



Taxonomy and Systematic

Two new species of *Arisemus* (Diptera: Psychodidae) from the Northeast Atlantic Forest, Brazil

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Abstract. *Arisemus atlanticus* Vilarinho, Araújo, Bravo & dos Santos sp. nov. and *Arisemus benignoi* Vilarinho, Araújo & Bravo sp. nov. are described from the Central Corridor of the Atlantic Forest. Currently, thirty-three species of the genus have been described from the Neotropical Region and only one from Brazil.

Keywords: Biodiversity; moth-flies; neotropics; Psychodinae; taxonomy.

In Brazil, there are 533 described species of Psychodidae distributed in 44 genera, of which 241 species were collected in the Atlantic Forest, a region in which the family is best sampled among the other Brazilian biomes (SHIMABUKURO *et al.* 2018). Psychodinae has the largest number of individuals described for the Atlantic Forest with 136 species distributed in 20 genera (CORDEIRO & BRAVO 2018).

Arisemus Satchell, 1955 was proposed as a subgenus of *Telmatoscopus*, being the type species *Telmatoscopus (Arisemus) maculosus* Satchell, 1955, synonymized as *Arisemus grabhamana* (Dyar, 1926) later by DUCKHOUSE (1974). It is a Neotropical genus of Psychodinae with 33 described species. QUATE & BROWN (2004) delimited the genus and included in the diagnostic characters the contiguous eyes, reduction of the last three flagellomeres, R_5 ending at the wing apex, and the presence of a tenaculum in each of the cercus; in this paper, the authors do not accept VAILLANT'S (1986) redescription of the genus because it is considered too broad.

The first record of *Arisemus* from Brazil was *Arisemus rubeni* Bravo & Araújo, 2013 collected in a semi-arid region placed on Caatinga biome (BRAVO & ARAÚJO 2013). In this paper, we propose two new species for the genus *Arisemus* from the Brazilian Atlantic Forest in the states of Bahia and Espírito Santo.

MATERIAL AND METHODS

Samples were collected and preserved in 70% ethanol, treated with 10% KOH, dehydrated, and mounted in Canada balsam. The terminology of morphological descriptions

follows CUMMING & WOOD (2017). All specimens described were deposited in the Entomological Collection Prof. Johann Becker of the Museu de Zoologia da Universidade Estadual de Feira de Santana, Bahia, Brazil (MZFS).

TAXONOMY

Arisemus atlanticus Vilarinho, Araujo, Bravo & dos Santos sp.nov.

Nomenclatural Act Registered in ZooBank:

[urn:lsid:zoobank.org:act:E4FA88D7-7F16-42DB-A079-F9F132F60013](https://zoobank.org/act:E4FA88D7-7F16-42DB-A079-F9F132F60013)

Type material: Holotype, male: BRAZIL, Bahia, Igrapiúna, Reserva Ecológica Michelin, (Vila 5), 28.X-18.XI.2012. Aragão, M. & Menezes, E. leg. Malaise (MZFS). Paratype, male; BRAZIL, Espírito Santo, Santa Teresa, Reserva Biológica Augusto Ruschi. 28.IX.2011 (MZFS).

Etymology: The specific epithet is dedicated to the biome in which the specimens were collected (Atlantic Forest).

Diagnosis: Gonocoxites robust touching base; bifurcated gonostylus with thin bristles at one end and an apical invagination on the other, asymmetrical aedeagus narrow and acuminate apically; complex parameres, paired, asymmetric, left pair less than the right pair; right paramere acuminate apically; left paramere with rounded apex; ejaculatory apodeme with a keel in the medial region.

