



Lopesiodinia alvarengai Prado, 1973 (Odiniidae: Traginopinae) with the first description of the male and the neotype designation

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Abstract

The type specimen of *Lopesiodinia alvarengai* Prado is lost. It is being redescribed and illustrated based on specimens from the type locality (Jacareacanga, Pará, Brazil) and the neotype is here designated with the purpose of clarifying the taxonomic status and objectively securing stability of nomenclature.

Key words: Acalyptratae, Amazon Forest, Opomyzoidea, Neotype designation, Neotropical, South America

Introduction

Lopesiodinia Prado, 1973 presently has five valid species: *L. alvarengai* Prado, 1973; *L. argentata* Tôrres, Rafael, Gaimari & Limeira-de-Oliveira, 2021; *L. diversa* Prado, 1973; *L. marcusii* Tôrres, Rafael, Gaimari & Limeira-de-Oliveira, 2021 and *L. pontarolloi* Tôrres, Rafael, Gaimari & Limeira-de-Oliveira, 2021.

One of these species, *L. alvarengai*, was described from a singleton female collected in Jacareacanga, in the state of Pará, Brazil. A major problem regarding the identity of *L. alvarengai* is related to the fact that Prado did not draw or even described the terminalia, the only morphological structures that offers confident elements for identification. Here we redescribe the female and give the first description of the male for this species. In addition, we are designating a neotype for *Lopesiodinia alvarengai* for the express purpose of clarifying its taxonomic status—the type locality remains the same.

Material and Methods

This study is based on the examination of specimens collected in the Amazon biome in the state of Pará, Brazil, housed in the Coleção Zoológica do Maranhão, Caxias, Maranhão, Brazil (CZMA), Instituto Nacional de Pesquisas da Amazônia, Manaus, Amazonas, Brazil (INPA), Museu Nacional do Rio de Janeiro, Rio de Janeiro, Rio de Janeiro, Brazil (MNRJ) and Museu de Zoologia da Universidade de São Paulo, São Paulo, São Paulo, Brazil (MZUSP).

Morphological descriptive terminology follows Cumming & Wood (2017). Specimen length was measured in lateral view from the frons (excluding antenna) to the apex of the abdomen. Measurements of the head and wing follow Limeira-de-Oliveira *et al.* (2017).

To dissect the terminalia, the abdomen was first removed and then macerated in hot (150°C) 85% lactic acid for approximately 25 minutes. After maceration, the pieces were rinsed in distilled water; and then further dissected and examined in glycerin in an excavated slides. After analysis, the pieces were placed in microvials containing glycerin and each microvial was fixed on the pin of the corresponding specimen.

The images were made using a Zeiss®Discovery V12 stereomicroscope, with a 1.4 megapixel AxionCan ICc1 digital camera coupled through the Zen®2012 program. Plates were made in CorelDRAW 2020.

Additional data not contained on the specimen labels are added between square brackets “[]”.

Neotype designation

Prado (1973) stated that the types of his two new species of *Lopesiodinia* (*L. alvarengai* and *L. diversa*) were to be deposited in MNRJ, but they never were. The holotype of *L. diversa* was found at MZUSP, although both the tube with the genitalia, and the pinned female allotype, were lost. The holotype of *L. alvarengai*, a singleton female, is apparently lost (Tôrres *et al.* 2021). There is no possibility to check among specimens in MNRJ due to the recent fire, although queries with the curators at MNRJ prior to the fire indicated they did not have this holotype. Additionally, the holotype was not located at Prado's home in Campinas, nor at his institution, the Universidade de Campinas, state of São Paulo, Brazil, nor at MZUSP. The neotype designation for *L. alvarengai* herein is made for the express purpose of clarifying its taxonomic status to support the stability of the name, and follows the qualifying conditions required by the Article 75.3 of the ICZN (2000). The neotype (and additional specimens) are from the same type locality, Jacareacanga, in the state of Pará, Brazil. The characters differentiating this taxon from congeners are given in the remarks below the redescription. Although the species was originally described from a female holotype, we are following Article 75.3.5 of the ICZN (2000) in designating a male specimen as neotype to provide more stability relative to the identity of the species since male characteristics are often required to differentiate closely related species. The neotype is consistent with what is known from the original description in all characters, including the vertex being strongly convergent, the arista having well-developed, almost feathery setae, and the mesonotum and pleuron being predominantly golden yellow pruinose. The neotype is deposited at INPA.

