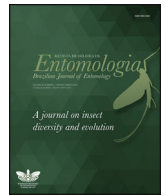




REVISTA BRASILEIRA DE
Entomologia
A Journal on Insect Diversity and Evolution

www.rbentomologia.com



Systematics, Morphology and Biogeography

A new species and new records of *Oxysarcodexia* Townsend (Diptera: Sarcophagidae) from Brazil



Fernando da Silva Carvalho-Filho^a, José Roberto Pereira de Sousa^{b,*}, Maria Cristina Esposito^c

^a Museu Paraense Emílio Goeldi, Coordenação de Zoologia, Belém, PA, Brazil

^b Universidade Estadual do Maranhão, Centro de Ciências Agrárias, Departamento de Zootecnia, São Luis, MA, Brazil

^c Universidade Federal do Pará, Instituto de Ciências Biológicas, Belém, PA, Brazil

ARTICLE INFO

Article history:

Received 8 February 2017

Accepted 17 July 2017

Available online 3 August 2017

Associate Editor: Diana Grisales

Keywords:

Calypttratae

Oestroidea

Sarcophaginae

Flesh fly

ABSTRACT

Oxysarcodexia cocais **sp. nov.** from Brazil is described and illustrated based on male specimens collected in a babassu palm forest in the state of Maranhão. The remarkable elongated surstylus (as long as cercus) and U-shaped male sternite 5 distinguishes the new species from other species in the genus. In addition, *Oxysarcodexia nitida* Soares & Mello-Patiu, 2010 is recorded for the first time from Brazil, and *Oxysarcodexia adunca* Lopes, 1975 is a new record from the Brazilian Amazon.

© 2017 Sociedade Brasileira de Entomologia. Published by Elsevier Editora Ltda. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

Introduction

The genus *Oxysarcodexia* Townsend, 1917 is confined to the Americas, with a cumulative range extending from southern part of the U.S.A. to Argentina, but three species have been recorded from Canada (Ontario, Quebec) and at least two species have been introduced into the Australasian Region (Pape, 1996). This genus comprises about 90 small to medium-sized species (6–12 mm) and is one of the largest Neotropical genera of Sarcophagidae (Pape and Dahlem, 2010). The monophyly of *Oxysarcodexia* has been supported by molecular (Stamper et al., 2013; Piwczyński et al., 2014) and morphological (Giroux et al., 2010) phylogenetic analyses, and a distinctive autapomorphy is the presence of a lateral triangular projection of the phallic tube distal to the base of vesica (Figs. 6, 10) (Giroux et al., 2010).

Some species of *Oxysarcodexia* have been collected in cities and suburban areas (Lopes, 1973; Dias et al., 1984; Mulieri et al., 2011; Yepes-Gaurisas et al., 2013) and may be anthropophilic. Adults of this genus are the most common flies in traps baited with dung or carrion in Brazil (Sousa et al., 2011, 2015), as these substrates are utilized by the adult females as larviposition sites (Lopes, 1973), making some species of *Oxysarcodexia* important for forensic science (Carvalho and Mello-Patiu, 2008). Adult specimens of this

genus are also collected in butterfly traps baited with fermented fruits (Lopes, 1975a). Little is known of the biology of immatures of this genus, but some species has been bred from carrion and dung of mammals and birds (Lopes, 1973; Pape and Dahlem, 2010).

The genus *Oxysarcodexia* is expected to contain a high number of undescribed species (Mara Souza, unpubl.), and we are here describing one new species from Maranhão, northern Brazil.

Material and methods

Specimens were obtained with a “fly trap” as described by Almeida et al. (2003, pp. 26 and 27), which are baited with rotting beef lung.