Description: Male (Figure 1. A-G). Head (Figure 1A) as wide as long; frons hair patch without median extension, divided centrally; eyes contiguous; eye bridge with three facet rows

touching each other. Antennae with scape to pedicel ratio 2:1 (Figure 1E), scape not enlarged, with an apical tuft of long, black bristles on the inner margin, 14 flagellomeres observed; first flagellomere larger than following flagellomeres, approximately two times longer than the second flagellomere; flagellomeres 1-11 nodiform, internodes short; flagellomeres 12-14 reduced, lacking internodes, 12-13 globular; ascoids lost. The ratio of segments of palpus: 1:2:2:3 (Figure 1F); last segment of palpus striated. Anteprepronotum with a pyriform sensory organ in front of anterior spiracle. Wing (Figure 1B) with spots of infuscation at the apices of each longitudinal vein; base of vein M_2 without glandular structure; CuA_2 without apical enlargement, not reaching the wing margin; jugum with a tuft of long and black bristles (Figure 1C). Male terminalia (Figure 1G): gonocoxites stout touching at base; gonostylus bifurcate with a thin bristle on one end and an apical invagination on the other; aedeagus asymmetrical, narrow and apically acuminate, with small median projection; parameres complex, paired, asymmetric, left pair shorter than right pair; right paramere acuminate apically; left paramere with rounded apex; ejaculatory apodeme with a keel in the middle region, rounded, two times longer than the gonocoxites; epandrium sclerotized longer than wide; cercus (Figure 1D) with bristles on the dorsal surface, each with an apical tenaculum; hypoproct with apical micropilosity.

Female: Unknown.

Remarks: *Arisemus atlanticus* sp. nov. resembles *Arisemus atrasetus* (Rapp, 1945), *Arisemus buzbyae* Wagner & Masteller, 1996, *Arisemus guhli* Wagner & Joost, 1994, *Arisemus obandoi* Wagner & Joost, 1994, *Arisemus rubeni*, *Arisemus tetradactylus* Botosaneanu & Vaillant, 1970, *Arisemus triatrapars* Quate & Brown, 2004, and *Arisemus waideir* Quate & Brown, 2004 because all of them has a bifurcated gonostylus.

Arisemus atrasetus has narrower and more closed gonostylus arms, while *A. atlanticus* sp. nov. has robust gonostylus with open arms; *A. buzbyae* has short gonostylus arms, whereas *A. atlanticus* sp. nov. has larger gonocoxites arms.

Arisemus guhli has the longest arm of the gonostylus with more than twice the length of the shortest arm; in *A. atlanticus* sp. nov. an arm is 0.4 times larger than the smaller arm. *A. obandoi* has a robust ejaculatory apodeme almost the same width from one end to the other as the gonocoxite, while *A. atlanticus* sp. nov. has a thin ejaculatory apodeme, not reaching half the width of the gonocoxite.

Arisemus rubeni has gonostylus with the same length as gonocoxite, while in *A. atlanticus* sp. nov. the gonostylus are smaller than gonocoxite. *A. tetradactylus* has slender and long gonostylus arms, while in *A. atlanticus* sp. nov. the arms are robust and short.

Arisemus triatrapars has a thin aedeagus with a curved apex, while *A. atlanticus* sp. nov. has an aedeagus apically acuminate with a small median projection. *A. waideir* has thin gonocoxite, while *A. atlanticus* sp. nov. has robust gonocoxite.

Arisemus benignoi Vilarinho, Araujo & Bravo sp. nov.

Nomenclatural Act Registered in ZooBank:

[urn:lsid:zoobank.org:act:DB737D68-5AF1-440F-BBDE-2B9611E6903E](https://zoobank.org/act:DB737D68-5AF1-440F-BBDE-2B9611E6903E)

Type material: Holotype, male: BRAZIL, Bahia, Santa Teresinha, Pedra Branca, Serra da Jibóia, 80 m below the waterfall, 12°51'00"S 39°28'48" W, 678 m.a.n.m. 08.VII-28. IX.2009 - Malaise. Calor, A. & Lecci, L.S. leg. (MZFS).

Etymology. The species is dedicated to the grandfather of the first author, Benigno Alves Vilarinho.

Diagnosis: Aedeagus asymmetrical, bifid with an apical acuminate branch and another with a truncated apex; parameres complex, paired, asymmetrical, with two branches, one with acuminate apex and the second with truncated apex; ejaculatory apodeme compressed dorsoventrally, rounded in the proximal part, two times longer than gonocoxite, with a keel in the central part.