Taxonomy

Lopesiodinia alvarengai Prado

(Figs 1–27)

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Lopesiodinia alvarengai Prado, 1973: 503. Type locality: Brazil. Pará: Jacareacanga. NT ♂ (designated herein) deposited in INPA. References—Prado 1975: 2 [catalog]; Prado and Papavero 2002: 1 [list, Brazil]; Carvalho-Filho *et al.* 2009: 66 [in key]; Gaimari 2010: 1053 [discussion]; Gaimari & Mathis 2011: 317 [catalog, world]; Tôrres *et al.* 2021: 332 [revision].

Diagnosis. Male. Inner surstylus spiniform, strongly sclerotized; outer surstylus spatuliform; subepandrial sclerite W-shaped. Pregonite toothed ventrodistally. Female. Tergite 7 membranous, weakly sclerotized at basal dorsomedial region, forming a strongly sclerotized but incomplete ring, open ventrally; spiracle inserted ventrally on posteroventral margin of tergite 7.

Description. Neotype ♂. Body length 3.19 mm. **Head** (Figs 1–5). Height 1.82X the length, width 2.17X the length and 1.19X wider than high. Eye only slightly higher than long. Ocellar triangle with silvery-gray to yellowish-gray pruinosity, with sparse, tiny, dark, proclinate ocellar setulae; posterior ocelli slightly closer to each other than the distance between the anterior and a posterior ocellus; robust ocellar setae, subequal in length and diameter to the postocellar setae; inner and outer vertical setae equal in length, these slightly longer. Postcranium (Fig. 1) slightly concave in dorsal view. Frons (Fig. 3) 2.00X wider than long, with lateral edge diverging ventrally and generally converging dorsally; frons reddish-brown in dorsal view apparently without pruinosity, and goldish-yellow pruinosity, dense, in anterior view. Fronto-orbital plate (Fig. 3) yellow, goldish-yellow pruinosity, dense; 3

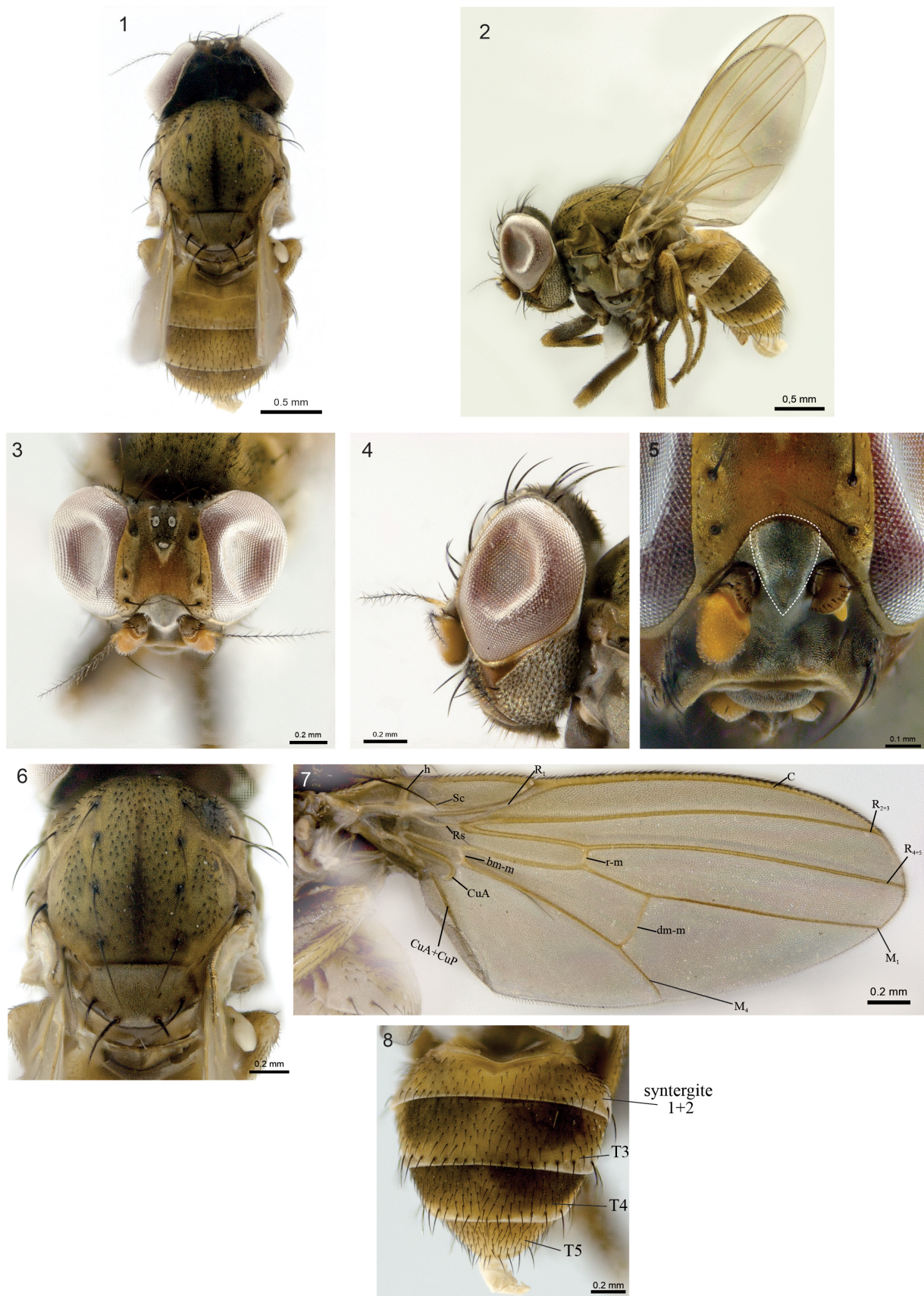
fronto-orbital setae, anterior pair inclined and 2 posterior pairs recumbent, anterior pair originating below the top of the lunule, middle pair originating closer to the anterior pair than the posterior, posterior pair originating above the level of the anterior ocellus. Lunule (Figs 3, 5) 0.11 mm high, arched; 0.46X height of frons; light brown to brown, silvery-gray pruinosity in lateral or ventral view, with fine, short setae along dorsal edge, almost inconspicuous; lunule with dark brown to black spot with a triangular appearance, large, most evident in dorsal view or when moistened with alcohol. Antenna (Figs 3–5) with scape and pedicel light brown to brown; postpedicel entirely dark yellow; arista with first segment yellow, remainder black, bipectinate, with moderate-sized setae, darkened. Face (Fig. 5), parafacial and gena light brown to brown. Oral vibrissa (Fig. 5) accompanied by a group of dark brown to black setae and 1 well-differentiated subvibrissal seta. Gena (Figs 2, 4) with brown setae and gray pruinosity. Clypeus dark brown, almost entirely covered with light gray pruinosity. Palpus yellow, subcylindrical, with black setulae, some slightly longer. Prementum and labellum light brown, with light colored setulae.