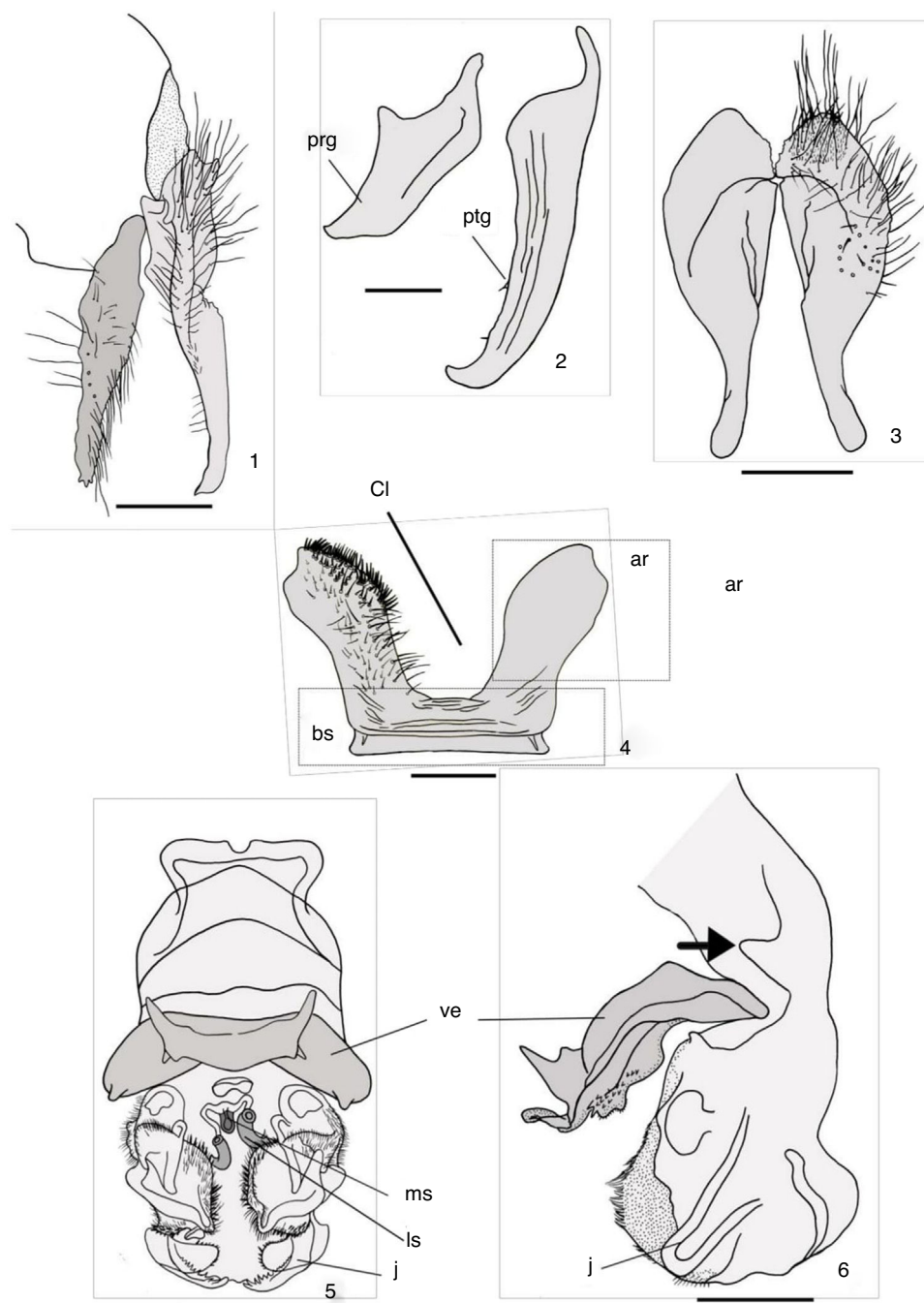
The male terminalia was dissected by detaching the abdomen from the body and clearing it in cold 10% KOH at room temperature for one day, followed by neutralization in acetic acid, dehydration in alcohol and washing in distilled water. Dissected terminalia was stored in glycerin in microvials pinned beneath the source specimens.

A LEO 1450VP scanning electron microscope at the Museu Paraense Emílio Goeldi was used to generate images of a male sternite 5 mounted on an aluminum stub and sputter-coated with a gold-palladium alloy.

Terminology of external morphology follows Cumming and Wood (2009) and that of the male terminalia follows Giroux et al. (2010).

* Corresponding author.

E-mail: jrszoo@hotmail.com (J.R. Sousa).



Figs. 1–6. *Oxysarcodexia cocais* sp. nov., male terminalia of holotype. (1) Epandrium, surstylus and cercus, left lateral view; (2) Right pregonite and postgonite, lateral view; (3) Cerci, dorsal view; (4) Sternite 5, ventral view; (5) Phallus, ventral view; (6) Phallus with an arrow pointing to the triangular projection, lateral view. Scale bars = 3 mm. (Abbreviations: ar, arm; bs, base; cl, cleft; j, juxta; ls, lateral stylus; ms, median stylus; prg, pregonite; ptg, postgonite; ve, vesica.)

