PROGRAMA DE PÓS-GRADUAÇÃO EM ZOOLOGIA
UNIVERSIDADE FEDERAL DO PARÁ
MUSEU PARAENSE EMÍLIO GOELDI

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REVISÃO TAXONÔMICA E ANÁLISE FILOGENÉTICA DAS ESPÉCIES DE *Retrocitomyia* LOPES, 1983 (DIPTERA: SARCOPHAGIDAE)

Belém – PA, 2018

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Dissertação apresentada ao Programa de Pós-Graduação em Zoologia, do convênio da Universidade Federal do Pará e Museu Paraense Emílio Goeldi, como requisito para obtenção do título de Mestre em Zoologia.
Área de concentração: Evolução
Linha de Pesquisa: Sistemática e Taxonomia

Orientador: Dr. Fernando da Silva Carvalho Filho
Co-orientadora: Dra. Cátia Antunes de Mello Patiu

Belém – PA, 2018

Dados Internacionais de Catalogação na Publicação (CIP) de acordo com ISBD Sistema de Bibliotecas da Universidade Federal do Pará
Gerada automaticamente pelo módulo Ficat, mediante os dados fornecidos pelo(a) autor(a)

S719r Souza, Caroline Costa de.
Revisão taxonômica e análise filogenética das espécies de Retrocitomyia Lopes, 1983 (Diptera: Sarcophagidae) / Caroline Costa de Souza. — 2018.
85 f. : il. color.

Orientador(a): Prof. Dr. Fernando da Silva Carvalho-Filho Coorientação: Profª. Dra. Cátia Antunes de Mello Patiu
Dissertação (Mestrado) - Programa de Pós-Graduação em Zoologia, Instituto de Ciências Biológicas, Universidade Federal do Pará, Belém, 2018.

1. Fauna neotropical. 2. Sarcophaginae. 3. Taxonomia. 4. cladística. I. Título.

CDD 576.8

FOLHA DE APROVAÇÃO

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Aprovada em 17 de dezembro de 2018.

Dedico esse trabalho à minha família que sempre me apoiou em todas as minhas decisões, mesmo quando uma delas foi estudar moscas e não borboletas. Além disso, dedico esse trabalho também à Dra. Cátia Antunes de Mello Patiu, curadora da coleção entomológica do Museu Nacional do Rio de Janeiro e minha co-orientadora, pela força, amor ao que faz e ensinamentos, principalmente sobre o "nunca desistir e seguir em frente". Obrigada por se manter firme. O MUSEU NACIONAL RESISTE!

"If I have seen further it is by standing on the shoulders of Giants."

-Isaac Newton, 1675

AGRADECIMENTOS

Desafio gigantesco foi utilizar algumas páginas para agradecer as pessoas que fizeram parte da minha jornada até aqui. Sendo assim, espero que eu não esqueça de ninguém.

Imensamente à minha família, em especial a minha mãe, meus dois pais e irmã que compreenderam a minha ausência durante essa jornada e me deram apoio em todos os momentos da minha vida. Porém, mais que apoio, me ofereceram a melhor coisa que alguém pode oferecer: o amor incondicional. Amo vocês!

Sou muito grata ao meu orientador Dr. Fernando Carvalho-Filho pelos ensinamentos, dedicação e disponibilidade não somente acerca do estudo de Sarcophagidae, mas pelos ensinamentos para a vida. Muito obrigada pela amizade, amor, carinho e brincadeiras ao longo desses cinco anos, que, sem dúvida, foram imprescindíveis.

À minha co-orientadora Dr. Cátia Mello-Patiu pelos ensinamentos, disponibilidade, suporte oferecido quando visitei a coleção do MNRJ e, acima de tudo, por se manter firme mesmo quando todos achávamos que nós mesmos não conseguiríamos.

Aos curadores das coleções e suas respectivas instituições que, gentilmente, viabilizaram o empréstimo do material: Dr. Carlos Lamas (MZUSP), Dr. Christopher Grinter (CAS), Dr. Márcio Oliveira (INPA) e Dr. Orlando Tobias (MPEG). Sou especialmente grata ao Dr. Carlos Lamas, Dr. Cláudio de Carvalho e Dr. Márcio Oliveira pelo auxilio e atenção durante as visitas às coleções de suas instituições.

Ao Dr. Daniel Whitmore (BNMH) e ao Dr. James O'Hara (CNC) pelas fotografias de alta qualidade dos espécimes tipos.

Ao Dr. Orlando Tobias Silveira pela amizade, valiosas sugestões ao longo desse trabalho e por toda ajuda ao longo da minha jornada na Entomologia.

Ao Dr. Inocêncio de Sousa Gorayeb pela amizade, sugestões ao longo desse trabalho, pela orientação durante os meus primeiros anos como Dipteróloga e por todo o incentivo.

Á Dra. Maria Cristina Esposito pelas conversas, carinho, incentivo e atenção durante as minhas visitas à UFPA.

À Dra. Marina Mendonça pela disponibilização do material de estudo sobre análise filogenética, pelo carinho e amizade.

Sou imensamente grata aos meus amigos da GDM (Galera do Museu) e do Laboratório de Invertebrados da UFPA por tonarem os dias mais fáceis e divertidos. Em especial, gostaria de agradecer ao Matheus Tavares por todo o suporte com a vetorização dos desenhos, amizade e pelos memes e vídeos fofos diários; à Thayane Mendonça e Cláudia Xavier por constituírem a melhor equipe de trabalhos durante as disciplinas e, principalmente, pelo suporte emocional e científico; à Sofia Lins por todo o apoio, antes mesmo de eu entrar na pós-graduação, pela companhia durante a disciplina e visita ao MZUSP, pela análise e fotos do material no BMNH e, principalmente, pela amizade; à Jéssica Soares pela ajuda durante a visita e análise do material no INPA e pela amizade inestimável ao longo desses seis anos; ao Mariano Brandão pela amizade, conversas, incentivo e carinho; à Marcely Valois pelas conversas "cabeça", dicas e amizade; e ao Paulo Roberto pelas dicas sobre a produção de mapas e amizade.

À CBF (Cássia, Bianca e Flavio) por me acolherem em todos os momentos que precisei. Por me proporcionarem momentos de descontração e me incentivarem da melhor maneira possível. Amo vocês!

Ao Washington e a Suzy, minha família em Curitiba, por me acolherem durante o tempo que visitei a coleção da UFPR – DZUP sem nem ao menos me conhecerem. Obrigada pelo suporte, carinho, amor e proteção que tiveram comigo. É muito bom saber que ainda existem pessoas como vocês no mundo, pessoas dispostas a conhecer as histórias e ajudar outras pessoas. Aproveito para agradecer a plataforma Couchsurfing por ter me proporcionado conhecer pessoas maravilhosas.

Ao Lucas Roberto por me receber tão bem no laboratório da UFPR, por tornar as horas do almoço muito mais divertidas, pelas dicas sobre mapas e análise filogenética e principalmente pela amizade. Muito obrigada por tudo!

À tia Karinna e ao Guilherme por me receberem em sua casa no Rio de Janeiro durante a minha visita ao Museu Nacional. Obrigada pelo carinho e cuidado comigo. Amo vocês!

Á Carolina Camargo por ter me acolhido em São Paulo durante a minha visita ao MZUSP. Muito obrigada por todo carinho e suporte.

Ao Museu Paraense Emílio Goeldi (MPEG), que tem sido minha segunda casa durante esses cincos anos, por todo suporte oferecido durante a minha jornada desde aluna de PIBIC à Pós. Que nossos governantes olhem mais para a importância dos museus e da ciência para esse país.

Aos técnicos do MPEG Augusto Quaresma e José Orlando por todo o suporte com a curadoria do material recebido e enviado e pela amizade.

A Universidade Federal do Pará pela infraestrutura concedida para a realização deste trabalho.

Ao Programa de Pós-Graduação em Zoologia- PPGZOOL pelo suporte oferecido durante o mestrado.

Ao Programa de Apoio à Pós-Graduação -PROAP, pelo recurso financeiro concedido durante uma das viagens às coleções entomológicas.

A Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (CAPES) pela concessão da bolsa durante o mestrado.

Á Willi Hennig Society por disponibilizar o acesso ao programa TNT.

Por fim, agradeço a todos que contribuíram direta ou indiretamente para a realização desse trabalho.

SUMÁRIO

Taxonomic revision and phylogenetic analysis of *Retrocitomyia* Lopes, 1983 (Diptera: Sarcophagidae)

ABSTRACT

Retrocitomyia Lopes, 1983 is a Neotropical genus of medium-sized flesh flies (5-11 mm), characterized mainly by the postgonite laterally curved and pointed apex. This genus comprises 10 valid species which biology is poorly known. The taxonomic revision of the genus resulted in 11 species, being one new species, *Retrocitomyia silveirai* sp. n. All species are redescribed and illustrated. Distribution maps and an update of key for male identification is provided. In addition, it is proposed a hypothesis of the phylogenetic relationship to the species of the genus, based on 19 external morphological characters of male adults, mainly from terminalia. The analysis has 14 terminal taxa, being 11 *ingroup* and three *outgroups.* The monophyly of *Retrocitomyia* was recovered sustain by four autapomorphies: (1) abdominal ST5 with posterior arm long, (2) abdominal ST5 with median lobe rounded, (3) median lobe of abdominal ST5 protruding, (4) cercus with a dorsal concavity. The result of phylogenetic analysis shows a basal polytomy included the type-species (*R. retrocita*) and *R. mizuguchiana*, *R. silveirai* **sp. nov.**, *R. adolenda,* e *R. fluminensis*. Besides that, the analysis recovered a clade (Clade A) formed by (*R. andina*, (*R. mexicana* + *R. trinitatensis*), (*R. sisbiota* + (*R. urumajoensis* + *R. paraguayensis*)).

Keywords: Neotropical fauna, flesh flies, Sarcophaginae, taxonomy, cladistic.

Revisão taxonômica e análise filogenética das espécies de *Retrocitomyia* Lopes, 1983 (Diptera: Sarcophagidae)

RESUMO

Retrocitomyia Lopes, 1983 é um gênero neotropical de moscas de tamanho médio (5-11 mm), caracterizadas principalmente pelo pós-gonito curvado lateralmente com um ápice pontiagudo. Este gênero possui 10 espécies válidas na qual a biologia é pouco conhecida. A revisão taxonômica desse gênero resultou em 11 espécies, sendo uma espécie nova, *Retrocitomyia silveirai* sp. n. Todas as espécies foram redescritas e ilustradas. Mapas de distribuição e uma atualização da chave de identificação para machos foi apresentada. Além disso, foi proposta uma hipótese de relação filogenética para o gênero baseado em 19 caracteres da morfologia externa dos machos adultos, principalmente da terminália. A análise contém 14 táxons terminais, sendo 11 *ingroup* e três *outgroups.* A monofilia de *Retrocitomyia* foi recuperada sustentada por quatro autapomofias: (1) braço posterior do esternito 5 longo, (2) esternito 5 com lobo mediano arredondado, (3) lobo mediano do esternito 5 protuberante, (4) cerco com concavidade dorsal. O resultado da análise filogenética mostrou uma politomia basal incluindo a espécie-tipo (*R. retrocita)* e *R. mizuguchiana*, *R. silveirai* **sp. nov.**, *R. adolenda,* e *R. fluminensis*. Além disso, a análise recuperou um clado (Clado A) formado por (*R. andina*, (*R. mexicana* + *R. trinitatensis*), (*R. sisbiota* + (*R. urumajoensis* + *R. paraguayensis*)).

Palavras-chave: fauna Neotropical, Sarcophaginae, taxonomia, cladística.

INTRODUÇÃO GERAL

1.1 Diptera e Sarcophagidae

A ordem Diptera é composta por insetos conhecidos popularmente como moscas, mosquitos, mutucas, maruins, carapanãs, tatuquiras, piuns, entre outros, facilmente reconhecidas pelas asas mesotorácicas bem desenvolvidas e as metatorácicas modificadas em halteres, também chamados de balancins, um órgão com função de estabilidade para o voo (Grimaldi & Engel, 2005; Carvalho *et al.*, 2012).

As moscas são os insetos ecologicamente mais diversos, podendo ser hematófagos, endoparasitas e ectoparasitas de vertebrados, galhadores, minadores, predadores, parasitoides, polinizadores, saprófagos e brocadores de madeira (Grimaldi & Engel, 2005).

Entre os clados mais diversos de Diptera, está a superfamília Oestroidea, a qual compreende cerca de 15.000 espécies (Marinho *et al.,* 2012). É composta por sete famílias: Calliphoridae, Sarcophagidae, Rhinophoridae, Rhiniidae, Tachinidae, Oestridae e Mystacinobiidae (Kutty *et al.,* 2010). Pape (1992), em um estudo sobre as relações filogenéticas do grupo Tachinidae, propôs que Sarcophagidae e Tachinidae formam um clado que é grupo irmão do clado composto por (Rhinophoridae + (Oestridae + Calliphoridae)). Na hipótese filogenética de Kutty *et al*. (2010), baseada em dados moleculares, Mystacinobiidae é grupo irmão de Sarcophagidae. No entanto, na hipótese filogenética de Cerretti *et al.* (2017), baseados em dados morfológicos e moleculares, Oestridae é o grupo irmão de Sarcophagidae.

Sarcophagidae é a segunda família mais diversa de Oestroidea, com 173 gêneros e cerca de 3.100 espécies descritas distribuídas em todo o mundo, com exceção dos polos (Pape, 1996; Pape *et al*., 2011). Muitas espécies são necrófagas, no entanto, há as larvas parasitas de vertebrados e invertebrados. Os sarcofagídeos são de tamanho médio a grande (8 a 25 mm), mas algumas espécies são pequenas (5 a 10 mm) e geralmente possuem coloração cinza, três faixas pretas longitudinais no tórax, abdômen enxadrezado ou manchado coberto com polinosidade cinzenta, azulada ou dourada (Pape & Dahlem, 2010).

Por possuírem morfologia externa pouco variada, a identificação das espécies é baseada principalmente em características da terminália dos espécimes machos. Contudo, a morfologia da terminália das fêmeas pode fornecer importantes caracteres para estudos sistemáticos (Mello-Patiu & Santos, 2001; Carvalho-Filho & Esposito, 2012; Vairo *et al*., 2015; Camargo *et al.*, 2018). Tibana & Mello-Patiu (1985), a partir do estudo de fêmeas de *Oxysarcodexia* Townsend, 1917, observaram e descreveram a morfologia da terminália feminina de 38 espécies baseadas, principalmente, no sintergito 6+7 das fêmeas. Mello-Patiu & Santos (2001), em uma análise detalhada e comparada entre

a morfologia da terminália feminina de 13 espécies de *Nephochaetopteryx*, verificaram que existem diferenças principalmente no formato da placa vaginal.

A monofilia de Sarcophagidae é sustentada pelas seguintes sinapomorfias: oviduto com bolsa incubatória bilobada; esclerito baciliforme (esternito 10) dos machos curto e quase perpendicular ao plano mediano; esternitos abdominais sem sétula alfa (*sensilla trichodea*); espiráculo posterior da larva situados em uma cavidade; larvas de segundo e terceiro estádio com peritrema do espiráculo posterior incompleto e botão espiracular pouco perceptível (Rognes 1997; Pape 1992; Pape & Arnald, 2001). Além disso, a monofilia do grupo também é corroborada por dados moleculares (Kutty *et al.,* 2010; Marinho *et al.,* 2012).

Pape (1996), no catálogo de espécies de Sarcophagidae do mundo, propôs a classificação dos sarcofagídeos em três subfamílias: Miltogramminae, Paramacronychiinae e Sarcophaginae, sendo que as duas últimas formam um clado (Pape, 1996; Giroux *et al.,* 2010; Kutty *et al*., 2010). A maioria das espécies Neotropicais pertence à subfamília Sarcophaginae, enquanto que Miltogramminae e Paramacronychiinae são mais diversas no Velho Mundo. Na região Neotropical, Paramacronychiinae é representada somente por uma espécie, *Galopagomyia inoa* (Walker, 1849), endêmica das Ilhas Galápagos (Pape, 1996).

Recentemente, Buenaventura & Pape (2018), em um estudo baseado em dados morfológicos, apresentaram uma proposta filogenética para a subfamília Sarcophaginae, fornecendo uma compreensão inicial das relações entre os gêneros bem como um entendimento da evolução e funcionalidade da terminália masculina. Contudo, os gêneros da subfamília ainda carecem de revisão taxonômica que viabilize a identificação a nível específico. Além disso, há poucos estudos sobre as relações filogenéticas interespecíficas, quando comparado ao número de espécies conhecidas. Estas análises poderiam ajudar também na delimitação de alguns gêneros, que ainda não são bem definidos (Roback, 1954; Pape, 1996; Giroux *et al*., 2010; Stamper *et al*., 2012; Buenaventura & Pape, 2015; Buenaventura & Pape, 2018).

1.2 *Retrocitomyia* Lopes, 1983

Retrocitomyia é um gênero da subfamília Sarcophaginae que possui 10 espécies válidas que ocorrem na região Neotropical, do sul do México ao sul da América do Sul.

As fêmeas são pouco conhecidas e somente três espécies possuem descrição das terminálias femininas: *R. retrocita,* descrita por Lopes (1945) como *P. setifacies*; *R. sisbiota,* descrita por Mello-Patiu & Salazar-Souza (2016) e *R. trinitatensis*, descrita por Lopes (1985).

Nada é conhecido sobre a biologia dos imaturos das espécies deste gênero e os espécimes adultos têm sido coletados com armadilhas contendo matéria orgânica animal em decomposição

como isca (Lopes, 1975; Dias *et al.,* 1984; Tibana & Xerez, 1985; Mello-Patiu *et al.,* 2009; Pape & Dahlem 2010; Alves *et al.,* 2014; Sousa *et al.,* 2015; Mello-Patiu & Salazar-Souza, 2016; Sousa *et al.,* 2016). Os adultos ocorrem em vários tipos de biomas e algumas espécies parecem estar restritas a ambientes costeiros.