Thorax (Figs 1–2, 6). Greyish- to goldish-brown pruinosity with distinct dark brown median vitta; all macrosetae with alveolae slightly oblong and slightly raised, margins darkened. Chaetotaxy: 1+3 dorsocentral (two posteriormost strongest), prescutellar acrostichal absent, 1 postpronotal (along with a few setulae), 1 presutural intra-alar, 2 notopleurals (anterior seta strongest), 2 supra-alars (posterior one strongest), 2 postalars (anterior seta strongest and additional 1 tiny setula between them). Prescutellum absent. Scutellum (Figs 1, 6) concolorous with scutum, including pruinosity, arched dorsally, with 2 pairs of macrosetae and 1 to 3 pairs of setulae between them. Pleuron (Fig. 2) yellowish-gray pruinose; pleuron above katapisternum lacking setae or setulae except for 1 propleural seta. Katapisternum with 3 stout setae along dorsal edge, in addition to some setulae. **Legs** (Fig. 2). Coxae and femora dark brown, except for the yellow distal ends, with sparse yellowish-gray pruinosity. Tibiae and tarsi light yellow, except for subproximal and subdistal ends of the tibiae with brown rings, most clearly defined on the fore tibia. **Wing** (Figs 2, 7). Length 2.84 mm; width 1.14 mm; 2.49X longer than width. Vein *C* extended to M_1 , although weaker beyond R_{4+5} , with costal spinules extended to apex of vein R_{2+3} . Membrane hyaline, slightly yellowish, with yellow veins. Halter yellow.

Abdomen (Figs 1–2, 8). Tergites predominantly yellow to yellowish-orange, with paired large hemispherical brown spots on tergites 3 and 4 (reddish-brown in females), the posterior ends of the tergites with a narrow band of yellowish-gray pruinosity, which widen towards lateral margins where they transition to light yellow-gold color; tergites 3–5 with longer setulae along posterior edges and laterally on syntergite 1+2.