Label data of type specimen are presented in verbatim quotation following the method proposed by O'Hara (1982): with a backslash (\) to indicate a line break and quotes (") to indicate the beginning and end of a label. Data from non-type specimen labels were transcribed in the following sequence: country (uppercase), state, province or department (italics), municipality or city; date of collection; collection method; collector's name; and, in parenthesis, the number and sex of specimens and acronym for the institution where the specimens are deposited.

All the specimens were deposited in the entomological collection of the *Museu Paraense Emílio Goeldi* (MPEG), Belém, state of Pará, Brazil.

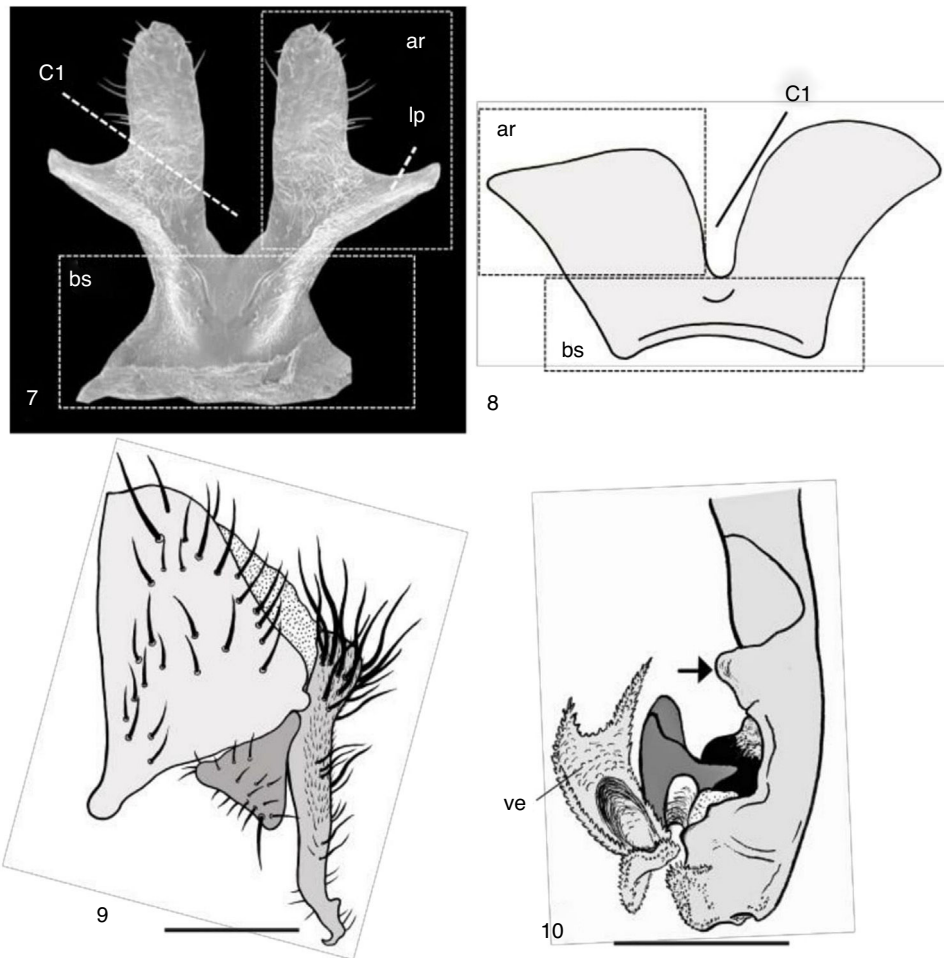
Results

Oxysarcodexia cocais sp. nov.

(Figs. 1–6)

Oxysarcodexia sp1: Sousa et al., 2015: 6.

Description. Male. Body length = 6.7 mm. **Head:** Fronto-orbital and parafacial plates with golden pruinosity; post-ocular plates with silvery gray pruinosity; frontal vitta black, with row of 6 subequal frontal setae; front about 0.1x head width at level of ocellar triangle; inner vertical seta well-developed; outer vertical seta not differentiated; ocellar seta similar to uppermost frontals; reclinate



Figs. 7–10. (7) *Oxysarcodexia thornax* (Walker, 1849), sternite 5 of male, ventral view. (8) *Oxysarcodexia cyanea* Lopes, 1973, sternite 5 of male, ventral view (redrawn of Lopes, 1975c). *Oxysarcodexia adunca* Lopes, 1975, male terminalia. (9) Epandrium, surstylus and cercus, lateral view; (10) Phallus left lateral view, lateral view. Scale bars = 3 mm. (Abbreviations: ar, arm; bs, base; cl, cleft; lp, lateral projection; ve, vesica.)