1.2.1 Histórico taxonômico

Lopes (1973) considerou a espécie *Sarcophaga retrocita* Hall, 1933, proveniente do Panamá, como pertencente ao gênero *Paraphrissopoda* (este gênero atualmente é sinônimo júnior de *Peckia*). Além disso, Lopes (1973) considerou as espécies *Paraphrissopoda setifacies* Lopes 1945, da Colômbia, e *Peckia irwini* Dodge (1966), de El Salvador, como sinônimos júnior de *P. retrocita* e apresentou ilustrações da terminália do holótipo e do parátipo das espécies nominais *Sarcophaga retrocita* e *Peckia irwini*, respectivamente. Segundo a ilustração de Lopes (1973), a terminália do holótipo de *P. irwini* é diferente da terminália do restante dos espécimes de *R. retrocita,* inclusive do espécime-tipo, porém Lopes (1973) considerou que esta diferença se tratava de uma variação intra-específica, uma vez que a espécie é amplamente distribuída.

A espécie *Sarcophaga adolenda* foi descrita por Lopes (1935) baseada em dois espécimes machos, um do Rio de Janeiro e outro proveniente do Rio Grande do Norte, os quais foram posteriormente transferidos para o gênero *Paraphrissopoda* por Lopes (1969).

Lopes (1983), em um detalhado estudo de morfologia comparada do esqueleto céfalo-faríngeo das larvas de primeiro estádio de várias espécies de Sarcophagidae da região Neotropical, erigiu o gênero *Retrocitomyia* para as espécies *Paraphissopoda retrocita* e *Paraphrissopoda adolenda*. Apesar disso, no catálogo das espécies de Sarcophagidae do mundo, Pape (1996) manteve *P. adolenda* no gênero *Peckia*. No entanto, esta combinação foi feita arbitrariamente, uma vez que Pape (1996) não analisou nenhum espécime.

Na análise filogenética do gênero *Peckia* de Buenaventura & Pape (2015), a espécie *P. adolenda*, formou um clado com a espécie *R. retrocita*, que foi usada como grupo externo, confirmando o arranjo taxonômico proposto por Lopes (1983).

Lopes (1985), descreveu seis espécies novas de *Retrocitomyia* e apresentou uma chave de identificação para as espécies até então descritas, baseado principalmente na morfologia da terminália masculina. No entanto, Lopes (1985) considerou que estas espécies formavam um grupo distinto do grupo formado por *R. retrocita* e *R. adolenda* (as duas espécies de *Retrocitomyia* previamente descritas) e que a inclusão das espécies novas neste gênero era provisória.

Tibana & Xerez (1985) descreveram uma espécie nova de *Retrocitomyia* do Brasil e redescreveram a espécie *R. retrocita* baseado em espécimes de Roraima.

Lopes (1988) descreveu *R. argentina* baseado em um espécime proveniente da Argentina e indicou que a inclusão desta espécie em *Retrocitomyia* era provisória. No trabalho de filogenia, evolução e funcionalidade da terminália masculina de Sarcophaginae, Buenaventura & Pape (2018) transferiram *R. argentina* para o gênero *Austrophyto*.

Recentemente, Mello-Patiu & Salazar-Souza (2016), descreveram *R. sisbiota* e atualizaram a chave produzida por Lopes (1985), fornecendo fotos das terminálias masculinas, redescrições de algumas espécies, novos registros de distribuição e um catálogo taxonômico.

Dessa forma, o gênero compreende 10 espécies válidas: *R. adolenda* (Lopes, 1935) (Brasil); *R. andina* Lopes, 1985 (Bolívia e Peru); *R. fluminensis* Lopes, 1985 (Brasil); *R. mexicana* Lopes, 1985 (México); *R. mizuguchiana* Tibana & Xerez, 1985 (Brasil); *R. paraguayensis* Lopes, 1985 (Brasil e Paraguai); *R. retrocita* (Hall, 1933) (Brasil, Colômbia, El Salvador, Guiana, Panamá e Peru); *R. sisbiota* Mello-Patiu & Salazar-Souza, 2016 (Brasil); *R. trinitatensis* Lopes, 1985 (Trinidad & Tobago) e *R. urumajoensis* Lopes, 1985 (Brasil).

1.2.2 Classificação

Lopes (1983) forneceu uma série de caracteres diagnósticos para *Retrocitomyia* quando erigiu este gênero, tais como: tórax com cerdas acrosticais pré-suturais não diferenciadas e duas cerdas acrosticais pós-suturais diferenciadas; duas ou três cerdas frontais abaixo do nível da antena; fêmur mediano sem ctenídeo; gena com setas claras; tergitos genitais da fêmea grande, representado por duas placas; edeago pequeno com teca (basifalo) curta; placa apical (juxta) desenvolvida. Os caracteres propostos por Lopes (1983) para os espécimes adultos, não permitem a caracterização do gênero, já que eles também ocorrem em outros gêneros de Sarcophagidae. Além disso, nem todas as espécies conhecidas atualmente possuem cerdas amarelas na gena.

Segundo Lopes (1983) os espécimes adultos de *Retrocitomyia* são semelhantes morfologicamente aos do gênero *Peckia*. No entanto, as larvas de primeiro estádio são completamente diferentes, já que são desprovidas de mandíbula e possuem arco clipeal curto. Por isso, Lopes (1983) alocou *Retrocitomyia* na tribo Cuculomyiini e *Peckia* na tribo Sarcodexiini.

Lopes (1983) dividiu a tribo Cuculomyiini em seis subtribos: Cuculomyiina (para os gêneros *Cuculomyia*, *Titanogripa* e *Aypel*), Panavina (*Panava*), Sarconeivina (*Sarconeiva*), Dexosarcophagina (*Dexosarcophaga*), Malacophagomyiina (*Malacophagomyia*) e Udamopygina (*Udamopyga*, *Retrocitomyia*, *Dexomyiophora* e *Chlorosarcophaga*, sendo que estes dois últimos gêneros são atualmente subgêneros de *Lepidodexia*). Apesar disso, Lopes (1983) mencionou que a inclusão de *Retrocitomyia* em Udamopygina era provisória.

Pape (1996) apresentou uma lista de caracteres diagnósticos para todos os gêneros de Sarcophagidae do mundo e para *Retrocitomyia* foram os seguintes: parafaciália com sétulas e sem cerdas; parede pós-alar com sétulas; fêmur do macho sem ctenídio; cerco dos machos achatado dorsalmente; edeago curto e compacto; estilo mediano e estilos laterais presentes e pós-gonitos direcionados lateralmente. Estes caracteres estão presentes em vários gêneros de Sarcophagidae e somente o último ocorre exclusivamente nas espécies de *Retrocitomyia*. Além disso, algumas espécies de *Retrocitomyia* não apresentam cerco achatado dorsalmente, e esta característica pode ser uma sinapomorfia de um grupo menor de espécies dentro de *Retrocitomyia*.

Nos trabalhos que apresentam hipóteses de filogenia dos gêneros de Sarcophagidae (Giroux *et al.,* 2010; Kutty *et al*., 2010; Piwczynski *et al*., 2014; Buenaventura & Pape, 2015; Zhang *et al.,* 2016; Buenaventura & Pape, 2018) somente Buenaventura & Pape (2015, 2018) utilizaram espécies de *Retrocitomyia*. No trabalho sobre o relacionamento filogenético das espécies de *Peckia* e gêneros relacionados (Buenaventura & Pape, 2015), foram utilizadas somente duas espécies, *R. retrocita* e *R. adolenda.* Neste estudo, *Retrocitomyia* formou um clado junto com *Peckiamyia* que foi caracterizado por apresentar espécies que possuem distifalo com placa lateral parafálica (plp) esclerotizada e direcionada anteriormente que se originam da margem anteromedial do paráfalo. No entanto, nem todas as espécies de *Retrocitomyia* possuem plp. Este clado faz parte de uma politomia que inclui o clado formado pelas espécies de *Engelimyia* e o clado formado pelas espécies de *Lipoptilocnema*, *Helicobia*, *Sarcophaga* e *Peckia*.

Posteriormente, na filogenia da subfamília Sarcophaginae, Buenaventura & Pape (2018), utilizaram três espécies de *Retrocitomyia*: *R. adolenda, R. fluminensis* e *R. retrocita.* O gênero foi alocado no clado *Peckiamyia* constituído por (*Retrocitomyia* + (*Peckiamyia* + *Duckemyia*)), sendo caracterizado por possuir o falo com comprimento menor ou quase igual aos pré-gonitos.

Apesar disso, até o momento, não há propostas de relacionamento entre as espécies do gênero *Retrocitomyia*. Desta forma, o presente trabalho teve como objetivo revisar as espécies do gênero fornecendo informações atualizadas e detalhadas que permitam identificações acuradas a nível específico, bem como hipóteses filogenéticas entre as espécies e chave de identificação.

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Capítulo 1

Taxonomic revision and phylogeny of *Retrocitomyia* Lopes, 1983 (Diptera: Sarcophagidae)

O capítulo I desta Dissertação foi elaborado e formatado conforme as normas da publicação científica Insect Systematics & Evolution, as quais se encontram em anexo (Anexo 1)

Taxonomic revision and phylogeny of *Retrocitomyia* Lopes, 1983 (Diptera: Sarcophagidae)

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Abstract

The taxonomy of the Neotropical genus *Retrocitomyia* Lopes, 1983 (Sarcophagidae) is revised and a morphological phylogeny to species is provided. Ten species were previously known for this genus, and in this work, we described a new species from the Brazilian Amazon Forest (*R. silveirai* **sp. n**.). All species are redescribed and illustrated. Distribution maps and an update of key for male identification is provided.

Key words: flesh flies, Sarcophaginae, Neotropical fauna, taxonomy, cladistics.

Introduction

The Sarcophagidae or flesh flies are world-wide in distribution and form a rich component of the dipteran fauna in many environments. The Neotropical region is one of the most diverse for the group with about 800 species (Carvalho et al. 2012).

The identification of flesh flies is based mainly on features of the male terminalia, such as fifth sternite, cercus, surstylus, gonites, and structures of the phallus (Carvalho-Filho & Esposito 2012; Buenaventura & Pape 2013; Mulieri & Mello-Patiu 2013; Santos & Mello-Patiu 2018). These structures are also important sources of characters in the reconstruction of evolutionary history

(Giroux et al. 2010; Whitmore et al. 2013; Buenaventura & Pape 2015, 2018). In spite of this, the structures of the genitalia of many species and genera are poorly characterized.

Although there has been an increase in the number of published papers on the phylogeny of Neotropical Sarcophaginae in the last years (Lopes 1984; Pape 1994; Giroux et al. 2010; Kutty et al. 2010; Stamper et al. 2012; Piwczyński et al. 2014; Buenaventura & Pape 2015, 2018), the evolutionary history of the species of many genera has not been studied. In addition, since these analyzes treat the relationships among the genera, few species of each genera have been utilized.

One of these genera is the Neotropical *Retrocitomyia* that includes ten valid species. Specimens of this genus show a small and darkened phallus, hampering the visualization of the structures that compose it. Some authors (Lopes 1983; Pape 1996; Mello-Patiu & Salazar Souza 2016; Buenaventura & Pape 2018) have proposed diagnostic features for this genus, but most of these are also present in other genera and thus are not synapomorphies. In addition, there is no consensus about the homologies of structures of the phallus (see Buenaventura & Pape 2015, 2018; Mello-Patiu & Salazar-Souza 2016).

Therefore, the main objectives of this paper are to provide a revision and phylogenetic hypothesis for species of *Retrocitomyia*, with emphasis on features of the male terminalia.

Material and methods

Loans of specimens were provided by the curators (in parenthesis) of the following institutions:

BMNH The Natural History Museum, London, United Kingdom (Daniel Whitmore)

CAS California Academy of Science, San Francisco, California, USA (Christopher Grinter)

CNC Canadian National Collection of Insects, Arachnids and Nematodes, Ottawa, Ontario, Canada (James O'Hara)

DZUP Departamento de Zoologia da Universidade Federal do Paraná, Curitiba, Paraná, Brazil (Cláudio B. de Carvalho)

INPA Instituto Nacional de Pesquisas da Amazônia, Manaus, Amazonas, Brazil (Márcio Oliveira)

MNRJ Museu Nacional da Universidade Federal do Rio de Janeiro, Rio de Janeiro, Brazil (Cátia A. Mello-Patiu)

MPEG Museu Paraense Emílio Goeldi, Pará, Brazil (Orlando Tobias Silveira)

MZUSP Museu de Zoologia da Universidade Federal de São Paulo, São Paulo, Brazil (Carlos Einicker Lamas)

The male and female terminalia were dissected and cleared in 10% potassium hydroxide, neutralized with 10% acetic acid, washed with distilled water, and mounted for study in non-permanent slides with glycerin. Illustrations were made using a Leica D1000 optical microscope and a Leica M205C stereomicroscope, both equipped with a camera lucida. The terminalia were then placed in plastic vials with glycerin and pinned below their source specimens. Images of relevant diagnostic structures and those in the key were produced with a system camera Leica DFC450 coupled to a Leica M205A stereomicroscope and with the stacking program Leica Application Suite Version 4.2.0. Scanning electron microscopes (SEM) images were produced with a Tescan Mira3 after gold-palladium coating. Images were vectorized and edited using and Adobe Illustrator CS6® and Adobe Photoshop CS6®, plates of images were made using Adobe InDesign CC® (Adobe Systems, Inc., San Jose, CA).

Specimens were identified by comparison with holotypes and paratypes whenever possible, as well as by comparison with original descriptions or redescriptions.

Terminology of adult morphology follows Cumming & Wood (2009). Phallic terminology follows Giroux et al. (2010), except for the terms “paraphallus” and “vesical lateral arm” which follow Whitmore et al. (2013) and Buenaventura & Pape (2018), respectively. In addition, the term “vesical arch” was used to facilitate comprehension of the vesica structures. Besides that, there are no terms to refer to the structures of sternite 5, and we thus adopted the terms “median cleft” for the fissure in the middle of the sternite, “median lobe” for the lobe located next to the cleft, and “posterior arm” for the lateral projection of the sternite (Carvalho-Filho et al., in preparation). The terminology of female terminalia follows Shewell (1987), except for the term vaginal plate, which follows Lopes (1941b). The abbreviation T is used for abdominal tergites and ST for abdominal sternites.

Label information of holotypes is cited verbatim, with lines separated by a forward slash, different labels separated by a double forward slash, and comments given in square brackets.

Distribution

Distributional data are organized alphabetically by country (and state or province). New records are marked with an asterisk.

The maps with geographic records of species were generated using Quantum Gis version 2.18.10. Collecting sites indicated on the map are based on label data of examined specimens and on data from the literature (Hall 1933; Lopes 1935; Lopes 1945; Dodge 1966; Lopes 1973; Lopes 1983; Dias et al. 1984; Lopes 1985; Tibana & Xerez 1985; Pape 1996; Pape et al. 2004; Mello-Patiu et al. 2009; Sousa et al. 2015; Sousa et al. 2016; Mello-Patiu & Salazar-Souza 2016).

Phylogenetic analysis

Only females of *R. retrocita*, *R. trinitatensis* and *R. sisbiota* are known. In this work, we describe the female of *R. urumajoensis.* For this reason, the key to species, redescriptions, descriptions, and cladistics are focused on male adults.

Three species were included in the phylogenetic analysis as outgroups: *Duckemyia latifrons* Kano & Lopes, *Peckiamyia abnormalis* (Hall), and *Peckiamyia minutipenis* (Hall). The choice of the terminal outgroup was based on phylogenetic hypotheses for Sarcophaginae (Buenaventura & Pape 2018), where these species are part of the same clade of *Retrocitomyia*.

Characters were coded from direct observations of specimens and were adapted from the cladistic analysis of Buenaventura & Pape (2018). They were treated as non-additive (unordered).

The character matrix (Table 1) was analyzed with TNT (Goloboff et al. 2008), using equal weights.

Tree searches were conducted with traditional search option with 1000 replicates of random-addition sequences followed by bisection-reconnection of the tree, saving 100 trees per replication, and collapsing rules min. length = 0 (memory = 9999), saving the most parsimonious trees (MPTs). Group support was estimated using Relative Bremer Support (rBS) (Goloboff & Farris 2001) and frequency differences (GC) (Goloboff et al. 2003). Bremer support was calculated for the MPTs and for 20.000 suboptimal trees up to 10 steps longer than the shortest tree. Frequency differences (GC) were calculated with 5000 replicates by symmetrical resampling (Goloboff et al. 2003) on the shortest tree. Characters and states were traced over trees using software WinClada ver. 1.00.08 software. Consistency index and retention index were calculated using Winclada.

Results and Discussion

Taxonomic history

Lopes (1973) transferred *Sarcophaga retrocita* Hall, 1933, known from Panama, to the genus *Paraphrissopoda* (currently a junior synonym of *Peckia*), and he considered *Paraphrissopoda setifacies* Lopes 1945, from Colombia, and *Peckia irwini* Dodge (1966), from El Salvador, to be junior synonym of *P. retrocita*. In his catalogue (Lopes 1969), the species *Sarcophaga adolenda* Lopes 1935 was transferred to *Paraphrissopoda*.

Retrocitomyia was erected by Lopes (1983) to include *Paraphrissopoda retrocita* (Hall 1933) (type species by original designation) and *Paraphrissopoda adolenda* (Lopes 1935). In the "Catalogue of the Species of Sarcophagidae of the World" (Pape 1996), *R. adolenda* was considered as belonging to the genus *Peckia*. However, in the phylogenetic hypothesis of

Buenaventura & Pape (2013, 2015), the species *R. adolenda* and *R. retrocita* were recovered as a clade.

Lopes (1985) described six new species of *Retrocitomyia* from Brazil (*R. fluminensis*, *R. urumajoensis*), Mexico (*R. mexicana*), Paraguay (*R. paraguayensis*), Trinidad (*R. trinitatensis*), Bolivia and Peru (*R. andina*), and he provided an identification key to species of this genus. However, he mentioned that these six new species form a "uniform group of species, somewhat distinct from the type-species, *Retrocitomyia retrocita*" and for this reason they were "considered provisionally in this genus". In the phylogenetic hypothesis of Buenaventura & Pape (2018), the only species of this group of species described by Lopes (1985) utilized in the analyzes, *R. fluminensis*, formed a clade with *R. retrocita* and *R. adolenda*.

Tibana and Xerez (1985) described a new species from Brazil, *R. mizuguchiana*, and redescribed *R. retrocita* based on Brazilian specimens. Posteriorly, Lopes (1988) described *R. argentina,* but this species was recently transferred to the genus *Austrophyto* Lopes 1989 (Buenaventura & Pape 2018).

