

Three new species, four new records, and an updated species key for males of *Trichomyia* (*Brachiotrichomyia*) Bravo & Araújo, 2013 (Diptera, Psychodidae)

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Abstract. Three new species of *Trichomyia* (*Brachiotrichomyia*) (*Trichomyiinae*, *Psychodidae*), *Trichomyia spatulata* sp. nov., *Trichomyia ciliata* sp. nov., and *Trichomyia recurva* sp. nov. are described and illustrated. Additionally, we present new records of *Trichomyia* (*Brachiotrichomyia*) *armata* Barretto, 1954, *Trichomyia* (*Brachiotrichomyia*) *quatei* Bravo, 2001, *Trichomyia* (*Brachiotrichomyia*) *inermis* Barretto, 1954, and *Trichomyia* (*Brachiotrichomyia*) *plumata* Bravo & Araújo, 2013 in Brazil. An identification key for males of the subgenus was updated to include the three new species.

Key-Words. New species; Moth-flies; Brazil; Neotropical Region.

INTRODUCTION

Brachiotrichomyia Bravo & Araújo, 2013 is a neotropical subgenus of *Trichomyia* Haliday in Curtis, 1839 included in the subfamily *Trichomyiinae* (*Psychodidae*) with seven described species: *T. (B.) armata* Barretto, 1954; *T. (B.) brasiliensis* Satchell, 1956; *T. (B.) inermis* Barretto, 1954; *T. (B.) plumata* Bravo & Araújo, 2013; *T. (B.) quatei* Bravo, 2001 from Brazil; *T. (B.) pseudodactylis* Quate, 1996 from Costa Rica; and *T. (B.) risaraldensis* Bejarano, Pérez-Doria & Sierra, 2009b from Colombia (Bravo & Araújo, 2013). The species of this subgenus can be easily recognized by the presence of four segments in the palpi, where the first two segments are partially fused, by the fusion of gonocoxites with hypandrium and by the posterior projection of the gonocoxites as long arms that each have long bristles at a proximal margin (Bravo & Araújo, 2013).

Here are described three new species of *Trichomyia* (*Brachiotrichomyia*) from Brazil and included in the identification key of for the species of *Trichomyia* (*Brachiotrichomyia*) proposed by Bravo & Araújo (2013). Moreover, four new records are presented.

MATERIALS AND METHODS

The specimens examined in this study were cleared with 10% potassium hydroxide (KOH), dehydrated in ethanol, and mounted with Canada balsam on slides. The type specimens were deposited in Coleção Entomológica Professor Johann Becker do Museu de Zoologia da Universidade Estadual de Feira de Santana, Bahia, Brazil (MZFS). Terminology follows Cumming & Wood (2009) and the specific terminology of *Psychodidae* follows Wagner & Ibáñez-Bernal (2009). The term "arm of gonocoxite" refers to the posterior expansion of each gonocoxite.

RESULTS

Taxonomy

Trichomyia (*Brachiotrichomyia*) *spatulata* Araújo & Bravo sp. nov. (Figs. 1A-E)

Diagnosis: Sensilla in concave pits on segments of the palpi 1 and 2; fourth segment of palpus 1.2 times the length of third segment; CuA₂ ending approximately at the same point as medial fork;

ejaculatory apodeme 0.6 times the length of the gonocoxal arm; cercus teardrop-shaped in ventral view; posterior arms of gonocoxite convergent, with apical feathered bristles; gonostylus paddle-shaped.

Description: Male: Head wider than long. Supraocular and occipital bristles arranged in a single row. Antennal socket quadrangular (Fig. 1A). Palpus with four segments, with the first two proximal, not observed articular membrane between them; first and second segments of palpus with sensilla in concave pit; fourth segment of palpus 1.2 times the length of third segment; palpus formula 1.0:0.9:0.9:1.0 (Fig. 1B). Antenna with flagellum lost; scape subcylindrical and pedicel subspherical approximately the same length (Fig. 1A). Wing folded in anal area in the preparation: apex of Sc without bristles, base of R_{4+5} without bristles; r-m absent; medial fork basal to radial fork; CuA_2 ending approximately at the same point as medial fork (Fig. 1C). Male terminalia: hypandrium and gonocoxites fused dorsally; gonocoxite longer than wide, glabrous; posterior arms of gonocoxite digitiform in dorsal view, approximately the same length of gonostylus, folded at apex, convergent, with feathered bristles

