



## Insect (Hexapoda) diversity in the oceanic archipelago of Fernando de Noronha, Brazil: Lauxaniidae (Diptera)

MATHEUS M. M. SOARES<sup>1</sup>, STEPHEN D. GAIMARI<sup>2\*</sup>, JOSÉ DE J. CORRÊA-NETO<sup>1</sup>, FRANCISCO LIMEIRA-DE-OLIVEIRA<sup>3</sup> & JOSÉ A. RAFAEL<sup>4</sup>

<sup>1</sup>Graduate Program in Entomology (PPG-Ent), Instituto Nacional de Pesquisas da Amazônia (INPA), Av. André Araújo, 2936, Petrópolis, CEP 69067-375, Manaus, Amazonas, Brazil

[✉ matheusmsoares@gmail.com](mailto:matheusmsoares@gmail.com); [ORCID](https://orcid.org/0000-0002-2355-1441) <https://orcid.org/0000-0002-2355-1441>

[✉ netoentomo@gmail.com](mailto:netoentomo@gmail.com); [ORCID](https://orcid.org/0000-0003-1391-9975) <https://orcid.org/0000-0003-1391-9975>

<sup>2</sup>Dipterists Society, P.O. Box 231113, Sacramento, California 95823, USA

[✉ sgaimari@dipterists.org](mailto:sgaimari@dipterists.org); [ORCID](https://orcid.org/0000-0002-4240-7154) <https://orcid.org/0000-0002-4240-7154>

<sup>3</sup>Universidade Estadual do Maranhão, Laboratório de Estudos dos Invertebrados, Praça Duque de Caixas, Morro do Alecrim, s/n, 65604-380 Caxias, MA, Brazil

[✉ limeiraf@gmail.com](mailto:limeiraf@gmail.com); [ORCID](https://orcid.org/0000-0002-4980-5454) <https://orcid.org/0000-0002-4980-5454>

<sup>4</sup>Instituto Nacional de Pesquisas da Amazônia, INPA, Coordenação de Biodiversidade, Manaus, Amazonas, Brazil

[✉ jarafael@inpa.gov.br](mailto:jarafael@inpa.gov.br); [ORCID](https://orcid.org/0000-0002-0170-0514) <https://orcid.org/0000-0002-0170-0514>

\*Corresponding author

### Abstract

The Lauxaniidae fauna from the oceanic Archipelago of Fernando de Noronha, Brazil is revised. Three genera and four species are recognized: *Camptoprosopella equatorialis* Shewell, 1939, *Pachyopella flavida* (Wiedemann, 1824), *Poecilominettia erebus* Soares & Gaimari, **sp. nov.** and *Poecilominettia octovittata* (Williston, 1896). In addition, we provided an illustrated key and high-resolution photographs of external morphology and male and female terminalia of species. Finally, we present the first insights into the effects of climate variables on the abundance of the species analyzed.

**Key words:** *Camptoprosopella*, *Pachyopella*, *Poecilominettia*, new species, oceanic islands fauna

### Introduction

Lauxaniidae are small to moderately large flies, measuring 2–11 mm in length (Gaimari & Silva 2010). It is one of the most diverse families of schizophoran Diptera, comprising nearly 200 extant genera and subgenera and more than 2,100 valid species worldwide, except Antarctica, with 392 species in the Neotropical Region (Gaimari & Silva 2020, Gaimari & Soares 2022), of which 111 species in 46 genera are recorded for Brazil. Larvae are widely documented as saprophagous (Miller 1977) and rarely as flower-head feeders (Silva & Mello 2008). Adults are fungal grazers on leaves (Broadhead 1984, 1989; Mello & Silva 2007). They are probably among the more important dipterans responsible for turnover of enormous quantities of organic litter in the tropics, likely playing a significant role in the healthy functioning of tropical ecosystems (Freidberg & Yarom 1990).

The entomofauna of the archipelago Fernando de Noronha was summarized in Rafael *et al.* (2020) that updated the taxonomic checklist citing 453 species or morphospecies of insects. Several papers treating different taxa were published, including the dipteran families Pipunculidae (Rafael *et al.* 2021a), Tabanidae (Rafael *et al.* 2021b), Tephritidae (Fernandes *et al.* 2021b), Scenopinidae (Rafael *et al.* 2022), and Clusiidae (Rafael *et al.* 2023), as well as the hymenopteran families Pompilidae (Fernandes *et al.* 2021a) and Halictidae (Mahlmann *et al.* 2022), and the order Embioptera (Costa-Pinto *et al.* 2021).

In this contribution, we redescribe *Camptoprosopella equatorialis* Shewell, *Pachyopella flavida* (Wiedemann), *Poecilominettia octovittata* (Williston), describe the new species *Poecilominettia erebus* Soares & Gaimari **sp. nov.**,

provide an illustrated key to species, high-resolution photographs, and also present the first insights into the effects of climate variables on the abundance of the species in the archipelago.

## Material and methods

The Brazilian archipelago of Fernando de Noronha (latitude 3°45'S to 3°57'S; longitude 32°19'W to 32°41'W) is of volcanic origin, has never been connected to the continent, and has a tropical oceanic climate (Aw—Köppen classification). Temperature ranges from 23.5°C to 31.5°C, with an annual mean of 27°C (IBAMA 2006), and the annual average of precipitation is 1,400 mm, but with significant interannual variability. It is characterized by a less rainy season, with a mean rainfall of 27.2 mm/month (August–January), and a rainy season with a mean precipitation of 211.7 mm/month (March–July). The archipelago has a harsh environment, lacking a permanent source of fresh water, low vegetation diversity, and shallow soils with little water retention (Freitas *et al.* 2013). Native flora, characterized as seasonally deciduous vegetation, is sparse and primarily represented by bushes and herbs, with several introduced plant species (Teixeira *et al.* 2003).

Studied specimens will be deposited in the following institutions: Coleção Zoológica do Maranhão (CZMA), Caxias, Maranhão; Instituto Nacional de Pesquisas da Amazônia (INPA), Manaus, Amazonas, Brazil; Museu Nacional do Rio de Janeiro (MNRJ), Rio de Janeiro, Brazil; Museu de Zoologia da Universidade de São Paulo (MZUSP), São Paulo, Brazil; American Museum of Natural History (AMNH), New York, New York, USA; California State Collection of Arthropods (CSCA), Plant Pest Diagnostics Center, California Department of Food and Agriculture, Sacramento, California, USA; National Museum of Natural History (USNM), Washington, DC, USA; and in the Stephen D. Gaimari collection (SDG).

Three sites on the main island Fernando de Noronha were selected for interception traps: 1) Sancho-Dolphins Bay trail, near the information and control desk, using two interception traps, model Townes (1972), placed around 100 meters from each other; 2) next to the lookout at Dolphins Bay, using one interception trap, model Gressitt & Gressitt (1962) and; 3) on the Capim-Açu trail, one interception trap, model Gressitt & Gressitt. The collecting activities were interrupted on March 15, 2020, as a result of the Covid-19 pandemic. Specimens were labeled, preserved in small containers with commercial ethanol (94%), dried, and pinned.

Genera were identified using the key of Gaimari & Silva (2010) and species were identified using the keys of Broadhead (1989) and Shewell (1939), and comparison with types and other specimens by Gaimari. Terminology follows Cumming & Wood (2017). The collecting license number for this project is 62.821, issued by Instituto Chico Mendes de Conservação da Biodiversidade (ICMBio).

## Data analysis

The meteorological data were obtained from Climate Data (<https://pt.climate-data.org/americas-do-sul/brasil/pernambuco/fernando-de-noronha-1006098/>). Based on these data, we generated a graph illustrating the fluctuation of climatic variables during the study (Fig. 9). Preliminary analyses showed that only two climatic variables, precipitation and humidity, were strongly correlated (Pearson's  $r > 0.93$ , Fig. 10). Therefore, we chose to use a simple linear regression, based on the coefficient of determination ( $R^2$ ), to evaluate the impacts of mean temperature (°C), humidity (%), and precipitation (mm) on the abundance of each species of Lauxaniidae. These analyses covered the continuous collection period in the archipelago, from June 9, 2019, to February 27, 2020, using data from flight interception traps. Data normality was assessed and confirmed using the Shapiro-Wilk test. All analyses were conducted in R v.4.4.0 (R Core Team 2024).

## Results

A total of 18,883 adult specimens of lauxaniid flies, belonging to three genera and four species were collected over nine months (June 2019 to February 2020), using interception traps, light traps and net sweepings: *Camptoprosopella equatorialis* (40 specimens); *Pachyopella flavida* (1,886 specimens); *Poecilominettia erebus* Soares & Gaimari **sp.**

**nov.** (409 specimens); and *Poecilominettia octovittata* (16,548 specimens). We highlight that *Po. octovittata* was the most abundant species in Fernando de Noronha, representing 87.6% of the total specimens collected over the nine-month period, during both the rainy and dry seasons, as shown in Figure 11. During the six months of the dry season, from August to January (Fig. 11), we collected 13,500 specimens using interception traps, compared to the 2,282 specimens collected in just three months during the rainy season (June, July 2019, and February 2020). We recorded the lowest number of specimens in June, the first month of the rainy season (Fig. 11). In the following month, July, the second month of the rainy season, we observed a notable increase in the number of *Po. octovittata* specimens (Fig. 11). Additionally, we found that the population fluctuations *Pa. flavida* and *Po. erebus* Soares & Gaimari, **sp. nov.** were similar throughout the nine months of collection, as represented in Figure 11.

### Effects of climate variables

Temperature does not appear to influence the abundance of the studied species, but relative humidity and precipitation do. In the case of *Pachyopella flavida*, temperature had no impact on its abundance, while humidity and precipitation had a significant effect (Table 1). The increase in relative humidity and precipitation increased the abundance of *Pa. flavida* (Fig. 12 a–b). For *Po. erebus* Soares & Gaimari, **sp. nov.**, none of the tested climatic variables affected its abundance (Table 1). Finally, the abundance of *Poecilominettia octovittata* was influenced by relative humidity and precipitation, but not by temperature (Table 1). The monthly increase in relative humidity and precipitation reduced the abundance of *Po. octovittata* (Fig. 12 c–d).

**TABLE 1.** Linear regression results for abundance of *Pachyopella flavida*, *Poecilominettia erebus* **sp. nov.** and *Poecilominettia octovittata* as a function of climatic variables (Temperature, humidity and precipitation) in the Fernando de Noronha archipelago, Pernambuco, Brazil.

Response variable	Predictor variable	R <sup>2</sup>	P
<i>Pachyopella flavida</i>	Temperature	0.004	0.86
	Relative humidity	<b>0.49</b>	<b>0.03</b>
	Precipitation	<b>0.51</b>	<b>0.02</b>
<i>Poecilominettia erebus</i>	Temperature	0.09	0.40
	Relative humidity	0.03	0.63
	Precipitation	0.02	0.66
<i>Poecilominettia octovittata</i>	Temperature	0.11	0.37
	Relative humidity	<b>0.70</b>	<b>0.004</b>
	Precipitation	<b>0.89</b>	<b>0.0001</b>

### Key to Lauxaniidae from the oceanic Archipelago of Fernando de Noronha

- 1 Anterior fronto-orbital seta reclinate (Figs. 5C, D, 7C, D); ocellar triangle not strongly contrasting with remainder of frons (Figs. 5E, 7E); postsutural intra-alar seta present (Fig. 5E); 2 katapisternal setae (Figs. 5A, 7A); epandrium with dorsal rectangular brown spot (Figs. 5G, 6A, 7G, 8A) ..... **2**
- Anterior fronto-orbital seta inclinate (Figs. 1C, 3C); ocellar triangle surrounded by dark brown patch contrasting with otherwise orange frons (Figs. 1E, 3E); postsutural intra-alar seta absent (Figs. 1E, 3E); 1 katapisternal seta (Figs. 1A, 3B); epandrium homogeneously yellow to pale yellow (Figs. 1G, 2A–C, 3G, 4A, B) ..... **3**
- 2 Face yellow with an oval dark brown spot at middle of lower margin (Fig. 7C); thorax with dorsocentral and supra-alar brown stripes (Fig. 7E); anterior margin of wing dark brown (Fig. 7F) ..... *Poecilominettia octovittata* (Williston, 1896)
- Face homogeneously brownish (Fig. 5C); thorax homogeneously brownish (Fig. 5E); wing wholly hyaline (Fig. 5F) ..... *Poecilominettia erebus* Soares & Gaimari, **sp. nov.**
- 3 First-flagellomere elongated, about 8X longer than high (Fig. 3A, B, D); face yellow with median rounded dark brown spot (Fig. 3C); surstylus elongated, about 4X longer than wide, somewhat finger-shaped (Fig. 4A, B) ..... *Pachyopella flavida* (Wiedemann, 1824)
- First flagellomere short, about 2.5X longer than high (Fig. 1D); face homogeneously yellow (Fig. 1C); surstylus somewhat oval, 1.5X longer than wide at widest point, with pointed apex (Fig. 2A–C) ... *Camptoprosopella equatorialis* Shewell, 1939

## *Camptoprosopella equatorialis* Shewell, 1939

(Figs. 1, 2)

