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Flesh fly (Diptera: Sarcophagidae) survey on coastal environments in northeastern Brazil: new records and notes on the expanded geographical distribution

Taciano Moura Barbosa[1], Cátia Antunes de Mello-Patiu[2], Simão Dias Vasconcelos[1]
[1]*Insects of Forensic Importance Research Group, Departamento de Zoologia, Universidade Federal de Pernambuco, Av. Prof. Moraes Rego, 50.670-420,Recife – PE, Brazil.*
[2]*Laboratório de Biodiversidade e Sistemática de Diptera, Departamento de Entomologia, Museu Nacional/ Universidade Federal do Rio de Janeiro, Quinta da Boa Vista, São Cristóvão, 20.940-040 Rio de Janeiro-RJ, Brazil.*

Abstract

Barbosa TM, Mello-Patiu CA, Vasconcelos SD. 2015. Flesh fly (Diptera: Sarcophagidae) survey on coastal environments in northeastern Brazil: new records and notes on the expanded geographical distribution. Entomotropica 30(12): 112-117.

Despite the medical, veterinary and forensic relevance of flesh flies (Diptera: Sarcophagidae) species, knowledge on their diversity in Brazil is limited, especially in northeastern Brazil. We performed a survey of Sarcophagidae species in coastal environments in Pernambuco, Brazil, using traps baited with decomposing fish and chicken liver in 2011-2013. Twenty-four species were registered, belonging to ten genera: *Argoravinia*, *Dexosarcophaga*, *Malacophagomyia*, *Oxysarcodexia*, *Peckia*, *Ravinia*, *Sarcofahrtiopsis*, *Titanogrypa*, *Tricharaea* and *Villegasia*. *Peckia villegasi* Dodge, 1966 is reported for the first time in Brasil and five Sarcophagidae species in the northeastern region of Brasil. Images of habitus and male terminalia of *P. villegasi* are also provided for the first time. The results expand the knowledge on the geographical distribution and habitat occupation of the family as well as on their forensic relevance.

Aditional key words: Carrion, coastal environment, flesh flies, forensic entomology.

Resumen

Barbosa TM, Mello-Patiu CA, Vasconcelos SD. 2015. Muestreo de moscas de la carne (Diptera: Sarcophagidae) en ambientes costeros del noreste de Brasil: nuevos registros y notas sobre la distribución geográfica. Entomotropica 30(12): 112-117.

A pesar de la relevancia médica, veterinaria y forense de las especies de moscas de la carne (Diptera: Sarcophagidae), el conocimiento de su diversidad en Brasil es limitada, sobre todo en el noreste de Brasil. Se realizó un estudio de las especies de Sarcophagidae en ambientes costeros de Pernambuco, Brasil, con el uso de trampas con pescado y de hígado de pollo en descomposición en el período 2011-2013. Se registraron 24 especies, de diez géneros: *Argoravinia, Dexosarcophaga, Malacophagomyia, Oxysarcodexia, Peckia, Ravinia, Sarcofahrtiopsis, Titanogrypa, Tricharaea* y *Villegasia*. Se registra por primera vez a *Peckia villegasi* Dodge, 1966 en Brasil y a cinco especies de Sarcophagidae en el noreste de Brasil. Imágenes de habitus y terminalia masculina de *P. villegasi* también están disponibles por primera vez. Los resultados amplían el conocimiento sobre la distribución y hábitat de la familia, así como de su relevancia forense.

Palabras clave adicionales: Ambientes costeros , carroña, entomología forense, mosca de la carne.

Introduction

Flesh flies (Diptera: Sarcophagidae) are a diverse group of insects that comprises *ca.* 3,100 species (Pape et al. 2011) of which more than 800 occur in the Neotropical Region (Pape 1996). Species of this family exhibit a variety of feeding habits that include coprophagy, necrophagy, saprophagy, parasitism and predation (Pape and Dahlem 2010). Such diversity of feeding modes can be directly related to their medical and veterinary importance because several species cause myiasis and can act as pathogen vectors (Greenberg 1973, Guimarães and Papavero 1999). Also, sarcophagids have been associated with decomposing carcasses and human bodies (Magaña et al. 2006, Cherix et al. 2012, Vasconcelos et al. 2014), which enhances their usefulness in forensic entomology.