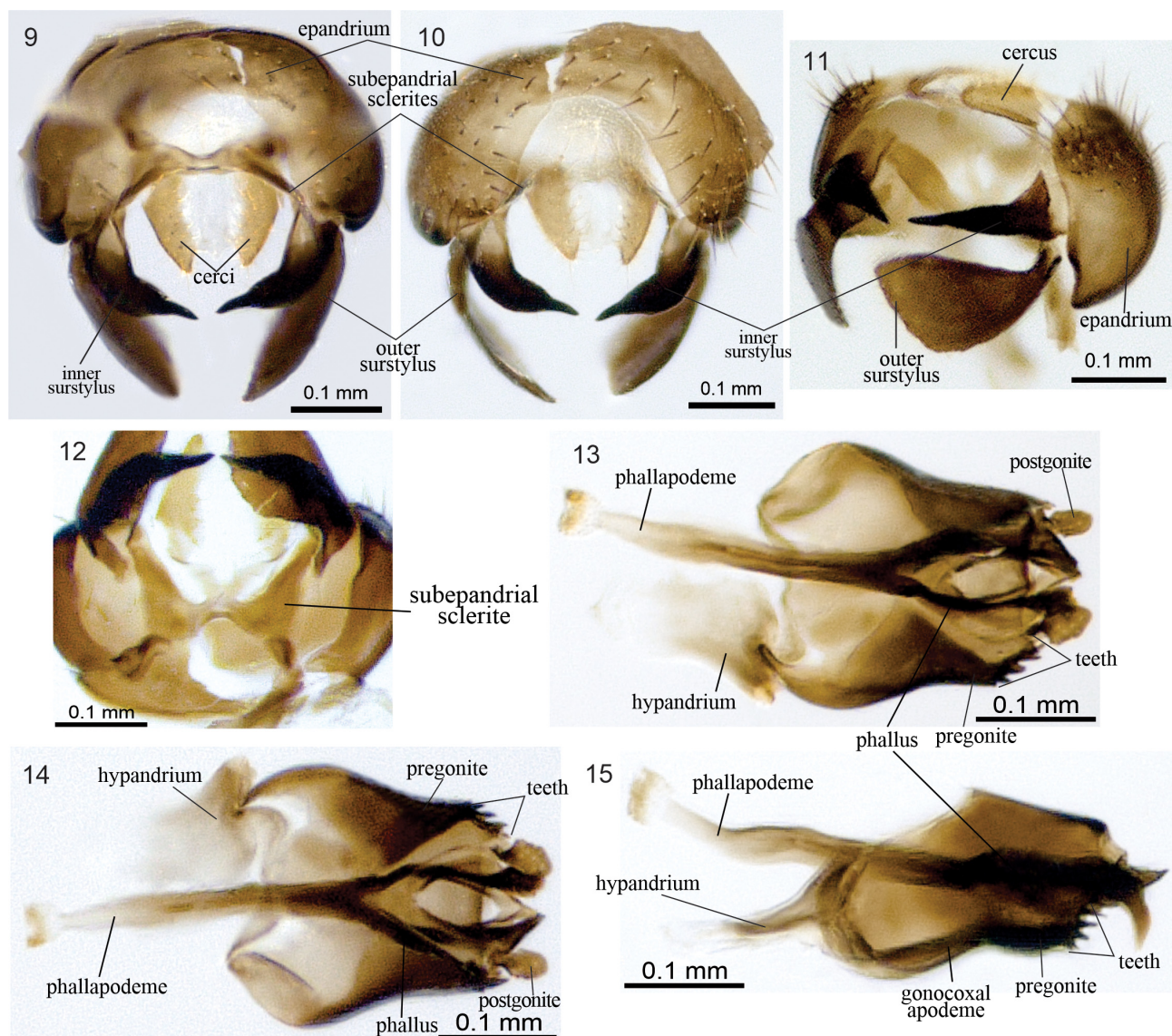
Male terminalia (Figs 9–15). Tergite 6 symmetrical; sternite 6 symmetrical, as a slender stripe, apparently not articulated with tergite 7. Syntergosternite 7 + 8 asymmetrical, bare, 4.00X wider than long. Epandrium (Figs 9–11) saddle-shaped, higher than long, light brown, setulose. Cercus (Figs 9–11) yellow, setulose. Surstyli (Figs 9–11) as two lobes, inner and outer, separately articulated with epandrial edge; inner surstylus spiniform, strongly sclerotized, ventrally curved; outer surstylus spatuliform, distal end about 5.00X the width of the base, slightly curved ventrally; both surstyli apparently glabrous. Subepandrial sclerite (Figs 9–10, 12), “W”-shaped, strongly sclerotized, weakly articulated with the hypandrial arms anteriorly; with four posterior projections, external projections slightly stronger, articulated at the base of the inner surstyli, median projections slightly weaker, articulated at the base of the cerci. Hypandrium (Figs 13–15) subtriangular (tapered anteriorly), slightly longer than wide, proximal half strongly sclerotized, distal half weakly sclerotized, lateral edges slightly higher at base in lateral view. Gonocoxal apodeme (Fig. 15) as a slightly rectangular capsule, with small anteroventral concavity (fitting hypandrium) and concave distally; strongly connected to pregonite (which makes it difficult to visualize without dismembering the hypandrium/gonocoxa complex). Pregonite (Figs 13–15), very large and projecting laterodorsally around the phallapodeme and phallus; when together with the gonocoxal apodeme they form the phallic capsule, inner margin with stout sparse setulae; with a toothed ventrodorsal edge. Postgonite (Figs 13–14) as large lobes, slightly flattened, positioned lateral to the distal end of the phallus. Phallapodeme (Figs 13–15) slightly longer than phallus. Phallus (Figs 13–15) bifid.