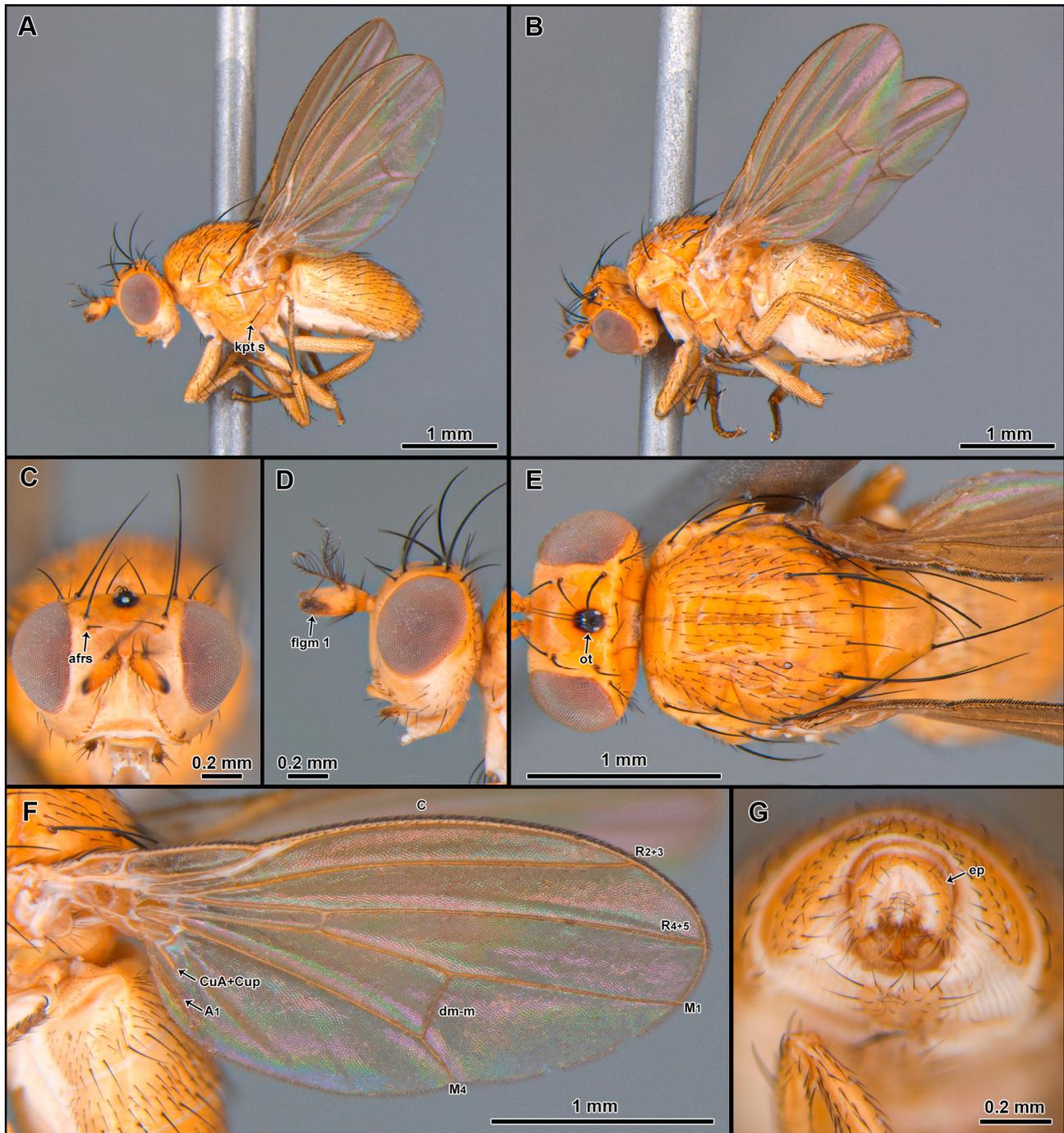
*Camptoprosopella equatorialis* Shewell, 1939: 140. Type locality: Brazil, Amazonas, Manaus. Holotype male, USNM (examined SDG).

**Diagnosis.** Easily distinguished from the other lauxaniid species from the archipelago of Fernando de Noronha by the combination of the dark patch over the ocellar triangle strongly contrasting with orange frons (shared with *Pachyopella flavida*); first flagellomere short, about 2.5X longer than high, mostly orangish yellow with dark brown apex (Fig. 1A–D); face homogeneously yellow (Fig. 1C); ocellar triangle at same level of inner vertical seta (Fig. 1E); surstylus broad and leaf-shaped, 1.5X longer than wide at widest point, with pointed apex (Fig. 2A–C).

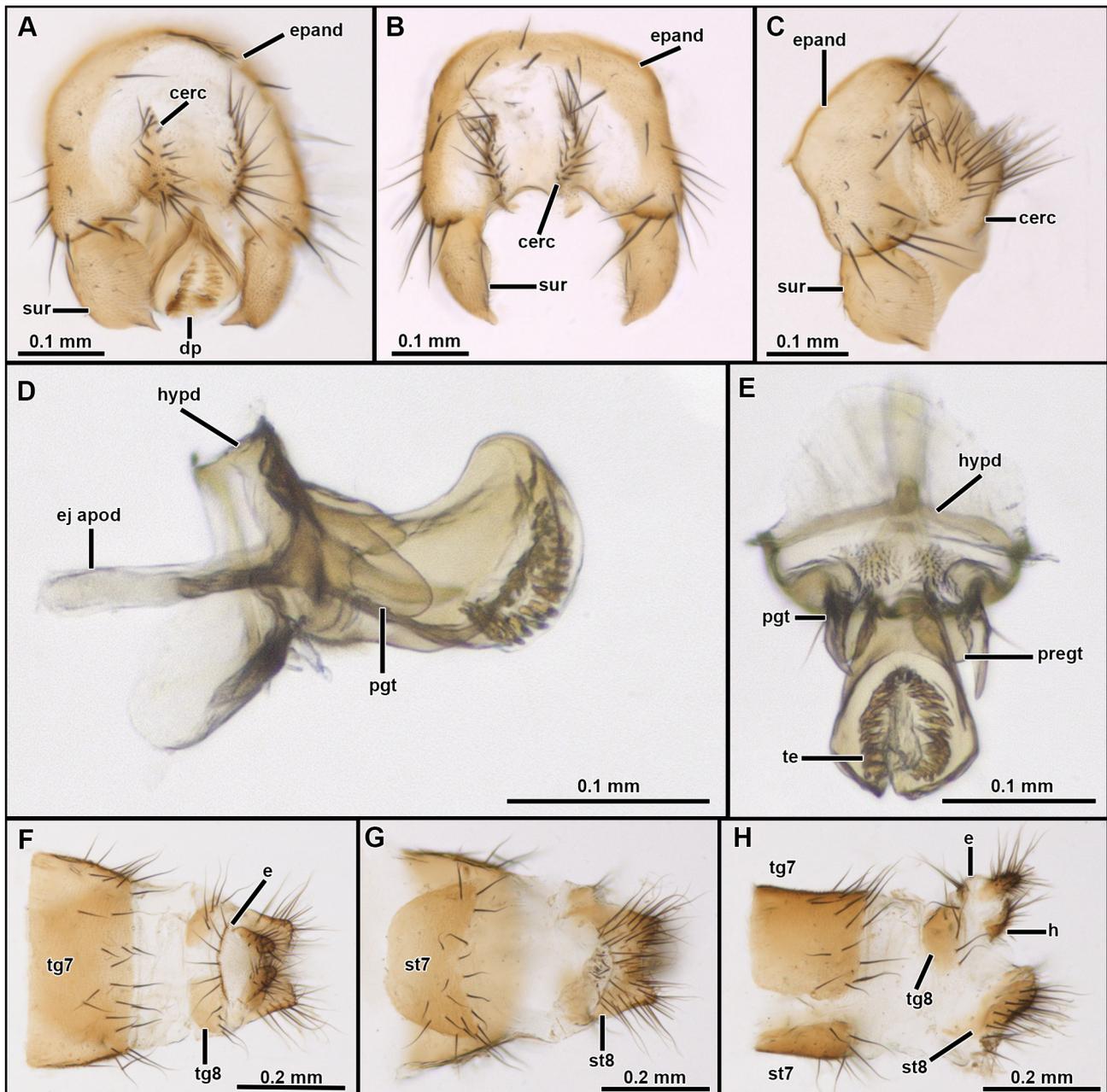
**Redescription.** *Head* (Figs. 1A–E). Mostly orangish yellow, except surrounding ocellar triangle dark brown; 1.3X higher than long, 1.6X wider than high, 1.1X wider than scutum; eye 1.2X higher than long; gena height (directly below eye) 0.2X eye height. Vertex shiny, rounded; inner vertical seta long and strong, about 3X longer than outer vertical seta, with distance between them about 1/2 that from inner vertical seta to central vertex. Ocellar triangle small, slightly raised, placed slightly in front of vertex, with posterior ocelli at same level as inner vertical seta; ocelli subequal in size and arranged in small equilateral triangle, with few tiny setulae posteriorly. Ocellar setae strong, proclinate and slightly divergent, about 0.6X as long as inner vertical seta. Postocellar setae cruciate, about 0.5X as long as ocellar seta. One row of short postocular setulae. Median occipital sclerite with group of short supracerical setae above occipital foramen. Frons 2X wider than long, flat, curved evenly into facial plane; with 2 strong fronto-orbital setae very close together, posterior seta reclinate, about 2X longer than anterior seta, located at midpoint between inner vertical seta and lunule; anterior seta inclinate, located closer to posterior seta than to lunule; frons not setulose, smooth. Lunule low, narrowly arched. Antenna mostly orangish-yellow, except dark brown on apical 1/3 of outer surface and tip of inner surface and entire arista; scape short, with few tiny apicodorsal setulae; pedicel with 1 long dorsal seta at middle length, with crown of short setae at apex and 3–4 long ventral setae; first flagellomere about 2.5X longer than high, and about 2.5X longer than scape and pedicel combined, with rounded apex; arista dorsobasal on first flagellomere, plumose, with upper rays longest and lower rays uniformly short. Parafacial, face, and gena light yellow, contrasting with orange of frons. Parafacial broad, nearly as wide as face. Face about 1.6X higher than wide. Gena mostly bare, only with row of short setae at ventral edge extended onto lower parafacial, postgena with few long and sparse setae. Clypeus nearly as wide as face, yellow. Maxillary palpus and labellum orangish yellow, except apex of maxillary palpus dark brown, outer edge with row of long and strong setae.

*Thorax* (Fig. 1A, B, E). Scutum slightly arched, length subequal to width; scutellum about 1/3 as long as scutum, with width at base about 1.8X greater than length; scutum homogeneously orangish yellow, pale yellow on postpronotum through notopleuron; scutellum and pleural region concolorous with scutum. Chaetotaxy: 0+3 dorsocentral setae, anterior seta short and thin, about 1/3 as long as middle seta, located at midpoint between middle seta and transverse suture, middle seta strong, located at midpoint between posterior seta and transverse suture; posterior seta strong, located closer to scutellar suture than to middle seta; prescutellar acrostichal seta present, slightly stronger than anterior dorsocentral seta; 1 postpronotal seta; 2 notopleural setae, in anterior and posterior corners, anterior seta slightly longer than posterior; postsutural intra-alar seta absent; 1 presutural and 1 postsutural supra-alar setae; 2 postalar setae, in anterior and posterior corners; 6–8 irregular rows of acrostichal setulae between dorsocentral setal rows, row of setulae along dorsocentral area, and setulose outside dorsocentral row, notopleuron lacking setulae; proepisternal seta present, small; anepisternal seta along posterior edge of anepisternum, anepisternum otherwise setulose in posterior 2/3; anepimeron bare; 1 katepisternal seta present, katepisternum otherwise with several smaller setulae anterior of seta, and with 2–3 long ventral setae, close to the coxa; 2 pairs scutellar setae, anterior setae subparallel, posterior setae convergent. *Legs* (Fig. 1A, B). Pale yellow to orangish yellow, slightly darker on distal tarsomeres. Fore femur with 3 long and strong posteroventral setae in apical 1/2, about 1.5X longer than width of femur, posterior and posterodorsal rows of setae from base to apex, shorter and thinner than posteroventral setae; ctenidium absent. Mid femur with anterior row of short and strong setae in apical 1/2, and with 1 short curved posteroventral preapical seta. Hind femur with anteroventral row of short setae in apical 1/3 and 2–3 longer anterodorsal setae. All tibiae with preapical dorsal seta, strongest on mid tibia; mid tibia with 1 longer preapical ventral seta, as long as dorsal seta; hind tibia with 1 short apical ventral spur. *Wing* (Fig. 1F). Hyaline; sapromyziform; veins mostly pale brown, paler yellow basally. Length 3.0 mm; 2.5X longer

than high. Cell dm about 3.8X longer than crossvein dm-m. Crossvein r-m located at midpoint of cell dm. Vein  $R_{4+5}$  ending at wing tip, slightly divergent from vein  $R_{2+3}$ , and subparallel with vein  $M_1$ . Crossvein dm-m straight, located slightly basal to midpoint between crossvein r-m and tip of vein  $M_1$ . Vein  $M_4$  about 0.5X as long as crossvein dm-m. Vein CuA+CuP short, about 1/2 as long as vein  $A_1$ .



**FIGURE 1.** *Camptoprosopella equatorialis* Shewell, 1939. **A, C–G** male (INPA), **B** female (INPA). **A, B.** Habitus, lateral view; **C, D.** Head anterior and lateral views, respectively; **E.** Head and thorax, dorsal view; **F.** Wing; **G.** Male terminalia, posterior view. Abbreviations:  $A_1$  = first branch of anal vein; afrs = anterior fronto-orbital seta; CuA+CuP = anterior branch of cubital vein + posterior branch of cubital vein; dm-m = discal medial crossvein; ep = epandrium; kpt s = katepisternal seta;  $M_1$  = first branch of media;  $M_4$  = fourth branch of media; flgm 1 = first flagellomere; ot = ocellar triangle;  $R_{2+3}$  = second branch of radius;  $R_{4+5}$  = third branch of radius.



**FIGURE 2.** *Camptoprosopella equatorialis* Shewell, 1939. A–E male (INPA), F–H female (INPA). A–C. Epandrium in oblique posterior, posterior and lateral views, respectively; D–E. Internal appendages in lateral and anterior views, respectively; F–G. Female terminalia in dorsal, ventral and lateral views, respectively. Abbreviations: cerc = cercus; dp = distiphallus; e = epiproct; epand = epandrium; h = hypoproct; hypd = hypandrium; ej apod = ejaculatory apodeme; te = teeth of distiphallus; st = sternite; tg = tergite; pgt = postgonite; pregd = pregonite; sur = surstylus.