on apex; gonostylus present, paddle-shaped, glabrous; cercus teardrop-shaped in ventral view (Fig. 1D); epanandrium wider than long, glabrous, subrectangular; ejaculatory apodeme 0.6 times the length of gonocoxal arm (Fig. 1E); hypoproct ending near cerci with dorsal micropilosity; finger-like (Fig. 1E).

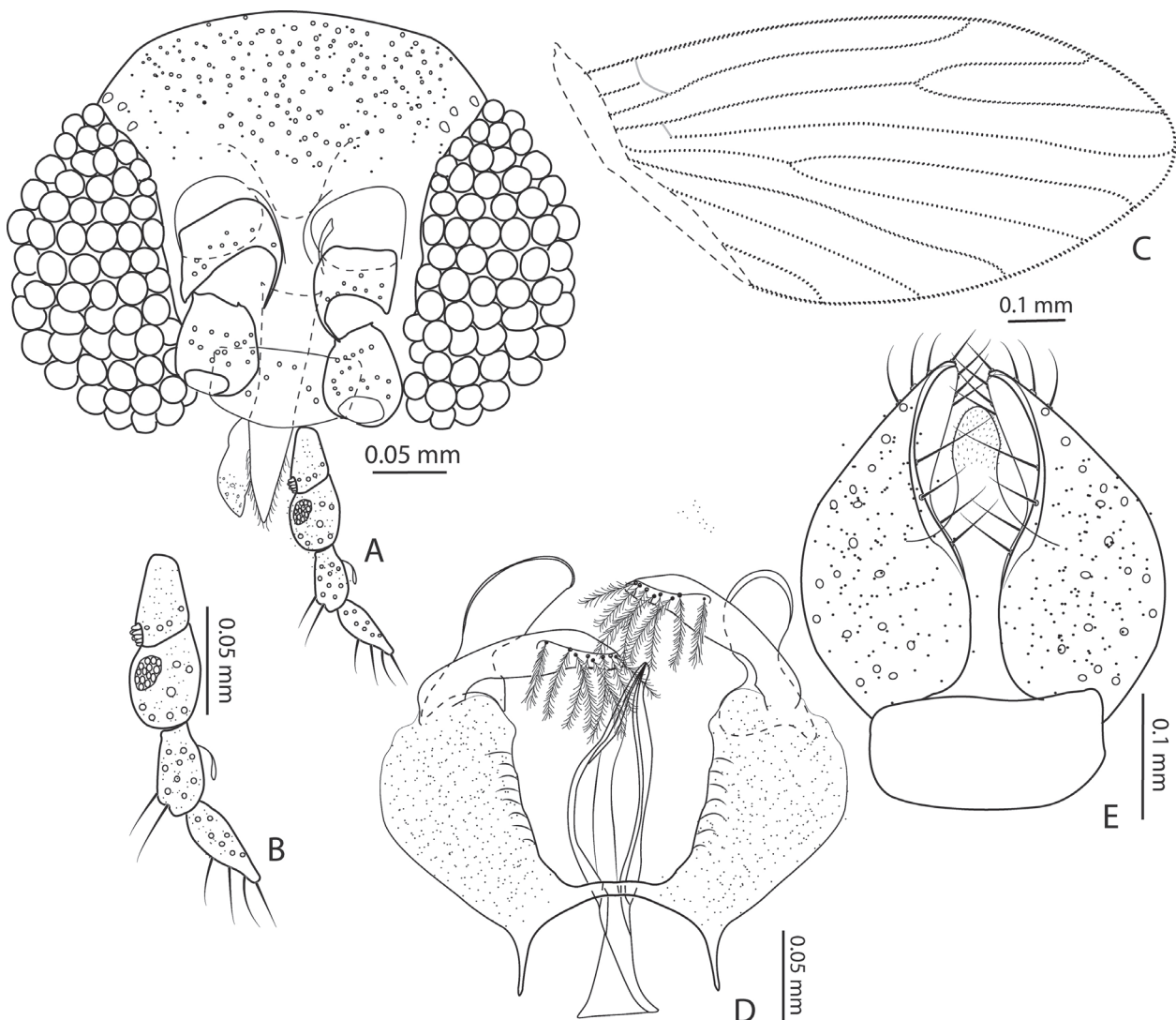
Material examined: Holotype male, Brazil, Amazonas, Manacapuru, WSW of Manaus, 03°17'48"S; 60°37'38"W, 18.IV.1998, leg. R.Q., R.N., P.E. (MZFS #56212).

