

A List of Current Valid Blow Fly Names (Diptera: Calliphoridae) in the Americas South of Mexico with Key to the Brazilian Species*

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Abstract. The calliphorids flies comprise a heterogenous family found in all zoogeographical regions, with over 1,000 species and 150 genera described. The blow flies have a great medical and veterinary importance, and can be use in forensic science, especially in order to estimate the postmortem interval. Despite its wide distribution and importance, the group presents many taxonomic problems, and many conflicting records regarding the number of species in the Neotropical Region. In this paper, we list all species of Calliphoridae found in the Americas south of Mexico, based on reports in the literature between the years 1960 and 2012. There are 29 genera and 99 species recognized distributed in seven subfamilies: Calliphorinae (three genera and eight species), Chrysomyinae (seven genera and 28 species), Luciliinae (one genus and 17 species), Mesembrinellinae (nine genera and 33 species), Polleniinae (one genus and one species), Rhiniinae (one genus and one species), and Toxotarsinae (seven genera and 11 species). An identification key for the species that occur in Brazil is presented.

Keywords: Biodiversity; Bluebottles; Checklist; Neotropical Region; Taxonomy.

Lista Atualizada de Nomes Válidos de Moscas-Varejeiras (Diptera: Calliphoridae) das Américas ao Sul do México, com uma Chave para as Espécies que Ocorrem no Brasil

Resumo. Os califorídeos constituem uma família heterogênea encontrada em todas as regiões zoogeográficas, com mais de 1.000 espécies e 150 gêneros. As moscas-varejeiras possuem grande importância médica e veterinária, e podem ainda ser utilizadas nas ciências forenses, principalmente para estimar o intervalo pós-morte. Apesar da sua vasta distribuição e importância, o grupo apresenta muitos problemas taxonômicos e diversos registros conflitantes no tocante ao número de espécies presentes na região Neotropical. Neste artigo nós listamos todas as espécies de Calliphoridae encontradas nas Américas ao sul do México, baseadas em registros na literatura entre os anos de 1960 e 2012. Existem 29 gêneros e 99 espécies reconhecidas e distribuídas em sete subfamílias: Calliphorinae (três gêneros e oito espécies), Chrysomyinae (sete gêneros e 28 espécies), Luciliinae (um gênero e 17 espécies), Mesembrinellinae (nove gêneros e 33 espécies), Polleniinae (um gênero e uma espécie), Rhiniinae (um gênero e uma espécie) e Toxotarsinae (sete gêneros e 11 espécies). Uma chave de identificação para as espécies que ocorrem no Brasil é apresentada.

Palavras-Chave: Biodiversidade; Lista; Mosca-varejeira; Região Neotropical; Taxonomia.

The members of the family Calliphoridae (Schizophora, Calypttratae, Oestroidea) are commonly known as blow flies, bluebottles, cluster flies or greenbottles. They are worldwide distributed, with over 1,000 species and about 150 genera described (SHEWELL 1987; VARGAS & WOOD 2010). Diagnosis for the family and identification keys for the main genera from North and Central Americas were presented by SHEWELL (1987) and VARGAS & WOOD (2010), respectively.

The family classification and its phylogeny are still very confusing. The most recent attempt (KUTTY *et al.* 2010) reinforces the results presented by ROGNES (1997) that the family does not appear to form a monophyletic group.

The necrophagous feeding habit of the blow flies is associated with numerous myths of the human history as a pest to man, and sometimes associated with gods or divinities (THOMPSON & PONT 1993; PAPAVERO *et al.* 2010). The blow flies have medical and veterinary importance since their larvae can cause myiasis in man and other animals. They can also act as mechanical vectors for several pathogens of human and animal's diseases (ZUMPT 1965; GUIMARÃES *et al.* 1983; HALL & WALL 1995). The calliphorids have a wide variety of habits, and can be found visiting flowers

(JIRON & HEDSTRÖM 1985), excrement, termite nest-mounds and driver-ant columns (PONT 1980), as well as in decomposing plant and animal (BYRD & CASTNER 2001; CARTER *et al.* 2007). The blow flies can be used as indicators of anthropogenic environments in urban ecology (NUORTEVA 1963; POLVONY 1971), in the ecology of the decomposition process (CARTER *et al.* 2007), and as a powerful tool to the estimate the *postmortem* interval (PMI) in forensic entomology (KEH 1985; BENECKE 2001; MORTON & LORD 2006; AMENDT *et al.* 2007; PUJOL-LUZ *et al.* 2008).

However, the lack of studies on the diversity of the family in tropical biomes, as well as the biology and ecology of the species, seems to be an obstacle to the knowledge of this group of insects in Latin America.

Although few authors have contributed to the knowledge of Calliphoridae in the Neotropical Region, between 1960 and 2012, important partial reviews and catalogs of the blowfly species described the diversity of Calliphoridae in different biogeographical sub-regions, specially in West Indies, Venezuela,

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Colombia, Brazil and Argentina (i.e., JAMES 1955, 1966, 1970, 1971; MELLO 1961, 1967, 1996, 2003; GUIMARÃES 1977; MARILUIS & PERIS 1984; DEAR 1985; MARILUIS 2002; PAPE *et al.* 2004; AMAT *et al.* 2008; AMAT 2009, 2010; CARVALHO & MELLO-PATIU 2008; WHITWORTH 2010, 2012). Among those authors that worked with neotropical blow flies, we highlight GARCIA (1952), MELLO (1961, 1962, 1965, 1967, 1968, 1969a, 1969b, 1972a, 1972b, 1974, 1978, 1996, 2003), MARILUIS (1978a, 1978b, 1979, 1980, 1981a, 1981b, 1982, 1983, 1987), PERIS & MARILUIS (1984), MARILUIS & AVALOS (1987), MARILUIS *et al.* (1990, 1994), CARVALHO & COURI (1991), GONZÁLEZ-MORA *et al.* (1998), PERIS *et al.* (1998), CARVALHO & RIBEIRO (2000), as well as FLOREZ & WOLFF (2009).

During several decades, even today, it is common to see misidentification in the blow flies species, as some authors grouping certain taxa while other authors split them. This scenario is well observed in the subfamily Toxotarsinae (LOPES & ALBUQUERQUE 1982). Although there are some experts on Neotropical Calliphoridae, there is no consensus on the number of species or sub-families occurring in the tropical Americas. This obviously reflects the lack of taxonomic studies, a vicious circle especially for studies of diversity or to younger students who do not even know how many species occur in the Americas. In the Neotropical Region is still notable the almost complete lack of taxonomic knowledge of these flies in the Andean sub-regions, sub-Andean, desert and semi-arid. We highlight the catalogs and the contributions of STONE *et al.* (1965), JAMES (1966, 1970), DEAR (1979, 1985), GUIMARÃES & PAPAVERO (1999), WHITWORTH (2010), as good references to the knowledge of the diversity of American species.