Mello-Patiu and Salazar-Souza (2016) presented the description of a new species, *R. sisbiota*, the redescription of four others (*R. fluminensis, R. mizuguchiana, R. paraguayensis* and *R. retrocita*), a catalog of the genus, and an identification key to the males of all species of *Retrocitomyia*.

Therefore, *Retrocitomyia* contains ten valid species: *R. adolenda* (Lopes 1935)*, R. andina* Lopes 1985*, R. fluminensis* Lopes 1985*, R. mexicana* Lopes 1985*, R. mizuguchiana* Tibana & Xerez 1985*, R. paraguayensis* Lopes 1985*, R. retrocita* (Hall 1933)*, R. sisbiota* Mello-Patiu & Salazar-Souza 2016*, R. trinitatensis* Lopes 1985, and *R. urumajoensis* Lopes 1985.

Diagnosis

Lopes (1983) described *Retrocitomyia* based mainly on characters of the first instar larvae. He also presented some diagnostic features of adult morphology, such as thorax with presutural acrostichal setae undifferentiated; two postsutural dorsocentral setae; two or three frontal setae inserted below the level of the antenna; mid femur without ctenidium; gena with pale setae; female genital with tergite VI large, represented by a pair of plates; phallus small with short basiphallus and juxta developed. All these adult features also occur in many other genera of Sarcophagidae.

Pape (1996), in his Catalogue of the Sarcophagidae of the World, presented a list of diagnostic characters for the valid genera of Sarcophagidae, including *Retrocitomyia*, that are the following: "Parafacial plate with setulae only; postalar wall setose; male mid femur without ctenidium; wing with third costal section bare ventrally; male cercus somewhat flattened dorsally

(posteriorly); phallus short and compact; phallus with three distinct styli and postgonite directed laterally". Although these features together are very useful for the identification of the genus, they are also present in many other genera of Sarcophagidae, and none are restricted to *Retrocitomyia.*

Mello-Patiu & Salazar-Souza (2016) mentioned that the three main diagnostic features of the genus are the "cercus somewhat flattened posteriorly, with the cercal base laterally extended as a flap and a characteristic depression; phallus small and compact, with a short basiphallus; and postgonite conspicuously curved laterally, perpendicular to the body axis and with a pointed tip". These features were previously mentioned by Pape (1996). However, the flattened cercus is not present in all species of this genus. The cercal prongs of *R. adolenda*, *R. mizuguchiana*, *R. retrocita*, and *R. silveirai* sp. nov. are not flattened (Figures 5A, D, F, 9C, 13C, 15C, 16C). The short and compact phallus and the laterally projected postgonite are features shared with *Peckiamyia*.

Buenaventura and Pape (2018) provided an extensive list of diagnostic features of the genus *Retrocitomyia*: "postalar wall setulose; tegula orange or yellowish; wing vein R_1 bare dorsally; wing vein R_{4+5} with dorsal setulae not reaching crossvein r-m; third costal sector of wing setulose ventrally; male mid-femur without a ctenidium; male hind tibia without an apical posteroventral seta; male abdominal ST5 with a wide V-shaped cleft; *cercal prong bilobed; cercal prong bilobed with a blunt tip*; *cercal prong without dorsomedial setae*; postgonite perpendicular to body axis; phallus almost as short or shorter than pregonite; phallus short and compact; phallus with a distinct hinge between basi and distiphallus; vesica three-lobed with a proximal section undivided and arch-shaped; *vesical lateral arms paddle-like with a hook-shaped apex*; acrophallus formed of a capitis, hillae, lateral styli and a median stylus; lateral styli tube-shaped and with an outlet; hillae directed ventrally; hillae sclerotized; hillae paddle-like; hillae touching the inner paraphallic wall only at apex; capitis flat and simple; median stylus tube-shaped and with an outlet; *juxta squared, with distal margin even; juxta undulated dorso-ventrally or with a median folding*". However, only the above features in italic were cited as autapomorphies of the genus by the authors.

The combination of these features is very useful in the identification of the genus. However, the bilobed cercal prong was observed only in *R. fluminensis* that was the species utilized by Buenaventura & Pape (2018) to illustrate this feature. Many species of *Retrocitomyia* have a cercal prong with dorso-medial setae. The shape of the vesical lateral arms is a useful feature to separate most of the species of *Retrocitomyia* since the shape varies markedly among the species and only some species (*R. mizuguchiana, R. retrocita, R. sisbiota*, and *R. urumajoensis*) show a paddle-like vesical lateral arm. Therefore, these features could not be synapomorphies of *Retrocitomyia*.

Based on the works mentioned above and on the large number of examined specimens, no unique feature of *Retrocitomyia* was found. On the other hand, the species of this genus are easily characterized by the combination of features mentioned by Buenaventura & Pape (2018), except

that mentioned in the previous paragraph. The postgonite perpendicular to body axis together with the short and compact phallus are present only in two closely related genera (*Retrocitomyia* and *Peckiamyia*), and thus they are useful in the identification of *Retrocitomyia*. This genus can be easily separated from *Peckiamyia* mainly in having ST4 without two posterior patches of dense black setae and vesical arch (see comment in the next section) not divided.

Phylogenetic relationship hypothesis and evolution of male terminalia

A total of 19 morphological characters were scored, nine from external morphology and 10 from terminalia. Analysis of the dataset recovered 14 Most Parsimonious Trees (MPTs). All 14 MPTs had a length of 24 steps (consistency index = 79 and retention index = 84). The strict consensus tree (Figure 1) had a length of 27 steps (consistency index = 70 and retention index = 75).

The analysis corroborated the generic status of *Retrocitomyia* by four autapomorphies (GC =89 and rBS = 100): (i) abdominal ST5 with posterior arm long (Char. 6:1), (ii) abdominal ST5 with median lobe rounded (Char. 8:1), (iii) median lobe of abdominal ST5 protruding (Char. 9:1), and (iv) cercus with dorsal concavity present (Char. 11:1). However, many sarcophagid species have the posterior arm of ST5 long, as well the rounded median lobe, making these features non-exclusive of *Retrocitomyia.* The first characteristic is absent in *R. sisbiota,* since this species has the posterior arm short, which is relatively unusual in Sarcophagidae. The protruding median lobe seems to be useful to characterize the species of this genus. Besides that, the dorsal concavity on the cercus seems to have arisen and then disappeared in some species (*R. adolenda, R. andina, R. mexicana, R. paraguayensis, R.sisbiota, R. trinitatensis,* and *R. urumajoensis*). This concavity is useful to characterize some species (*R. fluminensis, R. mizuguchiana, R. retrocita,* and *R. silveirai* sp. nov.), since the shape of this concavity is specific in each one.

The resulting phylogenetic hypothesis (Figure 1) shows a basal polytomy including the type-species (*R. retrocita*) and *R. mizuguchiana*, *R. silveirai* sp. nov., *R. adolenda,* and *R. fluminensis*. The sister clade (*R. andina*, (*R. mexicana* + *R. trinitatensis*), (*R. sisbiota* + (*R. urumajoensis* + *R. paraguayensis*)) (named as Clade A) is composed mainly by the species described by Lopes (1985) (Figure 1). This corroborates the hypothesis of Lopes (1985) that these species compose a natural group, but it is contrary to his hypothesis that this group may not belong to *Retrocitomyia*. However, the group of species proposed by Lopes (1985) also included *R. fluminensis*, what was not recovered in the phylogenetic hypothesis showed herein. This species was included in this group by Lopes (1985) since it has flattened cercal prongs. Therefore, the flattened cercal prong seems to have occurred independently in this species.

This clade was supported by the vesical composed only by the vesical lateral arms (Char. 14:1). In the other species of *Retrocitomyia* the vesica is composed by two paired elongated plates that are united anteriorly by an arch, which was named here as the vesical arch. This feature is also present in *R. fluminensis*, and, for this reason, it was not recovered as belonging to clade A, that is composed by a group of species where it was previously classified (Lopes 1983). Tibana and Xerez (1985) named the vesical arch as vesica and the vesical lateral arm as lateral plate. The term lateral plate was widely utilized in the past to name not homologous structures of the male terminalia. For this reason, this term is not utilized nowadays. Buenaventura and Pape (2015) named the vesical arch as vesica, and they considered that the vesical lateral arm is composed of two parts: paraphallic lateral plate and harpes. Therefore, these authors considered that these parts are not a single structure. However, Mello-Patiu and Salazar-Souza (2016) analysed the male terminalia of many specimens from various species and considered all these structures as belonging to the vesica. Recently, Buenaventura & Pape (2018), following the opinion of Mello-Patiu and Salazar-Souza (2016), proposed the name vesical lateral arm, that is utilized herein, but they labelled the remaining region only as the vesica.

The resolution of the species of clade A was partially resolved, and it is composed of three main lineages recovered as a polytomy: one composed by only one species (*R. andina*), one composed by (*R. mexicana* + *R. trinitatensis*) (GC = 66 and rBS = 100) (Clade B), and the other composed of (*R. sisbiota* + (*R. urumajoensis* + *R. paraguayensis*) (GC = 51 and rBS = 50) (Clade C). Clade B was supported by having the vesical lateral arm convergent between them (Char. 16:1) and clade C has the juxta perpendicular to apical margin of the distiphallus (Char. 19:0).

This is the first approximation of the phylogenetic relationships for species of *Retrocitomyia*, although the resolution is poorly resolved for some species. There was difficulty in coding the character states of the phallus, since they are relatively similar and there are no unique characteristics of the groups, resulting in many autapomorphies. A phylogeny based on molecular data may be an alternative to the morphological reconstruction of the evolutionary history of the species of this genus.

Description. Male.

Head. Reclinate orbital seta present and more developed than the longest frontals; postocellar seta similar to outer seta; arista long, plumose on basal 2/3; palpus brownish. *Thorax.* Gray with silvery pruinosity and three dark brown longitudinal bands. *Chaetotaxy.* Postalar wall setulose; postalar callus with 2 setae; proepisternum bare, prosternum setulose on posterior half. *Wing.* Hyaline, costal spine present, vein R_1 bare, vein R_{4+5} with dorsal setulae on 3/4 of distance to

crossvein r-m, cell r_{4+5} open at wing margin, third costal sector ventrally bare. *Legs.* Blackish-brown; fore tibia with 2 median-basal anterodorsal setae, 1 posteromedial and a row of apical setae; mid femur with 2 median anterior setae and a row of setae along posteroventral margin (but without ctenidium); mid tibia with 2 median anterior and 2 posterior setae on apical third; hind trochanter with normal median-ventral setae; hind femur with rows of anterodorsal, anteroventral and posteroventral setae, and 1 longer preapical anteroventral setae; hind tibia with 1 anterobasal setae , 2 anteromedial setae and a row of anterodorsal apical setae. *Abdomen.* Syntergite 1+2, T3 and T4 each with one lateral marginal seta, T4 with one pair of stronger median marginal setae, ST5 usually with short median cleft; median lobe protruding, covered by fine setulae. *Terminalia.* Postgonite laterally curved, with usually a pointed apex bearing a dilated region with a small ventral seta; pregonite elongate with a curved apex anteriorly; phallus blackish-brown, short and compact; basiphallus shorter than distiphallus.

Biology

The biology of *Retrocitomyia* species is poorly known, but some specimens have been collected in traps baited rotting fruit, vertebrate carrion (bovine beef lung, fish, chicken), or invertebrates (crab, shrimp) (Lopes 1975; Dias et al. 1984; Tibana & Xerez 1985; Mello-Patiu et al. 2009; Pape & Dahlem 2010; Alves et al. 2014; Sousa et al. 2015; Mello-Patiu & Salazar-Souza 2016; Sousa et al. 2016).

Retrocitomyia urumajoensis seems to be associated with Atlantic coastal environments, such as mangroves and beaches (Sousa et al. 2016, personal observation). *Retrocitomyia trinitatensis* was collected only in traps placed along river margins in Brazil (personal observation). Some species, such as *R. sisbiota* and *R. paraguayensis*, have been taken in wet environments while others, such as *R. adolenda* and *R. andina*, in dry environments.

Distribution

Retrocitomyia is restricted to the Neotropical region, ranging from Morelos (Mexico) in the north to the Chaco (Paraguay) in the south.

***Retrocitomyia* Lopes 1983**

Retrocitomyia Lopes 1983: 319. Type species: *Sarcophaga retrocita* Hall 1933, by original designation.

References: Dias et al. (1984, checklist, synanthropy); Lopes (1985, description of new species and key to genera); Tibana & Xerez (1985, description of new species); Lopes (1988, description of new species); Pape (1996, catalogue); Pape et al. (2004, checklist); Mello-Patiu et al. (2009, checklist); Buenaventura & Pape (2013, revision of *Peckia*) Alves et al. (2014, checklist); Sousa et al. (2015, checklist); Buenaventura & Pape (2015, phylogeny); Sousa et al. (2016, checklist); Mello-Patiu & Salazar-Souza (2016, description and redescriptions of species, catalogue and key to genera); Buenaventura & Pape (2018, phylogeny and diagnosis).

Key to the identification of ***Retrocitomyia*** *spp. (males only)*

Modified from Lopes (1985) and Mello-Patiu and Salazar-Souza (2016). Females are not included in this key since they are unknown for most of the species.

1 Cercal prong internal margin almost straight tapering gradually to the apex in posterior view (Figures 5A, D, F, 9C, 13C, 15C, 17C)……2

- Cercal prong internal margin curved, usually with the same width to the apex in posterior view (Figures 5B, C, E, 6A-C, 10C, 11C, 12C, 14C, 17C, 18C)……..5

2 Gena with silvery pruinosity; cercus with a central-median tuft of short setae and external margin slightly constricted and sinuous in posterior view (Figures 3A, 5A, 7A, 9B-C). …….. *adolenda* (Lopes, 1935)

- Gena with golden or silvery pruinosity; cercus without such a tuft of setae (Figures 3E, 4A-B, 5D, F, 13C, 15C, 16C)…….3

3 Cercus with a central depressed area with a cluster of setae; cercal prong strongly curved in lateral view (Figures 5D, 7E, 13B)……... *mizuguchiana* Tibana & Xerez, 1985

- Cercus with a central depressed area without a cluster of setae (Figures 5F, 15C, 16C); cercal prong almost straight with the apex slightly curved in lateral view (Figures 8A, 15B, 16B)…….… 4

4 Proclinate setae present; gena with silvery pruinosity; cercus short and robust, (Figures 4B, 16B-C)……... *silveirai* **sp. n.** Souza, Carvalho-Filho & Mello-Patiu

- Proclinate setae absent; gena with golden pruinosity; cercus elongate (Figures 4A, 5F, 8A, 15B-C)……. *retrocita* (Hall, 1933)

5 Setae on cercus interrupted on the middle region (Figures 5B, 6C, 11C, 18C). ……. 6

- Setae on cercus continuous on the middle region (Figures 5C, 5E, 6A, B)…….. 7

6 ST5 with a pair of sclerotized plates on median lobe (Figure 11A); setae on cercus interrupted in the middle by a strong depression (Figures 5B, 11B-C)…… *fluminensis* Lopes, 1985
- ST5 without sclerotized plates on median lobe (Figure 18A); setae on cercus not interrupted in the middle by a depression (Figures 6C, 18B-C)……...*urumajoensis* Lopes, 1985

7 Juxta wider than long in lateral view (Figure 14F); median cleft of ST5 deep, almost reaching anterior margin (Figure 14A)…… *paraguayensis* Lopes, 1985
- Juxta longer than wide in lateral view (Figures 10F, 12F, 17F); Median cleft of ST5 shallow (Figures 10A, 12A, 17A)……..8

8 ST5 with posterior arm short; vesica with apex bent laterally (see Mello-Patiu & Salazar-Souza 2016)…….*sisbiota* Mello-Patiu & Salazar-Souza, 2016
- ST5 with posterior arm long (Figures 10A, 12A, 17A); apex of vesica not bent laterally (Figures 10F, 12F, 17F)……..9

9 Median lobe of ST5 with pair of small teeth on inner margin (Figure 12A); juxta with hump in anterior margin in lateral view (Figure 12F). …….. *mexicana* Lopes, 1985
- Median lobe of ST5 without teeth on inner margin (Figures 10A, 17A); juxta without hump in lateral view (Figures 10F, 17F)……..10

10 Vesical lateral arm with pointed apex without median excision in lateral view (Figure 17F); juxta with expanded base on outer margin in lateral view (Figure 17F)……..*trinitatensis* Lopes,1985
- Vesical lateral arm with median excision and without pointed apex in lateral view (Figure 10F); juxta without expanded base on outer margin (Figure 10F)……...*andina* Lopes, 1985

Retrocitomyia adolenda (Lopes 1935)
(Figures 3A, 5A, 7A, 9A-F, 20A)

Sarcophaga adolenda Lopes 1935: 40 (male description). Type locality: Brazil, Rio de Janeiro
Paraphrissopoda adolenda; Lopes 1969: 36 (catalogue); Lopes (1975, checklist)
Peckia (*Peckia*) *adolenda*; Pape 1996: 284 (catalogue)

Retrocitomyia adolenda; Lopes (1983: 320; comb. nov.). Dias et al. (1984, checklist); Lopes (1985, key); Mello-Patiu et al. (2009, checklist); Buenaventura & Pape (2013, phylogeny) (2015, phylogeny); Mello-Patiu & Salazar-Souza (2016, catalogue and key); Buenaventura & Pape (2018, phylogeny)

Redescription. Male. Length: 8-12 mm (n = 5).

Head. Parafacial, fronto-orbital plate and posterior ocular orbits with silvery pruinosity; fronto-orbital plate without setulae in the upper region to the gena; face with silver pruinosity; frons about 0.43x head width at level of ocellar triangle; frontal vitta blackish along its whole length; 10 well-developed frontal setae reaching level of apex of pedicel; proclinate orbital setae absent; ocellar setae less developed than the upper frontals, inner vertical seta 2,0x longer than frontals, outer vertical seta undifferentiated from postocular setae; gena and genal groove with yellowish pruinosity, gena with white setae; postgena with silvery pruinosity and pale setae; occiput gray with an upper row of black setulae and the remaining setulae pale; antenna with pedicel dark gray and postpedicel blackish, with light gray pruinosity.

Thorax. Chaetotaxy: acrostichals 0+1, dorsocentrals 1+2, intra-alars 1+2, supra-alars 2+3, postpronotals 3; scutellum with marginal setae 2, apical 2 and discals 2; notopleurals 4, anepimerals 3, anepisternals 5, katepisternal setae 3, almost in a straight line; merals 6–7.