Etymology: The term originates from the Latin word *spatulata*, meaning spatulated, and refers to the shape of gonostylus.

Distribution: Known only from the type locality.

Female: Unknown.

Remarks: The male terminalia of the new species *T. spatulata* is similar to *T. plumata* by the teardrop-shaped form of the cercus and by the curved gonocoxite arms that converge to midline. The two species are differen-



Figures 1. (A-E) *Trichomyia spatulata* sp. nov. (A) Head; (B) Palpus; (C) Right wing, folded in anal area; (D) Male terminalia, dorsal; (E) Cerci, epanandrium, hypoproct.

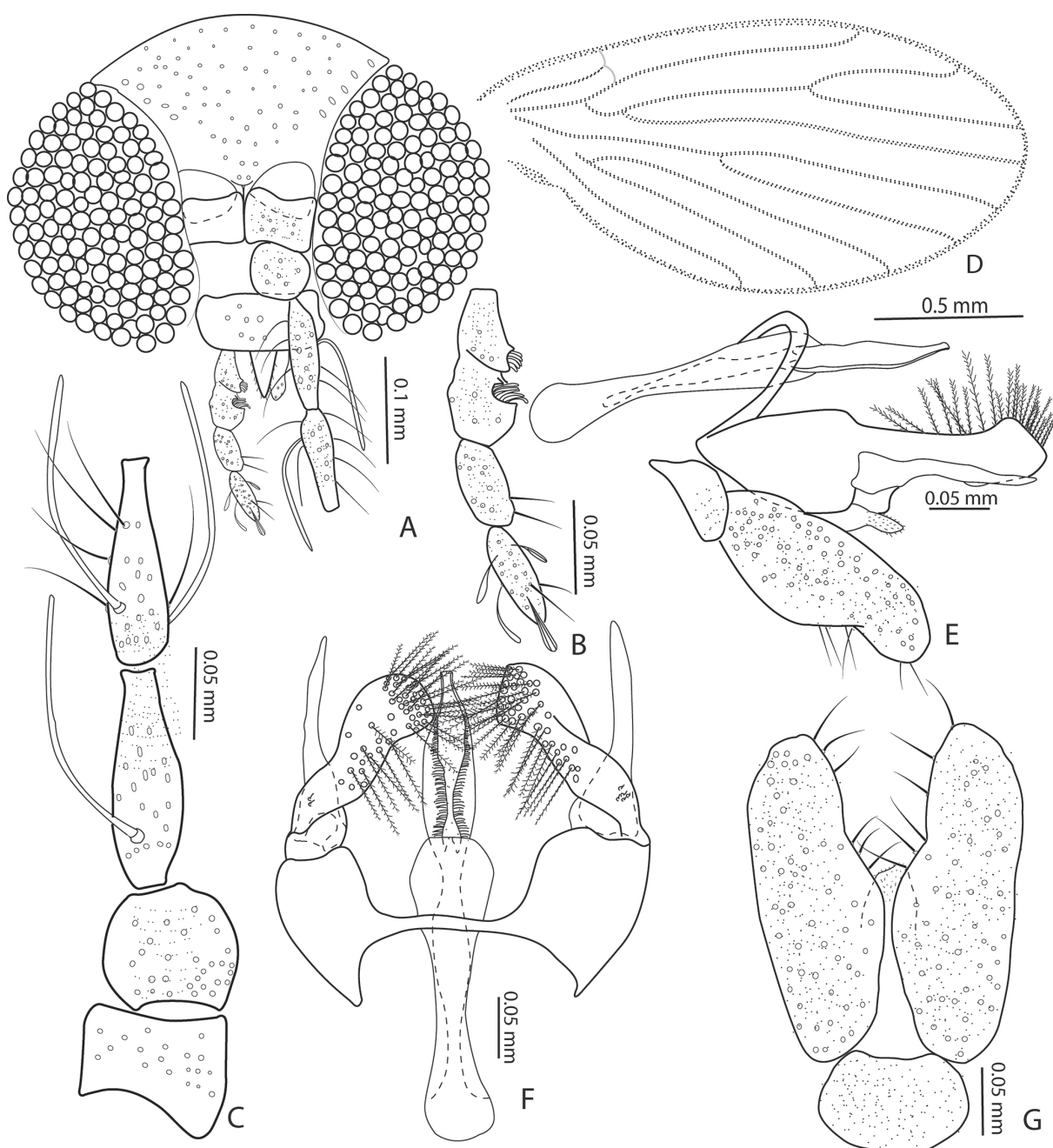
tiated by the format of the gonostylus, which is blade-shaped in *T. plumata* and paddle-shaped in the new species.