Female (Figs 16–27). Similar to male. **Terminalia** (Figs 23–27). Tergite 6 (Fig. 23) 2.70X wider than long, with shallow depression along anterior edge, with stronger setae on the posterior margin. Sternite 6 (Fig. 24) trapezoidal, like a “top hat”-shaped. Tergite 7 (Figs 22, 25–26) membranous except for basal dorsomedial region forming a strongly sclerotized but incomplete ring, open ventrally; spiracle inserted on posteroventral margin of tergite 7. Sternite 7 (Fig. 26) restricted to a very thin, almost imperceptible sclerite. Segment 8 fully membranous. Epiproct (Fig. 26) small, “plate”-shaped. Cerci (Figs 22, 25–26) light brown, setulose, separated, elongated and thin. Two spermathecae (Fig. 27), brown, “mushroom”-shaped.



FIGURES 1–8. *Lopsiodinia alvarengai*, neotype ♂ (pre-dissection). 1, habitus, dorsal view; 2, habitus, lateral view; 3, head, frontal view; 4, head, lateral view; 5, dark spot in spotlight on the lunule and face, dorsal view; 6, thorax, dorsal view; 7, wing; 8, abdomen, dorsal view.

Abbreviations: *bm-m*—basal medial crossvein; *C*—costal vein; *CuA*—anterior branch of cubital vein; *CuA+CuP*—anterior branch of cubital vein + posterior branch of cubital vein; *dm-m*—discal medial crossvein; *h*—humeral crossvein; *M₁*—first branch of media; *M₄*—fourth branch of media; *R₁*—anterior branch of radius; *R₂₊₃*—second branch of radius; *R₄₊₅*—third branch of radius; *r-m*—radial–medial crossvein; *Rs*—radial sector; *Sc*—subcostal vein; *T3*—tergite 3; *T4*—tergite 4; *T5*—tergite 5.