*Abdomen* (Fig. 1A). Homogeneously orangish-yellow, slightly tapering after segment 3. Tergites homogeneously covered with short setulae, with row of long and strong setae along posterior margin of each. Sternites pale yellow to white, with sparse fine setae, slightly longer at posterior edges; sternites 2–5 each slightly longer than wide, subequal in width sternite to sternite; sternite 6 as a membranous transverse strip. *Male genitalia* (Figs. 1G, 2A–E). Pale yellow. Syntergosternite 7+8 simple, bare, transversely saddle-shaped. Epandrium simple, saddle-shaped; mostly bare, with long setae at posterior edge, 1.4X longer than widest point (Fig. 2A–C). Surstylus somewhat leaf-shaped, 1.5X longer than wide at widest point, with pointed apex, with few short setulae (Fig. 2A–C). Subepandrial sclerite subrectangular, about 2X wider than long, with short convexity at posterior margin. Cercus narrow, simple, heavily

setose (Fig. 2A–C). Ejaculatory apodeme long and narrow, weakly sclerotized (Fig. 2D). Phallus somewhat boot-shaped, with rounded apex, about 1.5X longer than wide (Fig. 2D); opening of distiphallus with short, sclerotized teeth (Fig. 2D, E). Hypandrium a narrow transverse strip, with a short and rounded anterior projection at mid-length (Fig. 2E). Pregonite short and with rounded apex (Fig. 2E). Postgonite about 2X longer than pregonite, with rounded apex, and 1 long lateral seta (Fig. 2D, E).

**Female:** Similar to male (Fig. 1B). *Female terminalia* (Fig. 2F–H). Tergite 7 not fused to sternite 7. Tergite 8 divided into two rectangular hemitergites (Fig. 2F). Sternite 8 somewhat hourglass-shaped, heavily setose (Fig. 2G). Epiproct a thin transverse strip, with row of strong setae (Fig. 2F). Hypoproct simple, semicircular, weakly sclerotized at middle of anterior edge, setulose (Fig. 2H). Spermathecae round, with configuration 1+2, paired spermathecae, surface smooth.

**Material examined.** BRAZIL, Pernambuco, Fernando de Noronha: 03°51'30"S–32°25'50"W, 20–27.ii.2020, varredura [sweeping], J.A. Rafael, P.C. Grossi, F.L. Oliveira (1 ♂, INPA); same data, except interc voo [glue flight intercept trap] (1 ♀, INPA); Capim-Açu, 03°51'17"S–32°26'26"W, 24.vi–08.vii.2019, Malaise trap, J.A. Rafael, F. Limeira-de-Oliveira & L.C. Castro (1 ♀, INPA); Sancho, 03°51'17"S–32°26'26"W, 7–21.viii.2019, Malaise trap, J.A. Rafael, F. Limeira-de-Oliveira & L.C. Castro (1 ♀, INPA); same data, except 10–23.i.2020 (1 ♀, INPA); Sueste Mangue, 03°51'30"S–32°25'50"W, 20–27.ii.2020, Malaise trap, J.A. Rafael, F. Limeira-de-Oliveira & P.C. Grossi (4 ♂, 2 dissected, 26 ♀, 3 dissected, INPA); Trilha Atalaia, 03°51'30"S–32°25'50"W, 20–27.ii.2020, Malaise trap, J.A. Rafael, P.C. Grossi, F.L. Oliveira (1 ♂, INPA); same data, except varredura [sweeping] (1 ♀, INPA); Trilha Sancho, 3°51'30"S–32°25'50"W, 01–09.vi.2019, Shannon, J.A. Rafael, F. Limeira-de-Oliveira & D.M.M. Mendes (1 ♂, dissected, INPA).

**Remarks.** *Camptoprosopella equatorialis* can be easily recognized among the species occurring in Fernando de Noronha by the characters given in the key above. Among the four species known from the area, this is most similar to *Pachyopella flavida*, with which it shares the generally orangish yellow habitus, with a dark brown ocellar patch and strongly inclinate anterior fronto-orbital setae. The species is easily differentiated by having a short first flagellomere (elongated in *Pa. flavida*), a uniformly yellow face (with a central brown spot in *Pa. flavida*), a weak anterior dorsocentral seta located at midpoint between the middle seta and transverse suture (strong anterior seta close to transverse suture in *Pa. flavida*), and genitalic differences. The type locality is Manaus, in the state of Amazonas, Brazil, but the species is also known from Colombia and Peru (Gaimari & Silva 2020). This species was described from a single damaged male specimen (Steyskal 1971). It was recorded only recently from Fernando de Noronha (Rafael *et al.* 2020) and this is the only oceanic island where it has been recorded.

After nine months we collected 40 specimens in Fernando de Noronha, most of them (33) at Sueste mangrove. *Camptoprosopella equatorialis* was the least abundant lauxaniid species in Fernando de Noronha, representing 0.02% of the specimens collected throughout the nine months using interception traps, light traps and sweeping nets. During a short period, seven days (20–27.ii.2020), one large interception trap, Gressit & Gressit model, was mounted at mangrove and 33 specimens of *C. equatorialis* were collected, four times more than in all other traps together during nine months (8 specimens).

**Distribution.** Brazil (states of Amazonas and Pernambuco), Colombia and Peru.

**Discussion.** The genus *Camptoprosopella* has 41 currently valid species, 22 of them in the Neotropics. Steyskal (1971) found that the current species was reared from cassava, *Manihot utilissima*, in Colombia—very likely associated with decaying leaves. At least one species of the genus is known to feed in leaf litter of *Prunus* and *Acer*, and another as a scavenger associated with *Opuntia* prickly-pear cactus, but more generally this genus is thought to feed on decaying grasses, leaves and plant debris along forest margins (Miller 1977). The morphology of the immature stages for one species is discussed by Miller & Foote (1976). Broadhead (1984) discusses the adult mouthpart morphology adaptations for fungal grazing in one species.

### ***Pachyopella flavida* (Wiedemann, 1824)**

(Figs. 3, 4)

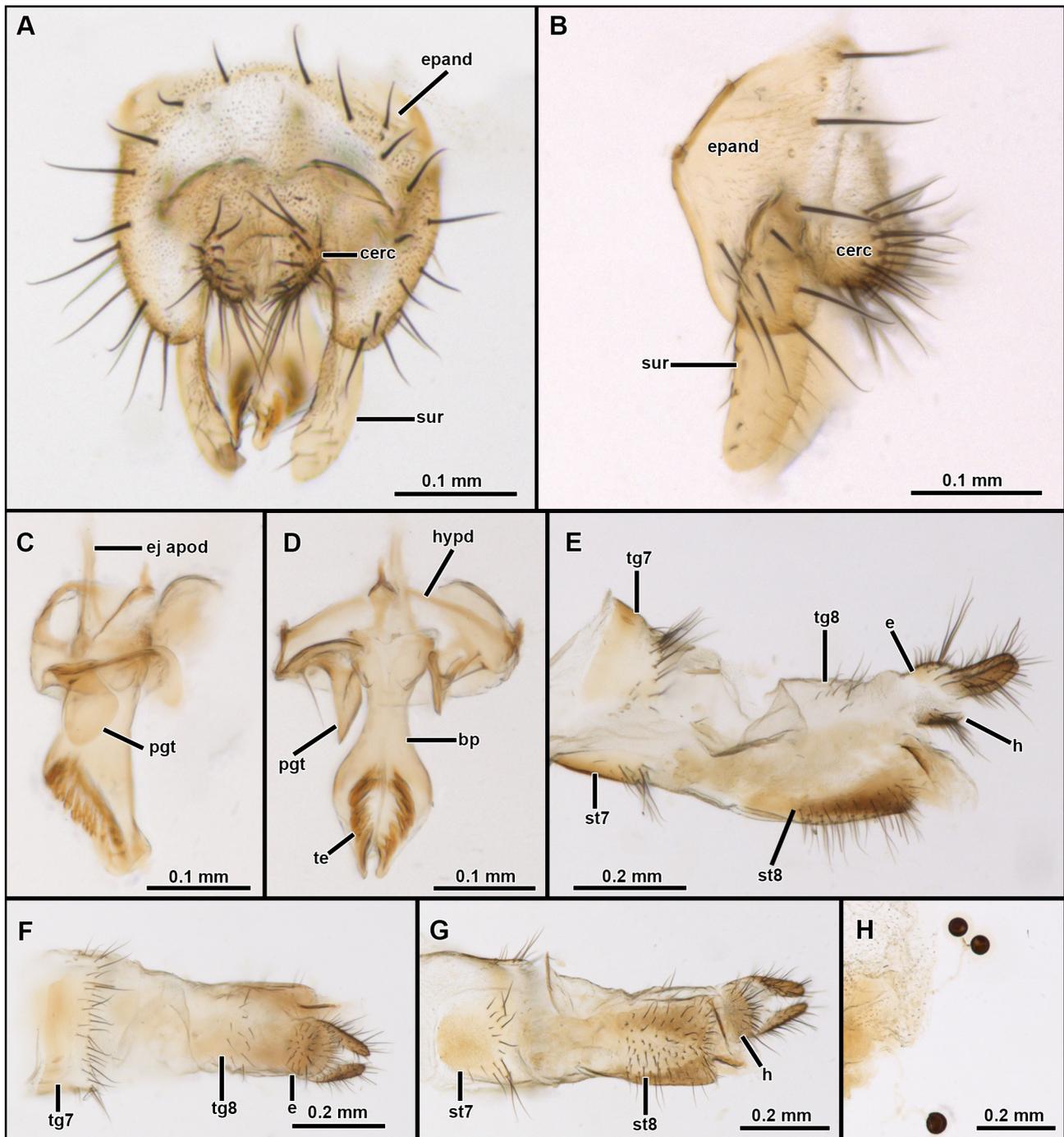
*Lauxania flavida* Wiedemann, 1824: 57. Type locality: South America. Syntype male, Natural History Museum of Denmark, Copenhagen (examined SDG).

**Diagnosis.** Easily recognized by the elongated first flagellomere, about 8X longer than high (Fig. 3A–D); face

yellow, with a rounded dark brown spot at middle (Fig. 3C); ocellar triangle in front of inner vertical seta (Fig. 3E); anterior dorsocentral seta strong, close to suture; surstylus elongated, about 4X longer than wide, somewhat finger-shaped (Fig. 4A, B).



**FIGURE 3.** *Pachyopella flavida* (Wiedemann, 1824). **A, C–G** male (INPA), **B** female (INPA). **A, B.** Habitus, lateral view; **C, D.** Head anterior and lateral views, respectively; **E.** Head and thorax, dorsal view; **F.** Wing; **G.** Male terminalia, posterior view. Abbreviations: afrs = anterior fronto-orbital seta; ep = epandrium; kpt s = katepisternal seta; flgm 1 = first flagellomere; ot = ocellar triangle.



**FIGURE 4.** *Pachyopella flavida* (Wiedemann, 1824). **A–D** male (INPA), **E–H** female (INPA). **A, B.** Epandrium in posterior and lateral views, respectively; **C, D.** Internal appendages in lateral and anterior views, respectively; **E–G.** Female terminalia in lateral, dorsal and ventral views, respectively; **H.** Spermathecae. Abbreviations: bp = basiphallus; cerc = cercus; e = epiproct; epand = epandrium; h = hypoproct; hypd = hypandrium; ej apod = ejaculatory apodeme; te = teeth of distiphallus; st = sternite; tg = tergite; pgt = postgonite; sur = surstylus.

**Redescription.** *Head* (Figs. 3A–E). Mostly orangish yellow, except dark brown surrounding ocellar triangle and with a small, rounded dark brown spot on face; 1.2X higher than long, 1.4X wider than high, 1.2X wider than scutum; eye 1.2X higher than long; gena height (directly below eye) 0.2X eye height. Vertex shiny, rounded; inner vertical seta long and strong, about 2X longer than outer vertical seta, with distance between them about 1/2 that from inner vertical seta to central vertex. Ocellar triangle small, slightly raised, placed slightly in front of vertex, in

front of level of inner vertical seta; ocelli subequal in size, arranged in small equilateral triangle, covered with few tiny setulae, with 2–3 pairs of setulae between the ocellar triangle and vertex. Ocellar setae proclinate and slightly divergent, subequal in length to outer vertical seta. Postocellar setae cruciate, slightly shorter than ocellar seta. One row of short postocular setulae. Median occipital sclerite with supracervical setae above occipital foramen. Frons 2X wider than long, flat, at a distinct obtuse angle with facial plane; with 2 strong fronto-orbital setae, posterior seta reclinate, about 2X longer than anterior seta, located at midpoint between inner vertical seta and lunule; anterior seta inclinate, located at midpoint between posterior seta and lunule; frons setulose at anterior corners and between the anterior and posterior fronto-orbital setae. Lunule low, straight; gap between antennae greater than diameter of one antennal base, antennal base slightly bulging. Antenna mostly dark brown, except scape brownish orange, pedicel orange, dorsal 1/4 of first flagellomere pale orange, and arista pale yellow; scape with short setulae on dorsal surface; pedicel with 1 long dorsal seta at middle length, with crown of short setulae at apex and 3–4 long ventral setae; first flagellomere about 8X longer than high, and about 4X longer than scape and pedicel combined, with rounded apex; arista shorter than first flagellomere and inserted at its base, plumose, with upper rays longer than lower, and rays decreasing in length towards apex. Gena with row of long and sparse setae at ventral edge, extended above middle of parafacial; postgena pale yellow, with few short and sparse setae. Face about 1.3X wider than high, face slightly bulging, concave at lower margin; parafacial silvery pruinose, wide, about 1/3 width of face. Clypeus orange, narrow. Maxillary palpus orangish yellow basally and dark brown apically, clavate, with long setae at apex; labellum orangish yellow.