***Trichomyia* (Brachiotrichomyia) ciliata**
Araújo & Bravo sp. nov. (Figs. 2A-G)

Diagnosis: Sensilla in concave pits on segments of the palpi 1 and 2; fourth segment of palpus 1.2 times the length of third segment; CuA_2 ending approximately at the same point as medial fork; ejaculatory apodeme 1.4 times the length of the gonocoxal arm; cercus subrectangular in ventral view; posterior arms of gonocoxite convergent, with feathered bristles along $\frac{2}{3}$ apical; gonostylus

blade-shaped, straight, pointy apex, approximately the same length of gonocoxal arm.

Description: Male: Head wider than long. Supraocular and occipital bristles arranged in a single row. Antennal socket subtriangular (Fig. 2A). Palpus with four segments, with the first two proximal, separated by a narrow articular membrane between them; first and second segments of palpus with sensilla in concave pit; fourth segment of palpus 1.2 times the length of third segment; palpus formula 1.0:1.0:1.5:1.3 (Fig. 2B). Antenna incomplete in all specimens; scape subcylindrical and pedicel subspherical approximately the same length; flagellomeres piriform, symmetrical, ascoids digitiform longer than flagellomere (Fig. 2C). Wing: Sc complete; sc-r present; base



Figures 2. (A-G) *Trichomyia ciliata* sp. nov. (A) Head; (B) Palpus; (C) Scape, pedicel, first and second flagellomeres; (D) Right wing; (E) Male terminalia, lateral; (F) Male terminalia, dorsal; (G) Cerci, epandrium, hypoproct.

of R_{4+5} without bristles; r-m absent; medial fork basal to radial fork; CuA_2 ending approximately at the same point as medial fork (Fig. 2D). Male terminalia: hypandrium and gonocoxites fused dorsally; posterior arms of gonocoxite digitiform in dorsal and lateral views (Figs. 2E-F), convergent, two times the length of gonostylus, apex rounded, with feathered bristles along $\frac{2}{3}$ apical; gonostylus blade-shaped, straight, pointy apex, approximately the same length of gonocoxal arm (Fig. 2F); epandrium wider than long, hirsute, subrectangular; cercus subrectangular in ventral view, basally wider than apex; ejaculatory apodeme 1.4 times of gonocoxal arm (Fig. 2G); hypoproct short, with dorsal micropilosity; finger-like (Fig. 2G).

Material examined: Holotype male, Brazil, Espírito Santo, Cariacica, Reserva Biológica Duas Bocas, 28.viii.2008, dos Santos, C.B. leg. (MZFS #56215); 5 paratypes male, Brazil, Espírito Santo, Cariacica, Roda d'água, 29.viii.2008, leg. dos Santos, C.B. (MZFS #56216, MZFS #56217, MZFS #56218, MZFS #56219, MZFS #56220); 3 paratypes male, Brazil, Espírito Santo, Cariacica, Reserva Biológica Duas Bocas, 05.x.2008, leg. dos Santos, C.B. (MZFS #56221, MZFS #56222, MZFS #56223); 1 paratype male, Brazil, Espírito Santo, Aracruz, 09-11.i.2008, leg. dos Santos, C.B. (MZFS #56224).