fronto-orbital seta longer than frontals and proclinate absent; gena and postgena with golden pruinosity and black setae; antenna dark brown, first flagellomere with pale golden pruinosity and about 2x as long as pedicel, arista plumose on basal third; palpus black. **Thorax:** Dark brown with gray pruinosity; chaetotaxy: acrosticals 0 + 1, dorsocentrals 2 + 4 (first two shorter), intra-alars 2 + 2, supralars 2 + 3, postalars 2, postpronotals 3, notopleurals 4 (2 long primaries and 2 short subprimaries intercalated), katepisternals 3 (middle one short, inserted slightly below anterior one), postalar wall setose, scutellum with one preapical, no apical, two long laterals; prosternum setose in almost full extension.

Wings: Hyaline, tegula black, R_1 bare, R_{4+5} setulose in proximal half, costal spine not differentiated.

Legs: Blackish brown, fore femur with rows of setae along dorsal, posterodorsal and posteroventral surfaces. All the other legs are missing.

Abdomen: Blackish with gray pruinosity; tergite 3 with one marginal lateral seta; tergite 4 with one pair of median marginals and 2 lateral marginal setae; sternites blackish, sternites 2 and 3 subsquare-shaped; sternite 4 trapezoid, with posterior concave margin, sternites 2 to 4 covered with long and slender setae and without differentiated marginal setae.

Terminalia: Sternite 5 with short base (wider than long) and widened arms without a lateral projection, inner lateral margin of arm distally covered with many scattered fine setae and with spine-like setae, with U-shaped cleft (Fig. 4).

Cercus, in lateral view, elongated and narrowing toward apex (Fig. 1). Dorsal margin of cercus at midlength with a depression followed by a grainy elevation (Fig. 1). Cerci, in dorsal view, with prongs divergent and apex rounded (Fig. 3). Cercal prong, in dorsal view, without setae or setulae (Fig. 3). Surstylus elongated, as long as distiphallus, with serrate apex (Fig. 1). Pregonite shorter than postgonite, deeply sinuous on ventral margin, distal third perpendicular to basal third (Fig. 2). Postgonite elongated, curved, with two short spine-like setae on ventral margin, and a rounded apex (Fig. 2). Phallus well sclerotized, with no division between basiphallus and distiphallus, and juxta widened in lateral view (Fig. 6). Ventral margin of distiphallus bearing many hair-like setulae (Figs. 5, 6). Phallus, in ventral view, with margin composed by plates covered with hair-like setulae and spines (Fig. 5). Lateral styli tubular (Fig. 5). Median stylus tubular and shorter than lateral styli (Fig. 5). Vesica, in lateral view, slightly angled, with a pre-apical pointed projection ventrally and many tiny pointed projections dorsally (Fig. 6).

Female. Unknown.

Discussion. *Oxysarcodexia cocais* sp. nov. differs from congener species in having surstylus very long and almost the same length as the cercus (Fig. 1). All described species of *Oxysarcodexia* have a triangular or oblong surstylus (Fig. 9), shorter than cercus. The shape of sternite 5 is very different as well. Most species of *Oxysarcodexia* have a sternite 5 with base (basal portion that ends in the cleft) usually longer than wide, a deep median cleft with almost parallel inner edges and arms narrowed and rounded apically with

a small projection laterally and base (basal portion that ends in the cleft) usually longer than wide, as shown in *Oxysarcodexia thornax* (Walker, 1849) (Fig. 7). However, there are nine species (*Oxysarcodexia aura* (Hall, 1937); *Oxysarcodexia cyanea* Lopes, 1975; *Oxysarcodexia edwardsi* Lopes, 1946; *Oxysarcodexia galeata* (Aldrich, 1916); *Oxysarcodexia liliarium* Souza & Buenaventura, 2016; *Oxysarcodexia terminalis* (Wiedemann, 1830); *Oxysarcodexia varia* (Walker, 1836); *Oxysarcodexia xon* (Dodge, 1968); and *Oxysarcodexia zayasi* Dodge, 1956) whose sternite 5 has a V-shaped cleft, arms broadened without the lateral projection, with a base wider than long (Fig. 8). The sternite 5 of *O. cocais* sp. nov. (Fig. 4) resembles that of these species in having the arm broadened and without a lateral projection, but the cleft is U-shaped rather than V-shaped.