*Thorax* (Fig. 3A, B, E). Scutum slightly arched, about 1.2X longer than wide; scutellum about 1/3 as long as scutum, with width at base about 1.6X greater than length; scutum mostly homogeneously orangish-yellow, postpronotum pale yellow; scutellum and pleural region pale yellow. Chaetotaxy: 0+3 dorsocentral setae, anterior seta short, about 1/2 as long as middle seta, located close to transverse suture, middle seta located at midpoint between posterior seta and transverse suture, posterior seta strongest, located near midpoint between scutellar suture and middle seta; prescutellar acrostichal seta present, weaker than anterior dorsocentral seta; 1 postpronotal seta; 2 notopleural setae, in anterior and posterior corners, anterior seta slightly longer than posterior; postsutural intra-alar seta absent; 1 presutural and 1 postsutural supra-alar setae; 2 postalar setae, in anterior and posterior corners; 6 regular rows of acrostichal setulae extending posteriorly to level of middle dorsocentral seta, only 2 rows between middle and posterior dorsocentral setae; row of setulae present along dorsocentral area, and setulose outside dorsocentral row; proepisternal seta present, slender; anepisternal seta along posterior edge of anepisternum, anepisternum sparsely setulose in posterior 2/3; anepimeron bare; 1 katapisternal seta present, katapisternum otherwise with several smaller setulae anterior of seta, and with 2–3 long ventral setae, close to the coxa; 2 pairs scutellar setae, anterior setae subparallel, posterior setae slightly convergent. *Legs* (Fig. 3A, B). Pale yellow, slightly darker on fore tarsomeres. Fore femur with 3 long and strong posteroventral setae at apical 1/2, about 1.3X longer than width of femur, posterior row of setae from base to apical 2/3, shorter and thinner than posteroventral setae; ctenidium absent. Mid femur with anterior row of short and strong setae in apical 1/2, and with 1 short curved posteroventral preapical seta. Hind femur with anteroventral row of short setae at apical 1/3 and 2–3 anterodorsal longer setae. All tibiae with preapical dorsal seta, strongest on mid tibia; mid tibia with 1 longer preapical ventral seta, as long as dorsal seta; hind tibia with 1 short apical ventral spur. *Wing* (Fig. 3F). Hyaline; sapromyziform; veins pale brown. Length 3.0 mm; 2.8X longer than high. Cell dm about 4X longer than crossvein dm-m. Crossvein r-m located at midpoint of cell dm. Vein  $R_{4+5}$  ending at wing tip, subparallel with veins  $R_{2+3}$  and  $M_1$ . Crossvein dm-m straight, located slightly basal to midpoint between crossvein r-m and tip of vein  $M_1$ . Vein  $M_4$  about 0.6X as long as crossvein dm-m. Vein CuA+CuP short, about 1/3 as long as vein  $A_1$ .

*Abdomen* (Fig. 3A). Homogeneously orangish-yellow, tapered gradually after segment 3. Tergites homogeneously covered with short setulae, longest and strongest along posterior edges of syntergite 1+2 and tergites 3–5. Sternites pale yellow to white, sternite 1 bare, sternites 2–5 with sparse fine setae, slightly longer at lateral edges; sternites 2–5 each slightly longer than wide, subequal in width sternite to sternite; sternite 6 a membranous transverse strip. *Male genitalia* (Figs. 3G, 4A–E). Yellow. Syntergosternite 7+8 simple, bare, transversely saddle-shaped. Epandrium simple, saddle-shaped; with long setae along posterior edge, 2X longer than widest point (Fig. 4A, B). Surstylus elongated, about 4X longer than wide, somewhat finger-shaped, slightly shorter than epandrium, with sparse short setulae (Fig. 4A, B). Subepandrial sclerite subrectangular, about 2X wider than long, weakly sclerotized. Cercus simple, small, ovoid, densely setose (Fig. 4A, B). Ejaculatory apodeme short and narrowed anteriorly. Phallus apically projected posteriorly, truncated at apex, about 2.5X longer than wide, phallus with a median constriction,

and widened before apex in posterior view; opening of distiphallus with short, sclerotized teeth (Fig. 4C, D). Hypandrium as a narrow transverse stripe, with 2 long setae close to the postgonite. Pregonite absent. Postgonite short and subrectangular in lateral view (Fig. 4C), pointed and somewhat subtriangular in posterior view (Fig. 4D).

**Female:** Similar to male (Fig. 3B). *Female terminalia* (Fig. 4F–H). Tergite 7 not fused to sternite 7. Tergite 8 almost entirely membranous, with 2–3 irregular rows of short setae at posterior edge (Fig. 4E, F). Sternite 8 somewhat rectangular, setulose, with large membranous median area, almost splitting the sternite (Fig. 4G). Epiproct semicircular, setulose, with row of strong setae at posterior edge (Fig. 4E, F). Hypoproct narrow, semicircular, heavily setulose (Fig. 4E, G). Spermathecae round, with configuration 1+2, paired spermathecae, surface smooth (Fig. 4H).

**Material examined.** BRAZIL, Pernambuco, Fernando de Noronha: Açude Xaréu, 03°51'30"S–32°25'50"W, 01–09.vi.2019, varredura [sweeping], J.A. Rafael, F. Limeira-de-Oliveira & D.M.M. Mendes (2 ♀, INPA); Capim-açu, 03°51'17"S–32°26'26"W, 09–24.vi.2019, large Malaise trap, J.A. Rafael, F. Limeira-de-Oliveira & L.C. Castro (2 ♂, 38 ♀, INPA; 1 ♂, 3 ♀, AMNH; 3 ♀, CSCA; 1 ♂, 3 ♀, USNM, 1 ♂, 3 ♀, SDG); Ilha Rata, 03°48'54"S 32°23'19"W, 01–09.vi.2019, varredura [sweeping], J.A. Rafael & D.M.M. Mendes (1 ♀, INPA); Sueste Mangue, 03°51'30"S–32°25'50"W, 01–09.vi.2019, arm. luz [light trap], J.A. Rafael, F. Limeira-de-Oliveira & D.M.M. Mendes (1 ♀, INPA); Trilha Sancho, 3°51'30"S–32°25'50"W, 01–09.vi.2019, Malaise trap, J.A. Rafael, F. Limeira-de-Oliveira & D.M.M. Mendes (3 ♂, 2 dissected, 25 ♀, INPA); same data, except fezes humana [human feces] (1 ♀, INPA). Additionally, 1798 specimens from nearly all localities and dates pinned and in ethanol.

**Remarks.** This species can be easily recognized among the lauxaniid species occurring in Fernando de Noronha by the long first flagellomere, about 8X longer than high. *Pachyopella flavida* is a widespread species, occurring from the southeastern United States (Florida) to Northern Argentina (Gaimari & Silva 2020). It was recorded only recently from Fernando de Noronha as *Pachyopella* cf. *flavida* based on more than 300 specimens. After nine months we collected 1886 specimens in Fernando de Noronha, 568 being in Capim-Açu, 1049 in Sancho and 269 in other localities of the archipelago, including one specimen from Ilha Rata. *Pachyopella flavida* was the second more abundant species in Fernando de Noronha, representing 10% of the specimens collected throughout the nine months using interception traps.

**Distribution.** Widespread throughout Central America and most of South America, and present in the southeastern United States (Florida).

**Discussion.** The genus *Pachyopella* comprises four described species, with this species being the most widespread. The other three are from Paraguay, Jamaica, and Central America. Although no biological information is known for any species of the genus, Broadhead (1984) discusses the adult mouthpart morphology adaptations for fungal grazing in one species. No immature stages are known for this genus.

### *Poecilominettia erebus* Soares & Gaimari sp. nov.

(Figs. 5, 6)

*Poecilominettia* sp. 1 (Rafael *et al.* 2020).

**Diagnosis.** Differs from the other congeneric species by the combination of the body being mostly homogeneously brown to orangish brown, and lacking spot or stripe patterns (Fig. 5A, B), with the pleuron being distinctly darker than the scutum; wing hyaline; femora wholly brownish (Fig. 5A, B); and surstylus short, somewhat comma-shaped in posterior view (Fig. 6A) and subtriangular in lateral view (Fig. 6B).

**Description.** *Head* (Figs 5A–E). Mostly brown to orangish brown, frons with two narrow central brown stripes, extended from the anterior margin to the ocellar triangle; face darkened medially, orange in lower corners and paler brown medially; parafacial dark brown, with silvery pruinosity. Head 1.3X higher than long, 1.3X wider than high, 1.1X wider than scutum; eye 1.1X higher than long; gena height (directly below eye) 0.1X eye height. Vertex orange pruinose, rounded; inner vertical seta long and strong, about 1.6X longer than outer vertical seta, with distance between them about 1/2 that from inner vertical seta to central vertex. Ocellar triangle small, slightly raised, placed slightly in front of vertex, and in front of level of inner vertical seta; ocelli subequal in size and disposed in small equilateral triangle, covered with few tiny setulae. Ocellar setae proclinate and divergent, small and weak.

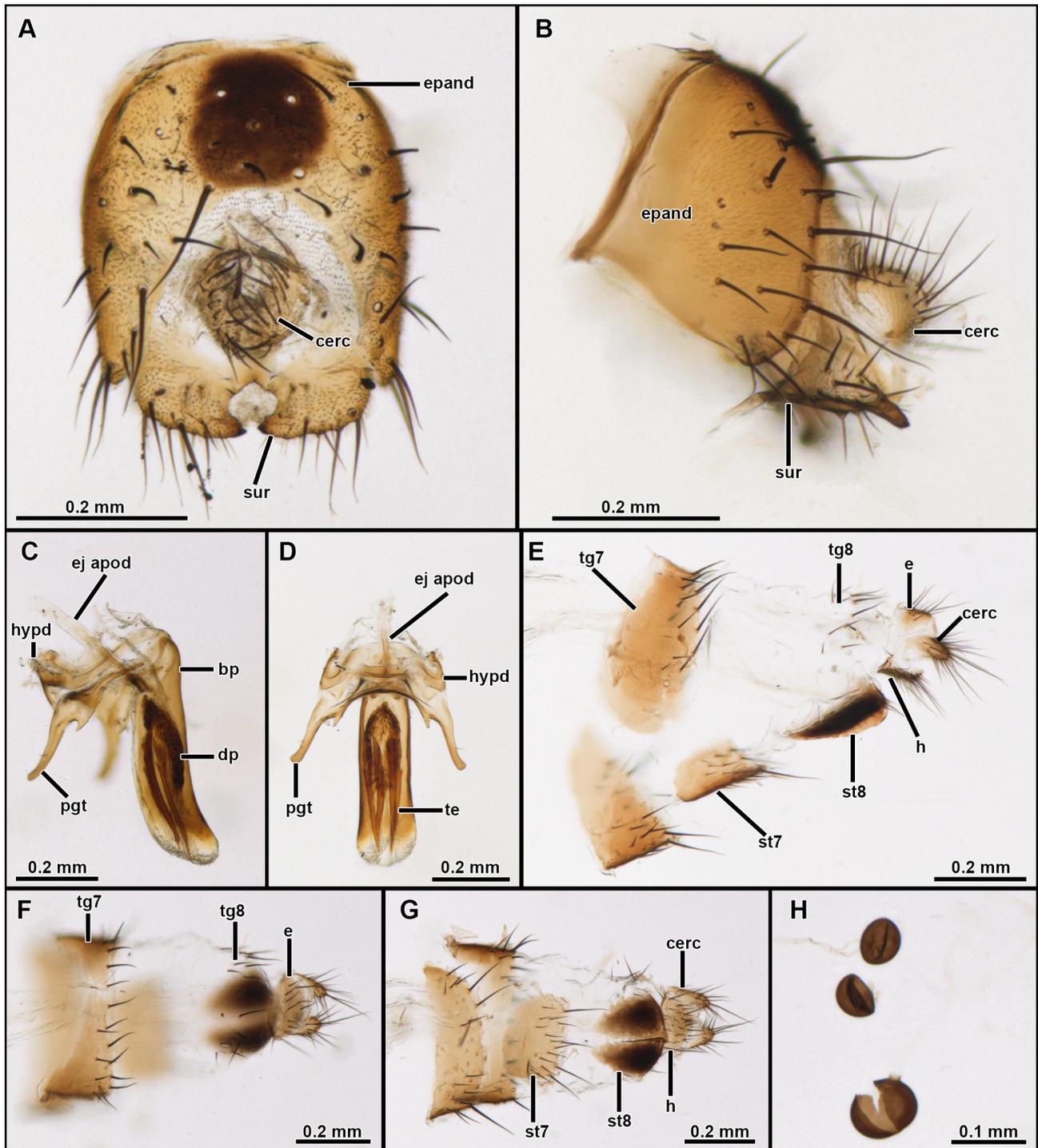
Postocellar setae convergent to cruciate, about 2X longer than ocellar seta. Two rows of short postocular setulae. Median occipital sclerite silvery pruinose and with supracervical setae above occipital foramen. Frons about as long as wide, frons arched, curved evenly into facial plane; with 2 strong reclinate fronto-orbital setae, posterior seta slightly longer than anterior seta, and located at midpoint between inner vertical seta and anterior seta, with anterior seta located at midpoint between posterior seta and lunule; frons setulose on anterior 1/2, and with few sparse setulae at posterior 1/2, almost wholly bronzy pruinose, except region between anterior and posterior fronto-orbital setae and around the ocellar triangle silvery pruinose, and a paler strip from the ocellar triangle to the lunule. Lunule low, straight. Antenna mostly dark orange, except apical 2/3 of arista dark brown; scape with few short dorsal setae; pedicel with 1 long dorsal seta at middle length, with crown of short setae at apex and 2–3 long ventral setae; first flagellomere about 1.5X longer than high, and about 2.5X longer than scape and pedicel combined, with rounded apex; arista inserted dorsobasally on first flagellomere, covered with short microtrichia. Gena with row of strong setae at ventral edge, extended onto lower parafacial; postgena orange, with rows of short, strong setae. Face about 1.2X wider than long, dark brown, except lower corners orangish and central part paler brown; parafacial dark brown, with silvery pruinosity. Clypeus orange, narrow. Maxillary palpus and labellum dark orange, ventral surface of maxillary palpus with rows of long setae.