Etymology: Ciliata is derived from the Latin word *cilium*, meaning "eyelash" in reference to the fringe of hairs on the apex of the gonocoxite's arm.

Distribution: Known only from the type locality.

Female: Unknown.

Remarks: The new species and *T. inermis* are morphologically similar by the presence of feathered bristles in the arm of gonocoxite and by the elongated cercus with subparallel lateral margins. They differ by the length of the ejaculatory apodeme, which is long and narrow in *T. inermis* and short and wide in *T. ciliata* sp. nov.

***Trichomyia* (*Brachiotrichomyia*) *recurva* Araújo & Bravo sp. nov. (Figs. 3A-G)**

Diagnosis: Sensilla in concave pits on segments of the palpi 1 and 2; fourth segment of palpus with the same length of third segment; CuA_2 ending approximately at the same point as medial fork; ejaculatory apodeme approximately the same length of gonocoxal arm; the cercus is elongated with a base wider than apex and the apex is bent; posterior arms of gonocoxite divergent, with feathered bristles throughout the arm, the apex directed outwards; gonostylus small, hemicircular.

Description: Male: Head wider than long. Supraocular and occipital bristles arranged in single row (Fig. 3A). Palpus with four segments, with the first two proximal, separated by a narrow articular membrane between them; first and second segments of palpus with sensilla in concave pit; fourth segment of palpus

with the same length of third segment; palpus formula 1.0:0.5:0.9:1.0 (Fig. 3B). Antenna incomplete in the holotype and paratype; scape subcylindrical and pedicel subspherical approximately the same length; basal flagellomeres piriform, ascoids lost (Fig. 3C). Wing: Sc ending at apex; sc-r present; base of R_{4+5} without bristles; r-m absent; medial fork basal to radial fork; CuA_2 ending approximately at the same point as medial fork (Fig. 3D). Male terminalia: hypandrium and gonocoxites fused dorsally; gonocoxite small; posterior arms of gonocoxite arched in dorsal view, divergent, longer than gonostylus, with feathered bristles throughout the arm, the apex directed outwards; gonostylus small, hemicircular, glabrous (Fig. 3G); cercus elongated, base wider than apex and apex bent (Fig. 3E); epandrium bilobated, glabrous; ejaculatory apodeme approximately the same length of gonocoxal arm (Fig. 3F); hypoproct with dorsal micropilosity, subtriangular, narrow posteriorly (Fig. 3F).

Material examined: Holotype male, Brazil, Bahia, Igrapiuna, Reserva Ecológica da Michelin, Pancada Grande, 18.v.2013, M. Aragão & E. Menezes leg.; 1 paratype male (MZFS #56214); 1 paratype male, Brazil, Espírito Santo, Cariacica, Roda d'água, 29.viii.2008, leg. dos Santos, C.B. (MZFS #56203).

Etymology: The term originates from the Latin word *recurva*, meaning bent back on itself or bent round, which refers to the shape the cercus apex.

Distribution: Known only from the type locality.

Female: Unknown.

Remarks: The new species differs from other species of *Trichomyia* (*Brachiotrichomyia*) mainly, by the form of the cercus, which is wider in the base than the bent apex and by the arched arms of gonocoxite.

New records

***Trichomyia armata* Barretto, 1954**

Trichomyia armata Barretto, 1954: 127-129, figs. 1-12. Holotype male. **Type-locality:** Brazil (São Paulo) in MZFS. References: Barretto, 1954: 130 (key); Duckhouse, 1973: 6A.4 (catalogue); Bravo, 2000: 191 (citation); Bravo, 2001: 34, fig. 4 (palpus, male and citation), 35, figs. 9-10 (male terminalia and citation), 36 (citation); Bejarano *et al.*, 2009a: 98, 100 (citation); Bejarano *et al.*, 2009b: 299 (citation); Santos & Leite, 2012: 42 (checklist); Bravo & Araújo, 2013: 330, 331 (citation), 331-332 (new record – Paraná and diagnosis), 336 (key); Araújo & Bravo, 2016: 7 (key), 12 (citation).