The lack of knowledge combined with the different points of view of several authors led to misunderstandings in the use of names and imply in taxonomic issues often discussed in the literature of the group for the Neotropical Region, but that are never resolved (JAMES 1970; MARILUIS & PERIS 1984; DEAR 1985; MELLO 2003; CARVALHO & MELLO-PATIU 2008). According to the catalog of JAMES (1970), followed with some changes in DEAR (1985) and MELLO (2003) about 90 species, 22 genera and four subfamilies (Mesembrinellinae, Chrysomyinae, Calliphorinae and Toxotarsinae) were registered in the Neotropical Region.

The purpose of this paper is to provide a list of species of Calliphoridae that occur in the Americas south of Mexico, as well as an identification key to the blow fly species found in Brazil.

MATERIAL AND METHODS

The geographical delimitation used in this work follows MORRONE (2004). The author considers the Neotropical Region with the following subregions: Caribbean, Amazon, Chaqueña and Paranaense. Some species mentioned here reach the limits of distribution and invade the southernmost South American transition zones and the Andean Region. Only the records of the distribution in the Neotropical Region were included.

The list of names of Calliphoridae's taxa occurring in the Americas south of Mexico presented here is based on the available literature between 1960 and 2012. We did not examine any type material and nomenclatural problems are not discussed. Here we adopt the current opinions and eventually made some taxonomic notes based on current references (STONE *et al.* 1965; JAMES 1966, 1970; DEAR 1979, 1985; PONT 1980; KURAHASHI 1989) and the **Systema Dipteroorum** (PAPE & THOMPSON 2010). We examined specimens of the Neotropical Region deposited in the collections of Fundação Instituto Oswaldo Cruz (FIOCRUZ) in Rio de Janeiro, in the Museu de Zoologia da Universidade de São Paulo (MZUSP), in the Coleção Entomológica do Departamento de Zoologia da Universidade de Brasília (DZUNB) and in the Colección Entomológica de la Universidad de Antioquia, Medellín, Colombia (CEUA). Taxonomic notes are indicated in the text with numbers, whenever necessary and listed after the

identification key.

In this paper, we considered Mesembrinellinae as a subfamily of Calliphoridae based on the works of ROGNES (1986) and TOMA & CARVALHO (1995). We used the classification of subfamilies presented by ROGNES (1997), and the autapomorfies of each subfamily present in the Americas south of Mexico, according to the author, are listed below. **Mesembrinellinae**. Methatoracic spiracle with a single large reniform lappet. Female present crossed interfrontal setae, and a very long, narrow and distally tapering spermathecae. **Chrysomyinae**. A row of setae along the anteroventral edge of the metathoracic spiracle. **Calliphorinae**. Lower calypter hairy above, anterior half of the anepimeron invaded by setae from behind. **Luciliinae**. Presence of a green setose metallic sclerite posteriorly on the supra-squamal ridge. **Polleniinae**. More or less developed facial carina and unarmed condition of the acrophallus. **Rhiniinae**. Quite uniform and characteristic adeagus, occiput with a hairless shining submarginal band, spinous setae at upper end of bacilliform sclerites, lobes of male 5th sternite often with spines apically, lower calypter usually narrow, stem vein that is setose on the upper surface. **Toxotarsinae**. Setulose ventral surface of the stem vein and two marginal scutellar setae.

The key presented here is based on MELLO (2003) with modifications. We did not include *Lucilia mexicana*, and *Lucilia japuhybensis* Mello, 1961, as their records are scarce and/or doubtful in Brazil (MELLO 1961 or see notes). *Lucilia purpurencens* (Walker, 1837) was also not included since that in the only published key (CARVALHO & RIBEIRO 2000) with this species, the characters used to separate it from *Lucilia eximia* (Wiedemann, 1819) are based primarily in color, which we find quite doubtful. The morphological characters used to identify and separate *Chrysomya ruffacies* (Macquart, 1843) and *Chrysomya putoria* (Wiedemann, 1818) were taken from SILVA *et al.* (2012). The terminology adopted for the key follows McALPINE (1981).

RESULTS

In the checklist we recognize 29 genera and 99 species distributed in seven subfamilies: Calliphorinae (three genera and eight species), Chrysomyinae (seven genera and 27 species), Luciliinae (one genus and 17 species), Mesembrinellinae (nine genera and 33 species), Polleniinae (one genus and one species), Rhiniinae (one genus and one species), and Toxotarsinae (seven genera and 11 species). All exotic species are marked as (*E).

We listed 38 species in the key, all of them occurring in Brazil and some in the border regions of south american contries.

Checklist

Subfamily CALLIPHORINAE

Genus *Blepharicnema* Macquart, 1843

splendens Macquart, 1843:284. Type-locality: "unknown". Neotropical: Bolivia, Colombia, Ecuador, Peru, Venezuela.

Genus *Calliphora* Townsend, 1908

irazuana Townsend, 1908:118. Type-locality: Costa Rica, Irazu. Neotropical: Costa Rica, El Salvador, Guatemala, Mexico.

lopesi Mello, 1962:270. Type-locality: Brazil, Rio de Janeiro, Teresópolis. Neotropical: Brazil, Uruguay.

maestrica Peris, Gonzalez-Mora, Fernandez & Peris, 1998:49. Type-locality: Cuba, Santiago, Serra Maestra. Neotropical: Cuba, Dominican Republic, Jamaica.

nigribasis Macquart, 1851:215. Type-locality: Colombia. Neotropical: Argentina, Bolivia, Colombia, Ecuador, Peru,

Venezuela.

triseta Whitworth, 2012:18. Type-locality: Costa Rica, San Jose, San Gerardo de Dota. Neotropical: Costa Rica, El Salvador, Mexico.

vicina Robineau-Desvoidy, 1830:435. Type-locality: U.S.A., Pennsylvania, Philadelphia. Neotropical: Argentina, Brazil, Colombia, Chile south to Tierra del Fuego, Cuba, Panama, Uruguay.

Genus *Metallicomyia* Röder, 1886

elegans (Röder), 1886:268 [*Chalcomyia*]. Type-locality: Ecuador, RioBamba. Neotropical: Ecuador.