Two genera stand out in terms of species richness and abundance of individuals: *Oxysarcodexia*, with 83 species, and *Peckia,* with 72 species (Pape 1996, Soares and Mello-Patiu 2010, Buenaventura and Pape 2013). Their association with human cadavers stimulates further field studies to assess their utility as indicators of place of death, especially in areas with high rates of homicides which is the case of northeastern Brazil.

The Northeast Region of Brazil is comprised of nine states, with total area of 1,558,196 km^2 and population of approximately 54 million (27.5 % of Brazilian population) (Figure 1). Coastal environments in northeastern Brazil consist of a variety of ecosystems such as mangroves, cliffs, rocky shorelines, continental islands and, most commonly, sandy beaches. This diversity highlights the need for inventories of the biodiversity of both synanthropic and asynanthropic insect species.

Materials and Methods

This survey was carried out in the State of Pernambuco, northeastern Brazil (Figure 1). Sampling was performed in six beaches with marked differences in human impact: Carne de Vaca (lat 07° 33' 38" S, long 35° 00' 09" W); Itamaracá (lat 07° 44' 52" S, long 34° 49' 51" W), Pau Amarelo (lat 07° 54' 36.8" S, long 34° 49' 22,2" W), Piedade (lat 08° 07' 30" S, long 35° 00' 55" W); Serrambi (lat 08° 33' 30" S, long 35° 06' 58" W) and Tamandaré (lat 08° 45' 36" S, long 35° 06' 18" W). Six sampling expeditions were performed at each beach from November 2011 to July 2013.

Insects were collected using a modified version of bait traps (Ferreira 1978), suspended 0.8 m above soil level, containing 200 g of decomposing chicken liver or sardine, both exposed to 24 h at room temperature prior to use. At each beach, a set of three grids composed of six traps was installed, separated from one another by 200 m. In each grid, three traps contained chicken liver baits and three contained sardine, separated 20 m from each other. Traps were left in the field for 48 h. A total of 648 independent traps were used in the survey. Adults were kept in 70 % alcohol and males were identified using the taxonomical keys of Carvalho and Mello-Patiu (2008), Vairo et al. (2011) and Buenaventura and Pape (2013) and by comparison with specimens deposited at the Diptera Collection of the Museu Nacional, Universidade Federal do Rio de Janeiro (MNRJ, curator C. A. Mello-Patiu). Photographs were taken using a Leica DFC420 digital camera on a Leica MZ16 stereomicroscope.

Results and Discussion

The combined samples contained a total of 3,539 adults, of which 470 were males. The males were used for species identification. Twenty-four species belonging to ten genera were identified, of which *Oxysarcodexia* and *Peckia* were represented by eight and seven species respectively (Table 1). *Peckia* (*Peckia*) *villegasi* Dodge, 1966 is reported for the first time from the Brazilian territory (Figure 2 A,B). Also, five species from four genera are reported