Biology. The holotype was collected in a type of palm tree forest known locally as “mata de cocais”, which occurs sporadically both in the rainforest and in the *cerrado* (savanna-like vegetation) in the state of Maranhão, northeastern Brazil. This type of forest is characterized mainly by the babassu palm (*Orbignya phalerata*).

Distribution. NEOTROPICAL – Brazil (Maranhão).

Etymology. The specific epithet refers to “mata de cocais”, the predominant vegetation in the type locality. The specific epithet should be treated as a noun in apposition.

Material examined. Holotype male labeled as follows: “Brasil, MA [Maranhão], Poção de Pedras/Pastagem-mata de cocais [pasture-palm forest]/S04°43'4.18"O[W] 04°55'05.08"J./R.P. Sousa [collector]”; “Armadilha p. moscas [fly trap]/com pulmão bovino [bovine lung]/Armadilha 26 [trap 26]/Área 06 [site 06]”. Specimen without mid, hind legs and with detached terminalia cleared and stored in a plastic microvial with glycerin pinned under the specimen.

Oxysarcodexia adunca Lopes, 1975 (Figs. 9–10)

Material examined. BRAZIL. Pará: Belém, Parque Ambiental de Belém, 03.V.2011, S.L.X.L. Camargo [collector], armadilha para moscas com pulmão bovino [fly trap with bovine lung] (1 male, MPEG); *ibidem*, 23.IV.2016, botão floral de [flower bud of] *Cassia*, F.S. Carvalho-Filho [collector] (1 male, MPEG).

Comments. The terminalia of studied specimens is quite different from that pictured in the original description by Lopes (1975). In the examined specimens, the shape of the distal part of the vesica (spiny membranous part represented in light gray in Fig. 10) have a concavity creating the two pointy edges (Fig. 10), while these expansions are not so developed in the illustration by Lopes (1975). In addition, the size of the distal part of the vesica is higher than the base (the part colored in dark gray in Fig. 10) in examined specimens, while in the terminalia illustrated by Lopes (1975) the distal part of vesical is shorter than the base. We analyzed photographs of the terminalia of the male holotype and it is similar to that of examined specimens.

This species has only been recorded for the states of Bahia, Espírito Santo and Rio Janeiro (Lopes, 1975b; Lopes and Tibana, 1987). Thus this is a new record for the Brazilian Amazon.

Biology. One specimen was collected in an urban forest in a trap baited with rotting beef lung, and another on flower buds of *Cassia* sp. (Fabaceae).

Distribution. NEOTROPICAL – Brazil (Bahia, Espírito Santo, Pará, Rio de Janeiro).

Oxysarcodexia nitida Soares & Mello-Patiu, 2010

Material examined. BRAZIL. Amazonas: Coari, Base Petrolífera Geólogo Pedro de Moura, 19–23.VII.2009, F.S. Carvalho-Filho [collector] (1 male, MPEG).

Comments. This species has only been recorded from the type locality, Avispas in Peru (Soares and Mello-Patiu, 2010). Therefore, this is a new record for Brazil.

Distribution. Brazil (Amazonas), Peru (Avispas).

Conflicts of interest

The authors declare no conflicts of interest.

Acknowledgments

We thank the *Fundação de Amparo à Pesquisa do Estado do Maranhão* (FAPEMA) (Maranhão State Research Foundation) for financial support and for doctoral fellowship granted to the second author. We are grateful to Dr William L. Overal (MPEG) and Dr. Thomas Pape (Natural History Museum of Denmark, Copenhagen) for reviewing the English and for suggestions. We also thanks Dr. Cátia Mello-Patiu (*Museu Nacional do Rio de Janeiro*) for sending pictures of the type material of *Oxysarcodexia adunca*. Important corrections and helpful comments were made by two anonymous reviewers.