Description: Male (Figure 2.A-G). Head (Figure 2A) larger than width; elongated vertex, eyes contiguous; eye bridge with three facet rows touching each other. Antennae with scape to pedicel ratio 1.0: 0.6, scape not enlarged, with a tuft of long, dark bristles on the inner margin. Incomplete flagellum, only the first flagellomere observed, nodiform, the same length as the scape. The ratio of segments of palpus: 1.0: 1.3: 1.5: 2.2; last segment of palpus striated (Figure 2A). Wing (Figure 2B) 0.8 times larger than wide, with spots of infuscation at the apices of each longitudinal vein; base of vein M_2 without glandular structure; R_5 ending at the pointed apex of the wing, CuA_2 without apical enlargement, not reaching the wing margin; jugum with a tuft of long and black bristles (Figure 2B). Male terminalia: sclerotized hypandrium; gonocoxites (Figure 2G) robust, not touching, with long bristles on the ventral region and a little sclerotized area on the distal region; gonostylus (Figure 2F) bifurcated with setae on the inner arm; anterior gonocoxal apodemes united in the center forming a narrow, triangular plate. Aedeagus (Figure 2C) asymmetrical, bifid with one branch apically acuminate and the other truncated; parameral complex (Figure 2E), paired, asymmetrical, with two branches, one with an acuminate apex and the second with truncated apex; ejaculatory apodeme dorsoventrally compressed, rounded in the proximal part, two times longer than gonocoxite, with a keel in the central region; cercus (Figure 2D) with spiniform and spatular bristles, each with an apical tenaculum; hypoproct and epiproct not visualized.

Remarks: *Arisemus benignoi* sp. nov. resembles *A. atlanticus* sp. nov., *Arisemus barbarus* Quate & Brown, 2004, *Arisemus boxi* (Satchell, 1955), *Arisemus grabhamana* (Dyar, 1926), *Arisemus hexadactylus* Botosaneanu & Vaillant, 1970 and *Arisemus rubeni*, for the presence of a tuft of dark bristles on the scape and jugum present in all cited species.

Arisemus atlanticus sp. nov. has long parameres, the larger arm reaching close to the length of the gonostylus, while in *A. benignoi* sp. nov. has short parameres. *A. barbarus* has a scape five times larger than the pedicel, while *A. benignoi* sp. nov. has the scape only two times larger than the pedicel.

Arisemus boxi and *A. grabhamana* have simple and thin gonostylus, *A. hexadactylus* has trifurcated gonostylus, while *A. benignoi* sp. nov. has bifurcated gonostylus.

Currently, three species of *Arisemus* are described from Brazil, *A. atlanticus* sp. nov., *A. benignoi* sp. nov., and *A. rubeni*. *Arisemus* is described, for the first time for the Atlantic Forest Biome and, for now, state of Espírito Santo is the southernmost record in South America.

