40 feet above the ground in the forest canopy (RAFAEL *et al.* 1991; HENRIQUES 2004). It is similar to *C. varians* and has the habit of landing in the high parts of the host body, entangling itself on human hair (1st author personal observation).

Examined material: Brazil, Rio de Janeiro, Mangaratiba, Ilha da Marambaia, Armação, insect hand net, 13.vi.1980, R.R. Guimarães col. G.B. Fairchild det., 1 ♀ (CEMA); *idem*, 16.i.1981, 1 ♀ (CEMA); *idem*, Vacaria Velha, 06.x.2012, R.R. Guimarães col. and det., 1 ♀ (CEMA).

Subfamily Pangoniinae; Tribe Pangoniini

Esenbeckia (Esenbeckia) lugubris (Macquart)

Comments: This species has been reported to Argentina, Paraguay, Bolivia and Brazil (Mato Grosso, São Paulo and Paraná) (COSCARÓN & PAPAVERO 2009b). They are large, glossy flies, dark-colored, with a powerful flight, and a painful sting (personal observation). At Marambaia Island, two specimens were collected by insect hand net, attracted by a horse. This is the first record of the species in Rio de Janeiro state.

Examined material: Brazil, Rio de Janeiro, Mangaratiba, Ilha da Marambaia, Vacaria Velha, insect hand net, equine bait, 04.xii.2013, R.R. Guimarães col., Gorayeb det., 1 ♀ (CEMA); *idem*, 20.xii.2013, 1 ♀ (CEMA).

Subfamily Pangoninae; Tribe Sepsini

Sepsis appendiculata (Macquart)

Comments: This species is distributed from states of Espírito Santo to Santa Catarina in Brazil, also occurring in Uruguay and questionably Argentina (COSCARÓN & PAPAVERO 2009b). It appears in Coscarón and Papavero's catalogue as *Sepsis nivalis* Walker, the senior synonym of *S. appendiculata* (Webb *et al.*). *Sepsis appendiculata* does not have blood-sucking habits and can be considered autogenous. Adults are found on sandy beaches, have short and low flight, not rising more than 20 cm above the soil surface and not reaching more than 1.5 m away. It has

white marble color, similar to the beach sand. Only one specimen was collected at Marambaia Island, by insect hand net, when flying over the whitish sand of "Praia Suja" (23°03'00.24" S and 043°58'40.99" W) north coast of the Island.

Examined material: Brazil, Rio de Janeiro, Mangaratiba, Ilha da Marambaia, Praia Suja, sand beach, insect hand net, 24.vii.1981, R. R. Guimarães col. and det., 1 ♀ (CEMA).

Subfamily Pangoninae; Tribe Scionini

Fidena (Fidena) winthemi (Wiedemann)

Comments: It has been recorded from Minas Gerais, Espírito Santo, Rio de Janeiro and São Paulo states (COSCARÓN & PAPAVERO 2009b). It is noteworthy to mention that LUTZ (1911) described a junior synonym of this species as *Erephopsis florisuga* based on specimens collected in Espírito Santo state, because he noted that they feed on flowers. On Marambaia Island, four specimens were collected at the ecotone area between forest sandbank and rain forest.

Examined material: Brazil, Rio de Janeiro, Mangaratiba, Ilha da Marambaia, Armação, insect hand net, 08.x.1982, R.R. Guimarães col., Gorayeb det., 2 ♀ (CEMA).

Scaptia (Lepmia) seminigra (Ricardo)

Comments: *Scaptia seminigra* occurs in Brazil (Espírito Santo, Minas Gerais, Rio de Janeiro, São Paulo and Paraná states) (COSCARÓN & PAPAVERO 2009b). Three specimens were collected in the area of sandbanks, by insect hand net during early afternoon, the hottest part of the day. The species has a powerful flight that produces loud buzz.

Examined material: Brazil, Rio de Janeiro, Mangaratiba, Ilha da Marambaia, Armação, insect hand net, 21.v.1981. R. R. Guimarães col., G. B. Fairchild det., 3 ♀ (CEMA).

Subfamily Tabaninae; Tribe Diachlorini

Acanthocera (Acanthocera) longicornis (Fabricius)

Comments: This species occurs in Brazil (Paráiba, Minas Gerais, Espírito Santo, Rio de Janeiro, São Paulo, Paraná and Santa Catarina states) (HENRIQUES & RAFAEL 1995; COSCARÓN & PAPAVERO 2009b). At Marambaia Island, two specimens were collected by insect hand net in area of ecotone between rain forest and sandbanks.

Examined material: BRAZIL, Rio de Janeiro, Mangaratiba, Ilha da Marambaia, Armação, insect hand net, 21.v.1981, R.R. Guimarães col., G.B. Fairchild det., 1 ♀ (CEMA). *idem*, 2.i.1982, 1 ♀ (CEMA).

Catachlorops (Amphichlorops) flavus (Wiedemann)

Comments: It was originally described from specimens collected at Montevideo, Uruguay, and also occurs in Paraguay, Argentina and the following Brazilian states: Rio de Janeiro and Santa Catarina States (COSCARÓN & PAPAVERO 2009b). On Marambaia Island next to marsh and woodland area, 13 specimens were caught by insect hand net, attracted by horse, only in the evening.

Examined material: Brazil, Rio de Janeiro, Mangaratiba, Ilha da Marambaia, Vacaria Velha, insect hand net, equine bait, 4-5.xii.2013, R.R. Guimarães col., I.S. Gorayeb det., 4 ♀ (CEMA); *idem*, 20-21.xii.2013, R.R. Guimarães col. and det., 1 ♀ (CEMA); *idem*, 20-21.xii.2013, 3 ♀ (MNRJ); *idem*, 4-5.xii.2013, 3 ♀ CEIOC).

Catachlorops (Catachlorops) leptogaster Barretto

Comments: It occurs in Argentina and Brazil, in Rio de Janeiro and Minas Gerais states (COSCARÓN & PAPAVERO 2009b). On Marambaia Island, 10 specimens were caught by insect hand net, attracted by horse, only in the late afternoon, after 17:00 h.