Subfamily CHRYSOMYINAE

Genus *Chloroprocta* Wulp, 1896

idioidea (Robineau-Desvoidy), 1830:445 [*Chrysomya*]. Type-locality: Brazil. Neotropical: Argentina, Bahamas, Brazil, Colombia, Costa Rica, Cuba, Ecuador, El Salvador, French Guyana, Guatemala, Guyana, Mexico, Nicaragua, Panama, Paraguay, Peru, Trinidad and Tobago, USA, Venezuela. [1]

Genus *Chrysomya* Robineau-Desvoidy, 1830

albiceps (Wiedemann), 1819:38 [*Musca*]. Type-locality: South Africa, Cape of Good Hope. Neotropical (*E): Argentina, Bolivia, Brazil, Colombia, Dominica, Guatemala, Nicaragua, Paraguay, Peru, Puerto Rico, Uruguay, Venezuela.

chloropyga (Wiedemann), 1818:44 [*Musca*]. Type-locality: South Africa, Western Cape Province, Cape of Good Hope. Neotropical (*E): Argentina.

megacephala (Fabricius), 1794:317 [*Musca*]. Type-locality: "Guinea", [error =? "Ex. Ind. Or." See Patton, 1925:179]. Neotropical (*E): Argentina, Brazil, Colombia, Dominica, Dominican Republic, Greater Antilles, Jamaica, Nicaragua, Puerto Rico, Peru.

putoria (Wiedemann), 1818:403 [*Musca*]. Type-locality: Sierra Leone. Neotropical (*E): Argentina, Bolivia, Brazil, Colombia, Panama, Paraguay, Peru. [2]

rufifacies (Macquart), 1843:303 [*Lucilia*]. Type-locality: "Nouvelle-Hollande", Australia. Neotropical (*E): Argentina, Brazil, Colombia, Cuba, Dominica, Guatemala, Jamaica, Mexico, Puerto Rico. [3]

Genus *Cochliomyia* Townsend, 1915

aldrichi Del Ponte, 1938:274. Type-locality: Bahama Islands, San Salvador Is. Neotropical: Bahamas, Bermuda, British Virgin Islands, Cayman Islands, Cuba, El Salvador, Puerto Rico, USA (Florida Keys).

hominivorax (Coquerel), 1858:173 [*Lucilia*]. Type-locality: "Guyana". Neotropical: Argentina, Brazil, Chile, Colombia, Costa Rica, Cuba, Dominican Republic, French Guyana, Greater Antilles, Guatemala, Jamaica, Mexico, Nicaragua, Parama, Peru, Puerto Rico, Trinidad and Tobago, Uruguay.

macellaria (Fabricius), 1775:776 [*Musca*]. Type-locality: "West Indies". Neotropical: Argentina, Bahamas, Belize, Bermudas, Bolivia, Brazil, Caribe, Chile, Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, Greater Antilles, Guatemala, Guyana, Honduras, Jamaica, Mexico, Nicaragua, Panama, Paraguay, Peru, Trinidad and Tobago, Uruguay, Venezuela. [4]

minima Shannon, 1926:124. Type-locality: West Indies, Santo Domingo, San Francisco M'ts. Neotropical: British

Virgin Islands, Cuba, Dominican Republic, Jamaica, Puerto Rico, Santo Domingo, USA (Florida Keys). [5]

Genus *Compsomyiops* Townsend, 1918

alvarengai (Mello), 1968:188 [*Paralucilia*]. Type-locality: Bolivia, La Paz, El Alto. Neotropical: Bolivia, Chile, Ecuador, Peru.

arequipensis (Mello), 1968:187 [*Paralucilia*]. Type-locality: Peru, Arequipa. Neotropical: Bolivia, Colombia, Ecuador, Peru.

callipes (Bigot), 1877:249 [*Somomya*]. Type-locality: "Mexico". Neotropical: USA to Bolivia. [6]

fulvicrura (Robineau-Desvoidy), 1830:446 [*Chrysomya*]. Type-locality: Uruguay, Montevideo. Neotropical: Mexico to Chile, Argentina, Bolivia, Brazil, Guyana, Uruguay.

melloi Dear, 1985:155. Type-locality: "Mexico". Neotropical: Colombia, Mexico.

verena (Walker), 1849:874 [*Musca*]. Type-locality: "Venezuela". Neotropical: Argentina, Colombia, Costa Rica, Peru, Venezuela.

Genus *Hemilucilia* Brauer, 1895

benoisti Séguy, 1925b:440. Type-locality: "French Guyana". Neotropical: Brazil, Colombia, Costa Rica, French Guyana, Guyana, Peru, Venezuela.

melusina Dear, 1985:134. Type-locality: Peru. Neotropical: Colombia, Peru.

segmentaria (Fabricius), 1805:292 [*Musca*]. Type-locality: "South America". Neotropical: Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Ecuador, El Salvador, Guatemala, Guyana, Mexico, Panama, Paraguay, Peru, Trinidad and Tobago.

semidiaphana (Rondani), 1850:177 [*Mya*]. Type-locality: Brazil, São Paulo, São Sebastião Is. Neotropical: Argentina, Bolivia, Brazil, Colombia, Costa Rica, Ecuador, Guatemala, Guyana, Panama, Paraguay, Peru, Trinidad and Tobago, Venezuela. [7]

souzalopesi Mello, 1972b:132. Type-locality: Brazil. Neotropical: Argentina, Brazil.

townsendi Shannon, 1926:125. Type-locality: Peru, Yahuarmayo. Neotropical: Colombia, Peru.

Genus *Paralucilia* Brauer & Bergenstamm, 1891

borgmeieri (Mello), 1969b:313 [*Myolucilia*]. Type-locality: Brazil, Goiás, Campinas. Neotropical: Brazil.

fulvinota (Bigot), 1877:251. [*Somomyia*]. Type-locality: Mexico. Neotropical: Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Ecuador, Guatemala, Guyana, Mexico, Peru, Venezuela.

nigrofacialis (Mello), 1969b:308 [*Myolucilia*]. Type-locality: Brazil, Rio de Janeiro, Angra dos Reis. Neotropical: Brazil.

paraensis (Mello), 1969b:305 [*Myolucilia*]. Type-locality: Brazil, Pará, Belém. Neotropical: Brazil, Colombia, Costa Rica, Guatemala, Guyana, Panama, Paraguay, Peru, Surinam, Venezuela. [8]

pseudolyrcea (Mello), 1969b:310 [*Myolucilia*]. Type-locality: Brazil, Santa Catarina, Nova Teutônia. Neotropical: Argentina, Bolivia, Brazil, Colombia, Paraguay. [9]

Genus *Phormia* Robineau-Desvoidy, 1830

regina (Meigen), 1826:58 [*Musca*]. Type-locality: Germany. Neotropical (*E): Bahamas.