Material examined

3 males: Brazil, Espírito Santo, Cariacica, Roda d'água, 29.viii.2008, leg. C.B. dos Santos (new record).

Distribution

Brazil: São Paulo (Serra da Cantareira, Horto Florestal; Mogi das Cruzes, km 67 Rio de Janeiro – São Paulo, road); Paraná (Guarapuava; Jundiá do Sul), Espírito Santo (Cariacica).

Trichomyia quatei Bravo, 2001

Trichomyia quatei Bravo, 2001: 32-34, figs. 1-3, 5-8. Holotype male. **Type-locality:** Brazil (Bahia) in MZFS. Distr.: Brazil (Bahia). References: Bejarano et al., 2009a: 98, 100 (citation); Bejarano et al., 2009b: 299 (citation); Santos & Leite, 2012: 43 (checklist); Bravo & Araújo, 2013: 330, 331 (citation), 334 (diagnosis), 336 (key); Araújo & Bravo, 2016: 7 (key), 12 (citation).

Material examined

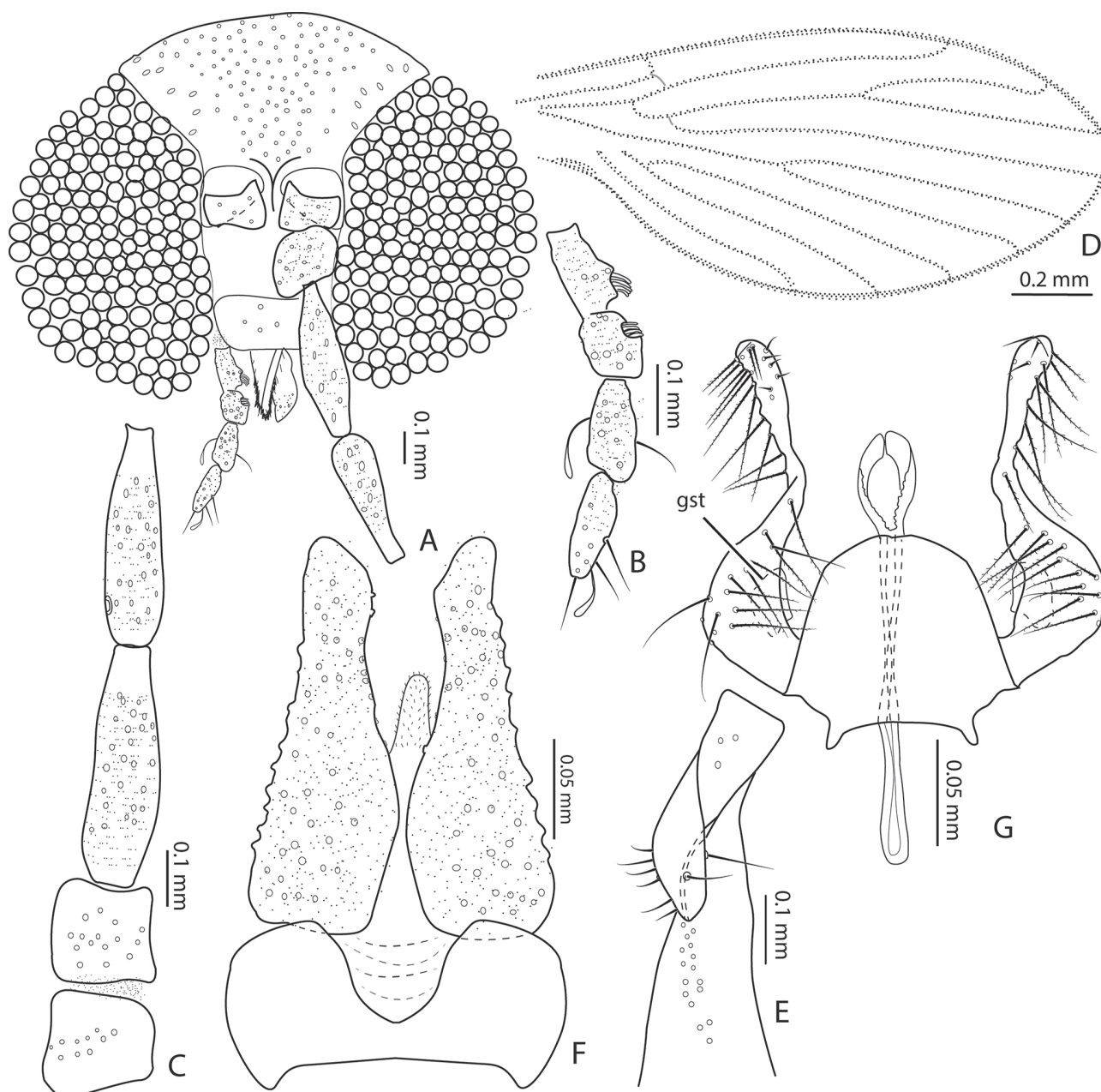
2 males: Brazil, Espírito Santo, Santa Teresa, Reserva Ecológica Augusto Rushi, 16.xii.2011, leg. C.B. dos Santos (new record).