Examined material: Brazil, Rio de Janeiro, Mangaratiba, Ilha da Marambaia, Vacaria Velha, insect hand net, equine bait, 27.x.2012, R. R. Guimarães col., I. S. Gorayeb det., 1 ♀ (CEMA); *idem*, 27.x.2013, R. R. Guimarães col. and det., ♀ (CEMA); *idem*, 20-21.xii.2013, 2 ♀ (MNRJ).

Chlorotabanus inanis (Fabricius)

Comments: The species is record from Mexico, Costa Rica, Saint-Domingue, Suriname, French Guiana. Ecuador, Peru and Brazil. In the latter, it is known from the states of Roraima, Amapá, Amazonas, Pará, Maranhão, Acre, Rondônia, Mato Grosso, Goiás, Tocantins, Minas Gerais, Rio de Janeiro Espírito Santo, São Paulo, Santa Catarina, Paraná and Rio Grande do Sul (COSCARÓN & PAPAVERO 2009b; KROLOW & HENRIQUES, 2010; GUIMARÃES *et al.* 2014; LIMA *et al.* 2015). It is a crepuscular species with powerful flight. It is voracious, starting the blood meal quickly on its host, which were equines. Its sting is quite painful (personal observation); the specimens are very active and aggressive before 07:00 h and after 18:00 h. The females start hematophagism usually on legs of horses; when feeding, this horse fly becomes seemingly indifferent to the environment and is easily captured. On Marambaia Island, the species seems to be bivoltine, as most were highly numerous in April and May and from October to December.

Examined material: Brazil, Rio de Janeiro, Mangaratiba, Ilha da Marambaia, Armação, insect hand net, equine bait, 03.xii.1980, R. R. Guimarães col., G. B. Fairchild det., 1 ♀ (CEMA); *idem*, 08.iv.1981, R. R. Guimarães col. and det., 2 ♀ (CEMA); *idem*, 13.v.1981, 12 ♀ (CEMA).

Diachlorus bivittatus (Wiedemann)

Comments: This species is distributed from Rio de Janeiro to Santa Catarina (COSCARÓN & PAPAVERO 2009b) but it also occurs in Espírito Santo state (LUTZ & NEIVA 1909). This species is more active in the brightest and warmest hours of the day, with maximum activity around 14:00 h. It is low flying and prefers to land on the lower parts of the host, including the legs, feet, and in humans, more rarely around the waist and on the arms. The females are very aggressive, but their bites are not among the most painful (1st author personal observation). This species was captured in Armação and Vacaria Velha, by canopy trap and insect hand net. It is a bivoltine species being more abundant between March to May and September to December.

Examined material: Brazil, Rio de Janeiro, Mangaratiba, Ilha da Marambaia, Armação, insect hand net, 18.i.1981 R.R. Guimarães col., G.B. Fairchild det., 4 ♀ (CEMA); *idem*, 28.iii.1981, R.R. Guimarães col. and det., 29 ♀ (CEMA); *idem*, 23.xi.2012, 3 ♀ (CEMA).

Diachlorus distinctus Lutz

Comments: This species occurs in Rio de Janeiro, Minas Gerais, São Paulo, Paraná and Santa Catarina states of Brazil (COSCARÓN & PAPAVERO 2009b), and has morphological and ethological similarities with *Diachlorus bivittatus*.

Examined material: Brazil, Rio de Janeiro, Mangaratiba, Ilha da Marambaia, Armação, insect hand net, 18.i.1981, R.R. Guimarães col., A.L. Henriques det., 1 ♀ (CEMA); *idem*, 28.iii.1981, R. R. Guimarães col. and det., 1 ♀ (CEMA); *idem*, Vacaria Velha, insect hand net, equine bait, 23.xi.2012, 1 ♀ (CEMA); *idem*, 10.x.2013, 2 ♀ (CEMA); *idem*, 4-5.xii.2013, 1 ♀ (CEMA).

Diachlorus varipes (Rondani)

Comments: The species occurs in Brazil, in Pará and Rio de Janeiro states (COSCARÓN & PAPAVERO 2009b). At Marambaia Island, five specimens were collected by insect hand net, attracted by horse during October, next to the forest and marsh site. No specimen was collected at the ecotone between the sandbank and rain forest.

Examined material: Brazil, Rio de Janeiro, Mangaratiba, Ilha da Marambaia, Vacaria Velha, insect hand net, equine bait, 06.x.2012, R. R. Guimarães col., I. S. Gorayeb det., 1 ♀ (CEMA); *idem*, 14.x.2013, R. R. Guimarães col. and det., 2 ♀ (CEMA); *idem*, 27.x.2013, 2 ♀ (CEMA).

Dichelacera (Dichelacera) alcicornis (Wiedemann)

Comments: The species occurs in Bolivia, Argentina and Brazil, including the states of Mato Grosso, Minas Gerais, Rio de Janeiro, Paraná, Santa Catarina, and Rio Grande do Sul (DUTRA & MARINONI 1994; COSCARÓN & PAPAVERO 2009b; KROLOW *et al.* 2007). Most specimens observed on Marambaia Island prefer to land over humans' legs and feet.

Examined material: Brazil, Rio de Janeiro, Mangaratiba, Ilha da Marambaia, Armação, sandbank forest, insect hand net, 18.xi.1981, R.R. Guimarães col., A.L. Henriques det., 2 ♀ (CEMA).

Dichelacera (Dichelacera) walteri Guimarães, Gorayeb, Rodrigues-Guimarães & Carvalho

Comments: The specimens were collected by canopy trap and insect hand net at sandbank forest, from September to December. This species is similar in morphology to *Dichelacera alcicornis* (Wiedemann) and it was described from specimens collected on Marambaia Island (GUIMARÃES *et al.* 2015), which is, by consequence, its type locality.