Subfamily LUCILIINAE**Genus *Lucilia* Robineau-Desvoidy, 1830**

cluvia (Walker), 1849:885 [*Musca*]. Type-locality: West Indies. Neotropical: Anguilla, Argentina, Colombia, Cuba, Guatemala, Honduras, Martinique, Mexico, Nicaragua, Puerto Rico, Southeastern USA.

coelureiviridis Macquart, 1855:133. Type-locality: U.S.A., Maryland, Baltimore. Neotropical: Cuba, Guatemala.

cuprina (Wiedemann), 1830:654 [*Musca*]. Type-locality: "China". Almost world-wide. Neotropical (*E): Argentina, Bermuda, Brazil, Colombia, Cuba, Haiti, Jamaica, Peru, Puerto Rico, Trinidad, Uruguay, Venezuela, Virgin Islands.

deceptor (Curran), 1934:166 [*Virindisula*]. Type-locality: Galápagos Islands, North Seymour (Baltra). Neotropical: Ecuador.

eximia (Wiedemann), 1819:53 [*Musca*]. Type-locality: "Brazil". Neotropical: Argentina, Barbados, Brazil, Chile, Colombia, Costa Rica, Dominica, Dominican Republic, Ecuador, Guatemala, Grenada, Guadeloupe, Mexico, Nicaragua, Peru, Puerto Rico, St. Vincent, Trinidad, Venezuela, Virgin Islands.

fayaeae Whitworth, 2010:22. Type-locality: Dominica, West Indies. Neotropical: Dominica, Puerto Rico, Saint Lucia, Saint Vincent.

ibis Shannon, 1926:132. Type-locality: Peru, Huadquiña. Neotropical: Peru.

japuhbensis Mello, 1961:274. Type-locality: Brazil, Rio de Janeiro, Angra dos Reis, Japuíba. Neotropical: Brazil.

lucigerens (James), 1971:384 [*Phaenicia*]. Type-locality: Jamaica. Neotropical: Jamaica.

mexicana (Macquart), 1843:300 (separate, p. 143) [*Lucilia*]. Type-locality: "Mexico". Neotropical: Southwestern USA, Mexico, Guatemala. Hall (1948) says south to Brazil.

pionia (Walker), 1849:880 [*Musca*]. Type-locality: Galapagos Islands. Neotropical: Ecuador.

problematica Johnson, 1913:448. Type-locality: Bermuda, West Indies. Neotropical: Bermuda, uncommon, according to Hall (1948).

purpurescens (Walker), 1837:355 [*Musca*]. Type-locality: Brazil, Santa Catarina. Neotropical: Argentina, Bolivia, Brazil, Colombia, Costa Rica, Guatemala, Mexico, Peru, Venezuela.

rica Shannon, 1926:132. Type-locality: West Indies, Antigua. Neotropical: Antigua, Bermuda, Guadeloupe, Haiti, Puerto Rico, Saint Lucia.

retroversa (James), 1971:382 [*Phaenicia*]. Type-locality: Bahamas. Neotropical: Bahamas, Cayman Islands, Cuba, Dominican Republic, Haiti, Puerto Rico.

sericata (Meigen), 1826:53 [*Musca*]. Type-locality: "Germany". Almost World-wide. Neotropical (*E): Argentina, Bermuda, Brazil, Chile, Colombia, Peru, Venezuela.

setosa (James), 1966:479 [*Phaenicia (Viridinsula)*]. Type-locality: Galapagos Islands, Darwin Island. Neotropical: Ecuador.

Subfamily MESEMBRINELLINAE**Genus *Albuquerquea* Mello, 1967**

latifrons Mello, 1967:10. Type-locality: Brazil, Rio de Janeiro, Petrópolis. Neotropical: Brazil.

Genus *Eumesembrinella* Townsend, 1931

benoisti (Séguy), 1925a:196 [*Ochromyia*]. Type-locality: French Guyana. Neotropical: Brazil, French Guyana, Guyana, Venezuela.

cyaneicincta (Surcouf), 1919:69 [*Ochromyia*]. Type-locality: Brazil. Neotropical: Brazil. [10]

quadrilineata (Fabricius), 1805:286 [*Musca*]. Type-locality: "America meridionalis". Neotropical: Bolivia, Brazil, Colombia, French Guyana, Guyana, Peru, Venezuela.

randa (Walker), 1849:852 [*Dexia*]. Type-locality: Brazil. Neotropical: Bolivia, Brazil, Colombia, French Guyana, Guyana, Surinam, Venezuela.

Genus *Giovanella* Bonatto, 2005

bolivar Bonatto, 2005:884. Type-locality: Venezuela, Bolivar, Kananayén. Neotropical: Venezuela.

Genus *Henriquella* Bonatto, 2005

spicata (Aldrich), 1925:13 [*Mesembrinella*]. Type-locality: Costa Rica, La Suiza de Turrialba. Neotropical: Colombia, Costa Rica.

Genus *Huascaromusca* Townsend, 1918

aeneiventris (Wiedemann), 1830:376 [*Dexia*]. Type-locality: Brazil. Neotropical: Brazil, Colombia, Costa Rica, Ecuador, Panama, Peru.

bequaerti (Séguy), 1925a:195 [*Mesembrinella*]. Type-locality: Peru. Neotropical: Peru.

decrepita (Séguy), 1925a:195 [*Mesembrinella*]. Type-locality: Colombia. Neotropical: Colombia, Venezuela.

lara Bonatto, 2005:888. Type-locality: Venezuela, Lara, Yacambu. Neotropical: Venezuela.

purpurata (Aldrich), 1922:16 [*Mesembrinella*]. Type-locality: Brazil, Espírito Santo. Neotropical: Brazil, Ecuador, Peru.

semiflava (Aldrich), 1925:14 [*Mesembrinella*]. Type-locality: Costa Rica, La Suiza de Turrialba. Neotropical: Costa Rica.

uniseta (Aldrich), 1925:13 [*Mesembrinella*]. Type-locality: Costa Rica, La Suiza de Turrialba. Neotropical: Costa Rica.

vogelsangi Mello, 1967:46. Type-locality: Venezuela, Aragua. Neotropical: Venezuela.

Genus *Laneella* Mello, 1967

nigripes Guimarães, 1977:57. Type-locality: Brazil, São Paulo, Salesópolis. Neotropical: Brazil, Paraguay.

perisi (Mariluis), 1987:107. Type-locality: Ecuador, Napo, Lago Agrio. Neotropical: Brazil, Colombia, Ecuador.