*Thorax* (Fig. 5A, B, E, H). Scutum slightly arched, 1.2X longer than wide; scutellum about 1/3 as long as scutum, with width at base about 2X greater than length; scutum mostly brown, with postpronotum pale yellow; scutellum pale brown, apical margin pale yellow between dark brown spots at bases of posterior scutellar setae (Fig. 5H, I); pleural region mostly dark brown (Fig. 5A, B). Chaetotaxy: 0+3 dorsocentral setae, anterior seta slightly shorter than middle seta, located at midpoint between transverse suture and middle seta, middle seta located at midpoint between posterior seta and anterior seta; posterior seta located closer to scutellar suture than to middle seta prescutellar acrostichal seta present, strong; 1 postpronotal seta; 2 notopleural setae, in anterior and posterior corners, anterior seta slightly longer than posterior; postsutural intra-alar seta present; 1 presutural and 1 postsutural supra-alar setae; 2 postalar setae, in anterior and posterior corners; 6 irregular rows of acrostichal setulae between dorsocentral setal rows, row of setulae along dorsocentral area present, and setulose outside dorsocentral row; proepisternal seta present, strong; anepisternum with anepisternal seta along posterior edge, otherwise setulose in posterior 2/3; anepimeron bare; 2 katepisternal setae present, both strong, anterior one slightly stronger than posterior, katepisternum otherwise setulose in anterior half, and with group of long ventral setae close to the coxa; 2 pairs scutellar setae, anterior setae subparallel, posterior setae convergent or cruciate. *Legs* (Fig. 5A, B). Mostly yellow, except all coxae and femora brown. Fore femur with 5 posteroventral long and strong setae in apical 2/3, about 1.5X longer than width of femur, posterior row of slender setae from base to apex and posterodorsal row of long and strong setae from base to apex; ctenidium absent. Mid femur with anterior row of short and strong setae in apical 1/2, and with 1 short curved posteroventral preapical seta. Hind femur with anteroventral row of short setae in apical 1/3 and 1 anterodorsal long preapical seta. All tibiae with preapical dorsal seta, strongest on mid tibia; mid tibia with 1 longer preapical ventral seta, as long as dorsal seta; hind tibia with 1 short apical ventral spur. *Wing* (Fig. 5F). Hyaline, veins orangish to pale brown. Length 3.4 mm; 2.6X longer than high. Cell dm about 4X longer than crossvein dm-m. Crossvein r-m located at midpoint of cell dm. Vein  $R_{4+5}$  ending at wing tip, subparallel with veins  $R_{2+3}$  and  $M_1$ . Crossvein dm-m straight, located slightly basal to midpoint between crossvein r-m and tip of vein  $M_1$ . Vein  $M_4$  about 0.4X as long as crossvein dm-m. Vein CuA+CuP short, about 1/2 as long as vein  $A_1$ .

*Abdomen* (Fig. 5A). Tapered gradually after segment 4; homogeneously orangish yellow. Tergites covered with short setulae, longest and strongest along posterior edges of syntergite 1+2 and tergites 3–6. Sternites pale yellow to white, sternite 1 bare, sternites 2–5 setulose, with slightly longer setae at lateral margins; sternites 2–5 each slightly wider than long, subequal in width sternite to sternite; sternite 6 as a membranous transverse strip. *Male genitalia* (Fig. 5G, 6A–D). Pale yellow, except epandrium with dorsal rectangular dark brown spot (Fig. 6A). Syntergosternite 7+8 simple, bare, transversely saddle-shaped. Epandrium simple, saddle-shaped, length and width subequal; setulose, with long setae in posterior 1/2 (Fig. 6A, B). Surstylus broadly comma-shaped in dorsal view, with apex incurved to pointed and darkened apex (Fig. 6A, B), with long setae on posterior 1/2; subtriangular in lateral view. Subepandrial sclerite short, about 2X longer than wide. Cercus short, ovoid, heavily setose (Fig. 6A, B). Ejaculatory apodeme long and narrow, weakly sclerotized anteriorly (Fig. 6C). Basiphallus somewhat tubular, weakly sclerotized at apex and covering the distiphallus, about 2X longer than wide; apex of distiphallus with short, sclerotized teeth and 5 long teeth, about 1/2 as long as basiphallus (Fig. 6C, D). Hypandrium as a narrow transverse band. Postgonite wide basally, posteriorly with 1 short and acute projection, anteriorly long and narrow, digitiform, with 1 short subapical seta (Fig. 6C, D).



**FIGURE 5.** *Poecilominettia erebus* Soares & Gaimari, *sp. nov.* **A, C–H** male holotype (INPA), **B, I, J** female paratype (INPA). **A, B.** Habitus, lateral view; **C, D.** Head, anterior and lateral views, respectively; **E.** Head and thorax, dorsal view; **F.** Wing; **G.** Male terminalia, posterior view; **H.** Male scutellum, posterior view. Abbreviations: afrs = anterior fronto-orbital seta; ep spt = spot on epandrium; ialp s = postsutural intra-alar seta; kpt s = katepisternal seta; flgm 1 = first flagellomere; ot = ocellar triangle; sctl spt = spot on scutellum.



**FIGURE 6.** *Poecilominettia erebus* Soares & Gaimari **sp. nov.** **A–D** male paratype (INPA), **E–H** female paratype (INPA). **A**, **B**. Epandrium in posterior and lateral views, respectively; **C**, **D**. Internal appendages in lateral and anterior views, respectively; **E–G**. Female terminalia in lateral, dorsal and ventral views, respectively; **H**. Spermathecae. Abbreviations: bp = basiphallus; cerc = cercus; dp = distiphallus; e = epiproct; epand = epandrium; h = hypoproct; hypd = hypandrium; ej apod = ejaculatory apodeme; te = teeth of distiphallus; st = sternite; tg = tergite; pgt = postgonite; sur = surstylus.

**Female:** Similar to male (Fig. 5B), except tergites 4–6 with narrow median stripe, and lateral portions of syntergite 1+2 and tergites 3–5 dark brown (Fig. 5H, I). *Female terminalia* (Fig. 5I, 6E–H). Tergite 7 not fused to sternite 7. Tergite 8 membranous, with row of long setae at posterior edge (Fig. 6E, F). Sternite 8 almost divided into two subtriangular dark brown hemitergites, posterior edge with row of short setae (Fig. 6G). Epiproct semicircular, setulose (Fig. 6E, F). Hypoproct simple, semicircular, setulose (Fig. 6E, G). Spermathecae round, with configuration 1+2, paired spermathecae, surface smooth (Fig. 6H).

**Type material examined.** Holotype ♂ (INPA), double mounted, in good condition, not dissected, with following data: “BRASIL, PE [Pernambuco], Fernando de / Noronha, 3°51'17"S–/ 32°26'26"W, Capim-Açu”, “11–27.xi.2019, Malaise trap / G[grande], J.A. Rafael, F. Limeira- / de-Oliveira, L.C. Castro”. PARATYPES. BRAZIL. Pernambuco, Fernando de Noronha: Capim-Açu, 03°51'17"S–32°26'26"W, 09–24.vi.2019, large Malaise trap, J.A. Rafael, F. Limeira-de-Oliveira & L.C. Castro (8 ♀, INPA); same data, except 08–25.ix.2019 (1 ♂, 12 ♀, CZMA; 1 ♂, 5 ♀, SDG); same data, except 25.ix–8.x.2019 (1 ♂, 5 ♀, AMNH; 1 ♂, 8 ♀, MNRJ); same data, except 08–27.x.2019 (1 ♂, 5 ♀, CSCA; 1 ♂, 13 ♀, MZUSP); same data, except 27.x–11.xi.2019 (10 ♀, AMNH; 10 ♀, CSCA; 10 ♀, CZMA; 19 ♀, INPA; 10 ♀, MNRJ; 10 ♀, MZUSP; 1 ♂, 5 ♀, USNM); same data, except 11–27.xi.2019 [same data as holotype] (5 ♂, 2 dissected, 3 ♀, 2 dissected, INPA); same data, except 27.xi–9.xii.2019 (17 ♀, INPA); Sancho, 03°51'17"S–32°26'26"W, 09–24.vi.2019, Malaise trap, J.A. Rafael, F.L. de Oiveira, L.C. Castro (21 ♀, INPA; 5 ♀, SDG); same data, except 24.vi–8.vii.2019, large Malaise trap (5 ♀, AMNH; 3 ♀, CSCA; 3 ♀, USNM; 3 ♀, SDG); same data, except 27.x–11.xi.2019 (1 ♀, INPA); same data, except 9–27.xii.2019 (4 ♀, AMNH; 5 ♀, CSCA; 4 ♀, USNM; 4 ♀, SDG); same data, except 23.i–12.ii.2020 (19 ♀, INPA; 5 ♀, USNM); Trilha Sancho, 3°51'30"S–32°25'50"W, 01–09.vi.2019, Malaise trap, J.A. Rafael, F. Limeira-de-Oliveira & D.M.M. Mendes [=same data as holotype] (27 ♀, INPA); same data, except armadilha luminosa [light trap] (1 ♀, INPA); same data, except 09–24.vi.2019 (1 ♂, dissected, INPA); same data, except 24.vi–08.vii.2019, J.A. Rafael, F. Limeira-de-Oliveira & L.C. Castro (1 ♀, dissected, INPA); same data, except 09–27.xii.2019 (1 ♂, dissected, INPA); same data, except 11–27.ii.2020, J.A. Rafael, F. Limeira-de-Oliveira & P.C. Grossi (2 ♀, INPA).

**Additional material examined.** 131 specimens from nearly all localities in ethanol.

**Remarks.** Using the key of Broadhead (1989), this species runs to couplet 34 and to *Po. grata* (Wiedemann, 1830). However, it is clearly not this species by comparison with the type, which is a wholly yellow species, with the pleuron not darkened and the female terminalia lacking paired dark patches. The new species is far more similar to *Po. brunneicosta* (Malloch, 1928), which is immediately different from the new species in having a distinctly darkened posterior 1/3 of the wing (through cells sc, c, r<sub>1</sub>, r<sub>2+3</sub>). The new species also differs from *Po. brunneicosta* in that the latter species lacks brown patches at the bases of the posterior scutellar setae, the parafacial and the face are yellow, and the surstylus is of a different shape. *Poecilominettia erebus* sp. nov. was the third more abundant species in Fernando de Noronha with 409 specimens, representing 2.2% of the specimens collected throughout the nine months using interception traps.

**Distribution.** The new species is known only from the oceanic Archipelago of Fernando de Noronha, Pernambuco, Brazil.

**Etymology.** A noun in apposition, from Greek mythology, the god Erebus is the personification of darkness, in reference to the dark color of this species.

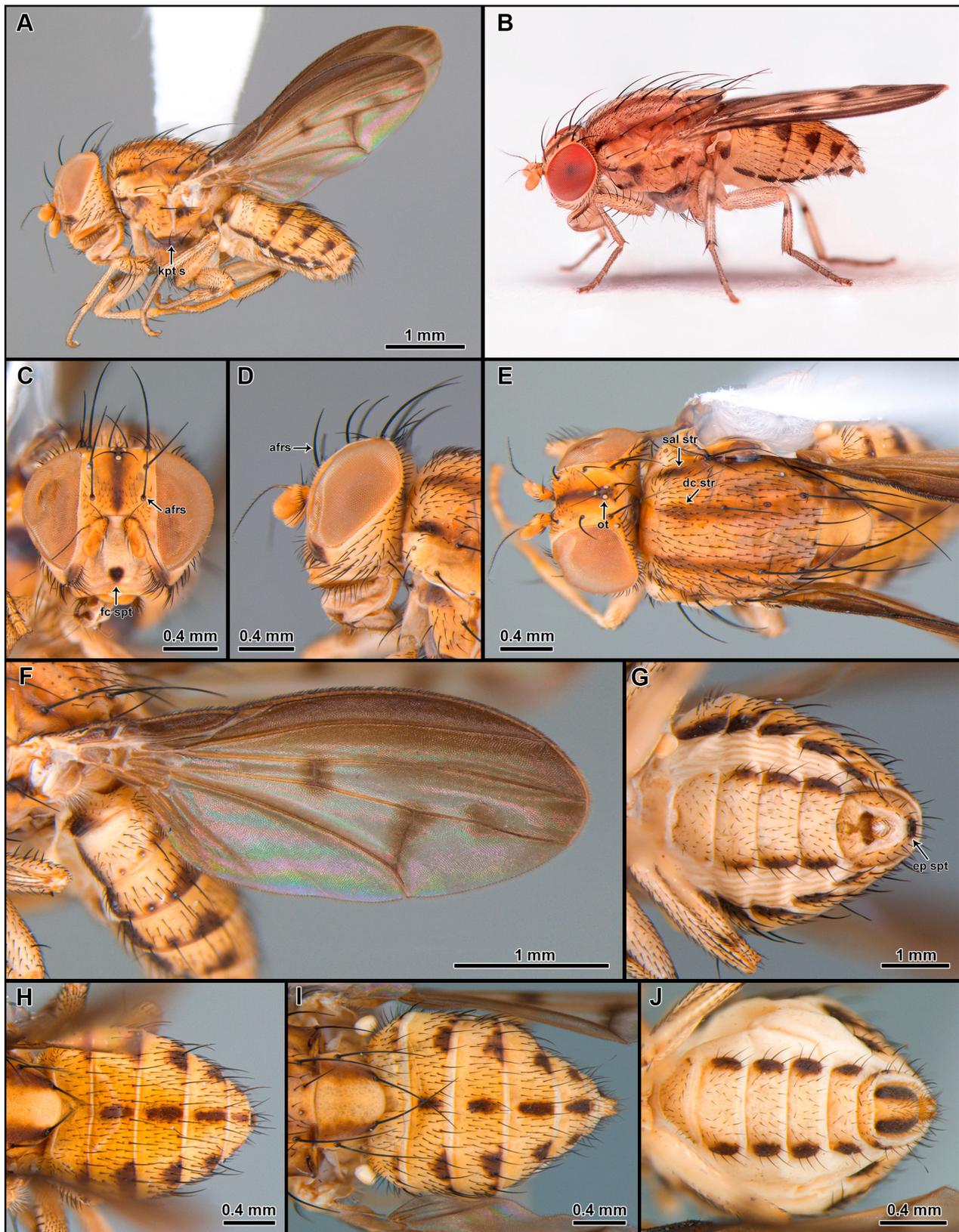
### *Poecilominettia octovittata* (Williston, 1896)

(Figs. 7–8)