Examined material: Brazil, Rio de Janeiro, Ilha da Marambaia, Armação, 14.x.2013, sandbank forest, insect hand net, R.R. Guimarães, col. and det., 4 ♀ (CEMA).

Leucotabanus sebastianus Fairchild

Comments: This species occurs from Minas Gerais to Santa Catarina Brazilian states (COSCARÓN & PAPAVERO 2009b). On Marambaia Island, seven specimens were collected by insect hand net, attracted by horse, next to marsh and rain forest areas.

Examined material: Brazil, Rio de Janeiro, Ilha da Marambaia, Vacaria Velha, insect hand net, equine bait, 10.x.2013, R. R. Guimarães col., I. S. Gorayeb det., 2 ♀ (MPEG); *idem*, 10.x.2013, 2 ♀ (CEMA); *idem*, 4-5.xii.2013, R. R. Guimarães col. and det., 4 ♀ (CEMA).

Phaotabanus cajennensis (Fabricius)

Comments: The species occurs in French Guiana Venezuela Trinidad, Colombia, Ecuador Bolivia and Brazil, where it is known from São Paulo, Paraná and Amazonas states (LUTZ & NUNEZ-TOVAR 1928; PATRICK & HAYS 1968; FAIRCHILD & BURGER 1994; CÁRDENAS *et al.* 2009; COSCARÓN & PAPAVERO 2009b; FERREIRA-KEPLER *et al.* 2010). On Marambaia Island, seven specimens were collected by canopy trap in "Armação". This is the first record of the species in Rio de Janeiro state.

Examined material: Brazil, Rio de Janeiro, Mangaratiba, Ilha da Marambaia, Armação, canopy trap, 18.i.1982, R.R. Guimarães col., G.B. Fairchild det., 1 ♀ (CEMA); *idem*, 26.i.2013, R.R. Guimarães leg. and det., 1 ♀ (CEMA); *idem*, 18.xi.2013, 1 ♀ (CEMA).

Phaotabanus limpidae (Wiedemann)

Comments: The species is known from Bahia, Rio de Janeiro, São Paulo, Santa Catarina, Rio Grande do Sul states; it also occurs in Argentina, Bolivia and Peru (KROLOW *et al.* 2007; COSCARÓN & PAPAVERO 2009b). LUTZ (1909a) recorded this species to Espírito Santo state, which was not mentioned by COSCARÓN & PAPAVERO'S (2009b) catalogue. Only one specimen was collected on Marambaia Island, in the month of December, by insect hand net, attracted by horse, next to marsh and rain forest areas.

Examined material: Brazil, Rio de Janeiro, Mangaratiba, Ilha da Marambaia, Vacaria Velha, 27.x.2012, R.R. Guimarães col. and det., 1 ♀ (CEMA).

Phaeotabanus litigiosus (Walker)

Comments: This species occurs in Brazil, in Minas Gerais, Rio de Janeiro, São Paulo and Paraná states (CARRERA & LANE 1945; COSCARÓN & PAPAVERO 2009b). On Marambaia Island, specimens were collected by canopy trap in "Armação", between sandbank and rain forest; at the pasture area, between marsh and forest, they were collected by insect hand net. The specimens were more abundant from 17:00 to 19:00 h.

Examined material: Brazil, Rio de Janeiro, Mangaratiba, Ilha da Marambaia, Armação, canopy trap, 10.xi.1981, R.R. Guimarães col., G.B. Fairchild det., 1 female (CEMA); *idem*, Vacaria Velha, insect hand net, equine bait, 4-5.xii.2013, R.R. Guimarães col. and det., 8 ♀ (MNRJ); *idem*, 20-21.xii.2013, 3 ♀ (CEMA); *idem*, 20-21.xii.2013, 10 ♀ (CEIOC).

Rhabdotylus planiventris (Wiedemann)

Comments: FAIRCHILD (1971) indicated that *Rhabdotylus planiventris* is distributed from São Paulo to Santa Catarina. However, LUTZ & NEIVA (1909) recorded it from Rio de Janeiro, Xerém, Baixada Fluminense. COSCARÓN & PAPAVERO (2009b) also record this species in Argentina. The species sometimes has been erroneously cited as *S. planiventre* (TURCATEL *et al.* 2007; COSCARÓN & PAPAVERO 2009b). On Marambaia Island, specimens were collected by canopy trap in Armação, the ecotone area between sandbank and rain forest.

Examined material: Brazil, Rio de Janeiro, Ilha da Marambaia, Armação, canopy trap, 26.i.1982, R.R. Guimarães col., I.S. Gorayeb det., 1 ♀ (CEMA); *idem*, 26.i.1982, R.R. Guimarães col. and det., 2 ♀ (CEMA).

Rhabdotylus viridiventris (Macquart)

Comments: The species occurs in Venezuela and Brazil (Rio de Janeiro and from Minas Gerais to Santa Catarina) (COSCARÓN & PAPAVERO 2009b). The species is still cited as *Stibasoma viridiventre*, in error (TURCATEL *et al.* 2007). On Marambaia Island, specimens of *R. viridiventris* were captured on both study sites, by insect hand net and canopy trap.

Examined material: Brazil, Rio de Janeiro, Mangaratiba, Ilha da Marambaia, Vacaria Velha, insect hand net, equine bait, 10.x.2013, R.R. Guimarães col., I.S. Gorayeb det., 1 ♀ (CEMA).

Stigmatophthalmus altivagus Lutz

Comments: The species has been recorded from Rio de Janeiro, São Paulo and Santa Catarina (COSCARÓN & PAPAVERO 2009b). In the state of Rio de Janeiro, specimens were collected in mountainous region of the county of Petropolis (800-2,150 m above sea level). The specimens from São Paulo state were caught at 1,200 m altitude (LUTZ 1913). This species occurs in many environments and two specimens were collected by canopy trap on Marambaia Island, in the ecotone area between the sandbank and rain forest.

Examined material: Brazil, Rio de Janeiro, Mangaratiba, Ilha da Marambaia, Armação, canopy trap, 27.x.2012, R.R. Guimarães col., Gorayeb det., 1 ♀ (CEMA).