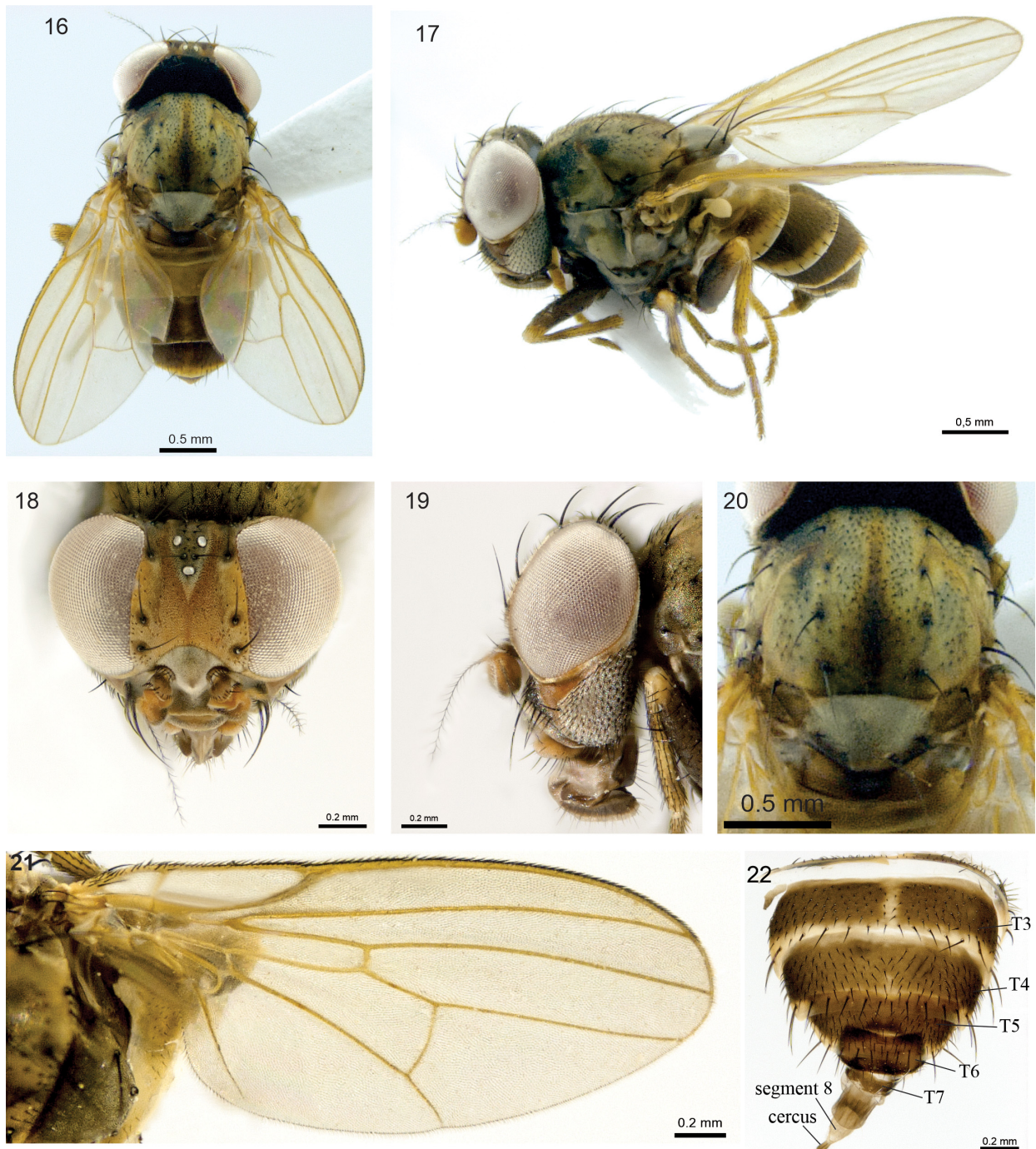
FIGURES 9–15. *Lopesiodinia alvarengai*, neotype ♂. Terminalia. **9**, epandrium, cerci, outer and inner surstyli and subepandrial sclerite, anterior view; **10**, epandrium, outer and inner surstyli and subepandrial sclerite, posterior view; **11**, epandrium, cercus and outer and inner surstyli, lateral view; **12**, subepandrial sclerite, anterior view; **13**, phallapodeme, hypandrium, phallus, pregonite showing teeth and postgonite, dorsal view; **14**, phallapodeme, hypandrium, phallus, pregonite, showing teeth and postgonite, ventral view; **15**, phallapodeme, hypandrium, gonocoxal apodeme, phallus, pregonite showing teeth, lateral view.

Type material examined. **NEOTYPE** ♂ (pinned, terminalia in microvial of glass), deposited in INPA: Brasil, PA[=Pará], Jacareacanga, Aeroporto, Floresta, 6°14'10.7"S, 57°46'40.6"W/PET (Vinagre V.[=Vinho] Tinto + Etanol), alta (30 mts[=metros]), 31.xii.2022–6.i.2023, F. Limeira-de-Oliveira, A. Tôrres & E. S. Pessoa, cols. \ FLO 8396. [Verbatim label data: Brasil, Pará, Jacareacanga / Aeroporto, Floresta / 6°14'10.7"S, 57°46'40.6"W / PET (Vinagre de Vinho Tinto + Etanol) / alta (30 metros), 31.xii.2023– / 6.i.2023, F. Limeira-de-Oliveira / A. Tôrres & E. S. Pessoa, cols./ "NEOTYPE / *Lopesiodinia alvarengai* / Prado, 1973/ desig.: Tôrres, Rafael, Gaimari &/ Limeira-de-Oliveira, 2023"]. **Additional material examined:** Same data as neotype, except/ FLO 7831 (pinned, terminalia in microvial of glass: 1♀, MZUSP); *idem* \ FLO 7834 (pinned, terminalia in microvial of glass: 1♀, MNRJ); *idem* \ FLO 8605 (1♀, CZMA).