Abdomen. Brown with yellowish pruinosity; T5 with about 15 marginal setae; ST5 with posterior arm long and divergent, with rounded apex, and long setulae on inner lateral margin; median lobe bearing an sclerotized plate on distal margin (Figure 10A).

Terminalia. Syntergosternite 7+8 reddish-brown with silvery pruinosity on the posterior margin, two well developed marginal setae; epandrium reddish-brown without pruinosity (Figure 7A); cercus, pregonite and postgonite blackish-brown; cercus long with numerous setae along its inner margin in basal half and a central-median tuft of short setae (posterior view); cercal prong external margin slightly constricted and sinuous (posterior view) (Figures 5A, 9C); surstylus subtriangular with rounded apex and several long setae in apical half (Figure 9C); postgonite shortest than pregonite (Figure 9D); vesica subtriangular (lateral view), vesical arch membranous with an elevation near to posterior margin, vesical lateral arm sclerotized with pointed apex curved toward the basiphallus (ventral view) (Figures 9E-F); juxta sclerotized, curved anteriorly (ventral view) and rounded apex strongly curved anteriorly (lateral view) (Figures 9E-F).

Female. Unknown.

Type material examined. Holotype ♂: “Rio de Janeiro / D. Mendes / [printed on white paper] / 5[v].[1] 931 [handwritten on the back]” // “TYPUS [printed on red paper, black frame]” // “Sarcophaga / adolenda Lopes [handwritten on white paper] / H. S. Lopes Det. xi.[1]934 [printed]”

// "Holotype [printed on red paper, black frame]" // "MNRJ 2272 [printed on white paper]" (MNRJ). [Specimen lost in the fire at MNRJ].

Paratype ♂: "Com. Pic. Nord. [Comissão de Piscicultura do Nordeste] / Caico – R. G^{ae} do Norte [Rio Grande do Norte] / Faz. Pitombeira 5 [v]. [1]933 [handwritten on white paper]" // "Cotypus [printed on red paper, black frame]" // "Sarcophaga / adolenda Lopes / H. S. LOPES – DET. XI – [1]934 [printed and handwritten on white paper]" // "INS. OSW. CRUZ [Instituição Oswaldo Cruz] / N. -10.756 [printed on white paper]" // "Paratype [printed on green paper, black frame]" (MNRJ). [Specimen lost in the fire at MNRJ].

Additional material examined. BRAZIL. *Ceará*: Pacatuba, 350 m. 23. VIII. 1973, H. S. Lopes leg. (1 ♂ e 1 ♀, MNRJ). *Rio de Janeiro:* Angra dos Reis, H. S. Lopes leg. 25.vi.1972 (1 ♂, MNRJ).

Distribution. Neotropical- Brazil (Ceará, Minas Gerais, Rio de Janeiro, Rio Grande do Norte) (Figure 20A).

Remarks. This species is easily distinguished from their congeners in having a central-median tuft of short setae in the cercus.

Biology. Nothing is known about the biology of *R. adolenda,* except that one male and one female were collected in Van Someren-Rydon butterfly traps baited with rotting bananas and brown sugar (Lopes, 1975). Dias et al. (1984) in a study of synanthropic sarcophagids collected with traps baited with fish, mouse carcasses, chicken viscera, banana mashed with brown sugar and human feces as bait also obtained some specimens of *R. adolenda*.

Retrocitomyia andina Lopes 1985
(Figures 3B, 7B, 10A-F, 20A)

Retrocitomyia andina Lopes 1985: 3 (male description and key). Type locality: Peru, Cuzco, Quincemil. Pape (1996, catalogue); Mello-Patiu & Salazar-Souza (2016, catalogue and key)

Redescription. Male. Length: 7.5-9 mm (n = 2).

Head. Parafacial, fronto-orbital plate and posterior ocular orbits with golden pruinosity; fronto-orbital plate without setulae in the upper region to the gena; face with yellowish pruinosity; frons about 0.23x head width at level of ocelar triangle; frontal vitta reddish brown along its whole length; 5 well-developed frontal setae reaching level of apex of pedicel; reclinate orbital seta present and less developed than the largest frontals, proclinate orbital setae absent; ocellar setae less developed than the upper frontals, inner vertical seta 2,0x longer than frontals, outer vertical seta differentiated from postocular setae; gena and genal groove with yellowish pruinosity, gena with

black upper and lower setae; postgena gray with yellowish pruinosity and black setae; occiput gray with an upper row of black setulae and the remaining setulae pale; antenna with pedicel dark gray and postpedicel brownish, with light gray pruinosity.

Thorax. Gray with silvery pruinosity and three dark brown longitudinal bands. Chaetotaxy: acrostichals 0+0, dorsocentrals 1+2, intra-alars 1+1, supra-alars 2+2, postpronotals 2, postalar callus with 2 setae; scutellum with marginal setae 2, apical 2 and discals 2; notopleurals 4, anepimerals 4, anepisternals 6, katepisternal setae 5, almost in a straight line; merals 5–6.

Abdomen. Reddish brown with slightly yellowish pruinosity; T5 with about 17 marginal setae. ST5 with posterior arm long, narrow, divergent, with rounded apex, and long setulae on inner lateral margin; median lobe rounded and protruding (Figure 10A).

Terminalia. The color of terminalia were not described since the abdomen of the examined specimens are clarified. Syntergosternite 7+8 with four well developed marginal setae; cercus elongate with continuous setae along its inner margin (posterior view) and almost straight (lateral view); cercal prong flattened dorsally, falciform and divergent, of the same width up to the apex (posterior view) (Figure 10C); surstylus triangular with rounded apex and several long setae in apical half (Figure 10B); postgonite shortest than pregonite (Figure 10D); pregonite setulose on its dorsal surface, with curved apex; (Figure 10F); vesica sub rectangular (lateral view), vesical arch absent, vesical lateral arm with a median excision, anterior margin sinuous and membranous and posterior margin sclerotized and almost straight (lateral view) (Figures 10E-F); juxta sclerotized, with rounded apex slightly curved anteriorly (lateral view) (Figure 10F).

Female. Unknown.

Type material examined. Paratype ♂: "BOLIVIA: Dept. / Beni, Romansos / 1 km. N. Junction / Rio Itenez & Rio Pa- / ragua, VII – 30 – 1964 [printed on white paper, black frame]" // "J. K. Bouseman / J. Lussenshop / Collectors [printed on white paper, black frame]" // "Retrocitomyia / andina n. sp. / paratype ♂ / Det. H. S. Lopes [printed and handwritten on white paper]" // "Paratype [printed on green paper, black frame]" (MNRJ). [Specimen lost in the fire at MNRJ].

Additional material examined. BRAZIL. *Pará*: Cametá, Estrada Coco, Vila Umarizal, 10 km NO de Cametá [= Northwest of Cametá], mata [= forest], armadilha malaise [= Malaise trap] 02°10'11.13''S 49°32'30.74W, 4a17 [= 4-17].IX.2014; I. S. Gorayeb, A. Quaresma, W. Carvalho and L. Lopes leg. (1 ♂ MPEG).

Distribution. Neotropical – Bolivia, Brazil (Pará)*, Peru (Figure 20A).

Remarks. The male terminalia of this species is similar to that of *R. trinitatensis* but differs in having vesica subtriangular with a median excision (the vesica is rounded with a pointed apex anteriorly in *R. trinitatensis*).

This species was known only from the type locality in Bolivia and Peru, therefore it is a new record from Brazil. *Retrocitomyia andina* problably occurs along the Amazon, however many areas are poorly sampled, resulting in absence of records.

Biology. Unknown.

Retrocitomyia fluminensis Lopes 1985

(Figures 3C, 5B, 7C, 11A-F, 20A)

Retrocitomyia fluminensis Lopes 1985: 4 (male description and key). Type locality: Brazil, Rio de Janeiro, Mangaratiba, Parada Saí. Pape (1996, catalogue); Mello-Patiu & Salazar-Souza (2016, redescription, catalogue, and key); Buenaventura & Pape (2018, phylogeny)

Male. Length: 6-11 mm (n = 11).

This species was recently redescribed by Mello-Patiu & Salazar-Souza (2016) and for this reason was not redescribed. The redescription should be complemented with the following: vesical arch sclerotized, vesical lateral arm 3/4 membranous with pointed apex (lateral view) (Figure 11F).

Female. Unknown

Type material examined. Holotype ♂: "Parada Sahy [Saí] x. [19]50 / Mangaratiba [BRAZIL, Rio de Janeiro] / Segadas Viana [leg.] [handwritten on white paper]" // "Holotype [printed on red paper, black frame]" // "Retrocitomyia ♂ / fluminensis n. sp. / Holotypus [handwritten on white paper] / Det. H. S. Lopes [printed]" // "MNRJ 2272 [printed on white paper]" (MNRJ). [Specimen lost in the fire at MNRJ].

Additional material examined. BRAZIL. *Mato Grosso*: Poconé, Fazenda Rio Clarinho, 20º41'54"S 56º52'55.04"W, sweep net, 16.vii.2012, C.J.E. Lamas leg., 3 ♂ (MNRJ); Parque Nacional da Chapada dos Guimarães, 15º24'33.0"S 55º49'54.9"W, modified van Sommeren trap (fish-baited), 06–07.ix.2011, C.J.E. Lamas et al. leg., 1 ♂ (MNRJ); *Mato Grosso do Sul*: Bodoquena, Fazenda Califórnia, 20º41'54"S 56º52'56.04"W, modified van Sommeren trap (fish-baited), 07–08.viii.2011, C.J.E. Lamas leg., 5 ♂ (MNRJ); same data as previous except hand net, swamp, 1 ♂ (MNRJ).

Distribution. Neotropical - Brazil (Mato Grosso, Mato Grosso do Sul, Rio de Janeiro) (Figure 20A).

Remarks. Retrocitomyia fluminensis can be differentiated from other species by a strong depression on the middle cercus which interrupt the distribution of setae.

Biology. The biology of this species is unknown. Mello-Patiu & Salazar-Souza (2016) collected specimens using fish as bait in modified Van Sommeren traps and suggest that it probably is a saprophagous species.

Retrocitomyia mexicana Lopes 1985
(Figures 3D, 5C, 7D, 12A-F, 21A)

Retrocitomyia mexicana Lopes 1985: 1 (male description and key). Type locality: Mexico, Morelos, Acatlipa. Pape (1996, catalogue); Mello-Patiu & Salazar-Souza (2016, catalogue and key).

Redescription. Male. Length. 8-9 mm (n = 2).

Head. Parafacial, fronto-orbital plate and posterior ocular orbits with golden pruinosity; fronto orbital plate with setulae in the upper region to the gena; face with silvery pruinosity; frons about 0,25x head width at level of ocelar triangle; frontal vitta brownish along its whole length; 6-7 well-developed frontal setae reaching level of apex of pedicel; reclinate orbital seta present and more developed than the largest frontals, proclinate orbital setae absent; ocellar setae less developed than the upper frontals, inner vertical seta 2,0x longer than frontals, outer vertical seta differentiated from postocular setae; gena and genal groove with golden pruinosity, gena with black setae; postgena gray with silvery pruinosity and black setae; occiput gray with an upper row of black setulae and the remaining setulae pale; antenna with pedicel and postpedicel brownish, with yellowish pruinosity.

Thorax. Gray with golden pruinosity and three dark brown longitudinal bands. *Chaetotaxy.* acrostichals 0+0, dorsocentrals 2+3, intra-alars 1+2, supra-alars 1+3, postpronotals 3; scutellum with marginal setae 2, apical 2 and discals 2; notopleurals 4, anepimerals 3, anepisternals 6, katepisternal setae 3, almost in a straight line; merals 6–7.

Abdomen. Reddish-brown with yellowish-gray pruinosity; T5 with a complete row of marginal setae. ST5 with posterior arm thin and convergent, with rounded apex, and with long setae on inner lateral margin; median lobe rounded, protruding, bearing a small tooth on inner margin (Figure 12A).

Terminalia. Syntergosternite 7+8 reddish with yellowish pruinosity on the posterior margin and six well developed marginal setae; epandrium reddish without pruinosity (Figure 7D); cercus, pregonite and postgonite blackish-brown; cercus elongate with many long setae (posterior view) and enlarged in the basal half (in lateral view); cercal prong curved and divergent (posterior view) (Figures 5C, 12C); surstylus elongate with rounded apex and several long setae in distal half (Figure 12B); postgonite shortest than pregonite, with a dilated apex bearing a small ventral seta (Figure

12D); vesica rounded (lateral view), vesical arch absent, vesical lateral arm sclerotized with a hook shaped apex (ventral view) (Figures 12E-F); juxta sclerotized, with rounded apex slightly curved anteriorly with a hump in anterior margin (lateral view) (Figures 12E-F).

Female. Unknown.

Type material examined. Holotype ♂: "Acatlipa, Morelos / July, 29, 1950 [handwritten on white paper] / Col. WG Downs [printed]" // "Holotype [printed on red paper, black frame]" // "Retrocitomyia ♂ / mexicana n. sp. / Holotypus [handwritten on white paper] / Det. H. S. Lopes [printed]" // "MNRJ 2273 [printed on white paper]" (MNRJ). Paratype ♂, same data as holotype (MNRJ). [Specimens lost in the fire at MNRJ].

Distribution. Neotropical - Mexico (Morelos) (Figure 21A).

Remarks. This species is similar to *R. trinitatensis* in the aspects of male terminalia, mainly of shape of cercus. However, *R. mexicana* can be distinguished of *R. trinitatensis* by having a juxta sclerotized, with rounded apex slightly curved anteriorly with a hump in anterior margin (lateral view) (Figure 13F, red arrow) while *R. trinitatensis* does not have such hump.

Biology. Unknown.

Retrocitomyia mizuguchiana Tibana & Xerez 1985
(Figures 3E, 5D, 7E, 13A-F, 20B)

Retrocitomyia mizuguchiana Tibana & Xerez 1985: 485 (male description). Type locality: Brazil, Minas Gerais, Pirapora. Pape (1996, catalogue); Alves *et al.* (2014, checklist); Sousa *et al.* (2015, checklist); Mello-Patiu & Salazar-Souza (2016, redescription, catalogue and key); Sousa *et al.* (2016, checklist).

Male. Length. 7-12 mm (n = 10).

Female. Unknown.

This species was recently redescribed by Mello-Patiu & Salazar-Souza (2016) and for this reason was not redescribed. These redescription should be complemented with the following: vesical arch membranous in posterior margin, vesical lateral arm sclerotized with a hook-shape apex (ventral view) (Figure 13E).

Type material examined. Holotype ♂: "Pirapora—MG [Minas Gerais] / Brasil / 20-29.xii.[19]78 / col. [leg.] C. B. Carvalho [handwritten on white paper]" // "isca galinha [chicken bait, handwritten on white paper]" // "Holotype [printed on red paper, black frame]" // "Retrocitomyia ♂ / mizuguchiana / sp. n. / Det. R. Tibana et R. de Xerez [handwritten on white

paper]" // "MNRJ 2274 [printed on white paper]" (MNRJ). ♂ paratype, same data as holotype (MNRJ). [Specimens lost in the fire at MNRJ].

Additional material examined. BRAZIL. *Mato Grosso do Sul*: Corumbá, Passo do Lontra [Base de Estudos do Pantanal/UFMS], 19º34'20.9"S 57º00'58.0"W, hand net, 07.xii.2011, Patiu & Patiu leg., 2 ♂ (MNRJ); Porto Murtinho, Fazenda Retiro Conceição, 21º41'18.8"S 57º45'53.7"W, hand net, 11.xii.2011, Patiu & Patiu leg., 1 ♂ (MNRJ); Dois Irmãos do Buriti, 27–30.xii.89, Tibana leg., 1 ♂ (MNRJ). *Minas Gerais:* Pirapora—MG [Minas Gerais] / Brasil / 20-29.xii.[19]78 / col. [leg.] C. B. Carvalho [handwritten on white paper] 3 ♂ (MNRJ); same data as previous except 9-10.IX. [19]78, 1 ♂ (MNRJ).

Distribution. Neotropical – Brazil (Maranhão, Mato Grosso do Sul, Minas Gerais, Paraíba) (Figure 20B).

Remarks. Retrocitomyia mizuguchiana can be differentiated from their congeners in having cercus with a central depressed area with a cluster of setae (Figure 13C).

Biology. Retrocitomyia mizuguchiana seems to be associated to xeric environments such as Cerrado and Caatinga biomes, and riparian environments as Chaco and Pantanal biomes. Some specimens have been collected with traps baited with rotting fish, banana, beef lung and pig carcasses (Alves et al 2014; Sousa et al 2015; Mello-Patiu & Salazar 2016).

Retrocitomyia paraguayensis Lopes 1985
(Figures 3F, 5E, 7F, 14A-F, 20B)

Retrocitomyia paraguayensis Lopes 1985: 4 (male description, key). Type locality: Paraguai, Chaco-i. Pape (1996, catalogue); Mello-Patiu & Salazar-Souza (2016, redescription, catalogue and key).

Male. Length. 9-11 mm (n = 3).

Female. Unknown.

This species was recently redescribed by Mello-Patiu & Salazar-Souza (2016) and for this reason was not redescribed. These redescription should be complemented with the following: vesical arch absent, vesical lateral arm sclerotized composed by a lobe with hook-shape apex (ventral view) (Figure 14E).

Type material examined. Holotype ♂: "Paraguay, Chaco-i / 6[= vi].1944, Mis. Cient. Brasil col. [Missão Científica do Brasil leg.] [printed on white paper]" // "Holotype [printed on red paper, black frame]" // "Retrocitomyia ♂ / paraguayensis n. sp. / Holotypus [handwritten on white

paper] / Det. H.S.Lopes [printed]" // "MNRJ 2275 [printed on white paper]" (MNRJ). [Specimen lost in the fire at MNRJ].

Additional material examined. BRAZIL. *Mato Grosso:* Chapada dos Guimarães, 15º26'10.7"S 55º47'22.9"W, Vale da Benção, forest, hand net, 19.i.2012, Lamas, Nihei et al. leg., 1 ♂ (MNRJ); Poconé, Fazenda Rio Clarinho, van Sommeren trap, artificial bait, 16.vii.2012, Patiu & Patiu leg., 1 ♂ (MNRJ).

Distribution. Neotropical – Brazil (Mato Grosso), Paraguay (Figure 20B).