Subfamily Tabaninae; Tribe Tabanini

Poeciloderas quadripunctatus (Fabricius)

Comments: The species occurs from Mexico to Argentina (FAIRCHILD & BURGER 1994), and in Brazil from the states of Amazonas, Goiás, Rio de Janeiro, Tocantins, Paraná and Rio Grande do Sul (COSCARÓN & PAPAVERO 2009b; LIMA *et al.* 2015). On Marambaia Island, specimens were collected in open meadows, from 10:00 h until ca. 16:00 h, during the sunniest and hottest

part of the day. They were collected at both study sites, only by insect hand net, and attracted by equines or humans.

Examined material: Brazil, Rio de Janeiro, Mangaratiba, Ilha da Marambaia, Armação, insect hand net, 14.xii.1981, R.R. Guimarães col. A.L. Henriques det., 1 ♀ (CEMA); *idem*, 25.viii.2003, R.R. Guimarães col. and det., 1 ♀ (CEMA); *idem*, Vacaria Velha, insect hand net, equine bait, 20-21.xii.2013, 2 ♀ (MNRJ); *idem*, 10.x.2013, 2 ♀ (MNRJ). *idem*, 4-5.xii.2013, 4 ♀ (MNRJ); *idem*, 20-21.xii.2013, 8 ♀ (CEIOC).

Tabanus claripennis (Bigot)

Comments: *Tabanus claripennis* is distributed in the Antilles, Costa Rica to Paraguay, Argentina, Chile and Brazil. In the latter, it was recorded from the states of Roraima, Amazonas, Mato Grosso do Sul and Rio Grande do Sul (BARROS 2001; BARROS *et al.* 2003; COSCARÓN & PAPAVERO 2009b). On Marambaia Island, only one specimen was captured by insect hand net, attracted by a horse, near the marsh and forest. This is the first record of this species to Rio de Janeiro state.

Examined material: Brazil, Rio de Janeiro, Mangaratiba, Ilha da Marambaia, Vacaria Velha, insect hand net, equine bait, 20-21.xii.2013, R.R. Guimarães col., I.S. Gorayeb det., 1 ♀ (CEMA).

Tabanus discus Wiedemann

Comments: The species is distributed in Trinidad, Venezuela, Guyana, Suriname, French Guiana, Ecuador and Brazil (states of Amapá, Amazonas, Roraima Acre, Rondônia, Pará and Mato Grosso) (FAIRCHILD & BURGER 1994; CÁRDENAS & VIEIRA 2005; COSCARÓN & PAPAVERO 2009b). Specimens are large, have a powerful and noisy flight that are easily detected by equines. The bite is painful. When the horseflies land on the flanks or abdomen of a horse, it scares the flies away by legs or muzzle, sometimes-reaching bite and crush them. A specimen smashed by bite of equine was observed and collected on Marambaia Island. This is the first record of this species in Rio de Janeiro.

Examined material: Brazil, Rio de Janeiro, Mangaratiba, Ilha da Marambaia, Vacaria Velha, insect hand net, equine bait, 4-5.xii.2013, R.R. Guimarães col. and det., 7 ♀ (CEMA); *idem*, 4-5.xii.2013, 4 ♀ (MNRJ). *idem*, 4-5.xii.2013, 3 ♀ (CEIOC).

Tabanus fuscus Wiedemann

Comments: The species occurs in Argentina, Uruguay and Brazil, where it is known from Mato Grosso to Rio Grande do Sul states (KROLOW *et al.* 2007; COSCARÓN & PAPAVERO 2009b) The species feeds on humans, pigs, and horses (BOUVIER 1952). This fly lands preferably on horses on the hips, belly, and front legs (BASSI *et al.* 2000), a behavior also observed on Marambaia Island.

Examined material: Brazil, Rio de Janeiro, Mangaratiba, Ilha da Marambaia, Armação, canopy trap, 12.x.1980, R.R. Guimarães col., G. B. Fairchild det., 1 ♀ (CEMA); *idem*, 12.ix.1981, R.R. Guimarães col., A.L. Henriques det., 1 ♀ (CEMA) *idem*, 15.ii.2012, R.R. Guimarães col. and det., 1 ♀ (CEMA); *idem*, 20-21.xii.2013, ♀ (CEMA).

Tabanus importunus Wiedemann

Comments: *Tabanus importunus* is distributed in Panama, Guyana, Trinidad, Peru, Bolivia, Paraguay and Brazil (Roraima, Amapá, Amazonas, Rondônia, Pará, Rio Grande do Norte, Bahia, Mato Grosso do Sul, Tocantins, Rio de Janeiro and Paraná states) (COSCARÓN & PAPAVERO 2009b; LIMA *et al.* 2015). On Marambaia Island, this species was collected by insect hand net, in both study areas: ecotone between the sandbank and rain forest, and near the marsh and forest, where the specimens were attracted by horse. It is a large species, almost 2 cm long. It is aggressive and has painful bite.

Examined material: Brazil, Rio de Janeiro, Mangaratiba, Ilha da Marambaia, Armação, insect hand net, 10.xi.1981, R.R. Guimarães

col., G.B. Fairchild det., 2 ♀ (CEMA); *idem*, 10.xi.1981, R.R. Guimarães col., A. L. Henriques det., 1 ♀ (CEMA); *idem*, Vacaria Velha, 27.iv.2013, R.R. Guimarães col. and det. 1 ♀ (MNRJ); *idem*, 10.x.2013, 2 ♀ (MNRJ); *idem*, 4-5.xii.2013, 3 ♀ (MNRJ); *idem*, 10.x.2013, 10 ♀ (CEIOC).

***Tabanus obsoletus* Wiedemann**

Comments: The species occurs in Brazil (Pará, Paraiba, Rio de Janeiro and São Paulo) (HENRIQUES & GORAYEB 1993; HENRIQUES 1995; COSCARÓN & PAPAVERO 2009b). LUTZ (1921) recorded the species in Guaratuba, Paraná, and COSCARÓN & PAPAVERO (2009b) did not list the latter record. Only one specimen, attracted by horse, was captured on Marambaia Island, next to the marsh area.