Distribution

Brazil: Bahia (Itabuna, CEPEC), Espírito Santo (Santa Teresa).

Trichomyia inermis Barretto, 1954

Trichomyia inermis Barretto, 1954: 129-130, figs. 13-17. Holotype male. **Type-locality:** Brazil (São Paulo) in MZFS. Distr.: Brazil (São Paulo, Bahia and Amazonas).



Figures 3. (A-G) *Trichomyia recurva* sp. nov. (A) Head (paratype); (B) Palpus; (C) Scape, pedicel, first flagellomeres; (D) Right wing; (E) Apex of cercus, dorsal view; (F) Cerci, epandrium, hypoproct; (G) Male terminalia, dorsal. (Abbreviation: gst = gonostylus).

References: Barretto, 1954: 130 (key); Duckhouse, 1973: 6A.5 (catalogue); Bravo, 2000: 191 (citation); Santos & Leite, 2012: 43 (checklist); Bravo & Araújo, 2013: 330, 331 (citation), 332-333, figs. 1-7 (redescription and new record – Bahia, Amazonas), 336 (key); Araújo & Bravo, 2016: 7 (key), 12 (citation), 73 (citation).

Material examined

1 male: Brazil, Bahia, Igrapiúna, Reserva Ecológica da Michelin, Pacangê, 15-16.xii.2012, leg. M. Aragão & E. Menezes (new record); 1 male: Brazil, Espírito Santo, Santa Teresa, Reserva Ecológica Augusto Rushi, 16.xii.2011, leg. C.B. dos Santos (new record).

Distribution

Brazil: São Paulo (Serra da Cantareira, Horto Florestal; Mogi das Cruzes, km 67 Rio de Janeiro – São Paulo, road); Paraná (Guarapuava; Jundiá do Sul), Bahia (Igrapiúna), Espírito Santo (Santa Teresa).

Trichomyia plumata Bravo & Araújo, 2013

Trichomyia plumata Bravo & Araújo, 2013: 334-335, figs. 8-12. Holotype male. **Type-locality:** Brazil (Amazonas) in MZFS. Distr.: Brazil (Amazonas). References: Bravo & Araújo, 2013: 336 (key); Araújo & Bravo, 2016: 7 (key), 12 (citation).

Material examined

1 male: Brazil, Mato Grosso, Barão de Melgaço, Bahia Sai Mariana, 03.iv.1998, leg. RF., FLS. & RDN. (new record).

Distribution

Brazil: Amazonas (Manacapuru; Purupuru); Barão de Melgaço (Mato Grosso).

Identification key

Trichomyia spatulata, *T. ciliata* and *T. recurva* were included in couplet 6 of the identification key for the species of *Trichomyia* (*Brachiotrichomyia*) (Bravo & Araújo, 2013). The key was modified from Bravo & Araújo (2013: 336).