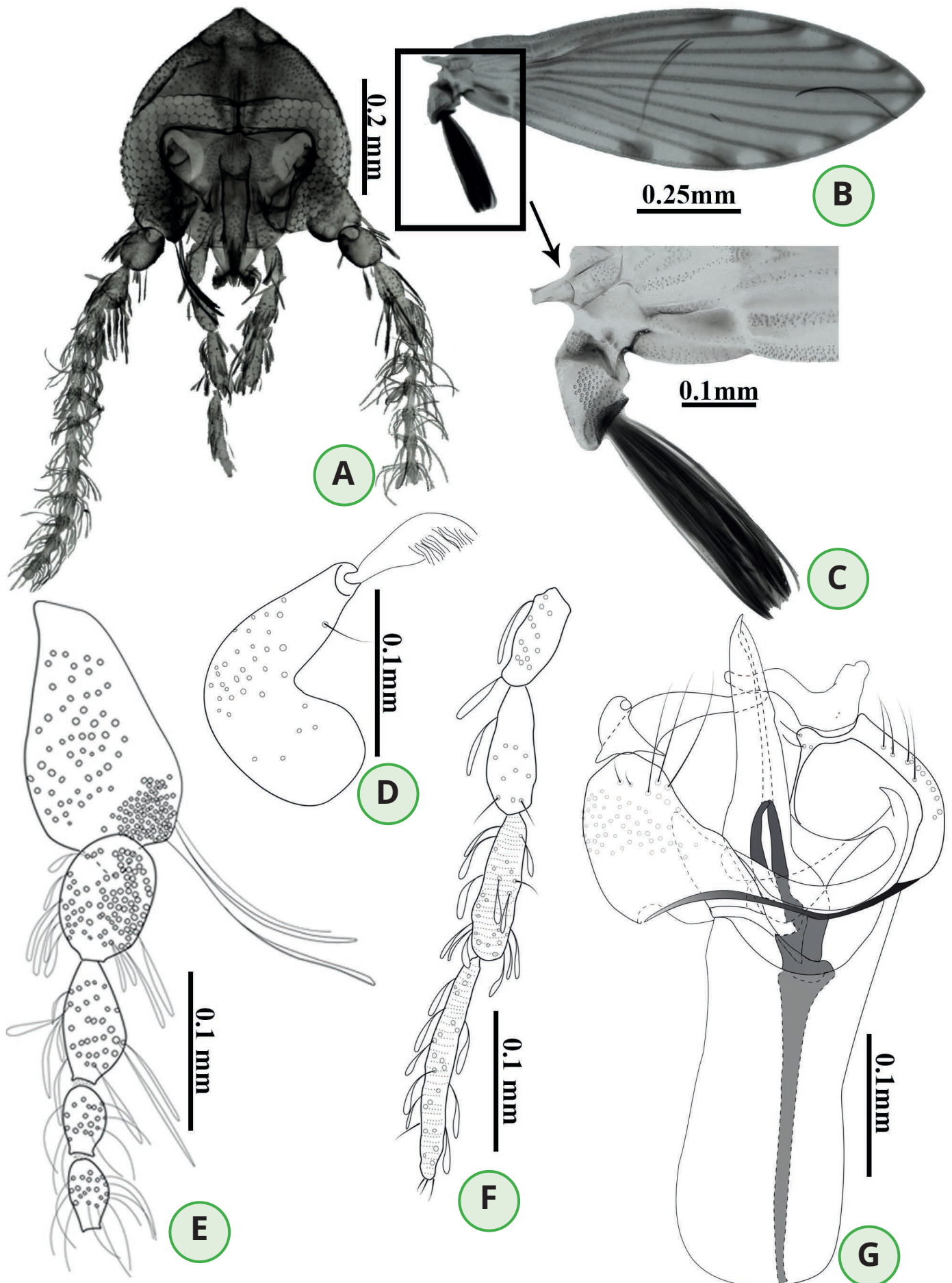
CHECKLIST OF *Arisemus* SATCHELL, 1955

Arisemus aenigmaticus Quate & Brown, 2004. Distribution: Costa Rica.

Arisemus ampliscapus Quate & Brown, 2004. Distribution: Venezuela.

Arisemus amydrus Quate & Brown, 2004. Distribution: Costa Rica.

Arisemus atlanticus Vilarinho, Araújo, Bravo & Santos, sp. nov. Distribution: Brazil, Bahia and Espírito Santo.



Figures 1 A-G. *Arisemus atlanticus* Vilarinho, Araújo, Bravo & dos Santos, sp. nov. (A) head; (B) wing; (C) wing, jugum with a tuft of bristles; (D) cercus and tenaculum; (E) scape, pedicel and three first segments; (F) palpus; (G) terminalia, ventral view.

Arisemus atrasetus (Rapp, 1945). Distribution: Costa Rica, Guatemala, Panama.