Examined material: Brazil, Rio de Janeiro, Mangaratiba, Ilha da Marambaia, Vacaria Velha, 27.x.2012, R.R. Guimarães col., I.S. Gorayeb det., 1 ♀ (CEMA).

***Tabanus occidentalis* Linnaeus**

Comments: *Tabanus occidentalis* is one of the most abundant species in the tropical region distributing from Mexico to Argentina. In Brazil, it was reported in Roraima, Amapá, Amazonas, Acre, Rondônia, Pará, Mato Grosso, Mato Grosso do Sul, Tocantins, Paraíba, Bahia, Rio de Janeiro, São Paulo and Paraná states (HENRIQUES & GORAYEB 1993; HENRIQUES 1995; DUTRA & MARINONI 1994; COSCARÓN & PAPAVERO 2009b; LIMA *et al.* 2015). In Central Amazonas, it occurs in forests and natural or artificial unsheltered areas, but it seems to be more frequent in savanna environments, and is also commonly observed and captured on surface water (RAFAEL & CHARLWOOD 1980; BASSI *et al.* 2000; HENRIQUES 2004; FERREIRA-KEPLER *et al.* 2010; KROLOW *et al.* 2010). In fact, on Marambaia Island specimens were observed flying over streams or freshwater collections, landing on rocks or driftwood above the water surface or on bathers. In equine, the species prefers to bite on the legs and lower parts of the body.

Examined material: Brazil, Rio de Janeiro, Mangaratiba, Ilha da Marambaia, Armação, canopy trap, 14.xii.1981, R.R. Guimarães col., G.B. Fairchild det., 3 ♀ (CEMA); *idem*, Vacaria Velha, insect hand net, equine bait, 10.x.2013, R.R. Guimarães col. and det., 10 ♀ (CEMA); *idem*, 20-21.xii.2014, 8 ♀ (MNRJ). *idem*, 10.x.2013, 9 ♀ (CEIOC).

***Tabanus pungens* Wiedemann**

Comments: This species occurs in USA, Trinidad and Neotropics, except Antilles and Chile (COSCARÓN & PAPAVERO 2009b). In Brazil, this species occurs in Acre, Pará, Amazonas, Mato Grosso do Sul, Paraná and Rio Grande do Sul states (FAIRCHILD 1971; HENRIQUES 1995; BARROS 2001; KROLOW *et al.* 2007; COSCARÓN & PAPAVERO 2009b). This species is here newly recorded from Rio de Janeiro state. Nine specimens were collected in a marsh area, near the rainforest, by insect hand net, using an equine bait.

Examined material: Brazil, Rio de Janeiro, Mangaratiba, Ilha da Marambaia, Vacaria Velha, insect hand net, equine bait, 4-5.xii.2013, R.R. Guimarães col., I.S. Gorayeb det. 1 ♀ (CEMA).

***Tabanus triangulum* Wiedemann**

Comments: The species is distributed in Paraguay, Uruguay, Bolivia, Argentina and Brazil (Espírito Santo, Rio de Janeiro, Mato Grosso, São Paulo, Paraná and Rio Grande do Sul states) (FAIRCHILD & BURGER 1994; KROLOW *et al.* 2007; COSCARÓN & PAPAVERO 2009b). On Marambaia Island, it was captured from February to May and September to December, which may indicate is a bivoltine species.

Examined material: Brazil, Rio de Janeiro, Mangaratiba, Ilha da Marambaia, Armação, 14.xii.1981, R.R. Guimarães col., G.B. Fairchild det., 5 ♀ (CEMA).

DISCUSSION

The species found on Marambaia Island, Rio de Janeiro, also occur in others topographic and climatic different geographic regions. They also have biological differences, particularly with respect to the time of appearance and relative abundance. These facts may be linked to the limitations imposed by climate, where altitudes, temperature and humidity can play important roles as balancing factors between different tabanids species populations composing the biocenosis of the different regions as Costa Rica (FAIRCHILD 1961c), Brazilian states of Mato Grosso (BARROS *et al.* 2003), Paraná (BASSI *et al.* 2000) and Rio Grande do Sul (KROLOW *et al.* 2007). On Ecuador, *Diachlorus* Osten Sacken, is considered an Andean and sub-Andean genus, with speciation determined by Andes uplift (CÁRDENAS *et al.* 2009). In Brazil, *Diachlorus* species are registered on costal areas of Espírito Santo, Rio de Janeiro, São Paulo and plateau region of Paraná (BOUVIER 1952; BASSI *et al.* 2000). On Marambaia Island, *Diachlorus bivittatus* is a bivoltine species being more abundant between March to May and September to December; in Paraná State, *D. bivittatus* presented only one generation in a year, and the species was active only from November to March (DUTRA & MARINONI 1994).

Despite the climatic factors may play an important role in the differences in the behavior of populations (CÁRDENAS *et al.* 2013) should not forget the other numerous factors, biotic and abiotic, which are involved in the structure of the landscape, as predators, parasites, environmental human changes, etc (KAY & REGIER 2000). However, several species of horse flies found on Marambaia Island are more or less common in either environment, like plateaus, delta river island, Pantanal ou Amazon forest (BOUVIER 1952; DUTRA & MARINONI 1994; BARROS 2001; BARROS *et al.* 2003; BARBOSA *et al.* 2005). Unsurprisingly whether forest sandbank or the rain forest, and the number of specimens taken, the species seems to vary according to the landscape, as mainly defined by vegetation (HENRIQUES 2004; BARBOSA *et al.* 2005).