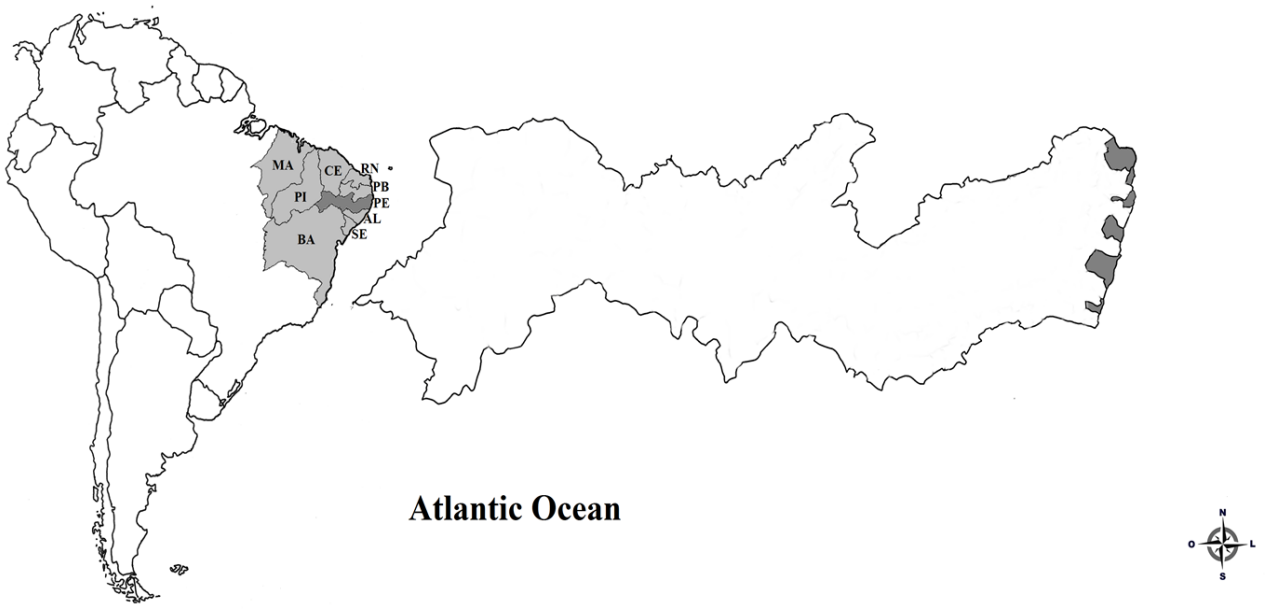

Figure 1. Location of the Northeastern Region in Brazil, depicting the nine states (BA = Bahia, SE = Sergipe, AL = Alagoas, CE = Ceará, MA = Maranhão, PE = Pernambuco, PI = Piauí, RN = Rio Grande do Norte), with emphasis in the sampling areas in the littoral of Pernambuco State (enlarged).

Figure 2. *Peckia* (*Peckia*) *villegasi* Dodge, 1966. A: Habitus, male. B: Male terminalia.

for the first time for the northeastern region of Brazil (Table 1). Most Sarcophagidae species were collected on both types of bait, chicken and sardine. *P. villegasi* occurred on both substrates.

Few reports of Sarcophagidae from northeastern Brazil are available, most of them were based on short term inventories performed in remnants of the original Brazilian rainforest (e. g. Lopes 1974, Vasconcelos and Araújo 2012, Vasconcelos et al. 2013). Two studies revealed the presence of Sarcophagidae as colonizers of human cadavers in the northeastern region, and the diversity was limited to three species: *Ravinia belforti* (Prado & Fonseca, 1932), *Oxysarcodexia riograndensis* Lopes, 1946 (Oliveira and Vasconcelos 2010)

Table 1. Sarcophagidae species collected on sandy beaches in Pernambuco state, northeastern Brazil, with notes on their previous register in seven of the nine states of the region. BA = Bahia, CE = Ceará, MA = Maranhão, PB = Paraíba, PE = Pernambuco, PI = Piauí, RN = Rio Grande do Norte.

Species	First register in northeastern Brazil	Previous record in northeastern Brazil by state
Argoravinia rufiventris (Walker, 1849)	No	BA, CE, MA
Dexosarcophaga carvalhoi (Lopes, 1980)	Yes	-
Malacophagomyia filamenta (Dodge, 1964)	Yes	-
Oxysarcodexia amorosa (Schiner, 1868)	No	BA, CE
Oxysarcodexia bakeri (Aldrich, 1916)	No	BA, PE
Oxysarcodexia fluminensis Lopes, 1946	No	PE
Oxysarcodexia fringidea (Curran & Walley, 1934)	No	BA, MA, PE
Oxysarcodexia intona (Curran & Walley, 1934)	No	CE, MA, PE
Oxysarcodexia modesta Lopes, 1946	No	PE
Oxysarcodexia thornax (Walker, 1849)	No	CE, PA, PE,
Oxysarcodexia timida (Aldrich, 1916)	No	CE, MA
Peckia (Pattonella) intermutans (Walker, 1861)	No	CE, PE
Peckia (Peckia) chrysostoma (Wiedemann, 1830)	No	CE, PE
Peckia (Peckia) pexata (Wulp, 1895)	No	BA, CE, PI
Peckia (Peckia) uncinata (Hall, 1933)	Yes	-
Peckia (Peckia) villegasi Dodge, 1966	Yes	-
Peckia (Sarcodexia) lambens (Wiedemann, 1830)	No	CE, PE
Peckia (Squamatodes) trivittata (Curran, 1927)	Yes	-
Ravinia belforti (Prado & Fonseca, 1932)	No	CE, PE
Sarcofahrtiopsis cuneata Townsend, 1935	No	CE, PE
Titanogrypa (Cucullomyia) larvicida (Lopes, 1935)	No	RN
Tricharaea (Sarcophagula) canuta (Wulp, 1896)	Yes	-
Tricharea (Sarcophagula) occidua (Fabricius, 1794)	No	CE, MA, PE
Villegasia pernambucana Tibana & Lopes, 1985	No	PE
Total	24	