Genus *Mesembrinella* Giglio-Tos, 1893

abaca (Hall), 1948:68 [*Huascaromusca*]. Type-locality: Barro Colorado Island, Canal Zone, Panama. Neotropical: Costa Rica, Nicaragua, Panama.

apollinaris Séguy, 1925a:196. Type-locality: Colombia,

Villavicencio. Neotropical: Colombia.

batesi Aldrich, 1922: 15. Type-locality: Brazil, Amazonas. Neotropical: Brazil, Colombia, Peru.

bellardiana Aldrich, 1922:21 [*Mesembrinella* (*Mesembolia*)]. Type-locality: Brazil, Espírito Santo. Neotropical: Argentina, Bolivia, Brazil, Ecuador, French Guyana, Guyana, Mexico, Paraguay, Venezuela. [11]

bicolor (Fabricius), 1805:201 [*Musca*]. Type-locality: "America meridionalis", Copenhagen. Neotropical: Mexico to Panama. South America, except Chile and South Argentina.

brunnipes Surcouf, 1919:78. Type-locality: Bolivia. Neotropical: Bolivia.

currani Guimarães, 1977:27. Type-locality: Brazil, Pará, Maloquinha. Neotropical: Brazil.

flavicrura Aldrich, 1925:16. Type-locality: Costa Rica, La Suiza de Turrialba. Neotropical: Costa Rica, Panama.

peregrina Aldrich, 1922:22. Type-locality: Brazil, Espírito Santo. Neotropical: Brazil.

pictipennis Aldrich, 1922:11. Type-locality: Bolivia, Yungas de La Paz. Neotropical: Bolivia.

semihyalina Mello, 1967:73. Type-locality: Brazil, Espírito Santo, Parque Sooretama. Neotropical: Brazil.

townsendi Guimarães, 1977:31. Type-locality: Peru, Puno, Fundo Chela. Neotropical: Peru.

umbrosa Aldrich, 1922:12. Type-locality: Costa Rica, Tucurrique. Neotropical: Bolivia, Colombia, Costa Rica, Ecuador, Panama.

xanthorrhina (Bigot), 1887: clxxx. Type-locality: Mexico. Neotropical: Mexico, Panama.

Genus *Souzalopesiella* Guimarães, 1977

facialis (Aldrich), 1922:17 [*Mesembrinella*]. Type-locality: Costa Rica, Higuito, San Mateo. Neotropical: Costa Rica, Guatemala, Honduras, Panama, Trinidad, Venezuela.

Genus *Thompsoniella* Guimarães, 1977

anomala Guimarães 1977:54. Type-locality: Venezuela, San Diego. Neotropical: Ecuador, Venezuela.

Subfamily POLLENIINAE

Genus *Pollenia* Robineau-Desvoidy, 1830

pediculata Macquart, 1834:155. Type-locality [?]. Neotropical (*E): Bahamas. [12]

Subfamily RHINIINAE

Genus *Stomorphina* Rondani, 1861

lunata (Fabricius), 1805:292 [*Musca*]. Type-locality: Madeira. Neotropical (*E): Bermuda. [13]

Subfamily TOXOTARSINAE

Genus *Chlorobrachycoma* Townsend, 1918

maurii (Mariluis), 1981b:104 [*Sarconesia*]. Type-locality: Ecuador. Neotropical: Ecuador.

splendida Townsend, 1918:155. Type-locality: Peru, Oroya. Neotropical: Bolivia, Colombia, Ecuador, Peru. [14]

Genus *Neta* Shannon, 1926

chilensis (Walker), 1837:354 [*Musca*]. Type-locality: "Chile". Neotropical: Argentina, Bolivia, Chile, Peru.

Genus *Roraimomusca* Townsend, 1935

roraima Townsend, 1935:70. Type-locality: Venezuela, Mt Roraima. Neotropical: Bolivia, Brazil, Colombia, Ecuador, Venezuela. [15]

Genus *Sarconesia* Bigot, 1857

chlorogaster (Wiedemann), 1830:359 [*Sarcophaga*]. Type-localities: Uruguay, Montevideo (original type-locality), Argentina, Buenos Aires, La Plata (neotype locality; see Dear, 1979:156). Neotropical: Argentina, Bolivia, Brazil, Chile, Paraguay, Peru, Uruguay.

versicolor (Bigot), 1857:302 [*Sarconesia*]. Type-locality: Chile. Neotropical: Argentina, Bolivia, Chile. [16]

Genus *Sarconesiomima* Lopes & Albuquerque, 1955

bicolor Lopes & Albuquerque, 1955:105. Type-locality: Chile, Santiago. Neotropical: Chile. [17]

Genus *Sarconesiopsis* Townsend, 1918

magellanica (Le Guillou), 1842:316 [*Calliphora*]. Type-locality: "Chile". Neotropical: Argentina, Bolivia, Chile, Colombia, Ecuador, Peru.

Genus *Toxotarsus* Macquart, 1851

ambrosianus (Lopes), 1961:456 [*Kuschelomyia*]. Type-locality: Chile, San Ambrosio Is. Neotropical: Chile. [18]

humeralis (Walker), 1837:348 [*Stomoxys*]. Type-locality: Chile, Concepción. Neotropical: Chile. [19]

nigrocyanus (Walker), 1837:354 [*Sarcophaga*]. Type-locality: Chile. Neotropical: Argentina, Chile. [20]

Key to the Brazilian Species of Blow Flies

01. Wing with vein M strongly curved (Figure 1); posterior thoracic spiracle with only one operculum 02
 . Wing with vein M distinctly angular (Figure 2); posterior thoracic spiracle with two opercula 15
02. Interfrontal setae presente; dichoptic males *Albuquerquea latifrons* Mello, 1967
 . Interfrontal setae absent; holoptic males 03
03. Tarsal claws with a white base *Laneella nigripes* Guimarães, 1977
 . Tarsal claws with a different color from above 04
04. Three (3) basal postpronotal setae (Figure 3) 05
 . Two (2) basal postpronotal setae (Figure 4) 10