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REFERENCES

- Barbosa, M.G., A.L. Henriques, J.A. Rafael & C.R.V. Fonseca, 2005. Diversidade e similaridade entre habitats em relação às espécies de Tabanidae (Insecta: Diptera) de uma floresta tropical de terra firme (Reserva Adolpho Ducke) na Amazônia Central, Brasil. *Amazoniana*, 18: 251-266.
- Barretto, M.P., 1946. Estudos sobre tabanidas brasileiros. II. Sobre o gênero *Catachlorops* Lutz, 1909, com descrição de sete espécies novas (Diptera, Tabanidae). *Anais da Faculdade de Medicina da Universidade de São Paulo*, 22: 151-183.
- Barros, A.T.M., 2001. Seasonality and Relative Abundance of Tabanidae (Diptera) Captured on Horses in the Pantanal,

- Brazil. Memórias do Instituto Oswaldo Cruz, 96: 917-923. DOI: <http://dx.doi.org/10.1590/S0074-02762001000700006>.
- Barros, A.T.M., L.D. Foil & S.A. Souza-Vazquez, 2003. Mutucas (Diptera: Tabanidae) do Pantanal: abundância relativa e sazonalidade na sub-região da Nhecolândia. Corumbá: EMBRAPA Pantanal. (Boletim de Pesquisas e Desenvolvimento, 48, 18 p.
- Bassi, R.M.A., M.C. Cunha & S. Coscarón, 2000. Estudo do comportamento de Tabanídeos (Diptera, Tabanidae) do Brasil. Acta Biológica Paraense, 29: 101-115. DOI: <http://dx.doi.org/10.5380/abpr.v29i0.585>.
- Benchimol, J.L. & M.R. Sá (Eds. and Orgs), 2005. Adolpho Lutz: Entomologia - tabanídeos = Entomology - tabanidae [online]. Rio de Janeiro: Editora FIOCRUZ. 704 p. Adolpho Lutz Obra Completa, v.2, book 2. ISBN: 85-7541-065-2. Available from SciELO Books.
- Bouvier, G., 1952. Notes sur les Tabanidés de la region de Campinas (Estado S. Paulo) - Brésil. Memórias do Instituto Oswaldo Cruz, 50: 581-595. DOI: <http://dx.doi.org/10.1590/S0074-02761952000100017>.
- Cárdenas R.E., N. Hernández-L, A.R. Barragán & O. Dangles, 2013. Differences in Morphometry and Activity among Tabanid Fly Assemblages in an Andean Tropical Montane Cloud Forest: Indication of Altitudinal Migration? Biotropica, 45: 63-72. DOI: <http://dx.doi.org/10.1111/j.1744-7429.2012.00885.x>.
- Cárdenas, R.E. & J.M. Vieira, 2005. Nuevas citas de tabanidos (Diptera: Tabanidae) para Ecuador. Boletín Sociedad Entomológica Aragonesa, 1: 153-156.
- Cardenas, R.E., J. Buestan & O. Dangles, 2009. Diversity and distribution models of horse flies (Diptera: Tabanidae) from Ecuador. Annales de la Société Entomologique de France, 45: 511-528. DOI: <http://dx.doi.org/10.1080/00379271.2009.10697633>.
- Carrera, M. & J. Lane, 1945. Diptera de Caiobá (Estado do Paraná). Arquivos do Museu Paranaense, 4: 127-136.
- Coscarón, S. & G.B. Fairchild, 1976. El género *Poeciloderas* Lutz en Argentina (Tabanidae, Diptera, Insecta). Physis, 35: 293-301.
- Coscarón, S. & N. Papavero, 2009a. Manual of Neotropical Diptera. Tabanidae. Neotropical Diptera, 6: 1-137. Available on: <http://revistas.ffclrp.usp.br/Neotropical_Diptera/article/viewFile/229/179>. [Accessed in: 02.iii.2014].
- Coscarón, S. & N. Papavero, 2009b. Catalogue of Neotropical Diptera. Tabanidae. Neotropical Diptera, 16: 1-199. Available on: <http://revistas.ffclrp.usp.br/Neotropical_Diptera/article/viewFile/210/165>. [Accessed in: 02.iii.2014].
- Dutra, R.R.C. & R.C. Marinoni, 1994. Insetos capturados com armadilha de Malaise na Ilha do Mel, Baía de Paranaguá, Paraná, Brasil. II. Tabanidae (Diptera). Revista Brasileira de Zoologia, 11: 247-256. DOI: <http://dx.doi.org/10.1590/S0101-81751994000200006>.
- Fairchild, G. B. & J.F. Burger, 1994. A catalog of the Tabanidae (Diptera) of the Americas South of the United States. Memoirs of the American Entomological Institute, 55: 1-249.
- Fairchild, G.B. & C.B. Philip, 1960. A revision of the Neotropical genus *Dichelacera* subgenus *Dichelacera* Macquart. Studia Entomologica, 3: 1-86.
- Fairchild, G.B. & R.C. Wilkerson, 1981. New species of *Esenbeckia* (*Proboscoides*) (Diptera: Tabanidae) with a key to the subgenus. Florida Entomologist, 64: 159-175. DOI: <http://dx.doi.org/10.2307/3494607>.
- Fairchild, G.B. & R.C. Wilkerson, 1986. A review of the Neotropical genus *Stypommisa* (Diptera: Tabanidae). Contributions of the American Entomological Institute, 22: 161. Available on: <<http://www.mosquitocatalog.org/files/pdfs/wr235.pdf>> [Access in: 02.iii.2014].