Remarks. Retrocitomyia paraguayensis is similar to *R. urumajoensis* by having the juxta parallel to apical margin of distiphallus. These species can be distinguished mainly by vesical lateral arm formed by lobes with hook-shape apex (ventral view) in *R. paraguayensis* and vesical lateral arm formed by lobes without hook-shape apex in *R. urumajoensis.*

Biology. Some specimens were collected in state of Mato Grosso, Brazil in riparian forest of Cerrado and Pantanal (Mello-Patiu & Salazar-Souza, 2016). The specimens were attracted by an artificial feces-scented bait used in livestock pest control.

Retrocitomyia retrocita (Hall 1933)

(Figures 2A-B, 4A, 5F, 8A, 15A-F, 21A)

Sarcophaga retrocita Hall 1933: 40 (male description). Type locality: Panamá, Corozal. Lopes (1941a) (checklist).

Paraphrissopoda setifacies Lopes 1945: 450 (male and female description). Type locality: Colombia, Gorgona Island.

Peckia irwini Dodge 1966 (male description). Type locality: El Salvador, Quezaltepeque.

Peckia retrocita: Dodge (1966: 695; comb. nov.); Dodge (1968, checklist).

Paraphrissopoda retrocita: Lopes (1973: 294; comb. nov.). Lopes (1969, catalogue);

Retrocitomyia retrocita: Lopes (1983: 319; comb. nov.). Lopes (1985, key); Tibana & Xerez (1985, redescription); Pape et al. (2004, checklist); Mello-Patiu et al. (2009, checklist); Buenaventura & Pape (2013, phylogeny); (2015, phylogeny); Sousa et al. (2015, checklist); Mello-Patiu & Salazar-Souza (2016, redescription, catalogue and key); Buenaventura & Pape (2017, phylogeny).

Male. Length. 6-9 mm (n = 49).

Female. Length. 8-10 mm (n = 14).

The male of *R. retrocita* was redescribed by Tibana & Xeres (1985) and Mello-Patiu & Salazar-Souza (2016) and for this reason was not redescribed. These redescription should be

complemented with the following: vesical arch membranous, vesical lateral arm sclerotized with a hook-shape apex (ventral view) (Figure 15E).

The female was described by Lopes (1945) and complemented by Mello-Patiu & Salazar-Souza (2016).

Type material examined. Holotype ♂ of *Paraphrissopoda setifacies* Lopes 1945, deposited in BMNH, labelled as follows: "Gorgona I [= Island] / 2.59 N. 78.20. W. / July 1924. / L.E. Cheesman. [printed on white paper, black frame]" // "St. George Exp. / B.M. 1925-573 [printed on white paper, black frame]" // "Paraphissopoda / setifacies / ♂ n.sp. / Det. H. S. Lopes [printed and handwritten on white paper]" // "Holotypus [printed on red paper, black frame]" // "slide prep.: / 010197897 [printed on white paper, black frame]" // "NHMUK 010862603 [printed on white paper, black frame]" (BMNH).

Paratype ♀ of *Paraphrissopoda setifacies* Lopes 1945, deposited in BMNH, labelled as follows: same data as holotype except "Allotypus [printed on red paper, black frame]" // "slide prep. 010197898 [printed on with paper, black frame]" // "NHMUK 010862604 [printed on with paper, black frame]". Holotype and paratype in good condition. Male and female terminalia are placed on slides with Canada balsam.

Holotype ♂ of *Peckia irwini* Dodge 1966, deposited in CAS, labelled as follows: "El Salvador: / Quezaltepeque / 6 mi. W.; 500 m. / 15.vii.1963 [printed on white paper, black frame]" // "D. Q. Cavagnaro & M. E. Irwin / collectors [printed on white paper, black frame]" // "*Peckia* / *irwini* / Holotype / det. H. E. Dodge 1964 [printed on white paper, black frame]" // "California Academy of Sciences / type no. 8889 [printed on white paper, black frame]" (CAS). Specimen in good conditions. Terminalia placed in plastic vial with glycerin and pinned below the specimen.

Additional material examined. BRAZIL. *Amazonas:* Mamirauá, várzea [= inundated forest], 14-18.vi.1994, armadilha Malaise [= Malaise trap], I. S. Gorayeb & O. T. Silveira leg., 1 ♂ (MPEG). *Espírito Santo:* Guarapari, 11.ii.1973, cultura [= rearing] 1100, H.S. Lopes leg., 1 ♀ (MNRJ). *Minas Gerais:* Santa Bárbara, Reserva de Peti, 20–21.ii.1988, L.F. Reys leg., 1 ♂ (MNRJ). *Mato Grosso:* Juína, v.1985, O. Roppa & B. Silva leg., 2 ♂, 1 ♀ (MNRJ); Parque Nacional da Chapada dos Guimarães, 15º24'21.8"S 55º50'07.5"W, Malaise trap, 19.ix–13.x.2011, C. Lamas, S. Nihei et al. leg., 1 ♂ (MNRJ); same data as previous except 13.x–08.xi.2011, 1 ♂ (MNRJ); same data as previous except 20.ix–31.x.2012, 1 ♂ (MNRJ). *Mato Grosso do Sul:* Corumbá, BEP [= Base de Estudos do Pantanal/UFMS], Paratudal, 19º34'11.4"S 57º01'08.5"W, Malaise trap, 14–29.ix.2012, C. Lamas, S. Nihei et al. leg., 1 ♂ (MNRJ). *Pará:* Juruti, ix. 1969, Expedição Perm. Amazônia [= Permanent Expedition to the Amazon] 1 ♂ (MZUSP); Benevides, 23-24.iii.1993, armadilha malaise [= Malaise trap], J. Dias leg., MPEG 02014222, 1 ♂ (MPEG); Viseu, Fazenda Ema, Área aberta de pastagem [= pasture], 24.xi-07.XII.1999, I. Gorayeb, T.

Pimentel, R. Bittencourt, J. Dias leg., armadilha Malaise [= Malaise trap] 24 ♂, 7 ♀ (MPEG); Barcarena, Caripi, Mata [= forest], 13-22.xi.2001, I. Gorayeb, T. Pimentel, R. Bittencourt, J. Dias leg., armadilha Malaise [= Malaise trap] 1 ♂ (MPEG); Barcarena, 24.ii.2017, R. R. Barbosa leg., coleta com puçá [= hand net], 1 ♂ (MPEG); Belo Monte, M1T2P2A2, 5. ii. 2015, H. Medeiros leg., 1 ♂ (MPEG); same data as previous except 24. ii. 2016, M1T1P1A1, 1 ♂ (MPEG); same data as previous except 23.ii.2016, M1T2P2A1, 1 ♂ (MPEG). *Roraima:* Surumu, ix, 1966, M. Alvarenga leg., 1 ♂, 3 ♀ (MZUSP); Surumu, ix.1968, M. Alvarenga leg., 1 ♂, 1 ♀ (MNRJ). *Rio de Janeiro:* Rio de Janeiro, Represa do Rio Grande, vi.1967 - x.1967, M. Alvarenga leg., 2 ♂ (MNRJ); Rio de Janeiro, Marambaia, 14.x.1993, C.A. Mello leg., 1 ♂ (MNRJ); MEXICO, Chiapas: Jiquipilas, 38 km, ESE. of Tierra y Libertad on road to Villa Flores, 1219 m, 23.vi.1981, D.E & P.M. Breedlove leg. 2 ♂ (CAS); PERU, Lambayeque: Chiclayo, 20 m., 17.i.1955, E. I. Schlinger & E. S. Ross leg., 1 ♂ (CAS).

Distribution. Neotropical – Brazil (Espirito Santo, Mato Grosso, Mato Grosso do Sul, Minas Gerais, Pará, Rio de Janeiro, Rio Grande do Norte, Roraima), Colombia, El Salvador, Guyane, Mexico (Chiapas)*, Panama, Peru (Figure 21A).

Remarks. Retrocitomyia retrocita is similar to *R. silveirai* sp. n. and can be differentiated by the following features: cercus without a strong depression on the middle such *R. silveirai* sp. n. and vesical arch membranous.

Holotype and paratype of *P. setifacies* were analyzed through photographs kindly provided by Daniel Whitmore (BMNH). The record from Chiapas is the first record from Mexico.

The male terminalia of *Paraphrissopoda setifacies* and *Peckia irwini* are identical to the *R. retrocita*, for this reason the synonymy proposed by Lopes (1979) was maintained.

Biology. This species is widely distributed and occurs in various environments. This have been sampled in primary forests and in open and dry environments (Sousa et al. 2015; Mello-Patiu & Salazar-Souza 2016). In a white-sand vegetation of Brazilian Amazon this species was sampled with traps baited with rotting beef lung (Carvalho-Filho et al. 2018).

Retrocitomyia silveirai sp. n. Souza, Carvalho-Filho & Mello-Patiu
(Figures 4B, 16A-F, 21B)

Diagnosis. Proclinate orbital setae present; gena with silvery pruinosity; cercus short and robust, with a strong depression on the middle region in posterior view.

Description. Male. Length: about 8 mm (n = 1).

Head. Fronto-orbital plate and posterior ocular orbits with light silvery pruinosity; face with light silver pruinosity and parafacial dark gray; frons about 0.23x head width at level of ocellar triangle; frontal vitta blackish along its whole length; 6 well-developed frontal setae reaching level of apex of pedicel; proclinate orbital setae present; ocellar setae as developed as the upper frontals; inner vertical seta the largest of the vertex, outer vertical seta undifferentiated from postocular setae; gena and genal groove with intense silvery pruinosity, gena with white setae; postgena gray with silvery pruinosity and white setae; occiput gray with an upper row of black setulae; antenna with pedicel dark gray and postpedicel blackish, with light gray pruinosity; arista long plumose on basal 2/3; palpus black.

Thorax. Chaetotaxy: acrostichals 0+1, dorsocentrals 3+ 2, intra-alars 1+2, supra-alars 1+2, postpronotals 2; scutellum with marginal setae 2, apical 2 and discals 2; notopleurals 4, anepimerals 3, anepisternals 5, katepisternal setae 3, almost in a straight line; merals 6. *Legs*. hind legs missing.

Abdomen. T5 with a row of marginal setae; ST5 with posterior arm long, narrowed, divergent, with rounded apex, and with long setulae on inner lateral margin; posterior margin of median lobe rectangular, protruding, covered by fine setulae and two strong setae (Figure 17A).

Terminalia. The color of terminalia were not described since the abdomen of the examined specimens are clarified. Syntergosternite 7+8 with four well developed marginal setae; cercus short and robust, with a strong depression, covered by many long setae along its inner margin and some small setulae on the outer margin of apical half (posterior view) (Figure 16C); cercal prong slightly divergent with a triangular tip (posterior view) (Figure 16C); surstylus clavate with several long setae in distal half (Figure 16B); postgonite narrowed, with a slightly dilated apex bearing a small ventral seta (Figure 16D); pregonite elongate, with triangular distal half; vesica sub rectangular (lateral view), vesical arch sclerotized, vesical lateral arm sclerotized with a conspicuously hook-like tip apex (ventral view) (Figure 16E-F); juxta longer than large wide, longer than paraphallus, with rounded apical margin, (lateral view), sclerotized, apically split into two tongue-shaped lobes (ventral view) (Figure 16E-F).

Female. Unknown.

Material Examined. Holotype ♂ labelled as follows: “Brasil, PA [state of Pará] -Melgaço / Caxiuanã -ECFPn [= Estação Cientifica Ferreira Pena] / 18.xi.1998 / O. Silveira and J. Pena legs. [printed on white paper, black frame]” // “Arm. Malaise [=Malaise trap] / Caxiuanã-ECFPn [= Scientific Station Ferreira Pena] / Mata da sede [= forest of station] / 18.xi.1998 [printed on white paper, black frame]” [Specimen without hind legs. Abdomen and terminalia clarified, placed in plastic vials with glycerin and pinned below the specimen].

Distribution. Neotropical – Brazil (Pará) (Figure 21B).

Etymology. This species is named in honor of Dr. Orlando Tobias Silveira (MPEG), the collector of the only known specimen of *R. silveirai*.

Remarks. This species is the only species of *Retrocitomyia* which has a proclinate orbital setae. *Retrocitomyia silveirai* sp. n. is similar to *R. retrocita* in the general aspects of the shape of cercus. These species can be distinguished by the following features: gena with silvery pruinosity, cercus short and robust, with a strong depression on the middle region in posterior view and vesical arch sclerotized in *R. silveirai* and gena with light golden pruinosity, cercus elongate, thin, without such depression as in *R. silveirai* sp. n. and vesical arch membranous in *R. retrocita.*

Biology. Unknown.

Retrocitomyia sisbiota Mello-Patiu & Salazar-Souza 2016
(Figures 4C, 6A, 8B, 21B)

Retrocitomyia sisbiota Mello-Patiu & Salazar-Souza 2016: 535 (male and female description, catalogue, key). Type locality: Brazil, Mato Grosso do Sul, Corumbá, Passo do Lontra.

The male and female were recently described by Mello-Patiu & Salazar-Souza (2016) and for this reason was not redescribed. The description should be complemented with the following: ST5 with truncated posterior arm; vesical arch absent, vesical lateral arm sclerotized composed by a rounded lobe curved laterally (ventral view).

Type material examined. Holotype ♂: "BRAZIL, MS [Mato Grosso do Sul], Corumbá / Passo do Lontra—B.E.P [Base de Estudos do Pantanal/UFMS] / 19º34'20.9"S 57º00'58.0"W / Shannon [trap] (peixe) [= fish] / 06.xii.2011 / Patiu & Patiu col. [leg.] [printed on white paper] / Sisbiota / CNPq/FAPESP [vertical]" // "Holotype [printed on red paper, black frame]" // "Retrocitomyia / sisbiota Mello-Patiu / & Salazar-Souza, 2016 [handwritten on white paper] / Det. C.A.Mello-Patiu [printed]" (MNRJ). Paratypes (73 ♂ and 17 ♀ in total): same data as holotype, 46 ♂, 6 ♀; same data as holotype except 07.xii.2011, 4 ♂, 5 ♀ (MNRJ); same data as holotype except hand net, Lamas, Nihei & equipe leg., 9 ♂, 1 ♀ (MNRJ); same data as previous except 07.xii.2011, 5 ♂, 4 ♀ (MNRJ); same data as previous except yellow pan trap, 06.xii.2011, 2 ♂ (MNRJ); same data as previous except 07.xii.2011, 3 ♂ (MNRJ); same data as previous except Malaise trap, 02–17.xii.2011, 1 ♂, 1 ♀ (MNRJ); same data as previous except 16–31.i.2012, 1 ♂ (MNRJ); same data as previous except 02–17.xi.2012, 1 ♂ (MNRJ); same data as previous except modified van Sommeren trap, 07.xii.2012, 1 ♂ (MNRJ) [Holotype and all paratypes, except two of then were lost in the fire at MNRJ.]

Distribution. Neotropical – Brazil (Mato Grosso do Sul) (Figure 21B).

Remarks. Retrocitomyia sisbiota is similar to *R. paraguayensis* and *R. urumajoensis* in the shape of cercus. These species can be distinguished by the following features: in ventral view, vesical lateral arm composed by a rounded lobe curved laterally in *R. sisbiota* (see Mello-Patiu & Salazar-Souza 2016), vesical lateral arm composed by a lobe with hook-shape apex in *R. paraguayensis* (Figure 15E), and vesical lateral arm sclerotized composed by a sinuous lobe in internal margin in *R. urumajoensis* (Figure 19E). Besides that, *R. sisbiota* is the only which has a truncated posterior arm of ST5.

Biology. Retrocitomyia sisbiota seems to be associated with annually flooded forest in Pantanal. Where it was sampled with Shannon and Van Sommeren-Rydon butterfly traps baited with rotten fish, entomological nets, Malaise traps, and yellow pan traps (Mello-Patiu & Salazar-Souza 2016).

Retrocitomyia trinitatensis Lopes 1985
(Figures 4D, 6B, 8C-D, 17A-F, 20B)

Retrocitomyia trinitatensis Lopes 1985: 2 (male and female description, key). Type locality: Trinidad & Tobago, Trinidad, Centeno. Pape (1996, catalogue); Mello-Patiu & Salazar-Souza (2016, catalogue and key).

Male. Length. 8-9.5 mm (n = 3).

Redescription. Head. Parafacial, fronto-orbital plate and posterior ocular orbits with golden pruinosity; fronto orbital plate with setulae in the upper region to the gena; face with silvery pruinosity; frons about 0.32x head width at level of ocelar triangle; frontal vitta black along its whole length; 5-6 well-developed frontal setae reaching level of apex of pedicel, proclinate orbital setae absent; ocellar setae less developed than the upper frontals, inner vertical seta 2.0x longer than frontals, outer vertical seta differentiated from postocular setae; gena and genal groove with golden pruinosity, gena with black setae; postgena gray with silvery pruinosity and black setae; occiput gray with an upper row of black setae and the remaining setae white; antenna with pedicel and postpedicel brownish, with yellowish pruinosity; arista long plumose on basal 2/3; palpus brownish.

Thorax. *Chaetotaxy:* acrostichals 0+0, dorsocentrals 1+2, intra-alars 1+2, supra-alars 1+3, postpronotals 3; scutellum with marginal setae 2, apical 2 and discals 2; notopleurals 4, anepimerals 2, anepisternals 5, katepisternal setae 3, almost in a straight line; merals 5-6.

Abdomen. Reddish-brown with yellowish-gray pruinosity; T5 with a complete row of marginal setae. ST5 brownish with posterior arm long and convergent, rounded apex, and with long setulae; median lobe composed by a sclerotized and pigmented plate (Figure 17A).

Terminalia. Syntergosternite 7+8 reddish with yellowish pruinosity on posterior margin, six well developed marginal setae; epandrium reddish without pruinosity; cercus, pregonite and postgonite blackish-brown; cercus elongated with numerous long setae in median region (posterior view) and enlarged in the anterior portion of the basal half (in lateral view) (Figure 17B-C); cercal prong curved and convergent (posterior view) (Figure 17C); surstylus clavate, with several long setae in distal half (Figure 17B); postgonite short (Figure 17D); vesical arch absent and vesical lateral arm elongate, sclerotized with a pointed apex (Figure 17E-F); juxta well sclerotized, with posterior margin prominent and rounded apex slightly curved anteriorly (lateral view) (Figure 17E-F).

Female. As described by Lopes (1985).