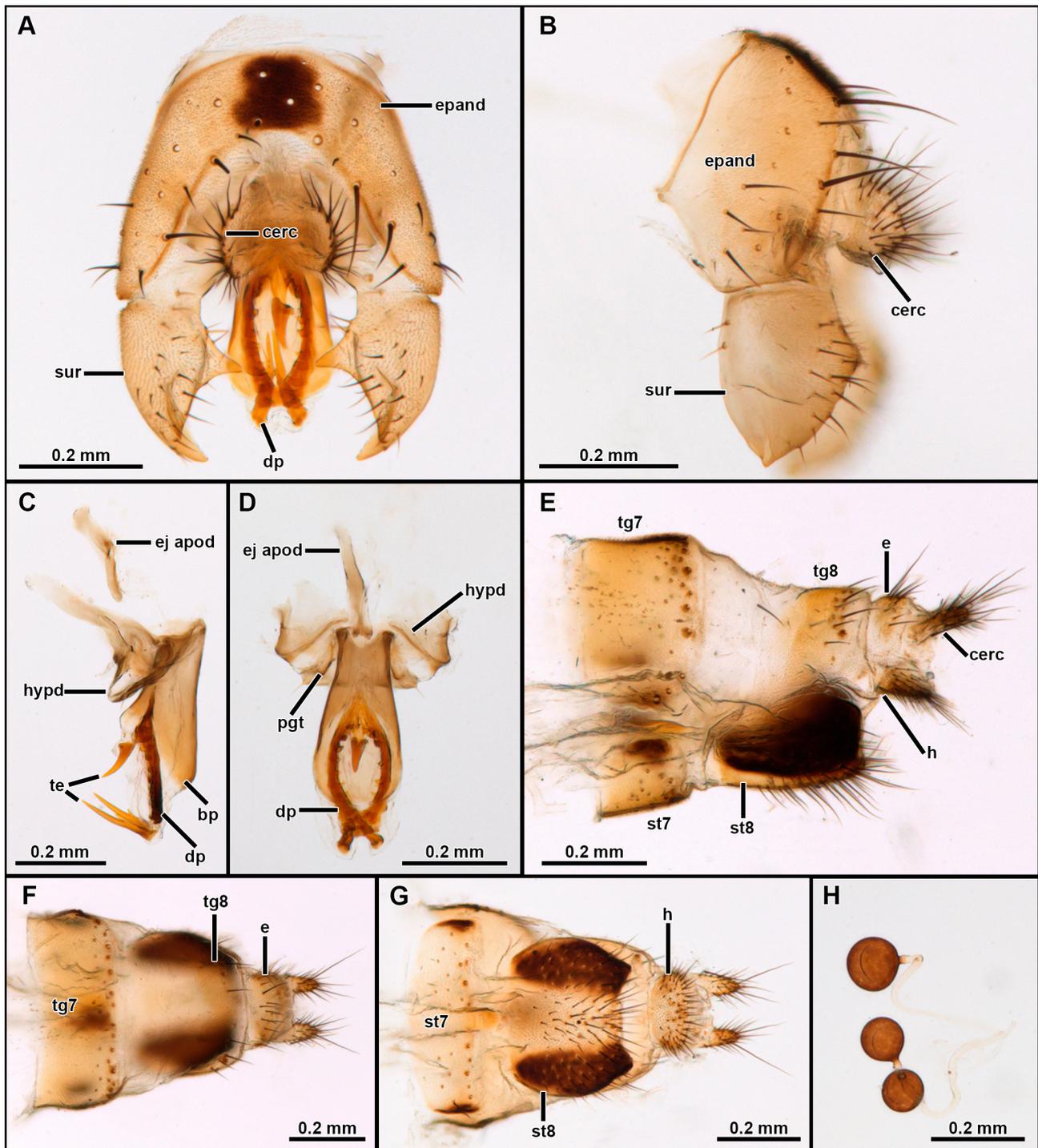
*Sapromyza octovittata* Williston, 1896: 382. Type locality: Saint Vincent (West Indies). Lectotype female (designated by Gaimari & Silva 2020), Natural History Museum, London, United Kingdom (examined SDG).

*Poecilominettia* sp. 2 (Rafael *et al.* 2020).

**Diagnosis.** Easily differentiated from the other congeneric species by the distinct pattern of spots on the thorax, wing and abdomen (Fig. 7A, B); femora yellow, tibiae with a ventral brown spot near base (Fig. 7A, B); anterior margin of wing dark brown (Fig. 7F); surstylus ovoid, 1.5X longer than wide at widest point, with 2 pointed processes, 1 at middle of inner edge and 1 at apex (Fig. 8A, B).



**FIGURE 7.** *Poecilominettia octovittata* (Williston, 1896). **A, C–H** male (INPA), **B** (living female from municipality of Olha d'Água das Flores, state of Alagoas), **I, J** female (INPA). **A, B.** Habitus, lateral view; **C, D.** Head anterior and lateral views, respectively; **E.** Head and thorax, dorsal view; **F.** Wing; **G.** Male terminalia, posterior view; **H.** Male abdomen, dorsal view; **I–J.** Female abdomen, dorsal and ventral views respectively. Abbreviations: afrs = anterior fronto-orbital seta; dc str = dorsocentral stripe; ep spt = spot on epandrium; fc spt = facial spot; kpt s = katepisternal seta; flgm 1 = first flagellomere; ot = ocellar triangle; sal str = supra-alar stripe. Photograph **B** provided by Alenilson Rodrigues.



**FIGURE 8.** *Poecilominettia octovittata* (Williston, 1896). **A–D** male (INPA), **E–H** female (INPA). **A, B.** Epandrium in posterior and lateral views, respectively; **C, D.** Internal appendages in lateral and anterior views, respectively; **E–G.** Female terminalia in lateral, dorsal and ventral views, respectively; **H.** Spermathecae. Abbreviations: bp = basiphallus; cerc = cercus; dp = distiphallus; e = epiproct; epand = epandrium; h = hypoproct; hypd = hypandrium; ej apod = ejaculatory apodeme; te = teeth of distiphallus; st = sternite; tg = tergite; pgt = postgonite; sur = surstylus.

**Redescription.** *Head* (Fig. 7A–E). Mostly yellowish, except frons with a narrow central dark brown median stripe extended from ocellar triangle to edge of lunule, subparallel to tapered anteriorly; face with an ovoid, median dark brown spot at lower margin; and with dark brown spot in area of gena and bottom of parafacial. Head 1.6X higher than long, 1.3X wider than high, 1.1X wider than scutum; eye 1.4X higher than long; gena height (directly

below eye) 0.2X eye height. Vertex silvery-yellow pruinose, rounded; inner vertical seta long and strong, about 1.5X longer than outer vertical seta, with distance between them about 1/3 that from inner vertical seta to central vertex. Ocellar triangle dark brown, small, slightly raised, placed slightly in front of vertex, at same level as inner vertical seta; ocelli subequal in size and arranged in small equilateral triangle, covered with few tiny setulae. Ocellar setae proclinate and divergent, weak. Postocellar setae cruciate, slightly longer than ocellar seta. Two rows of short postocular setulae. Median occipital sclerite with silvery pruinosity and supracervical setae above occipital foramen. Frons 1.2X wider than long, frons flat, curved evenly into facial plane; with 2 strong reclinate fronto-orbital setae, posterior seta slightly longer than anterior seta, located near midpoint between inner vertical seta and anterior seta; anterior seta closer to lunule than to posterior seta; frons setulose at anterior 1/2, wholly bronzy pruinose except for central brown stripe. Lunule low, straight. Antenna mostly orangish-yellow, except scape and arista dark brown; scape with few short dorsal setae; pedicel with 1 long dorsal seta at middle length, with crown of short setae at apex and 3–4 long ventral setae; first flagellomere about 1.6X longer than high, and about 2X longer than scape and pedicel combined, with rounded apex; arista inserted dorsobasally on first flagellomere, covered with short and sparse rays. Gena with dense row of strong setae along ventral edge, extended onto lower parafacial; postgena with short and strong setae. Face about 1.2X wider than long, face and parafacial silvery pruinose, except parafacial darkened ventrally. Clypeus orange, narrow. Maxillary palpus and labellum brown, ventral surface of maxillary palpus with rows of long setae.

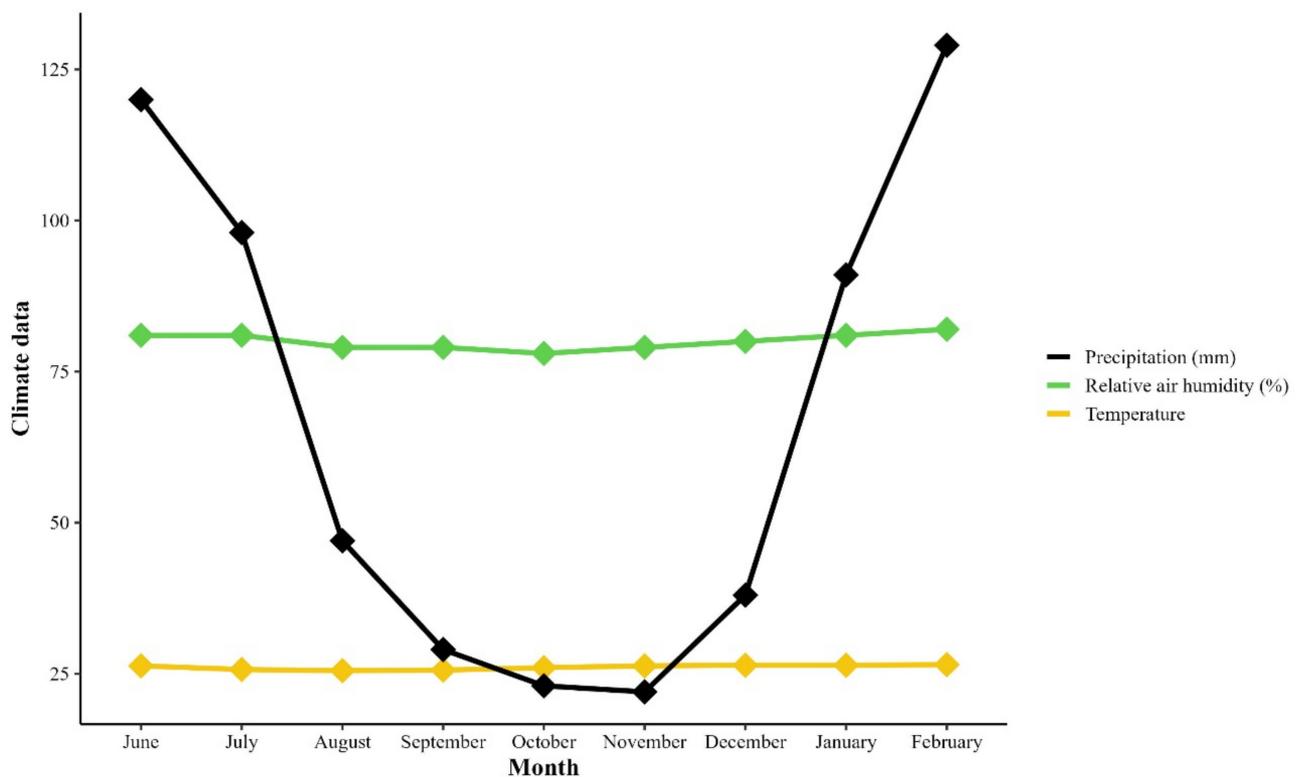
*Thorax* (Fig. 7A, B, E). Scutum slightly arched, about 1.2X longer than wide; scutellum about 1/3 as long as scutum, with width at base about 1.75X greater than length; scutum orangish-yellow, with dorsocentral and supra-alar brown stripes, pale yellow on postpronotum through notopleuron; scutellum pale yellow with dark brown lateral stripes as extended through dorsocentral stripes of scutum; pleural region mostly orangish-yellow, except anterodorsal quadrant of anepisternum, upper margin of katapisternum, lower margin of anepimeron, and meron dark brown. Chaetotaxy: 0+3 dorsocentral setae, anterior seta slightly shorter than middle seta, located close to transverse suture, middle seta located at midpoint between posterior seta and anterior seta; prescutellar acrostichal seta present, weak; 1 postpronotal seta; 2 notopleural setae, in anterior and posterior corners, anterior seta slightly longer than posterior; 1 postsutural intra-alar seta present; 1 presutural and 1 postsutural supra-alar setae; 2 postalar setae, in anterior and posterior corners; 7–8 irregular rows of acrostichal setulae between dorsocentral setal rows, row of setulae along dorsocentral area present, and setulose outside dorsocentral row; proepisternal seta present, strong; anepisternum with anepisternal seta along posterior edge, otherwise setulose in posterior 2/3; anepimeron bare; 2 katapisternal setae present, both strong, posterior one slightly stronger, katapisternum otherwise setulose through middle, and with group of long ventral setae, close to the coxa; 2 pairs scutellar setae, anterior setae subparallel, posterior setae cruciate. *Legs* (Fig. 7A, B). Pale yellow, except all tibiae with a ventral brown spot near base. Fore femur with posteroventral row of long and strong setae, about 1.5X longer than width of femur, posterior and posterodorsal rows of setae from base to apex, shorter and thinner than posteroventral row of setae; ctenidium absent. Mid femur with anterior row of short and strong setae in apical 1/2, and with 1 short curved posteroventral preapical seta. Hind femur with anteroventral row of short setae in apical 1/3 and 1 anterodorsal long preapical seta. All tibiae with preapical dorsal seta, strongest on mid tibia; mid tibia with 1 longer preapical ventral seta, as long as dorsal seta; hind tibia with 1 short apical ventral spur. *Wing* (Fig. 7A, F). Mostly hyaline, except dark brown in anterior 1/3 (through cells  $sc$ ,  $r_1$ , and most of  $r_{2+3}$ ) and curved around distal part of wing to the tip of vein  $M_1$ , on crossveins  $rm$  and  $dm-m$ , and with a spot at the midpoint of the distal part of vein  $M_1$ . Veins dark brown, except yellow in basal veins and sections of veins  $R_{4+5}$  and  $M_1$  (Fig. 7F). Length 3.5 mm; 2.5X longer than high. Cell  $dm$  about 4X longer than crossvein  $dm-m$ . Crossvein  $r-m$  located at midpoint of cell  $dm$ . Vein  $R_{4+5}$  ending at wing tip, subparallel with veins  $R_{2+3}$  and  $M_1$ . Crossvein  $dm-m$  straight, located slightly basal to midpoint between crossvein  $r-m$  and tip of vein  $M_1$ . Vein  $M_4$  about 0.2X as long as crossvein  $dm-m$ . Vein  $CuA+CuP$  short, about 1/2 length of vein  $A_1$ .