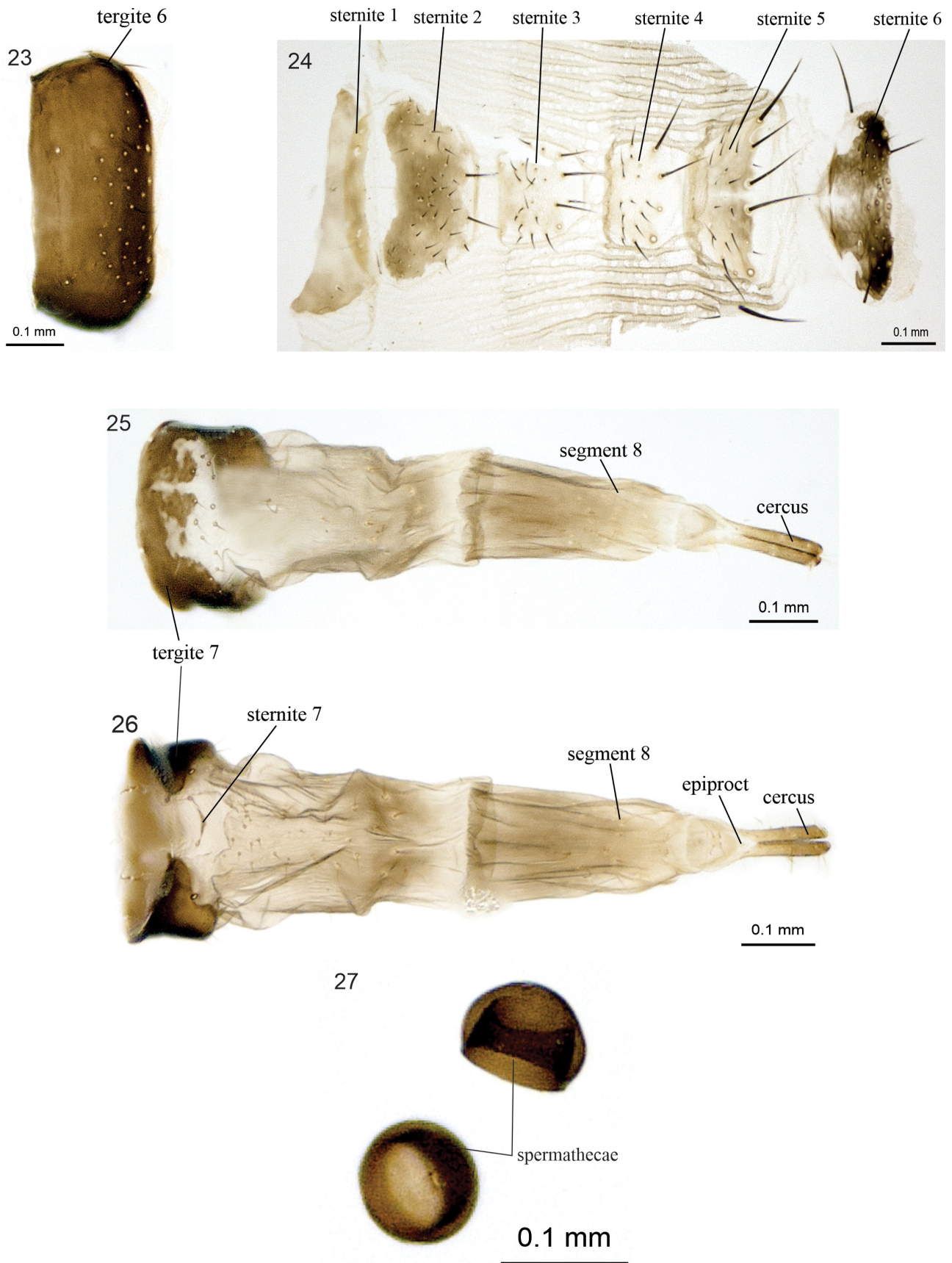
Variation. Female (n = 3). Body length 2.97–3.46 mm, mean 3.22 mm; wing length 2.62–3.08 mm, mean 2.82 mm; wing width 1.06–1.27 mm, mean 1.15 mm. **Abdomen** (Figs 16–17, 22), in female with tergites predominantly reddish-brown.

Geographical record. Brazil: Pará.