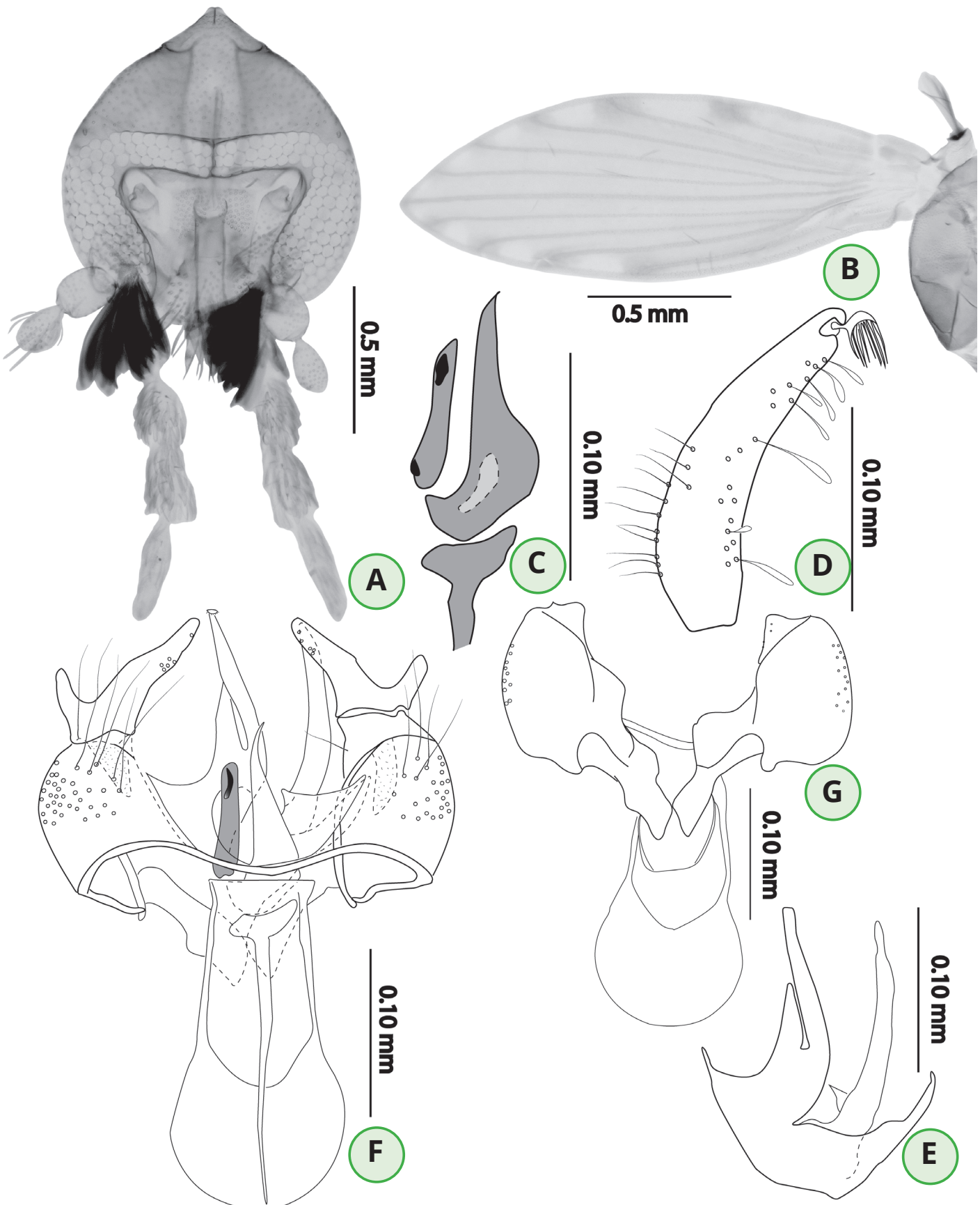
Arisemus barbarus Quate & Brown, 2004. Distribution: Costa Rica.

Arisemus benignoi Vilarinho, Araújo & Bravo sp. nov. Distribution: Brazil, Bahia.

Arisemus boxi (Satchell, 1955). Distribution: West Indies, Windward Is., St. Lucia, Bar de l'Isle.

Arisemus buzbyae Wagner & Masteller, 1996. Distribution: Puerto Rico.

Arisemus caceresi Quate & Brown, 2004. Distribution: Peru.



Figures 2 A-G. *Arisemus benignoi* Vilarinho, Araújo & Bravo, sp nov. (A) head; (B) wing; (C) apex of aedeagus; (D) cercus and tenaculum; (E) parameres; (F) terminalia, ventral view; (G) gonocoxite and gonocoxal apodeme.