*Abdomen* (Fig. 7G, H). Tapered gradually after segment 4; mostly yellow, except for lateral margins of syntergite 1+2 and tergites 3–6 dark brown forming a narrow stripe, paired semicircular brown spots along posterolateral margins of syntergite 1+2 and tergites 3–6, and central brown macula on tergites 3–6 forming a narrow stripe. Tergites covered with short setulae, longest and strongest along posterior edges of syntergite 1+2 and tergites 3–6. Sternites pale yellow to white, except lateral margins of sternites 3–5 dark brown, sternite 1 bare, sternites 2–5 setulose, with slightly longer setae at lateral margins; sternites 2–5 each slightly wider than long, subequal in width sternite to sternite; sternite 6 a membranous transverse strip. *Male genitalia* (Figs. 7G, 8A–D). Pale yellow,

epandrium dorsally with rectangular dark brown spot at middle. Syntergosternite 7+8 simple, bare, transversely saddle-shaped. Epandrium simple, saddle-shaped; mostly bare, with median row of short setae and with row of long setae at posterior edge, 2X longer than widest point. Surstylus large, leaf-shaped in lateral view, 1.5X longer than wide at widest point, with 2 medially-pointed processes, inner process at middle of inner edge and apical process at apex, with sparse short setulae in posterior 1/2, close to the inner process and with 2 short inner setae above the process. Subepandrial sclerite narrow, about 5X longer than wide. Cercus short, ovoid, heavily setose. Ejaculatory apodeme long and narrow, weak sclerotized. Phallus mostly tubular, widened towards apex, about 2X longer than wide; apex of distiphallus with short, sclerotized teeth, 2 apical long and pointed teeth, apparently articulated with distiphallus, 1 short and stout tooth at base of distiphallus. Hypandrium a narrow transverse band. Postgonite short, rounded and weak sclerotized, with small seta.

**Female:** Similar to male. Sternite 6 pale yellow to white, except lateral margin dark brown (as in sternites 3–5) (Fig. 7K). *Female terminalia* (Figs. 7I, J, 8E–H). Tergite 7 not fused to sternite 7. Tergite 8 narrow, somewhat saddle-shaped, weakly sclerotized, with posterior row of setae. Sternite 8 somewhat quadrangular, lateral edges curved, heavily setose, dark brown, except for median rectangular yellow area. Epiproct narrow, with row of strong setae. Hypoproct simple, semicircular, heavily setulose. Spermathecae round, with configuration 1+2, paired spermathecae; surface smooth.

**Material examined.** BRAZIL, Pernambuco, Fernando de Noronha: Capim-Açu, 03°51'17"S–32°26'26"W, 09–24.vi.2019, large Malaise trap, J.A. Rafael, F. Limeira-de-Oliveira & L.C. Castro (7 ♂, 36 ♀, INPA; 1 ♂, 3 ♀, AMNH; 1 ♂, 3 ♀, CSCA; 1 ♂, 3 ♀, USNM; 1 ♂, 3 ♀, SDG); same data, except 08–27.x.2019 (1 ♀, dissected, INPA); same data, except 03°51'30"S–32°25'50"W, 01–09.vi.2019, varredura [sweeping], J.A. Rafael, F. Limeira-de-Oliveira & D.M.M. Mendes (9 ♀, INPA); Sueste Mangue, 03°51'30"S–32°25'50"W, 01–09.vi.2019, armadilha luminosa [light trap] (3 ♂, 7 ♀, INPA); same data, except 20–27.ii.2020, Malaise trap, J.A. Rafael, F. Limeira-de-Oliveira & P.C. Grossi (1 ♂, 4 ♀, INPA); Trilha Sancho, 03°51'30"S–32°25'50"W, 01–09.vi.2019, Malaise trap, J.A. Rafael, F. Limeira-de-Oliveira & D.M.M. Mendes (11 ♂, 2 dissected, 17 ♀, 2 dissected, INPA; 1 ♂, 1 ♀, AMNH; 1 ♂, 1 ♀, CSCA; 1 ♂, 1 ♀, USNM; 1 ♂, 1 ♀, SDG); same data, except CDC-UV light trap (2 ♂, 3 ♀, INPA); same data, except Caracas (1 ♀, INPA). Additionally, 16,422 specimens from nearly all localities and dates in ethanol.



**FIGURE 9.** Monthly averages of temperature, humidity and rainfall in the Fernando de Noronha archipelago, Pernambuco, Brazil.

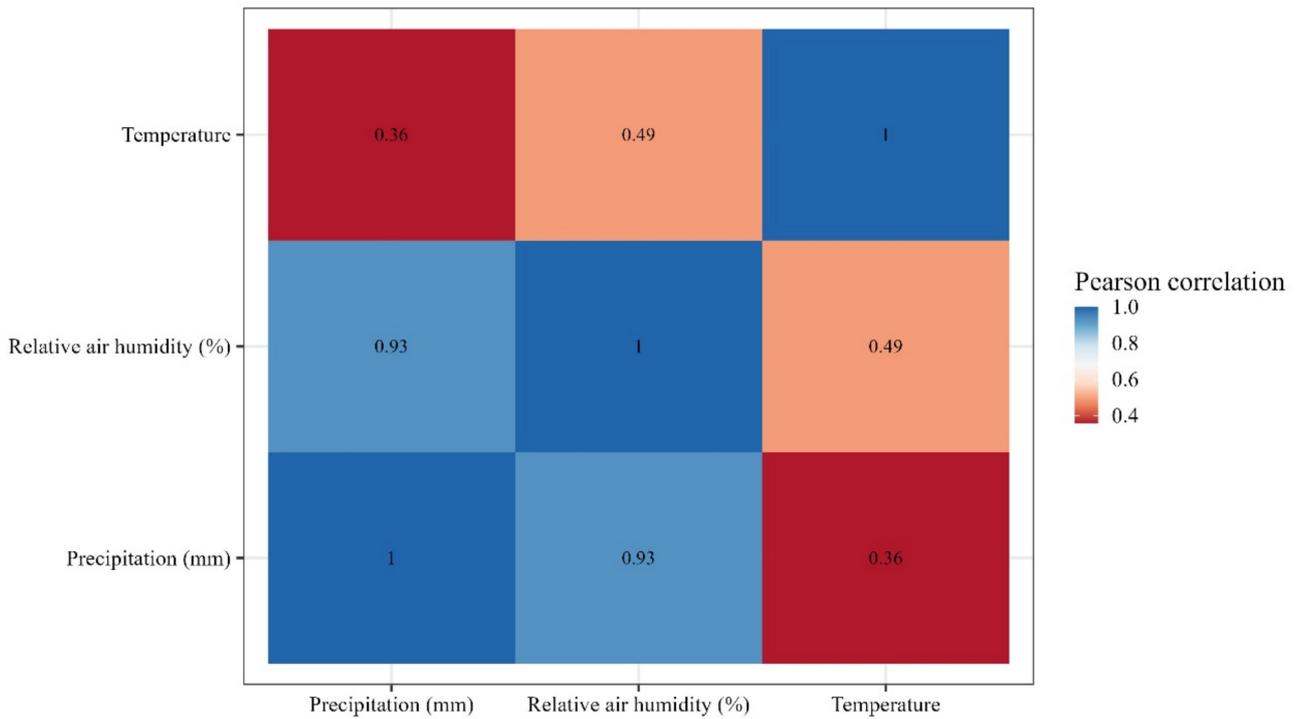


FIGURE 10. Pearson correlation between weather variables in the Fernando de Noronha archipelago, Pernambuco, Brazil.

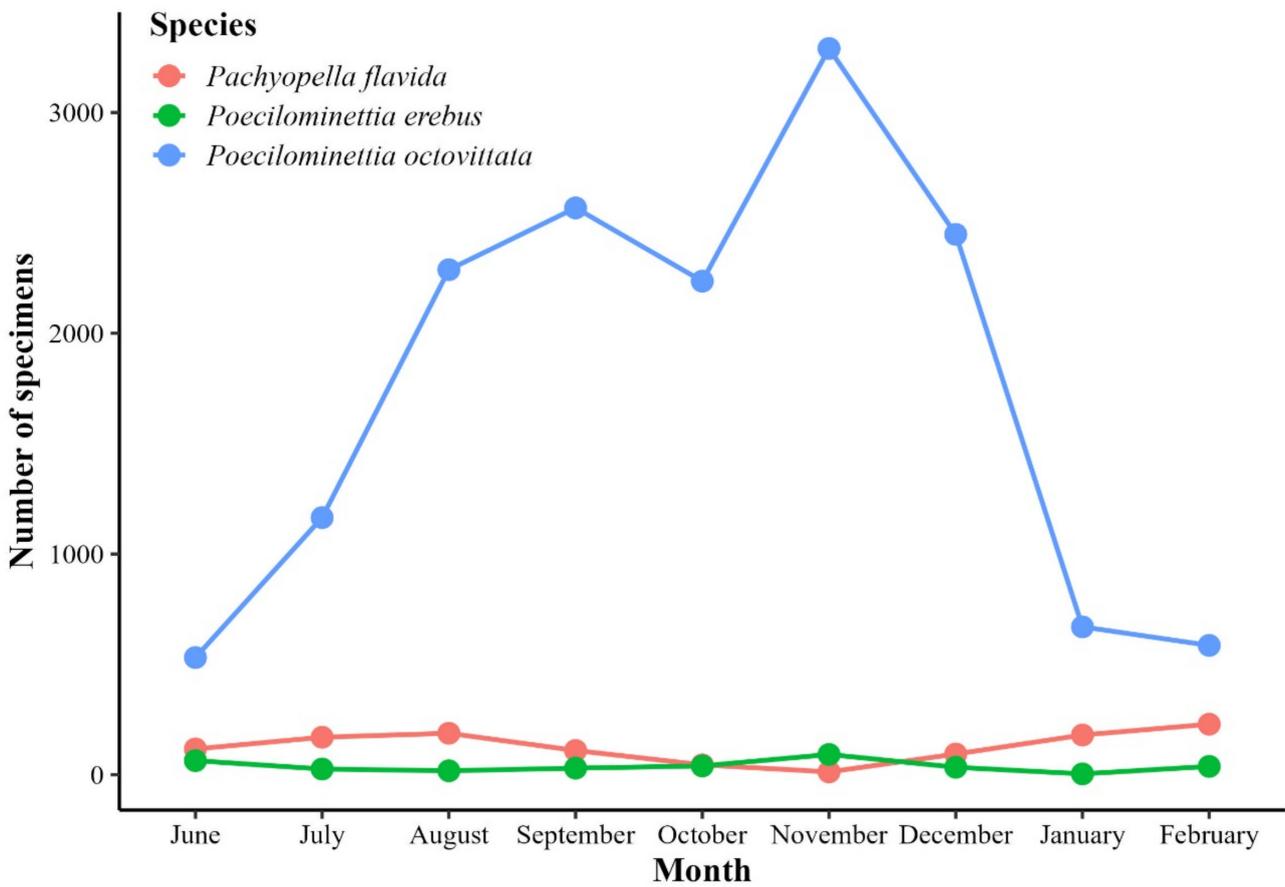
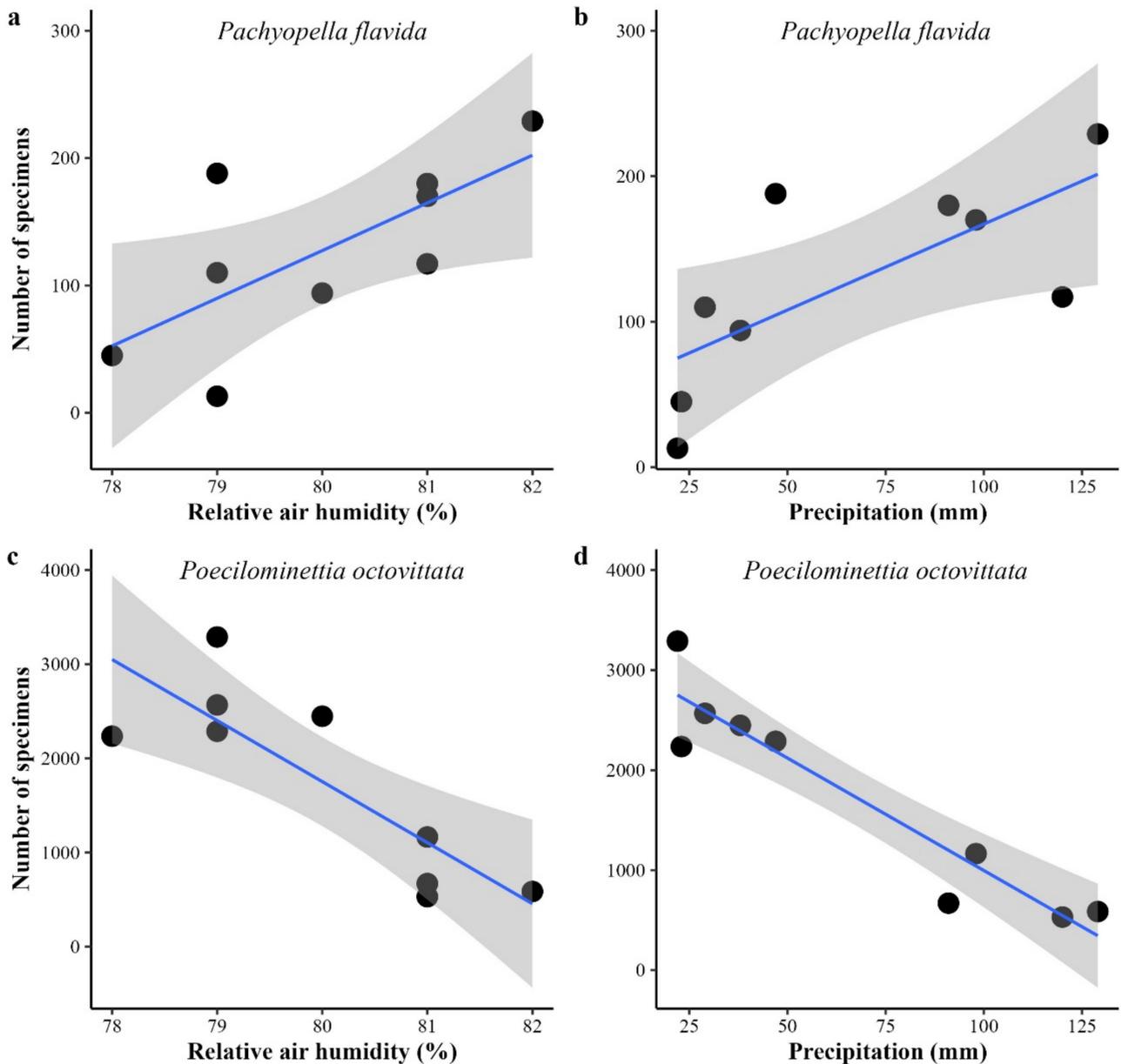


FIGURE 11. Seasonal occurrence of *Pachyopella flavida* (Wiedemann, 1824), *Poecilominettia erebus* Soares & Gaimari, **sp. nov.** and *Poecilominettia octovittata* (Williston, 1896), collected with interception traps in the Fernando de Noronha archipelago, Pernambuco, Brazil.