Type material examined. Holotype ♂: "Centeno / Trinidad / Feb. [= february] 11.1960 [printed on white paper, black frame]" // "Holotype / R. trinitatensis / Lopes / CNC No. 20055 [handwritten and printed on red paper, black frame]" // "Retrocitomyia / trinitatensis / holotypus n. sp. ♂ / Det. H. S. Lopes [handwritten and printed on red paper, black frame]" // "holotypus [handwritten and printed on white paper, black frame]" (CNC). [Specimen in good condition].

Additional material examined. BRAZIL – Tocantins: Pium, CP Canguçú [= Centro de Pesquisas Canguçú], Pet (PN) Arm7 [= traps made of 2-liter plastic bottles, Nacional Park, Sample 7], 17-19.v.2016, FS Carvalho-Filho, CC Souza, CAC Favacho legs. (2 ♂, MPEG).

Distribution. Neotropical – Brazil (Tocantins)*, Trinidad & Tobago (Trinidad) (Figure 20B).

Remarks. The holotype was analyzed by photographs of high resolution kindly provided by James O'Hara (CNC). This species was known only from the type locality on the islands of Trinidad and Tobago, thus is the first record from Brazil

This species is morphologically similar to *R. andina* in the aspects of male terminalia. *Retrocitomyia trinitatensis* differs from *R. andina* in having vesical lateral arm elongate with a pointed apex anteriorly and without a median excision (Figures 17E-F). In *R. andina* the vesical lateral arm has a median excision and the pointed apex is lacking (Figures 10E-F).

Biology. Unknown.

Retrocitomyia urumajoensis Lopes 1985

(Figures 2A-B, 4E, 6C, 9E, 18A-F, 19A-F, 21B)

Retrocitomyia urumajoensis Lopes 1985: 3 (male description, key). Type locality: Brazil, Pará, Bragança, Urumajó [= Augusto Côrrea]. Pape (1996, catalogue); Sousa et al. (2015, checklist); Mello-Patiu & Salazar-Souza (2016, catalogue and key); Sousa et al. (2016, checklist).

847

848 *Redescription. Male.* Length = 7.5 – 10.4 mm (n = 122).

849 *Head.* Parafacial, fronto-orbital plate and posterior ocular orbits with golden pruinosity;
850 fronto-orbital plate with setulae in the upper region to the gena; face with silvery pruinosity; frons
851 about 0.72x head width at level of ocelar triangle; frontal vitta black along its whole length; 5-7
852 well-developed frontal setae reaching level of apex of pedicel; proclinate orbital setae absent;
853 ocellar setae less developed than the upper frontals, inner vertical seta 1.5 x largest than frontals,
854 outer vertical seta differentiated from postocular setae; gena and genal groove with golden
855 pruinosity, gena with black setae; postgena gray with silvery pruinosity and light brown setae;
856 occiput golden with an upper row of black setulae and the remaining setulae pale; antenna with
857 pedicel and postpedicel brownish, with silvery pruinosity; arista long plumose on basal 2/3; palpus
858 brownish.

859 *Thorax*. *Chaetotaxy:* acrostichals 0+0, dorsocentrals 1+2, intra-alars 1+2, supra-alars 1+3,
860 postpronotals 2; scutellum with marginal setae 2, apicals 2 and discals 2; notopleurals 4,
861 anepimerals 3, anepisternals 6, katepisternals setae 4, almost in a straight line; merals 5.

862 *Abdomen.* Brownish black with yellowish pruinosity; T5 with a complete row of marginal
863 setae. ST5 brown, with posterior arm long, narrow, divergent, with rounded apex, and with long
864 setulae on inner lateral margin; median lobe, rounded, and with a short-pigmented plate on inner
865 margin (Figure 18A).

866 *Terminalia.* Syntergosternite 7+8 blackish-brown with yellowish pruinosity on the
867 posterior margin with six well developed marginal setae; epandrium brownish without pruinosity
868 (Figure 8E); cercus, pregonite and postgonite blackish-brown; cercus enlarged and dorsally
869 flattened, covered by numerous long setae along its inner margin, interrupted on the middle, some
870 setulae on outer margin of apical half (posterior view) (Figure 18C); cercal prong falciform and
871 convergent, of the same width up to the apex (posterior view) (Figure 18C); surstylus subtriangular
872 with rounded apex and several long setae in apical half (Figure 18B); postgonite biggest than
873 pregonite (Figure 18D); vesica subtriangular (lateral view), vesical arch absent, vesical lateral arm
874 sclerotized formed by a sinuous lobe in internal margin (ventral view) with apical margin slightly
875 curved anteriorly (lateral view) (Figure 18E-F); juxta well sclerotized, wider than long, with
876 posterior margin sinuous (lateral view) (Figure 18E-F).

877 *Female*. Length = 8-9.5 mm (n = 6). Differs from male as follow: *Head.* Parafacial,
878 fronto-orbital plate and posterior ocular with silvery pruinosity; frons about 0.54x head width at
879 level of ocelar triangle; 10-11 well-developed frontal setae reaching level of apex of pedicel; 2
880 proclinate orbital setae similar to or slightly longer than reclinate orbitals; outer vertical seta about
881 2/3 to 1/2 of length of inner vertical seta; gena with silvery pruinosity and pale setulae; occiput

882 silvery with pale setulae; antenna with pedicel brownish and postpedicel gray with brownish
883 pruinosity. *Thorax*. Scutellum with distal seta undifferentiated. *Abdomen*. Posterior margin of T5
884 elliptical, brown with yellowish pruinosity, with 7-8 pairs of premarginal setae (Figure 19D); T6
885 divided in two hemitergites, orange with golden pruinosity, and with a row of setae along posterior
886 margin (Figures 19A, D); spiracle 6 and 7 located on T6 (Figure 19A); T8 absent; Epiproct formed
887 by a row of setae; hypoproct broad; cercus covered with long setae (Figure 19A). ST 2-5 oval,
888 longer than wide, with two pairs of long setae on posterior margin; ST6 wider than long with
889 medial depressions, posterior margin narrowed, with pointed lateral apex, and six setae, median
890 setae thinner than others (Figure 19A); ST6 and ST7 united, but with a well-defined delimitation
891 between them and both with posterior margin medially concave (Figure 19A); ST7 and ST8 fused
892 with tiny setulae on distal half (Figure 19A). Vaginal plate slightly darkened, wider than long
893 without setae (Figure 19A). Spermathecae globular, with parallel grooves and a small rounded
894 chamber where they receive the spermathecal duct (Figure 19B).
895 *Type material examined*. Holotype ♂: "Urumajó [= Augusto Corrêa], mun. de
896 [municipality of] Bragança / Pará—18-23.viii.[19]56 / E. Lobato [printed on white paper]" //
897 "Holotype [printed on red paper, black frame]" // "Retrocitomyia ♂ / urumajoensis / n. sp. /
898 Holotypus [handwritten on white paper] / Det. H.S.Lopes [printed]" // "MNRJ 2276 [printed on
899 white paper]" (MNRJ). ♂ paratype, same data as holotype (MNRJ). [Specimens lost in the fire at
900 MNRJ).
901 *Additional material examined*: BRAZIL. *Maranhão:* Cândido Mendes, Manguezal [=
902 mangrove forest], armadilha para mosca [= fly trap], J. R. Sousa leg.; *Pará*: Marudá, 25.I.1968, T.
903 Pimentel leg., 1 ♂ (MPEG); Bragança, Ajuruteua, Mangue [= mangrove forest], 23-24.XI.1988,
904 Armadilha Malaise [= Malaise trap], 1 ♂, 2 ♀ (MPEG); Bragança, Ilha Canelas, Lado oceânico da
905 Ilha [=ocean side of the island], 02-06.XI.1997, I. Gorayeb, J. Ribeiro, W. Torres, N. Bittencourt
906 legs., Armadilha Malaise [= Malaise trap], 10 ♂, 3 ♀ (MPEG); Augusto Corrêa, Praia Mandarité [=
907 Madarité beach], 20-23.X.2001, I. Gorayeb, L. Sousa legs., Armadilha Malaise [=Malaise trap], 1
908 ♂, 1 ♀ (MPEG); Magalhães Barata, Vila de Calafate [= Calafate village], Manguezal [= mangrove
909 forest] Açaiteua, 16-18. XII.2015, C. C. Souza, J. Soares, K. Tavares-Jesus legs., Armadilha de
910 garrafa PET [= traps made of 2-liter plastic bottles], isca de camarão [= shrimp bait], 17 ♂ (MPEG);
911 same data as previous except beef lung as bait, 9 ♂ (MPEG); same data as previous except crab as
912 bait, 27 ♂ (MPEG); same data as previous except fish as bait, 10 ♂ (MPEG); Vigia de Nazaré, Vila
913 de Itapuá [= Itapuá village], Manguezal [= mangrove forest] Anauerá,18-20.II.2016, C. C. Souza, J.
914 Soares, K. Tavares-Jesus legs., Armadilha de garrafa PET [= traps made of 2-liter plastic bottles],
915 isca de camarão [= shrimp bait], 1 ♂ (MPEG); same data as previous except beef lung as bait, 1 ♂
916 (MPEG); Vigia de Nazaré, Vila de Itapuá [= Itapuá village], Manguezal [= mangrove forest]

Anauerá, 15-18. X.2015, C. C. Souza, J. Soares, K. Tavares-Jesus legs., Armadilha de garrafa PET [= traps made of 2-liter plastic bottles], isca de camarão [=crab bait] 8 ♂ (MPEG); same data as previous except beef lung as bait, 6 ♂ (MPEG); same data as previous except shrimp as bait, 28 ♂ (MPEG); same data as previous except fish as bait, 2 ♂ (MPEG).

Distribution. Neotropical – Brazil (Maranhão, Pará) (Figure 21B).

Remarks. Retrocitomyia urumajoensis is similar to *R. paraguayensis* by having a juxta parallel to apical margin of distiphallus. *Retrocitomyia urumajoensis* differs from *R. paraguayensis* mainly in having vesical lateral without hook-shaped apex.

Biology. In an inventory performed in many environments of state of Maranhão, this species was obtained only in traps baited with rotting beef lung placed in the mangrove forests (Sousa et al. 2015, 2016). In a study about community of flesh flies of a mangrove forest in the state of Pará this species was sampled in large number with traps baited with rotting animal organic matter, such as shrimp, crab, fish, and beef lung (Souza et al., in preparation). All the specimens in the collection of MPEG were obtained only in traps placed in coastal environments. Therefore, this species seems to be restricted to Atlantic coastal environments.

Acknowledgments

We are grateful to all collections and curators which send the specimens and made this work possible. We also grateful to Dr James O'Hara (CNC), who provided photos and information on the *R. trinitatensis* holotype, to Ms. Sofia Camargo (UFPA) and Dr. Daniel Whitmore (BNHM), who provided photos of *P. setifacies* holotype and paratype, and to Matheus Tavares de Souza for the image vectorization. Thanks to Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (CAPES) for master's fellowship to CCS. Additionally, we thank Dr. William Leslie Overal (MPEG) for reviewing the English and for valuable suggestion.

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Figure captions

Figure 1. Phylogenetic hypothesis to species of *Retrocitomyia.* Black circles indicate synapomorphies, white circles represent non-unique changes in the tree, either forward or reverse; above are the character numbers and below are the character states. The values below branches correspond to GC (left)/Relative Bremer (right). In green, the basal polytomy, in pink the clade A, in yellow the clade B, and in purple the clade C.

Figure 2. SEM images of male distiphallus of *Retrocitomyia*. **A-B.** grade retrocita*, R. retrocita* (specimen from Cametá, PA). **A.** distiphallus, ventral view. **B.** distiphallus, lateral view. **C-D.** clade urumajoensis, *R. urumajoensis* (specimens from Magalhães Barata, PA). **C.** distiphallus, ventral view. **D.** distiphallus, lateral view). Abbreviations: jx = juxta, pp = paraphallus, var = vesical arch, vla = vesical lateral arm. Red arrow pointed to absence of vesical arch. Scale bars: 100 µm.

Figure 3. Species of *Retrocitomyia* (lateral view). **A.** *R. adolenda* (holotype, MNRJ). **B.** *R. andina* (paratype, MNRJ). **C.** *R. fluminensis* (specimen from Poconé, MT). **D.** *R. mexicana* (paratype, MNRJ). **E.** *R. mizuguchiana* (paratype, MNRJ). **F.** *R. paraguayensis* (holotype, MNRJ). Scale bars: 5 mm.

Figure 4. Species of *Retrocitomyia* (lateral view). **A.** *R. retrocita* (specimen from Cametá, PA). **B.** *R. silveirai* sp. n. (holotype, MPEG). **C.** *R. sisbiota* (holotype, MNRJ). **D.** *R. trinitatensis* (holotype, CNC). *mexicana.* **E.** *R. urumajoensis* (holotype, MNRJ). Scale bars: 5 mm.

Figure 5. Male terminalia, posterior view. **A.** *R. adolenda* (holotype, MNRJ). **B.** *R. fluminensis* (specimen from Poconé, MT). **C.** *R. mexicana* (paratype, MNRJ). **D.** *R. mizuguchiana* (paratype,

MNRJ). **E.** *R. paraguayensis* (specimen from Chapada dos Guimarães, MT). **E.** *R. retrocita* (specimen from Cametá, PA). Scale bars: 1 mm.

Figure 6. Male terminalia, posterior view. **A.** *R. sisbiota* (holotype, MNRJ). **B.** *R. trinitatensis* (holotype, CNC). **C.** *R. urumajoensis* (specimen from Magalhães Barata, PA). Scale bars: 1 mm.

Figure 7. Male terminalia, lateral view. **A.** *R. adolenda* (holotype, MNRJ). **B.** *R. andina* (paratype, MNRJ). **C.** *R. fluminensis* (specimen from Poconé, MT). **D.** *R. mexicana* (paratype, MNRJ). **E.** *R. mizuguchiana* (paratype, MNRJ). **F.** *R. paraguayensis* (specimen from Chapada dos Guimarães, MT). Scale bars: 1 mm.

Figure 8. Male terminalia, lateral view. **A.** *R. retrocita* (specimen from Cametá, PA). **B.** *R. sisbiota* (holotype, MNRJ). **C-D.** *R. trinitatensis* (holotype, CNC). **E.** *R. urumajoensis* (specimen from Magalhães Barata, PA). Scale bars: 1 mm.

Figure 9. *R. adolenda* (specimen from Pacatuba, CE). **A.** Male sternite 5, ventral view. **B.** Terminal segments of male abdomen, lateral view. **C.** Male cerci, posterior view. **D.** Gonites, ventral view. **E.** Phallus, ventral view. **F.** Phallus, lateral view. Abbreviations: bp = basiphallus, ce = cercus, ep = epandrium, jx = juxta, mc = median cleft, ml = median lobe, pa = posterior arm, pp = paraphallus, prg = pregonite, ptg = postgonite, su = surstylus, var = vesical arch, vla = vesical lateral arm. Scale bars: 0,2 mm.

Figure 10. *R. andina* (paratype, MNRJ). **A.** Male sternite 5, ventral view. **B.** Terminal segments of male abdomen, lateral view. **C.** Male cerci, posterior view. **D.** Gonites, ventral view. **E.** Phallus, ventral view. **F.** Phallus, lateral view. Abbreviations: bp = basiphallus, ce = cercus, ep = epandrium, jx = juxta, mc = median cleft, ml = median lobe, pa = posterior arm, pp = paraphallus, prg = pregonite, ptg = postgonite, su = surstylus, vla = vesical lateral arm. Scale bars: 0,2 mm.

Figure 11. *R. fluminensis* (specimen from Chapada dos Guimarães, MT). **A.** Male sternite 5, ventral view. **B.** Terminal segments of male abdomen, lateral view. **C.** Male cerci, posterior view. **D.** Gonites, ventral view. **E.** Phallus, ventral view. **F.** Phallus, lateral view. Abbreviations: bp = basiphallus, ce = cercus, ep = epandrium, jx = juxta, mc = median cleft, ml = median lobe, pa = posterior arm, pp = paraphallus, prg = pregonite, ptg = postgonite, su = surstylus, var = vesical arch, vla = vesical lateral arm. Scale bars: 0,2 mm.

Figure 12. *R. mexicana* (holotype, MNRJ). **A.** Male sternite 5, ventral view. **B.** Terminal segments of male abdomen, lateral view. **C.** Male cerci, posterior view. **D.** Gonites, ventral view. **E.** Phallus, ventral view. **F.** Phallus, lateral view. Abbreviations: bp = basiphallus, ce = cercus, ep = epandrium, jx = juxta, mc = median cleft, ml = median lobe, pa = posterior arm, pp = paraphallus, prg = pregonite, ptg = postgonite, su = surstylus, vla = vesical lateral arm. Scale bars: 0,2 mm. Red arrow point to the hump on juxta (lateral view).

Figure 13. *R. mizuguchiana* (specimen from Corumbá, MS). **A.** Male sternite 5, ventral view. **B.** Terminal segments of male abdomen, lateral view. **C.** Male cerci, posterior view. **D.** Gonites, ventral view. **E.** Phallus, ventral view. **F.** Phallus, lateral view. Abbreviations: bp = basiphallus, ce = cercus, ep = epandrium, jx = juxta, mc = median cleft, ml = median lobe, pa = posterior arm, pp = paraphallus, prg = pregonite, ptg = postgonite, su = surstylus, var = vesical arch, vla = vesical lateral arm. Scale bars: 0,3 mm. Red arrow point to the central depressed area with a cluster of setae on cercus (posterior view).

Figure 14. *R. paraguayensis* (holotype, MNRJ). **A.** Male sternite 5, ventral view. **B.** Terminal segments of male abdomen, lateral view. **C.** Male cerci, posterior view. **D.** Gonites, ventral view. **E.** Phallus, ventral view. **F.** Phallus, lateral view. Abbreviations: bp = basiphallus, ce = cercus, ep = epandrium, jx = juxta, mc = median cleft, ml = median lobe, pa = posterior arm, pp = paraphallus, prg = pregonite, ptg = postgonite, su = surstylus, vla = vesical lateral arm. Scale bars: 0,5 mm.

Figure 15. *R. retrocita* (specimen from Cametá, PA). **A.** Male sternite 5, ventral view. **B.** Terminal segments of male abdomen, lateral view. **C.** Male cerci, posterior view. **D.** Gonites, ventral view. **E.** Phallus, ventral view. **F.** Phallus, lateral view. Abbreviations: bp = basiphallus, ce = cercus, ep = epandrium, jx = juxta, mc = median cleft, ml = median lobe, pa = posterior arm, pp = paraphallus, prg = pregonite, ptg = postgonite, su = surstylus, var = vesical arch, vla = vesical lateral arm. Scale bars: 0,3 mm.