05. Basal section of stem vein (R_1) with setulae on dorsal view (Figure 5)	06
. Basal section of stem vein (R_1) bare on dorsal view	07
06. Subcostal sclerite with setulae (Figure 6)	<i>Mesembrinella bellardiana</i> Aldrich, 1922 (Figure 15)
. Subcostal sclerite bare	<i>Mesembrinella peregrina</i> Aldrich, 1922
07. Abdomen with rough aspect, with pollinosis forming rounded spots at the base of the hairs	<i>Mesembrinella batesi</i> Aldrich, 1925
. Abdomen different from above	08
08. Wing with a strong dark band along the costal vein	<i>Mesembrinella semyhialina</i> Mello, 1967
. Wing without a dark band along the costal vein	09
09. One to three (1-3) subapical scutellar setae; junction of R_{2+3} and R_{4+5} with one setula (Figure 7)	<i>Mesembrinella bicolor</i> Fabricius, 1805 (Figure 16)
. Subapical scutellar setae absent; junction of R_{2+3} and R_{4+5} with 2-3 setulae	<i>Mesembrinella currani</i> Guimarães, 1977
10. Tergite V without discal setae	11
. Tergite V with discal setae	14
11. Posterior ridge of the abdominal tergites with distinctly violet stripes	<i>Eumesembrinella cyaneicyncta</i> (Surcouf, 1919)
. Posterior ridge of the abdominal tergites without distinctly violet stripes	12
12. Tergite IV with a complete series of distinctly marginal setae; mid and hindtibiae black	<i>Eumesembrinella quadrilineata</i> (Fabricius, 1805)
. Tergite IV only with lateral marginal setae	13
13. Wing with a strong dark stain along the costal vein	<i>Eumesembrinella randa</i> (Walker, 1849)
. Wing without a dark stain along the costal vein	<i>Eumesembrinella benoisti</i> (Séguy, 1925a)
14. Presutural acrostichal setae absent	<i>Huascaromusca aneiventris</i> (Wiedemann, 1830)
. Presutural acrostichal setae present	<i>Huascaromusca purpurata</i> (Aldrich, 1922)
15. Stem vein (base of vein R) with setulae on dorsal view	16
. Stem vein (base of vein R) without setulae on dorsal view	34
16. Stem vein (base of vein R) with setulae on ventral view (Figure 8)	17
. Stem vein (base of vein R) without setulae on ventral view	18
17. Abdomen metallic and thorax not metallic; postsutural acrostichal setae absent; eyes bare	<i>Sarconesia chlorogaster</i> (Wiedemann, 1830) (Figure 17)
. Abdomen and thorax metallic; 3 postsutural acrostichal setae; eyes with dense pilosity	<i>Roraimomusca roraima</i> Townsend, 1935 (Figure 18)
18. Lower calypter with setulae in the whole surface	19
. Lower calypter bare, or with setulae only in the basal third or internal half	22
19. Anterior thoracic spiracle brown or gray; male with superior ommatidia enlarged (Figure 9)	<i>Chrysomya megacephala</i> (Fabricius, 1794)
. Anterior thoracic spiracle white; male with uniform ommatidia	20
20. Proepimeral seta absent	<i>Chrysomya albiceps</i> (Wiedemann, 1819)
. Proepimeral seta present (Figure 10)	21
21. Males: outer vertical setae usually absent; female: tergite V without dorsal cleft in the posterior margin	<i>Chrysomya putoria</i> (Wiedemann, 1818)
. Males: outer vertical setae present; female: tergite V with a dorsal cleft in the posterior margin	<i>Chrysomya rufifacies</i> (Macquart, 1843)
22. Lower calypter bare in the whole surface	23
. Lower calypter with setulae in the basal third or internal half	27
23. Black legs; wings with dark maculae restricted to the costal margin	<i>Chloroprocta idioidea</i> (Robineau-Devoidy, 1830) (Figure 19)
. Yellow legs; wings with maculae in the distal third	24
24. Anterior and posterior thoracic spiracles yellow; 3 presutural dorsocentral setae	25
. Anterior thoracic spiracle yellow and posterior thoracic spiracle brown; 2 presutural dorsocentral setae	26

25. 4 postpronotal bristles *Hemilucilia segmentaria* (Fabricius, 1805)
 . 3 postpronotal bristles *Hemilucilia benoisti* Séguy, 1925b
26. Occiput black *Hemilucilia semidiaphana* (Rondani, 1850) (Figure 20)
 . Occiput black in the superior half and yellow in the inferior half *Hemilucilia souzalopesi* Mello, 1972
27. Palpus short and filiform 28
 . Palpus normal 29
28. Tergite V with dense white pollinosity in ventral surface; females with brown basicosta
 *Cochliomyia macellaria* (Fabricius, 1775)
 . Tergite V with dense black pollinosity in ventral surface; females with black basicosta
 *Cochliomyia hominivorax* (Coquerel, 1858)
29. Red legs; presutural dorsocentral setae absent; hair in the basal third of the dorsal surface of the lower calypter (Figure 11)
 *Compsomyiops fulvicrura* (Robineau-Desvoidy, 1830)
 . Black legs; presutural dorsocentral setae present; hair in the internal half of the dorsal surface of the lower calypter (Figure 12)
 30
30. Mesonotum with metallic shine; prescutum, when viewed from behind, with dense silver pollinosity, but without forming distinct longitudinal stripes 31
 . Mesonotum without mettalic shine; prescutum, when viewed from behind, with three black stripes reaching the scutellum that are separated by stripes of silver gray pollinosity 32
31. Three (3) postsutural acrostichal setae; 1 intra-alar seta; sternite V not strongly split; upper calypter bare
 *Paralucilia fulvinota* (Bigot, 1877)
 . One (1) postsutural acrostichal seta; 2 intra-alar setae; sternite V strongly split; upper calypter with hairs on the dorsal surface
 *Paralucilia nigrofacialis* (Mello, 1969)
32. Postgenal bristles shinny white *Paralucilia borgmeieri* (Mello, 1969)
 . Postgenal bristles shinny orange 33
33. Yellow head; fronto-orbital plate recovered with silver hairs; weak pair of ocellar bristles; 2 postsutural acrostichal setae; 3 presutural dorsocentral setae; 3 postpronotal setae *Paralucilia paraensis* (Mello, 1969)
 . Red head; fronto-orbital plate recovered with golden hairs; ocellar bristles long and proclinate; 3 postsutural acrostichal setae; 4 presutural dorsocentral setae; 4 or 5 postpronotal setae *Paralucilia pseudolyrcea* (Mello, 1969b)
34. Lower calypter bare on dorsal surface; parafacial usually entirely bare 35
 . Lower calypter with hairs on dorsal surface; parafacial partially with hairs 37
35. Two (2) postsutural acrostichal setae (Figure 13) *Lucilia eximia* (Wiedemann, 1819) (Figure 21)
 . Three (3) postsutural acrostichal setae (Figure 14) 36
36. Body brass-colored; 2-4 postpronotal setae *Lucilia cuprina* (Wiedemann, 1830)
 . Body green or metallic blue; 6-8 postpronotal setae *Lucilia sericata* (Meigen, 1826)
37. Gena red; 3 presutural acrostichal setae; blue abdomen with silvery pollinosity
 *Calliphora vicina* Robineau-Desvoidy, 1830 (Figure 22)
 . Gena brown; 2 presutural acrostichal setae; blue abdomen with dark pollinosity *Calliphora lopesi* Mello, 1962

Taxonomic Notes

[1] DEAR (1985) believes that *Chloropocta* is a monotypic genus with one species (*C. idioidea*) that has wide distribution and shows variation in color, which is dependent on geographical distribution.