**FIGURE 12.** Abundance of (a–b) *Pachyopella flavida* (Wiedemann, 1824) and (c–d) *Poecilominettia octovittata* (Williston, 1896) in relation to relative air humidity (%) and precipitation (mm) in the Fernando de Noronha Archipelago, Pernambuco, Brazil.

**Remarks.** *Poecilominettia octovittata* is easily recognized by the patterns of stripes and spots on the head and body, and by the wing pattern of being darkened anteriorly, on the crossveins, and in the distal part of vein  $M_1$ , as well as the distinctive characteristics of the male genitalia (particularly the shape and structure of the surstylus and the phallus) and female terminalia (particularly the paired darkened patches on sternite 8). The species was described from Saint Vincent (West Indies), and later recorded from Brazil (Gaimari & Silva, 2020). This is by far the most abundant lauxaniid in Fernando de Noronha, after nine months we collected 16,548 specimens in all traps, representing 87,6% of the specimens collected, with 13,416 in Capim-açu, 2,769 in Sancho and 363 in other localities of the archipelago. It is worth noting that Fig. 7B is a living specimen photographed in Olho d'Água das Flores, in the state of Alagoas, being the first record of this species from the state (<https://www.inaturalist.org/observations/140062464>).

**Discussion.** The genus *Poecilominettia* comprises 81 described species, all found in the Neotropics except for three strictly Nearctic species, and with 56 of the Neotropical species found in Panama, and 10 recorded in Brazil

(Gaimari & Silva 2020). The revisionary work of Broadhead (1989) represents the most comprehensive treatment of the genus, with a key to species and illustrations for most species. Broadhead (1989) also discusses the biology of the species of this genus, finding that adults feed on fungal hyphae and fungal spores, based on examination of food particles found in the pseudo-tracheal canals and gut contents. She also discusses the idea that although their larval habits are not known, they are generally thought to develop within the tissues of fall, decaying leaves. Some species of the genus are also known to feed in decaying matter in birds' nests (Miller & Foote 1975, Miller 1977). Further, Miller & Foote (1976) provide details of the morphology of immatures for a species of *Poecilominettia*.

## Acknowledgments

We are grateful the Instituto Chico Mendes de Conservação da Biodiversidade (ICMBio) for the Collecting License number 62.821; to Parque Nacional Marinho Fernando de Noronha staff, Ricardo Araújo, Viviane Vilella, and Carolina Fonseca, for administrative help; to Autarquia Territorial do Distrito Estadual de Fernando de Noronha (ATDEFN) for administrative facilities and to Layane Carvalho de Castro for field support; to Alenilson Rodrigues for use of his photograph from iNaturalist; and to Wayne Mathis and Li Shi for their helpful reviews of the manuscript. MMMS thanks Conselho Nacional de Pesquisas (CNPq) for post-doctoral fellowship (PROTAX-PDJ 151271/2023-2). JAR thanks the Instituto Nacional de Pesquisas da Amazônia (INPA) for research support; the Fundação de Amparo à Pesquisa do Estado do Amazonas (FAPEAM) and Conselho Nacional de Pesquisas (CNPq) for financial support (processes number 300997/2016-7 and 306661/20217).

## References

- Broadhead, E.C. (1984) Adaptations for fungal grazing in lauxaniid flies. *Journal of Natural History*, 18, 639–649.  
<https://doi.org/10.1080/00222938400770531>
- Broadhead, E.C. (1989) The species of *Poecilominettia*, *Homoeominettia* and *Floriminettia* (Diptera, Lauxaniidae) in Panama. *Bulletin of the British Museum (Natural History), Entomology*, 58 (2), 185–226.
- Costa-Pinto, P.J., Olivier, R.S. & Rafael, J.A. (2021) The first species of Embioptera (Insecta) from the archipelago of Fernando de Noronha (Pernambuco: Brazil). *Zootaxa*, 4941 (1), 142–150.  
<https://doi.org/10.11646/zootaxa.4941.1.9>
- 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.
- Fernandes, D.R.R., Rafael, J.A., Sobral, R. & Santos, E.F. (2021a) A new combination for *Pompilus nesophilus* Kirby, 1890 (Hymenoptera: Pompilidae): a forgotten spider wasp from the archipelago of Fernando de Noronha (Pernambuco: Brazil). *Zootaxa*, 5047 (2), 197–200.  
<https://doi.org/10.11646/zootaxa.5047.2.10>
- Fernandes, D.R.R., Araujo, E.L., Marques, D.W.A., Limeira-de-Oliveira, F. & Rafael, J.A. (2021b) First report of *Anastrepha obliqua* (Macquart) and *Ceratitis capitata* Wiedemann (Diptera: Tephritidae) and the parasitoid *Doryctobracon areolatus* (Szépligeti) (Hymenoptera: Braconidae) in the oceanic archipelago of Fernando de Noronha, Brazil. *Revista Brasileira de Entomologia*, 65 (4), e20210114.  
<https://doi.org/10.1590/1806-9665-RBENT-2021-0114>
- Freidberg, A. & Yarom, I. (1990) The Lauxaniidae (Diptera) of Israel, with an emphasis on *Minettia*. *Israel Journal of Entomology*, 24, 93–105. [<https://api.semanticscholar.org/CorpusID:82025584>]
- Gaimari, S.D. & Silva, V.C. (2010) Lauxaniidae. 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. 971–995.
- Gaimari, S.D. & Silva, V.C. (2020) A conspectus of Neotropical Lauxaniidae (Diptera: Lauxanioidea). *Zootaxa*, 4862 (1), 1–217.  
<https://doi.org/10.11646/zootaxa.4862.1.1>
- Gaimari, S.D. & Soares, M.M.M. (2022) Unusual sexually dimorphic head morphology in Lauxaniidae (Diptera: Lauxanioidea)—a new species of the genus *Trivialia* Malloch from Peru. *Zootaxa*, 5120 (3), 391–401.  
<https://doi.org/10.11646/zootaxa.5120.3.5>
- Gressitt, J.L. & Gressitt, M.K. (1962) An improved Malaise trap. *Pacific Insects*, 4 (1), 87–90.
- Mahlmann, T., Limeira-de-Oliveira, F. & Rafael, J.A. (2022) The sweat bees from Fernando de Noronha Archipelago, Brazil (Hymenoptera: Halictidae). *Biota Neotropica*, 22 (3), e20221353, 1–10.  
<https://doi.org/10.1590/1676-0611-BN-2022-1353>

- Malloch, J.R. (1928) Notes on American two-winged flies of the family Sapromyzidae. *Proceedings of the United States National Museum*, 73(23) [2744], 1–17.  
<https://doi.org/10.5479/si.00963801.73-2744.1>
- Mello, R.L. de & Silva, V.C. (2007) Morphological ultrastructure of the labellum in three Neotropical Lauxaniidae (Diptera, Muscomorpha). *Studia Dipterologica*, 13 (2), 397–403. [2006]
- Miller, R.M. (1977) Ecology of Lauxaniidae (Diptera: Acalyptatae). I. Old and new rearing records with biological notes and discussion. *Annals of the Natal Museum*, 23 (1), 215–238.
- Miller, R.M. & Foote, B.A. (1975) Biology and immature stages of eight species of Lauxaniidae (Diptera). I. Biological observations. *Proceedings of the Entomological Society of Washington*, 77, 308–328.
- Miller, R.M. & Foote, B.A. (1976) Biology and immature stages of eight species of Lauxaniidae (Diptera). II. Descriptions of immature stages and discussion of larval feeding habits and morphology. *Proceedings of the Entomological Society of Washington*, 78, 16–37.
- Rafael, J.A., Limeira-de-Oliveira, F., Hutchings, R.W., Miranda, G.F.G., Silva-Neto, A.M., Somavilla, A., Camargo, A., Asenjo, A., Pinto, A.P., Bello, A.M., Dalmorra, C., Mello-Patiu, C.A., Carvalho, C.J.B., Takiya, D.M., Parizotto, D.R., Almeida-Marques, D.W.A., Cavalheiro, D.O., Mendes, D.M.M., Zeppelini, D., Carneiro, E., Lima, E.F.B., Lima, E.C.A., Godoi, F.S.P., Pessoa, F.A.C., Vaz-de-Mello, F.Z., Sosa-Duque, F.J., Flores, H.F., Fernandes, I.O., Silva-Júnior, J.O., Gomes, L.R.P., Monné, M.L., Castro, M.C.M., Silva, M.P.G., Couri, M.S., Gottschalk, M.S., Soares, M.M.M., Monné, M.A., Rafael, M.S., Casagrande, M.M., Mielke, O.H.H., Grossi, P.C., Costa-Pinto, P.J.; Bartholomay, P.R., Sobral, R., Heleodoro, R.A., Machado, R.J.P., Corrêa, R.C., Hutchings, R.S.G., Ale-Rocha, R., Santos, S.D., Lima, S.P., Mahlmann, T., Silva, V.C. & Fernandes, D.R.R. (2020) Insect (Hexapoda) diversity in the oceanic archipelago of Fernando de Noronha, Brazil: updated taxonomic checklist and new records. *Revista Brasileira de Entomologia*, 64 (3), e20200052.  
<https://doi.org/10.1590/1806-9665-rbent-2020-0052>
- Rafael, J.A., Marques, D.W.A., Silva-Neto, A.M. & Limeira-de-Oliveira, F. (2021a) Insect (Hexapoda) diversity in the oceanic archipelago of Fernando de Noronha, Brazil: Pipunculidae (Diptera). *Entomological Communications*, 3, ec03008.  
<https://doi.org/10.37486/2675-1305.ec03008>
- Rafael, J.A., Marques, D.W.A., Silva-Neto, A.M. & Limeira-de-Oliveira, F. (2021b) Insect (Hexapoda) diversity in the oceanic Archipelago of Fernando de Noronha, Brazil: Seasonality and Populational Density of Tabanidae (Diptera). *Biota Neotropica*, 21 (3), e20211211.  
<https://doi.org/10.1590/1676-0611-bn-2021-1211>
- Rafael, J.A., Ale-Rocha, R. & Limeira-de-Oliveira, F. (2022) Insect (Hexapoda) diversity in the oceanic Archipelago of Fernando de Noronha, Brazil: Scenopinidae (Diptera). *Biota Neotropica*, 22 (2), e20211282.  
<https://doi.org/10.1590/1676-0611-bn-2021-1282>
- Rafael, J.A., Marques, D.W.A. & Limeira-de-Oliveira, F. (2023) Insect (Hexapoda) diversity in the oceanic Archipelago of Fernando de Noronha, Brazil: Clusiidae (Diptera). *Zootaxa*, 5353 (4), 332–350.  
<https://doi.org/10.11646/zootaxa.5353.4.2>
- R Core Team (2024) *R: A language and environment for statistical computing. Version 4.4.0*. R Foundation for Statistical Computing, Vienna. Available from: <https://www.R-project.org/> (accessed 25 September 2024)
- Shewell, G.E. (1939) A revision of the genus *Camptoprosopella* Hendel (Diptera, Lauxaniidae). *The Canadian Entomologist*, 71, 130–144.  
<https://doi.org/10.4039/Ent71130-6>
- Silva, V.C. & Mello, R.L. (2008) Occurrence of *Physoclypeus farinosus* Hendel (Diptera: Lauxaniidae) in flowerheads of Asteraceae (Asterales). *Neotropical Entomology*, 37 (1), 92–96.  
<https://doi.org/10.1590/S1519-566X2008000100015>
- Steyskal, G.C. (1971) A note on *Camptoprosopella equatorialis* Shewell (Diptera: Lauxaniidae). *Proceedings of the Entomological Society of Washington*, 73, 209.
- Townes, H. (1972) A lightweight Malaise trap. *Entomological News*, 83, 239–247.
- Wiedemann, C.R.W. (1824) *Munus rectoris in Academia Christiana Albertina aditurus analecta entomologica ex Museo Regio Havniensi maxime congesta profert iconibusque illustrat*. Regio typographeo scholarum, Kiliae [Kiel], 60 pp., 1 pl.  
<https://doi.org/10.5962/bhl.title.77322>
- Williston, S.W. (1896) On the Diptera of St. Vincent (West Indies). *Transactions of the Entomological Society of London*, 1896 (3), 253–446, pls. 8–14.  
<https://doi.org/10.1111/j.1365-2311.1896.tb00965.x>