Figure 16. *R. silveirai* sp. n. (holotype, MPEG). **A.** Male sternite 5, ventral view. **B.** Terminal segments of male abdomen, lateral view. **C.** Male cerci, posterior view. **D.** Gonites, ventral view. **E.** Phallus, ventral view. **F.** Phallus, lateral view. Abbreviations: bp = basiphallus, ce = cercus, ep = epandrium, jx = juxta, mc = median cleft, ml = median lobe, pa = posterior arm, pp = paraphallus, prg = pregonite, ptg = postgonite, su = surstylus, var = vesical arch, vla = vesical lateral arm. Scale bars: 0,2 mm.

Figure 17. *R. trinitatensis* (specimen from Pium, TO). **A.** Male sternite 5, ventral view. **B.** Terminal segments of male abdomen, lateral view. **C.** Male cerci, posterior view. **D.** Gonites, ventral view. **E.** Phallus, ventral view. **F.** Phallus, lateral view. Abbreviations: bp = basiphallus, ce = cercus, ep = epandrium, jx = juxta, mc = median cleft, ml = median lobe, pa = posterior arm, pp = paraphallus, prg = pregonite, ptg = postgonite, su = surstylus, vla = vesical lateral arm. Scale bars: 0,2 mm.

Figure 18. *R. urumajoensis* (specimen from Magalhães Barata, PA). **A.** Male sternite 5, ventral view. **B.** Terminal segments of male abdomen, lateral view. **C.** Male cerci, posterior view. **D.** Gonites, ventral view. **E.** Phallus, ventral view. **F.** Phallus, lateral view. Abbreviations: bp = basiphallus, ce = cercus, ep = epandrium, jx = juxta, mc = median cleft, ml = median lobe, pa = posterior arm, pp = paraphallus, prg = pregonite, ptg = postgonite, su = surstylus, vla = vesical lateral arm. Scale bars: 0,2 mm.

Figure 19. *R. urumajoensis* (specimen from Bragança, PA). **A.** female terminalia, ventral view. **B.** Spermatecha, lateral view, scale bars: 0,01 mm. **C.** female specimen, lateral view. **D.** Female abdomen, posteroventral view, **E.** Female abdomen, dorsal view. **F.** Female abdomen, ventral view. Abbreviations: ce = cercus ep = epiproct, hp = hypoproct, ST = sternite, T = tergite, VP = vaginal plate. Scale bars: 2 mm.

Figure 20. Distribution data of *Retrocitomyia*. **A.** Geographic record of *R. adolenda, R. andina* and *R. fluminensis.* **B.** Geographic record of *R. mizuguchiana, R. paraguayensis* and *R. trinitatensis.*

Figure 21. Distribution data of *Retrocitomyia*. **A.** Geographic record of *R. retrocita* and *R. mexicana.* **B.** Geographic record of *R. silveirai, R. sisbiota* and *R. urumajoensis.*

CONCLUSÕES GERAIS

Com base na revisão taxonômica e na análise cladística das espécies de *Retrocitomyia* foram obtidas as seguintes conclusões:

- *Retrocitomyia* compreende 11 espécies, incluindo uma espécie nova, até o momento;
- Ampliação da distribuição das espécies conhecidas;
- A terminália de *Pa. setifacies* e *Pe. irwini* são idênticas a de *R. retrocita,* por esse motivo a sinonímia proposta por Lopes (1979) foi mantida.
- *Retrocitomyia* é monofilético, no entanto não há uma característica única do gênero. A combinação de vários caracteres da morfologia externa e da terminália podem ser úteis para diferenciar este gênero dos demais.
- O gênero possui dois grupos de espécies caracterizados principalmente pela presença ou ausência do arco da vesica e pela presença ou ausência de concavidade dorsal no cerco.

ANEXO

Insect Systematics & Evolution

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Instructions for Authors

Scope

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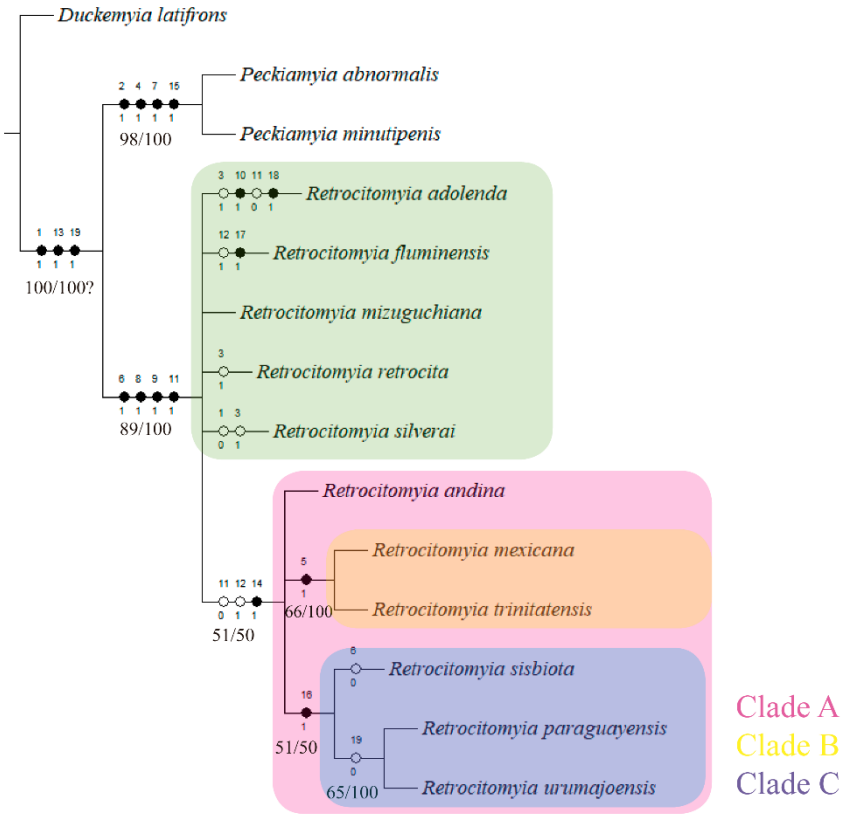
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Peckiamyia abnormalis
Peckiamyia minutipenis
98/100
100/100?
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Retrocitomyia fluminensis
Retrocitomyia mizuguchiana
Retrocitomyia retrocita
Retrocitomyia silverai
89/100
Retrocitomyia andina
Retrocitomyia mexicana
Retrocitomyia trinitatensis
66/100
51/50
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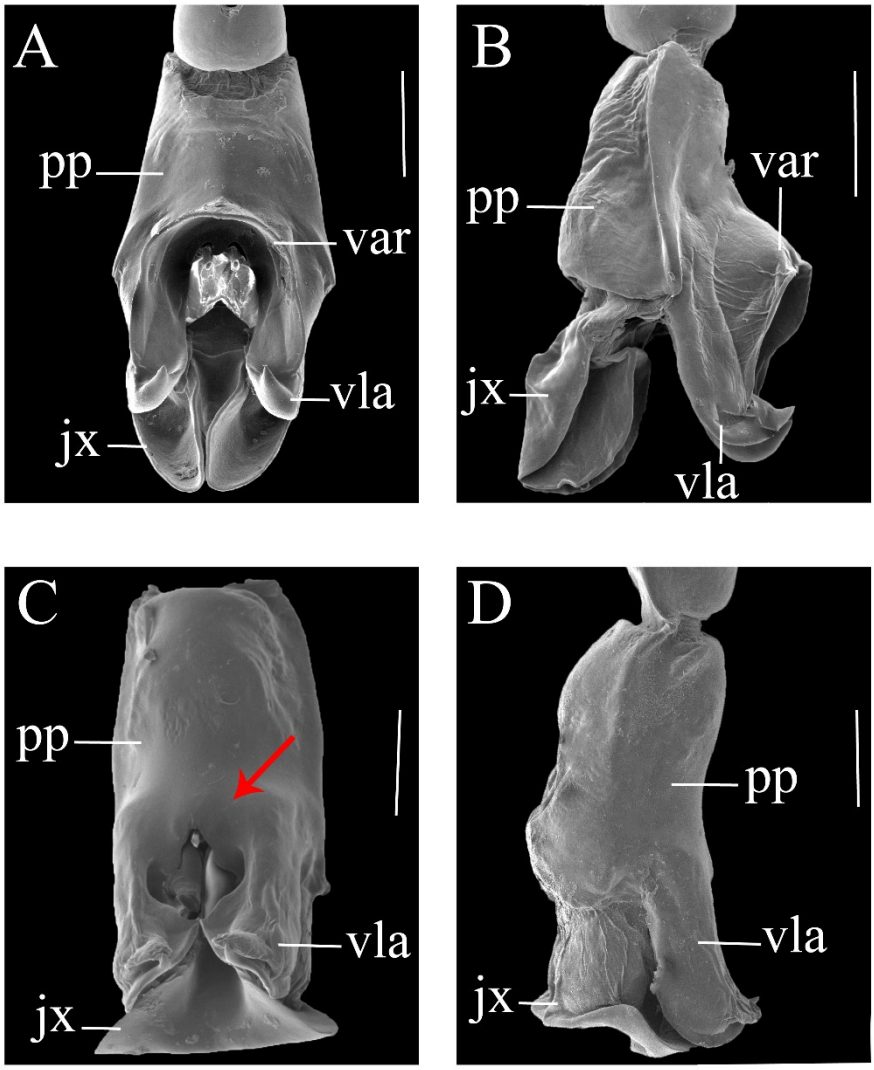
Clade A
Clade B
Clade C

Figure 1



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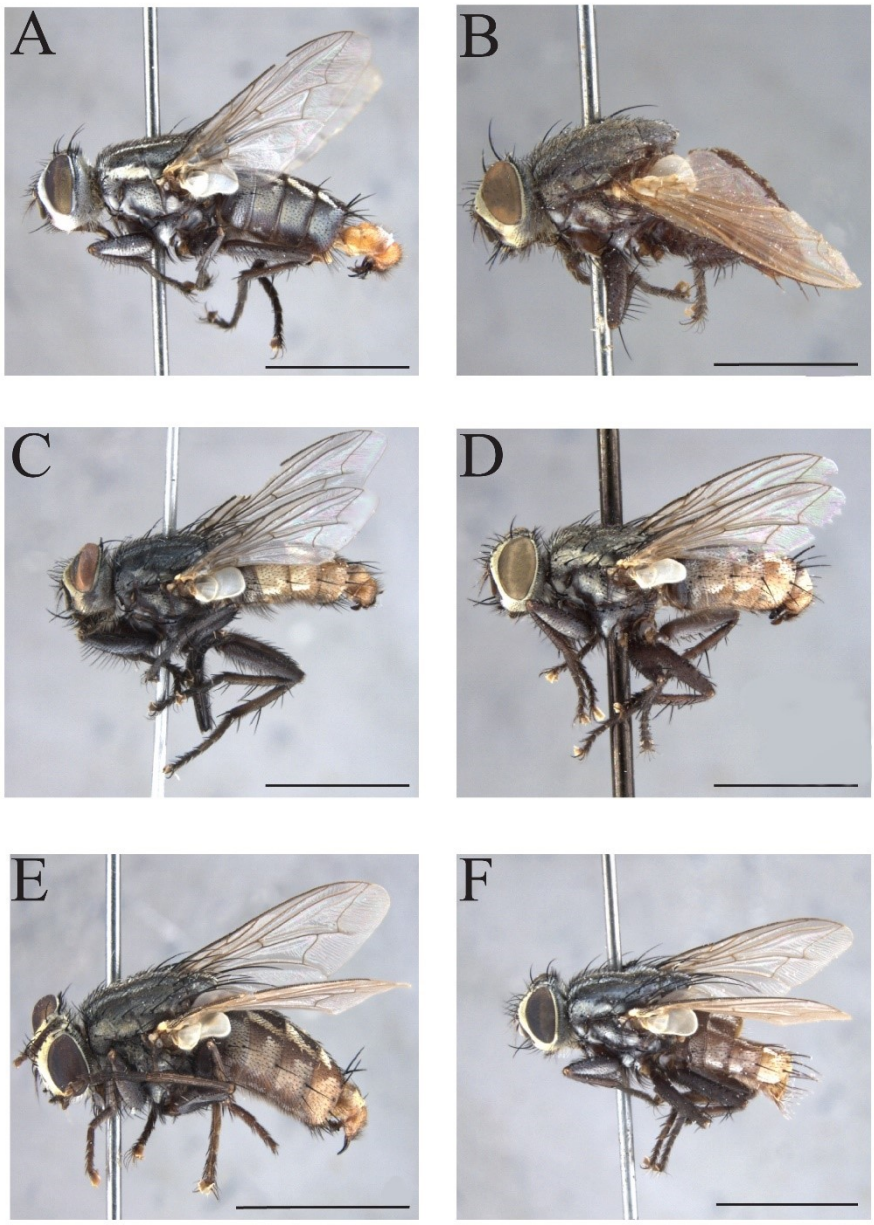

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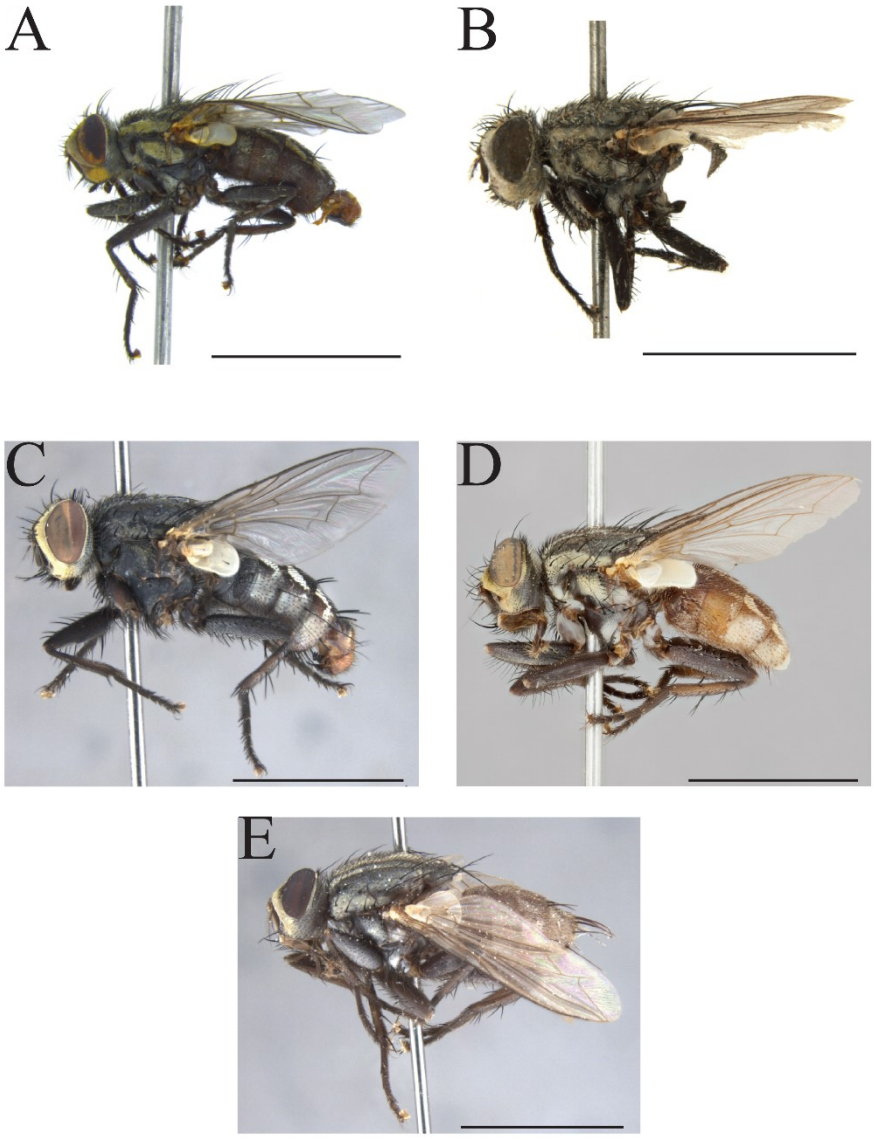

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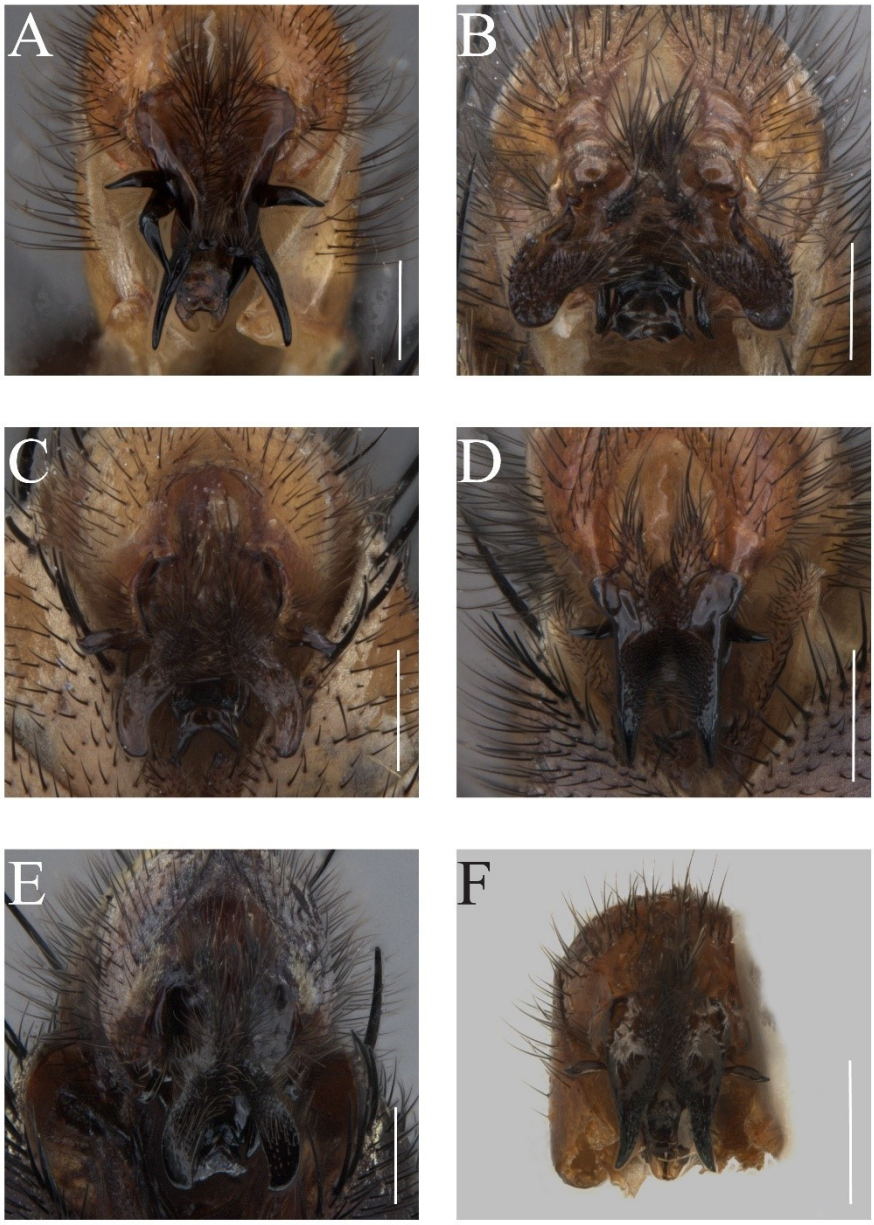