[2] According to personal information (RPM and Dr. Arício Xavier Linhares), the specimens identified as *Chrysomya chloropyga* (Wiedemann, 1818) in Brazil during the 1970s and 1980s are actually *Chrysomya putoria* (Wiedemann, 1818). Thus, we strongly believe that *C. chloropyga* is not present in Brazil.

[3] SILVA *et al.* (2012) recorded the presence of *Chrysomya ruffacies* for the first time in Brazil (State of Maranhão), increasing the distribution of this exotic species in the Americas. The second author RPM also confirms the presence of this species in the Rio de Janeiro' State.

[4] DEAR (1985) synonymized *Cochliomyia fontanai* with

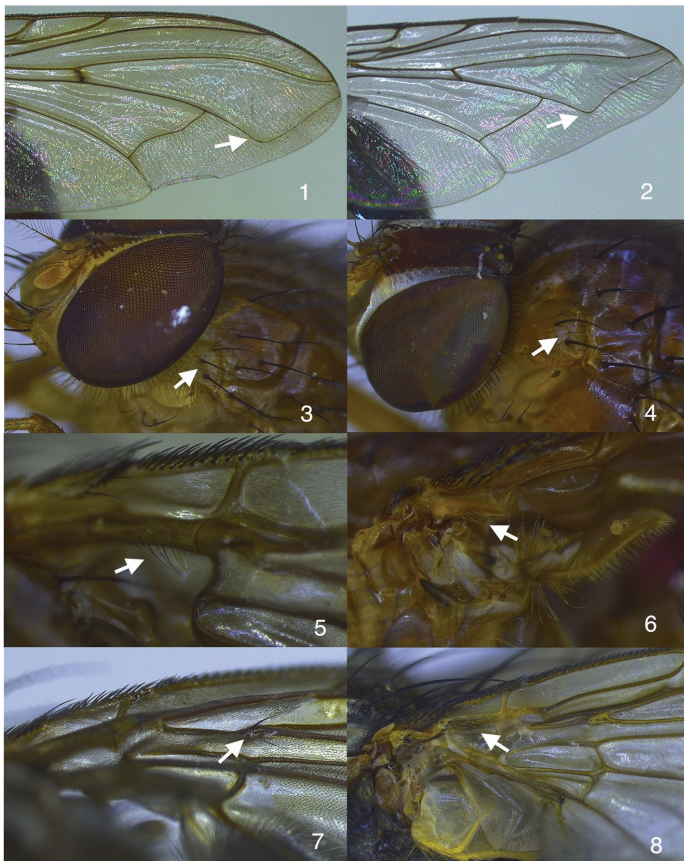
Cochliomyia macellaria, arguing that GARCIA (1952) separated the two species based on size and color, characters that are quite variable in the group.

[5] WHITWORTH (2010) says that DEAR (1985) listed *Cochliomyia minima* occurring in the Florida Keys and that it was probably a mistake, since he had examined numerous specimens of *Cochliomyia* from this locality and had never found one *C. minima*.

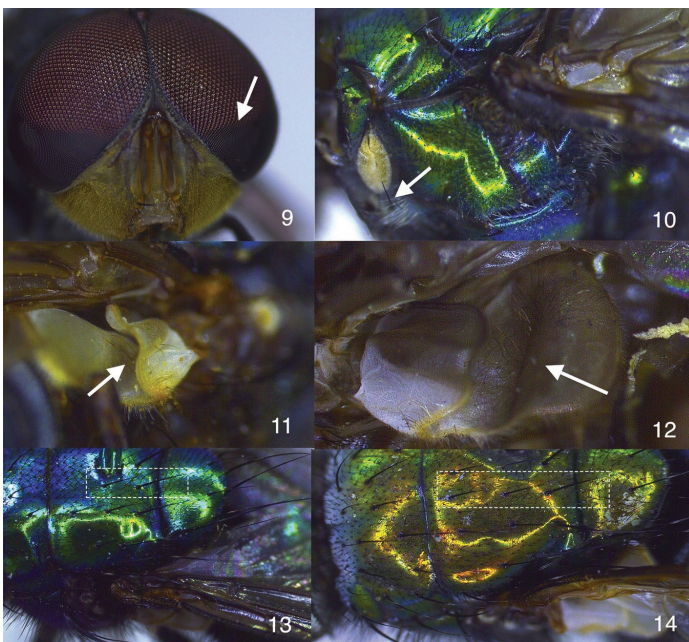
[6] DEAR (1985) brings *Chrysomya wheeleri* Hough, 1899 as synonym of *Compsomyiops callipes*.

[7] DEAR (1985) synonymized *Hemilucilia hermalenti* with *Hemilucilia semidiaphana*, however without looking the type.

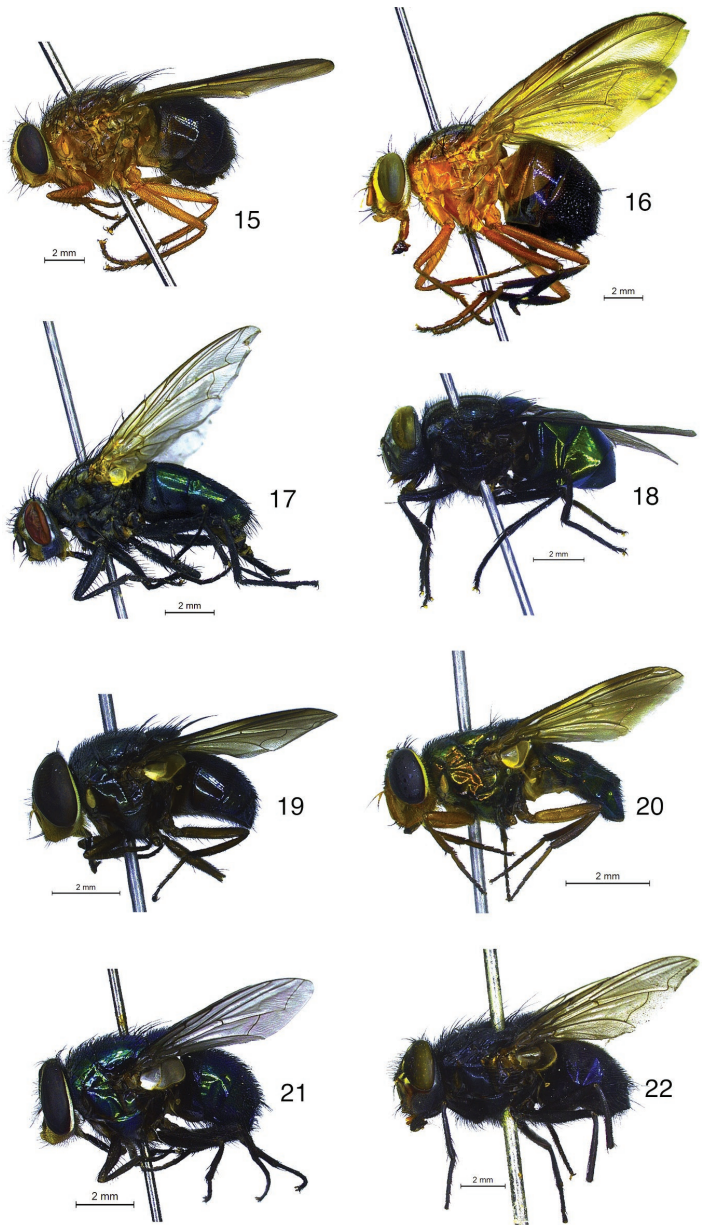
[8] In his work of 1996, MELLO synonymized *Paralucilia adespota* with *Paralucilia paraensis* based on the examination of the holotype, description, and drawings of the genitalia.