- Fairchild, G.B., 1961a. The Adolfo Lutz collection of Tabanidae (Diptera). I. The described genera and species, condition of the collection, and selection of lectotypes. Memórias do Instituto Oswaldo Cruz, 59: 185-249. Available on: <[http://www.scielo.br/pdf/mioc/v59n2/tomo59\(f2\)_181-184.pdf](http://www.scielo.br/pdf/mioc/v59n2/tomo59(f2)_181-184.pdf)> [Accessed in: 02.iii.2014].
- Fairchild, G.B., 1961b. Insecta Amapaensi. Diptera: Tabanidae. Studia Entomologica, 4: 433-448.
- Fairchild, G.B., 1961c. A preliminary check list of the Tabanidae (Diptera) of Costa Rica. Revista de Biología Tropical, 9: 23-38.
- Fairchild, G.B., 1971. Family Tabanidae, pp. 1-163. In: Papavero (Eds.). A Catalogue of the Diptera of the Americas South of the United States. 26. São Paulo: Ed. Universidade de São Paulo.
- Fairchild, G.B., 1972. Notes on Neotropical Tabanidae (Diptera) XIII. The Genus *Diachlorus* O. S. The Florida Entomologist, 55: 219-229. DOI: <http://dx.doi.org/10.2307/3493370>.
- Fairchild, G.B., 1983. Notes on Neotropical Tabanidae (Diptera) XIX. The *Tabanus lineola* complex. Annals of the Entomological Society of America, 57: 1-51.
- Fairchild, G.B., 1984. Notes on Neotropical Tabanidae (Diptera). XX. The larger species of *Tabanus* of eastern South America. Contributions of the American Entomological Institute, 21: 1-50.
- Fairchild, G.B., 1985. Notes on Neotropical Tabanidae (Diptera). XVIII. The genus *Leucotabanus* Lutz. Myia, 3: 299-331.
- Ferreira, R.L.M., A.L. Henriques & J.A. Rafael, 2002. Activity of Tabanids (Insecta: Diptera: Tabanidae) attacking the reptiles *Caiman crocodiles* (Linn.) (Alligatoridae) and *Eunectes murinus* (Linn.) (Boidae), in the Central Amazon, Brazil. Memórias Instituto Oswaldo Cruz, 97: 133-136. DOI: <http://dx.doi.org/10.1590/S0074-02762002000100024>.
- Ferreira-Keppeler, R.L., J.A. Rafael & J.C.H. Guerrero, 2010. Sazonalidade e uso de ambientes por espécies de Tabanidae (Diptera) na Amazônia Central, Brasil. Neotropical Entomology, 39: 645-654. DOI: <http://dx.doi.org/10.1590/S1519-566X2010000400028>.
- Foil, L.D. & C.J. Issel, 1991. Transmission of retroviruses by arthropods. Annual Review of Entomology, 36: 355-381. DOI: <http://dx.doi.org/10.1146/annurev.en.36.010191.002035>.
- Foil, L.D., 1989. Tabanids as vectors of disease agents. Parasitology Today, 5: 88-96. DOI: [http://dx.doi.org/10.1016/0169-4758\(89\)90009-4](http://dx.doi.org/10.1016/0169-4758(89)90009-4).
- Frost, S.W., 1957. The Pennsylvania insect light trap. Journal of Economic Entomology, 50: 287-292. DOI: <http://dx.doi.org/10.1093/jee/50.3.287>.
- Guimarães R.R., I.S. Gorayeb, R. Rodrigues-Guimarães, G.S. Seppa & R.W. Carvalho, 2015. Description of *Dichelacera* (*Dichelacera*) *walteri* n. sp. (Diptera: Tabanidae) with a Key to Related Species in the Subgenus *Dichelacera* Macquart. Neotropical Entomology, 44: 474-80. DOI: <http://dx.doi.org/10.1007/s13744-015-0311-8>.
- Guimarães, R.R., R.R. Guimarães-Júnior, S.R. Harlan-Rodrigues, R. Rodrigues-Guimarães, R. Xerez, G.S. Seppa & R.W. Carvalho, 2014. Remarks on Record of *Chlorotabanus inanis* (Fabricius, 1787) (Diptera, Tabanidae) and its Occurrence in Rio de Janeiro Province, Brazil. Entomology, Ornithology and Herpetology, 4: 139. DOI: <http://dx.doi.org/10.4172/2161-0983.1000139>.
- Henriques A.L. & J.A. Rafael, 1995. Revision of the neotropical genus *Acanthocera* Maquart (Diptera: Tabanidae). Acta Amazonica, 23: 402-440.
- Henriques, A.L., T.K. Krolow & J.A. Rafael, 2012. Corrections and additions to Catalogue of Neotropical Diptera (Tabanidae) of Coscarón & Papavero (2009). Revista Brasileira de Entomologia, 56: 277-280. DOI: <http://dx.doi.org/10.1590/S0085-56262012005000042>.
- Henriques, A.L. & I.S. Gorayeb, 1993. A Coleção de Tabanidae (Insecta: Diptera) do Museu Paraense Emílio Goeldi, Belém, Pará, Brasil. Goeldiana Zoologia, 20: 1-23.
- Henriques, A.L., 1995. A Coleção de Tabanidae (Diptera: Tabanidae) do Instituto Nacional de Pesquisas da Amazônia (INPA), Manaus, Amazonas, Brasil. Boletim do Museu Paraense Emílio Goeldi, Série Zoologia, 11: 57-99.