Arisemus confertus Quate & Brown, 2004. Distribution: Bahamas, Puerto Rico.

Arisemus grabhamana (Dyar, 1926). Distribution: Jamaica.

Arisemus grandilobus Quate & Brown, 2004. Distribution: Venezuela.

Arisemus guhli Wagner & Joost, 1994. Distribution: Colombia.

Arisemus hexadactylus Botosaneanu & Vaillant, 1970. Distribution: Cuba.

Arisemus imeldae Ibañez-Bernal & Suárez-Landa, 2017. Distribution: Mexico.

Arisemus lepidotos Quate, 1996. Distribution: Costa Rica.

Arisemus maculosus (Rapp, 1945). Distribution: Panama.

Arisemus maesi Quate & Brown, 2004. Distribution: Nicaragua.

Arisemus mariannae Wagner & Masteller, 1996. Distribution: Puerto Rico.

Arisemus martinezi Wagner & Joost, 1994. Distribution: Colombia.

Arisemus obandoi Wagner & Joost, 1994. Distribution: Colombia.

Arisemus pigmentatus Quate & Brown, 2004. Distribution: Peru.

Arisemus rhamphos Quate & Brown, 2004. Distribution: Venezuela.

Arisemus roessleri Wagner & Joost, 1994. Distribution: Colombia.

Arisemus rubeni Bravo & Araújo, 2013. Distribution: Brazil, Ceará.

Arisemus salazari Quate, 1996. Distribution: Costa Rica.

Arisemus sesquipedalis Quate & Brown, 2004. Distribution: Venezuela.

Arisemus spilotos Quate, 1996. Distribution: Costa Rica.

Arisemus stylofurcatus Collantes & Martínez-Ortega, 1999. Distribution: Nicaragua.

Arisemus tetradactylus Botosaneanu & Vaillant, 1970. Distribution: Cuba.

Arisemus triatrapars Quate & Brown, 2004. Distribution: Costa Rica.

Arisemus triconnectus Collantes & Baquero, 2000. Distribution: Ecuador.

Arisemus waideir Wagner & Masteller, 1996. Distribution: Puerto Rico.

Arisemus woodi Quate & Brown, 2004. Distribution: Costa Rica.

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REFERENCES

- Bravo, F & MX Araújo, 2013. Two new species of moth flies (Diptera, Psychodidae) from the semi-arid region of Brazil. *Zootaxa*, 3693: 85-90. DOI: <https://doi.org/10.11646/zootaxa.3693.1.6>
- Cordeiro, DP & F Bravo, 2018. Psychodinae in Catálogo Taxonômico da Fauna do Brasil. PNUD. Available in: <http://fauna.jbrj.gov.br/fauna/faunadoBrazil/3355>. [Access: 14.vi.2018].
- Cumming, JM & DM Wood, 2017. Adult morphology and terminology, pp. 89-133. *In*: Kirk-Spriggs, AH & BJ Sinclair (Eds.). *Manual of Afrotropical Diptera*. Vol. 1. Introductory chapters and keys to Diptera families. Suricata 4. SANBI Graphics & Editing, Pretoria.
- Duckhouse, DA, 1974. Redescription of the Neotropical Psychodidae (Diptera, Nematocera) described by Knab, Dyar and Coquillett. *Journal of Entomology*, 42: 141-152.
- Quate, LW & BV Brown, 2004. Revision of Neotropical Setomimini (Diptera: Psychodidae: Psychodinae). *Contribution in Science: Natural History Museum of Los Angeles*, 500: 1-117.
- Shimabukuro, PHF, AJ Andrade, EAB Galati, DP Cordeiro & F Bravo, 2018. Psychodidae in Catálogo Taxonômico da Fauna do Brasil. PNUD. Available in: <http://fauna.jbrj.gov.br/fauna/faunadoBrazil/2258>. [Access: 14.vi.2018].
- Vaillant, F, 1986. Le genre *Arisemus* Satchell et quelques genres voisins (Diptera, Psychodidae). *Nouvelle Revue d'Entomologie (N.S.)*, 3: 333-340.