Figures 1-8. Key charateres. 1. Vein M strongly curvated (*Mesembrinella peregrina*). 2. Vein M distinctly angular (*Lucilia eximia*). 3. Three basal postpronotal setae (*Mesembrinella peregrina*). 4. Two basal postpronotal setae (*Huascaromusca aeneiventris*). 5. R1 with setulae on dorsal view (*Mesembrinella peregrina*). 6. Subcostal sclerite with setulae in ventral view (*Mesembrinella bellardiana*). 7. Junction of R_{2+3} and R_{4+5} with one setula (*Mesembrinella bicolor*). 8. Stem vein with setulae in ventral view (*Sarconesia chlorogaster*).



Figures 9-14. Key charateres (cont.). 9. Head of male with superior ommatidia enlarged (*Chrysomya megacephala*). 10. Proepimeral seta present (*Chrysomya putoria*). 11. Hair in the basal third of the dorsal surface of the upper calypter (*Compsomyiops fulvicrura*). 12. Hair in the internal half of the dorsal surface of the upper calypter (*Paralucilia fulvinita*). 13. Two postsutural acrostical setae (*Lucilia eximia*). 14. Three postsutural acrostical setae (*Lucilia cuprina*).



Figures 15-22. Habitus lateral view. 15. *Mesembrinella bellardiana* (Mesembrinellinae). 16. *Eumesembrinella quadrilineata* (Mesembrinellinae). 17. *Sarconesia chlorogaster* (Toxotarsinae). 18. *Roraimomusca roraima* (Toxotarsinae). 19. *Chloroprocta idioidea* (Chrysomyinae). 20. *Hemilucilia semidiaphana* (Chrysomyinae). 21. *Lucilia eximia* (Luciliinae). 22. *Calliphora vicina* (Calliphorinae).

[9] MELLO (1996), based on the type, says that the description of *Paralucilia xanthogeneiates* from DEAR (1985) agrees perfectly with the description of *Paralucilia pseudolyrcea* Mello, 1969. Furthermore, the author says there is also overlap in geographic distribution of both species, reasons why he believes that this is a synonym.

[10] We considered *Eumesembrinella cyaneicincta* (Surcouf, 1919) as a valid name instead of the subspecies of GUIMARÃES (1977) (*Eumesembrinella cyaneicincta cyaneicincta* Surcouf, 1919 and *Eumesembrinella cyaneicincta pausiceta* Aldrich, 1922). The choice was made based on the *Systema Dipterorum*.

[11] We considered *Mesembrinella bellardiana* (Aldrich, 1922) as a valid name instead of the subspecies of GUIMARÃES (1977) (*Mesembrinella bellardiana bellardiana* Aldrich, 1922 and *Mesembrinella bellardiana fuscicosta* Séguy, 1925). The choice was made based on the *Systema Dipterorum*.

[12] WHITWORTH (2010) says that one specimen of *Pollenia pediculata* is known from Bahamas, and this presence is almost certainly the result of an introduction.

[13] This is the only Rhiniinae known in the New World, according to WHITWORTH (2010).

[14] DEAR (1979) considered the genus *Chlorobrachycoma* as a synonym of the genus *Sarconesia*. Nevertheless, LOPES & ALBUQUERQUE (1982) restored it, based on the holotype. They were followed by MARILUIS & PERIS (1984).

[15] In 1978, MELLO redescribed *Roraimomusca roraima*, with illustrations of head and genitalia that were unknown up until then. One year later, DEAR made a new combination, moving the species to the genus *Sarconesia* without citing MELLO's work (1978). LOPES & ALBUQUERQUE (1982) considered *Roraimomusca* as a valid genus based on MELLO's (1978) work and on the fact that "Dear mixed in the same genus (*Sarconesia*), *Sarconesiopsis magellanica*, with typical Calliphorid-like male genitalia and *Sarconesia chlorogaster* with a peculiar male genitalia". After that, in 1984, Mariluis & Peris moved the species to the genus *Chlorobrachycoma* without observing any type. In the Systema Dipteroformum the name appears under the genus *Sarconesia*, but the record lacks authority and revision date. We decided to follow MELLO (1978) and LOPES & ALBUQUERQUE (1982), considering the observation of type material, vast experience, and deep knowledge of the group by these authors.

[16] LOPES & ALBUQUERQUE (1982) erected *Sarconesia versicolor* to a new genus, *Sarconesisca*. Later, MARILUIS & PERIS (1984) moved the species to the genus *Chlorobrachycoma*. Despite all the changes, we believe that is more conservative to maintain the species under the name of *Sarconesia versicolor*, since DEAR (1979) was the only author who looked the lectotype.

[17] DEAR (1979) said that *Sarconesiomima bicolor* is a synonyme of *Sarconesia dichroa* Schiner, based on a neotype designed by himself. However, LOPES & ALBUQUERQUE (1982) affirmed that DEAR (1979) didn't look any type material of Schiner's species and that the description may have been done based on a specimen of *Sarconesia chlorogaster*.

[18] Based on the holotype of *Kuschelomyia ambrosiana*, DEAR (1979) proposed a new combination, moving the species to the genus *Toxotarsus*, as cited in the Systema Dipteroformum.

[19] Based on the holotype of *Callyntropyga humeralis*, DEAR (1979) proposed a new combination, moving the species to the genus *Toxotarsus*, as cited in the Systema Dipteroformum.

[20] DEAR (1979) said that *Toxotarsus rufipalpis* and *Toxotarsus fuscipennis* are synonymes of *Toxotarsus nigrocyaneus*, which LOPES & ALBUQUERQUE (1982) considered as species *inquirenda* of Calliphoridae. However, MARILUIS & PERIS (1984), based on the types, agreed with DEAR (1979).

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