- Henriques, A.L., 2004. Tabanidae (Insecta: Diptera) from Parque Nacional do Jaú. II. Chapter 9, p. 143-152. *In*: Burges, S.H., S. Iwanaga, C.C. Durigan, & M.R. Pinheiro (Eds.). Windows for Biodiversity in Parque Nacional do Jaú: a strategy for the study of biodiversity in the Amazon. Manaus, Fundação Vitória Amazônica.
- Henriques, A.L., R.L.M. Ferreira, J.F. Vidal & J.A. Rafael, 2000. *Betrequia ocellata* Oldroyd (Diptera, Tabanidae, Rhinomyzini) blood feeding in *Cayman crocodillus* (Linnaeus) (Crocodylia, Alligatoridae) in Manaus, Brazil. *Revista Brasileira de Zoologia*, 17: 609-613.
- Kay, J.J. & H. Regier, 2000. Uncertainty, complexity, and ecological integrity: Insights from an ecosystem approach, p. 121-156. *In*: Crabbé, P., A. Holland, L. Ryszowski & L. Westra. (Eds). *Implementing Ecological Integrity: Restoring Regional and Global Environmental and Human Health*. Dordrecht, Boston: Kluwer Academic Publishers.
- Krinsky, W.L., 1976. Animal disease agents transmitted by horse flies and deer flies (Diptera: Tabanidae). *Journal of Medical Entomology*, 13: 225-275. DOI: <http://dx.doi.org/10.1093/jmedent/13.3.225>.
- Krolow, T.K. & A.L. Henriques, 2010. Taxonomic Revision of the genus *Chlorotabanus* Lutz, 1913 (Diptera: Tabanidae). *Zootaxa*, 2565: 1-40. Available on: <<http://www.mapress.com/zootaxa/2010/f/zo2656p04of.pdf>>. [Accessed in: 04.iii.2014].
- Krolow, T.K., A.L. Henriques & J.A. Rafael, 2010. Tabanidae (Diptera) no dossel da floresta amazônica atraídos por luz e descrição de machos de três espécies. *Acta Amazonica*, 40: 605-612. DOI: <http://dx.doi.org/10.1590/S0044-59672010000300022>.
- Krolow, T.K., R.F. Krüger & P.B. Ribeiro, 2007. Chave pictórica para os gêneros de Tabanidae (Insecta: Diptera) do bioma Campos Sulinos, Rio Grande do Sul, Brasil. *Biota Neotropica*, 7: 253-264. Available on: <<http://www.biotaneotropica.org.br/v7n2/pt/abstract?identification-key+bn03307022007>> [Accessed in: 02.iii.2014]. DOI: <http://dx.doi.org/10.1590/s1676-06032007000200028>.
- Lima, H.I.L., T.K. Krolow & A.L. Henriques, 2015. Checklist of horse flies (Diptera: Tabanidae) from Taquaruçu, Tocantins, Brazil, with new records for the state. *Checklist*, 11: 1596. DOI: <http://dx.doi.org/10.15560/11.2.1596>.
- Lutz, A., 1905. Beitrage zur Kenntnis der brasilianischen Tabaniden. *Revista da Sociedade Scientifica de São Paulo*, 1: 17-32.
- Lutz, A., 1909a. Contribuição para o conhecimento da fauna indígena de tabânidas. *Memórias do Instituto Oswaldo Cruz*, 1: 28-32. DOI: <http://dx.doi.org/10.1590/S0074-02761909000100004>.
- Lutz, A., 1909b. Coleção de tabânidas, p. 28-30. *In*: Instituto Oswaldo Cruz. Rio de Janeiro: Instituto Oswaldo Cruz.
- Lutz, A., 1910. Notas Dipterológicas. I. Habitat e tempo de aparecimento de *Diatomineura longipennis* Ricardo. *Memórias do Instituto Oswaldo Cruz*, 2: 58-59. DOI: <http://dx.doi.org/10.1590/s0074-02761910000100006>.
- Lutz, A., 1911. Novas contribuições para o conhecimento das Pangoninas e Chrysopinas do Brasil. *Memórias do Instituto Oswaldo Cruz*, 3: 65-85. DOI: <http://dx.doi.org/10.1590/S0074-02761911000100005>.
- Lutz, A., 1913. Tabanidas do Brazil e alguns Estados vizinhos. *Memórias do Instituto Oswaldo Cruz*, 5: 142-191.
- Lutz, A., 1914. Sobre a sistemática dos tabanídeos, sub-família Tabaninae. *Memórias do Instituto Oswaldo Cruz*, 6: 163-168. DOI: <http://dx.doi.org/10.1590/s0074-02761914000300003>.
- Lutz, A., 1921. Mutucas da Guaratuba. *Boletim do Instituto Oswaldo Cruz (Suplemento das Memórias)*, 1: 15.
- Lutz, A. & A. Neiva, 1909. Contribuição para o conhecimento da fauna indígena de Tabanidas. *Memórias do Instituto Oswaldo Cruz*, 1: 28-32.
- Lutz, A. & A. Neiva, 1914. As Tabanidae do Estado do Rio de Janeiro. *Memórias do Instituto Oswaldo Cruz*, 6: 282-287. DOI: <http://dx.doi.org/10.1590/S0074-02761914000200002>.
- Lutz, A. & M. Nuñez-Tovar. 1928. Tabanidae, p. 55-68. *In*: Lutz and Tovar (Eds.). *Estudios de zoología y parasitología venezolanas por el Dr. Adolpho Lutz*. Caracas, Editorial Sucre.
- Patrick, C.R. & K.L. Hayes, 1968. Some tabanidae (Diptera) from eastern Ecuador. *The Florida Entomologist*, 51: 219-221. DOI: <http://dx.doi.org/10.2307/3493422>.
- Pechuman, L.L. & H.J. Teskey, 1981. Tabanidae, p. 464-478. *In*: J. F. McAlpine et al. (Eds.). *Manual of Nearctic Diptera*. Ottawa: Research Branch, Agriculture Canada.
- Rafael, J.A. & J.D. Charlwood, 1980. Idade fisiológica, variação sazonal e periodicidade diurna de quatro populações de Tabanidae (Diptera) no Campus Universitário, Manaus, Brasil. *Acta Amazonica*, 10: 907- 927.
- Rafael, J.A., I.S. Gorayeb, M.S.S. Rosa & A.L. Henriques, 1991. Tabanidae (Diptera) da Ilha da Maracá e Serra Pacaraima, Roraima, Brasil, com descrição de duas novas espécies. *Acta Amazonica*, 21: 351-367. DOI: <http://dx.doi.org/10.1590/1809-43921991211367>.
- Turcatel, M., C.J.B. Carvalho & J.A. Rafael, 2007. Mutucas (Diptera: Tabanidae) do estado do Paraná, Brasil: chave de identificação pictórica para subfamílias, tribos e gêneros. *Biota Neotropica*, 7: 265-278. Available on: <<http://www.biotaneotropica.org.br/v7n2/pt/abstract?identification-key+bn05007022007>>. [Accessed in: 10.iii.2014]. DOI: <http://dx.doi.org/10.1590/s1676-06032007000200029>.

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