Remarks. *Lopesiodinia alvarengai*, differs from other species of this genus by having the inner surstylus spiniform and strongly sclerotized and the outer surstylus spatuliform, the subepandrial sclerite being “W”-shaped, and the pregonite having a toothed ventrodiscal edge (the pregonite lacks ventrodiscal teeth in the other species). Female specimens also differ in having tergite 7 as an incomplete ring, separated ventrally, with sternite 7 reduces to a very thin, almost imperceptible sclerite. In the other species whose females are known (*L. argentata*, *L. marcusii* and *L. pontarolloi*) tergite 7 forms a complete ring.



FIGURES 16–22. *Lopesiodinia alvarengai*, ♀. **16**, habitus, dorsal view; **17**, habitus, lateral view; **18**, head, frontal view; **19**, head, lateral view; **20**, thorax, dorsal view; **21**, wing; **22**, abdomen, dorsal view. Abbreviations: T3—tergite 3; T4—tergite 4; T5—tergite 5; T6—tergite 6; T7—tergite 7.



FIGURES 23–27. *Loposiodinia alvarengai*, ♀. Terminalia. **23**, Tergite 6, dorsal view; **24**, sternites 1–6, ventral view; **25**, tergite 7, segment 8 and cercus, dorsal view; **26**, tergite 7, sternite 7, segment 8, epiproct and cercus, ventral view; **27**, spermathecae.

Further comments

Prado (1973) indicated MNRJ (Museu Nacional do Rio de Janeiro) as the depository for holotypes of all species described in that paper, except for the holotypes of *Schildomyia lanei* Prado, 1973 and *S. reticulata* Prado, 1973. However, no specimen ever left Campinas, with all specimens remaining with Prado, or in his laboratory at UNICAMP (University of Campinas, state of São Paulo). About four decades later, part of the type material was recovered (in Prado's collection or his laboratory at UNICAMP), but unfortunately, some type specimens were absent, including the holotype of *L. alvarengai* (having been described from a single female specimen collected in Jacareacanga, in the state of Pará). Based on the information noted in the "Material examined" section of Prado (1973), it was possible to return to the type locality (Jacareacanga, Pará) and in the same period of the year (December) to collect a specimen of this species. Attempts to collect specimens of this species were concentrated in the forested area near the airport. On this occasion, four specimens were collected (1 ♂ and 3 ♀), which are described and illustrated here.

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References

- Carvalho-Filho, F.S., Esposito, M.C. & Santos, R.C.O. (2009) A new species of *Helgreelia* Gaimari (Diptera: Odiniidae) from Brazil, with a key to the Neotropical species of Odiniidae. *Zootaxa*, 2219 (1), 61–68.
<https://doi.org/10.11646/zootaxa.2219.1.6>
- Cumming, J.M. & Wood, D.M. (2017) 3. Adult morphology and terminology. In: Kirk-Spriggs, A.H. & Sinclair, B.J. (Eds.), *Manual of Afrotropical Diptera. Vol. 1. Introductory chapters and keys to Diptera families. Suricata 4*. SANBI Graphics & Editing, Pretoria, pp. 89–133.
- Gaimari, S.D. (2010) Odiniidae. 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*. National Research Council Press, Ottawa, pp. 1049–1055.
- Gaimari, S.D. & Mathis, W.N. (2011) World catalog and conspectus on the family Odiniidae (Diptera: Schizophora). *Myia*, 12, 291–339.
- ICZN (2000) *International Code of Zoological Nomenclature. 4th Edition*. The International Trust for Zoological Nomenclature, London, 306 pp.
- Limeira-de-Oliveira, F., Marques, D.W.A., Reis, G.A. & Rafael, J.A. (2017) *Inpauema*, a new genus of Odiniidae (Diptera) from Brazil, with description of five new species. *Zootaxa*, 4362 (4), 517–534.
<https://doi.org/10.11646/zootaxa.4362.4.3>
- Prado, A.P. (1973) Contribuição ao conhecimento da família Odiniidae (Diptera, Acalyptratae). *Studia Entomologica*, 16, 481–510.
- Prado, A.P. (1975) Family Odiniidae. *A Catalogue of the Diptera of the Americas south of the United States*, 82, 1–4.
- Prado, A.P. & Papavero, N. (2002) Insecta – Diptera – Odiniidae. *Fauna Amazônia Brasileira*, 8, 1–2.
- Tôrres, A., Rafael, J.A., Gaimari, S.D. & Limeira-de-Oliveira, F. (2021) Revision of the genus *Lopesiodinia* Prado, 1973 (Diptera: Odiniidae) with description of three new species. *Zootaxa*, 5052 (3), 332–352.
<https://doi.org/10.11646/zootaxa.5052.3.2>