- 6(2). Cercus elongated, never teardrop-shaped in ventral view; arms of gonocoxite subparallel or divergent 7
— Cercus teardrop-shaped in ventral view; arms of gonocoxite convergent to midline 9
7(6). Cercus with base wider than apex; apex of cercus bent in dorsal view; arms of gonocoxite divergent..... 9
..... *T. (B.) recurva* sp. nov. (Brazil: Espírito Santo)
— Cercus with lateral margins subparallel; apex of cercus not folded; arms of gonocoxite subparallel..... 8

- 8(7). Arms of gonocoxite with truncate apex, ejaculatory apodeme narrow.....
... *T. (B.) inermis* Barretto, 1954 (Brazil: São Paulo, Bahia, Amazonas)
— Arms of gonocoxite with rounded apex; ejaculatory apodeme wide *T. (B.) ciliata* sp. nov. (Brazil: Espírito Santo)
9(6). Gonostylus narrow, blade-shaped with truncate apex; ejaculatory apodeme long, approximately with the same length of arm of gonocoxite.....
..... *T. (B.) plumata* Bravo & Araújo, 2013 (Brazil: Amazonas)
— Gonostylus wide with rounded apex; ejaculatory apodeme short, shorter than arm of gonocoxite
..... *T. (B.) spatulata* sp. nov. (Brazil: Amazonas)

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REFERENCES

- Araújo, M.X. & Bravo, F. 2016. Description of forty four new species, taxonomic notes and identification key to Neotropical *Trichomyia* Haliday in Curtis (Diptera: Psychodidae, Trichomyiinae). *Zootaxa*, 4130: 1-76.
Barretto, M.P. 1954. Novas espécies de *Trichomyia* Hal. do Brasil (Diptera, Psychodidae). *Folia Clinica et Biológica*, 21: 127-137.
Bejarano, E.E.; Pérez-Doria, A. & Sierra, D. 2009a. *Trichomyia quimbaya*, una nueva especie de Trichomyiinae (Diptera: Psychodidae) de la Cordillera Central de Colombia. *Biota Neotropica*, 9(4): 97-100.
Bejarano, E.E.; Pérez-Doria, A. & Sierra, D. 2009b. Descripción de una nueva especie de *Trichomyia* (Diptera: Psychodidae) de los Andes Colombianos. *Revista de la Sociedad Entomológica Argentina*, 68(3-4): 295-300.
Bravo, F. 2000. Descrição de uma espécie de *Trichomyia* (Diptera, Psychodidae) do sudeste brasileiro, com comentários sobre a genealogia do gênero. *Acta Biológica Leopoldensia*, 22(2): 185-192.
Bravo, F. 2001. *Trichomyia quatei* (Diptera, Psychodidae), uma nova espécie do nordeste brasileiro. *Acta Biológica Leopoldensia*, 23(1): 31-37.
Bravo, F. & Araújo, M.X. 2013. *Trichomyia* (*Brachiotrichomyia* subgen. nov.) *plumata* sp. nov. from the Neotropical Region (Diptera: Psychodidae: Trichomyiinae). *Acta Entomologica Musei Nationalis Pragae*, 53(1): 329-338.
Cumming, J.M. & Wood, D.M. 2009. Adult morphology and terminology. In: Brown, B.V.; Borkent, A.; Cumming, J.M.; Wood, D.M. & Zumbado, M.A. (Eds.). *Manual of Central American Diptera*. Ottawa, NRC Research Press. v. 1, p. 9-50.
Duckhouse, D.A. 1973. Psychodidae. In: Papavero, N. (Ed.). *Catalogue of the Diptera of the America South of the United States*. São Paulo, Departamento de Zoologia da Secretaria de Agricultura. 6A, p. 1-29.
Santos, C.B. & Leite, G.R. 2012. A new species of *Trichomyia* Haliday (Diptera: Psychodidae: Trichomyiinae) from the Brazilian Atlantic Forest, with a checklist of Western Hemisphere species. *Zootaxa*, 3573: 40-46.
Wagner, R. & Ibáñez-Bernal, S. 2009. Psychodidae (sand flies, and moth flies or owl flies). In: Brown, B.V.; Borkent, A.; Cumming, J.M.; Wood, D.M. & Zumbado, M.A. (Eds.). *Manual of Central American Diptera*. Ottawa, NRC Research Press. v.1, p. 319-336.