References

- Almeida, I.M., Ribeiro-Costa, C.S., Marioni, L., 2003. Manual de coleta, conservação, montagem e identificação de insetos. Holos Editora, Ribeirão Preto, viii + 78 p.
- Carvalho, C.J., Mello-Patiu, C.A., 2008. Key to the adults of the most common forensic species of Diptera in South America. *Rev. Bras. Entomol.* 52, 390–406.
- Cumming, J.M., Wood, D.M., 2009. Adult morphology and terminology. In: Brown, B.V., Borkent, A., Cumming, J.M., Wood, D.M., Woodley, N.E., Zumbado, M. (Eds.), *Manual of Central American Diptera*, vol. 1. NRC Research Press, Ottawa, pp. 9–50, 714 pp.
- Dias, E.S., Neves, D.P., Lopes, H.S., 1984. Estudos sobre a fauna de Sarcophagidae (Diptera) de Belo Horizonte – Minas Gerais I – Levantamento taxonômico e sinantrópico. *Mem. Inst. Oswaldo Cruz* 79, 83–91.
- Giroux, M., Pape, T., Wheeler, T.A., 2010. Towards a phylogeny of the flesh flies (Diptera: Sarcophagidae): morphology and phylogenetic implications of the acrophallus in the subfamily Sarcophaginae. *Zool. J. Linn. Soc.* 158, 740–778.
- Lopes, H.S., 1946. Contribuição ao conhecimento das espécies do gênero *Oxysarcodexia* Townsend, 1917 (Diptera, Sarcophagidae). *Bol. Esc. Nac. Vet.* 1, 62–134.
- Lopes, H.S., 1973. Collecting and rearing sarcophagid flies (Diptera) in Brazil, during 40 years. *An. Acad. Bras. Ciênc.* 45, 279–291.
- Lopes, H.S., 1975a. Sarcophagid flies (Diptera) from Pacatuba, State of Ceará, Brazil. *Rev. Bras. Biol.* 34, 271–294.
- Lopes, H.S., 1975b. New or little known *Oxysarcodexia* (Diptera, Sarcophagidae). *Rev. Bras. Entomol.* 35, 461–483.
- Lopes, H.S., 1975c. Bredin-Archbold Smithsonian biological survey of Dominica: the Sarcophagidae of Dominica (Diptera). *An. Acad. Bras. Ciênc.* 45, 467–487.
- Lopes, H.S., Tibana, R., 1987. On *Oxysarcodexia* (Diptera, Sarcophagidae), with descriptions of five new species, key, list and geographic distribution of the species. *Rev. Bras. Biol.* 47, 329–347.
- Mulier, P.R., Patitucci, L.D., Schnack, J.A., Mariluis, J.C., 2011. Diversity and seasonal dynamic of an assemblage of Sarcophagid Diptera in a gradient of urbanization. *J. Insect Sci.* 11, 1–15.
- O'Hara, J.E., 1982. Classification, phylogeny and zoogeography of the North American species of *Siphona* Meigen (Diptera: Tachinidae). *Quaest. Entomol.* 18, 261–380.
- Pape, T., 1996. Catalogue of the Sarcophagidae of the world (Insecta: Diptera). *Mem. Entomol. Int.* 8, 1–558.
- Pape, T., Dahlem, G.A., 2010. Sarcophagidae. In: Brown, B.V., Borkent, A., Cumming, J.M., Wood, D.M., Woodley, N.E., Zumbado, M. (Eds.), *Manual of Central American Diptera*, vol. 2. NRC Research Press, Ottawa, pp. 1313–1335, 1442 pp.
- Piwczyński, M., Spizila, K., Grzywacz, A., Pape, T., 2014. A large-scale molecular phylogeny of flesh flies (Diptera: Sarcophagidae). *Syst. Entomol.* 39, 783–799.
- Soares, W.F., Mello-Patiu, C.A., 2010. Two new Neotropical species of the genus *Oxysarcodexia* Townsend (Diptera, Sarcophagidae). *Rev. Bras. Entomol.* 54, 72–75.
- Sousa, J.R.P., Esposito, M.C., Carvalho-Filho, F.S., 2011. Composition, abundance and richness of Sarcophagidae (Diptera: Oestroidea) in forests and forest gaps with different vegetation cover. *Neotrop. Entomol.* 40, 20–27.

- Sousa, J.R.P., Carvalho-Filho, F.S., Esposito, M.C., 2015. [Distribution and abundance of necrophagous flies \(Diptera: Calliphoridae and Sarcophagidae\) in Maranhão, Northeastern Brazil](#). *J. Insect Sci.* 15, 1–10.
- Stamper, T., Dahlem, G.A., Cookman, C., DeBry, R.W., 2013. [Phylogenetic relationships of flesh flies in the subfamily Sarcophaginae based on three mtDNA fragments \(Diptera: Sarcophagidae\)](#). *Syst. Entomol.* 38, 35–44.
- Yepes-Gaurisas, D., Sánchez-Rodríguez, J.D., Mello-Patiu, C.A., Echeverri, M.W., 2013. [Synantropy of Sarcophagidae \(Diptera\) in La Pintada, Antioquia-Colombia](#). *Rev. Biol. Trop.* 61, 1275–1287.