and *Peckia* (*Peckia*) *chrysostoma* (Wiedemann, 1830) (Vasconcelos et al. 2014).

Prior to this report, the known geographical distribution of *P. villegasi* was limited to localities in Venezuela (Miranda) and Colombia (Bolívar, Sucre) (Dodge 1966; Buenaventura and Pape 2013), all material collected in coastlands of the Caribbean. This fact suggests a preference for coastal habitats, although no other information on its bionomics and behavior is known. Species of *Peckia* are ecologically very diverse, with a few being restricted to coastal or estuarine habitats, like *Peckia* (*Peckia*) *gulo* (Fabricius, 1805) (Reeves et al. 2000). Other cases of Neotropical flesh flies living exclusively on beaches have been reported, e.g. *Tricharaea* (*Sarothromyia*) *femoralis* (Schiner, 1868) (Lopes 1973).

Nine specimens of *P. villegasi* were collected, and exclusively from one beach (Itamaracá), representing 1.91 % of all sarcophagids. The low abundance of *P. villegasi* may reflect its preference for specific substrates of the marine environment or may be a result of competition with other species of *Peckia* and *Oxysarcodexia* that tend to dominate necrophagous assemblages

in the Neotropics (Barros et al. 2008, Barbosa et al. 2009).

The first register of several species in northeastern Brazil shows not only the high diversity of sarcophagids, but also the scarcity of field inventories in the region. Several flesh fly species have been recorded on human cadavers and may be used as indicators of neglect of elderly and disabled people (Benecke 1998). Their recorded however, must be followed by bionomical studies in order to provide reliable life cycle data which, theoretically, can be used to estimate of *post-mortem* interval (IPM) in forensic investigations.

Empirical data on the geographical distribution of Sarcophagidae species and their association with human settlements are incipient. For example, species within the same genus can demonstrate marked differences in their synanthropy level, ranging from typically "urban" [*Peckia* (*Peckia*) *chrysostoma*] to averse to human-impacted environments [*Peckia* (*Pattonella*) *intermutans* (Walker, 1861)] (Yepes-Gaurisas et al. 2013).

The northeast region of Brazil has a variety of coastal environments in its nine states, a diversity of which was only partially sampled in this study. The absence of empirical data on the distribution of Sarcophagidae species in the region is supported by the fact that from the 24 species recorded here for Pernambuco state, none has been previously recorded in two northeastern states, Alagoas and Sergipe (Figure 1, Table 1). It is likely the future studies to be performed throughout different landscapes (rainforest fragments, urban areas, agroecosystemas, dry forests) will noticeably increase the number of described flesh fly species in the region.

Scientific databases available to taxonomists and criminal investigators are supported by inventories that contribute to map the occurrence of flesh fly species in a given region. For example, information on the post-mortem transfer of cadavers can be obtained by comparing the immature species present on the body with checklists of local species. This is much needed for northeastern Brazil, which harbors six of the ten capitals with the highest rates of homicide in Brazil (Waiselfiz 2011). The results presented here contribute to expand the knowledge on the geographical distribution of forensically relevant Sarcophagidae species.

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