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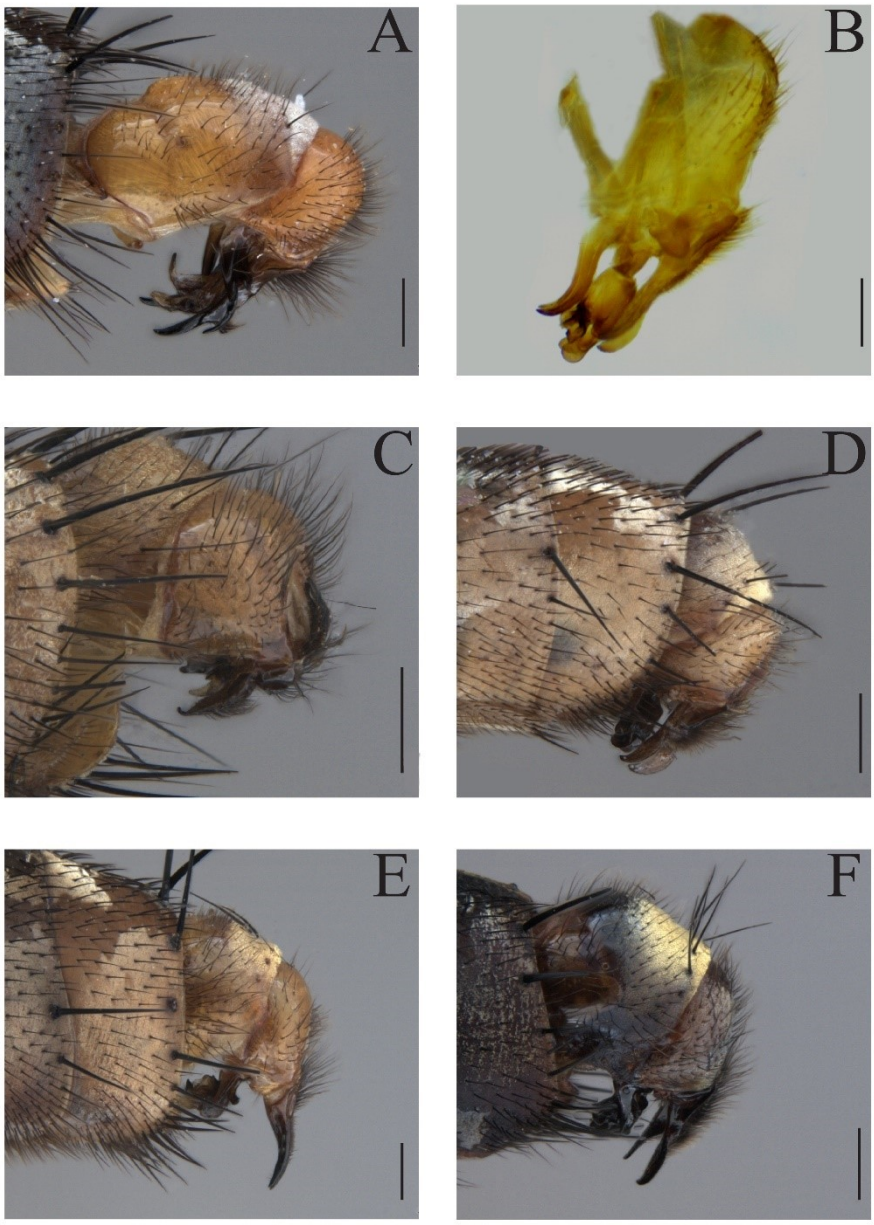

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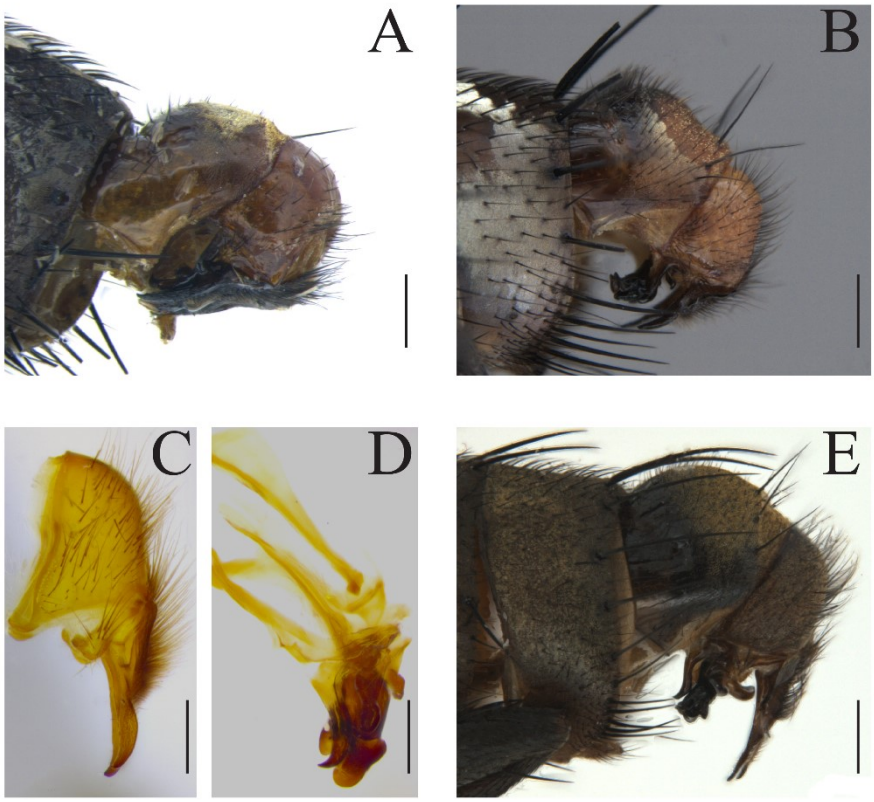

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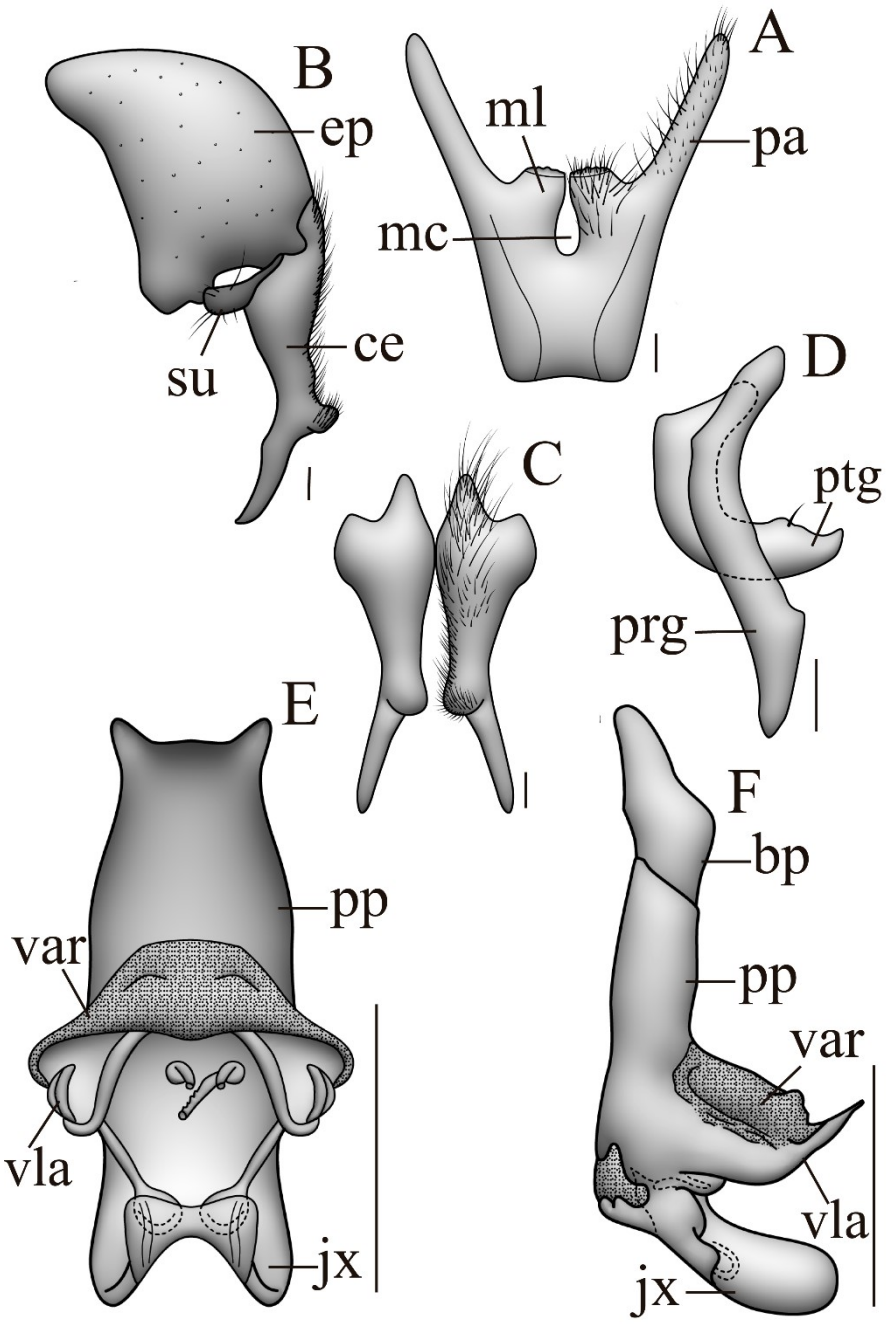

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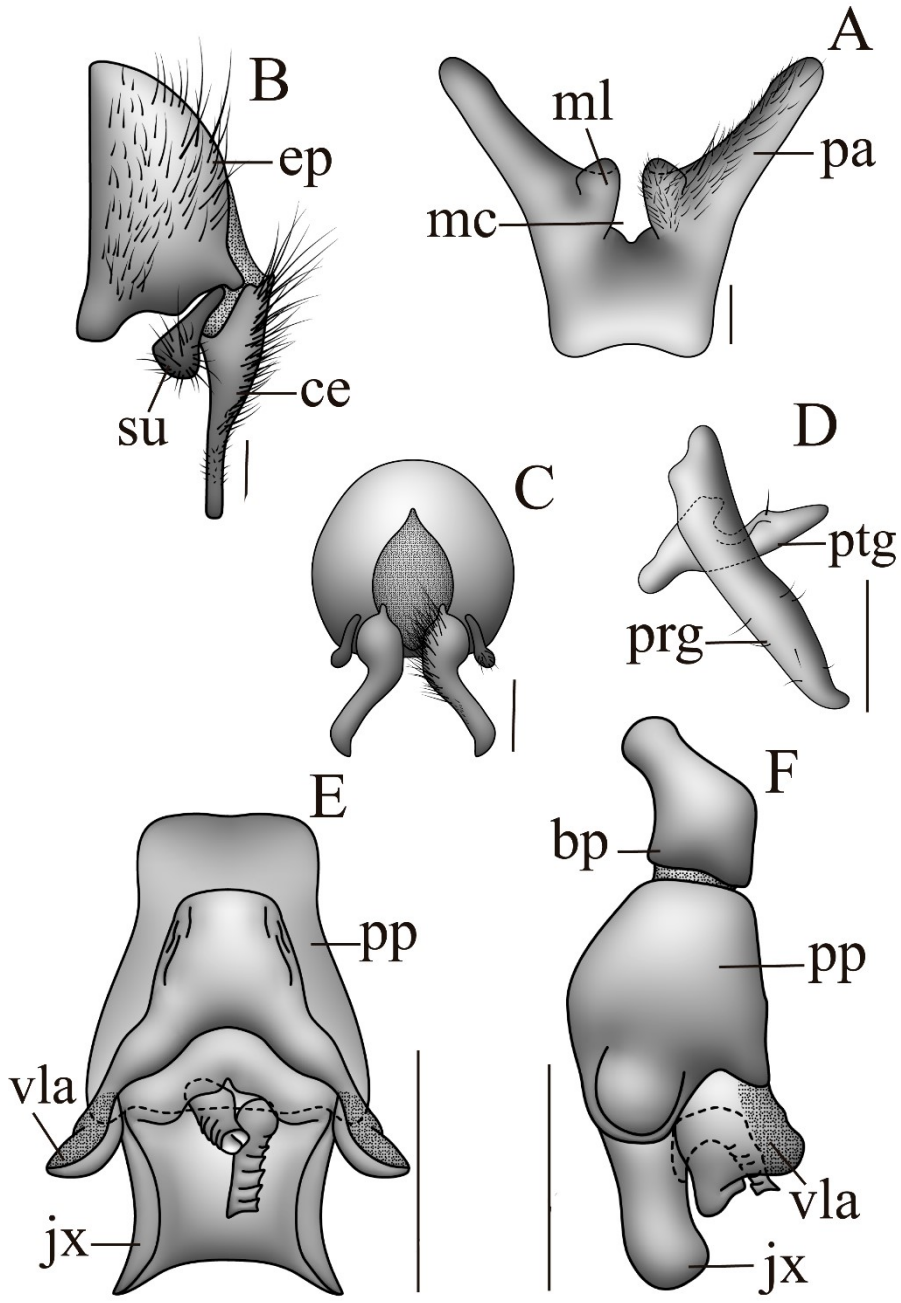

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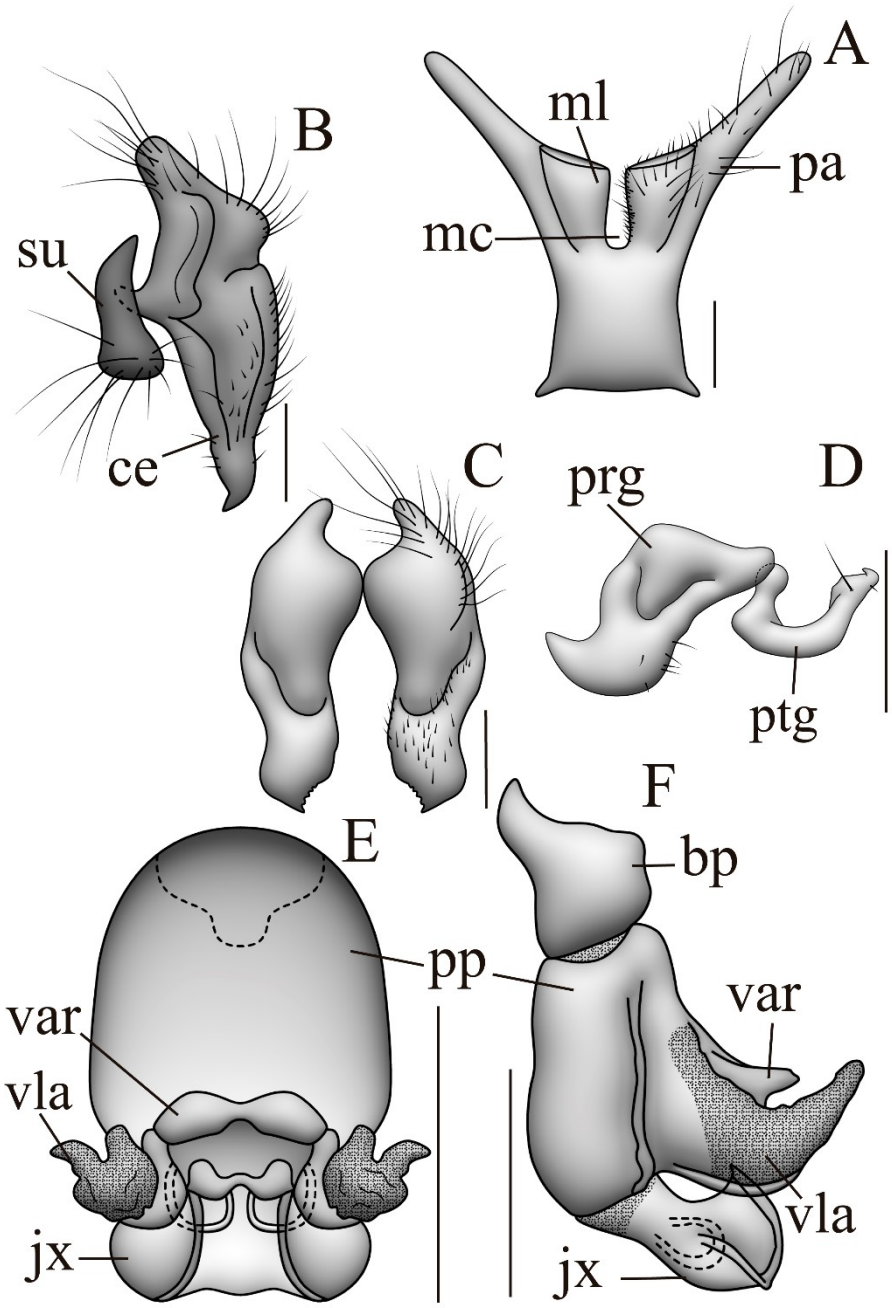

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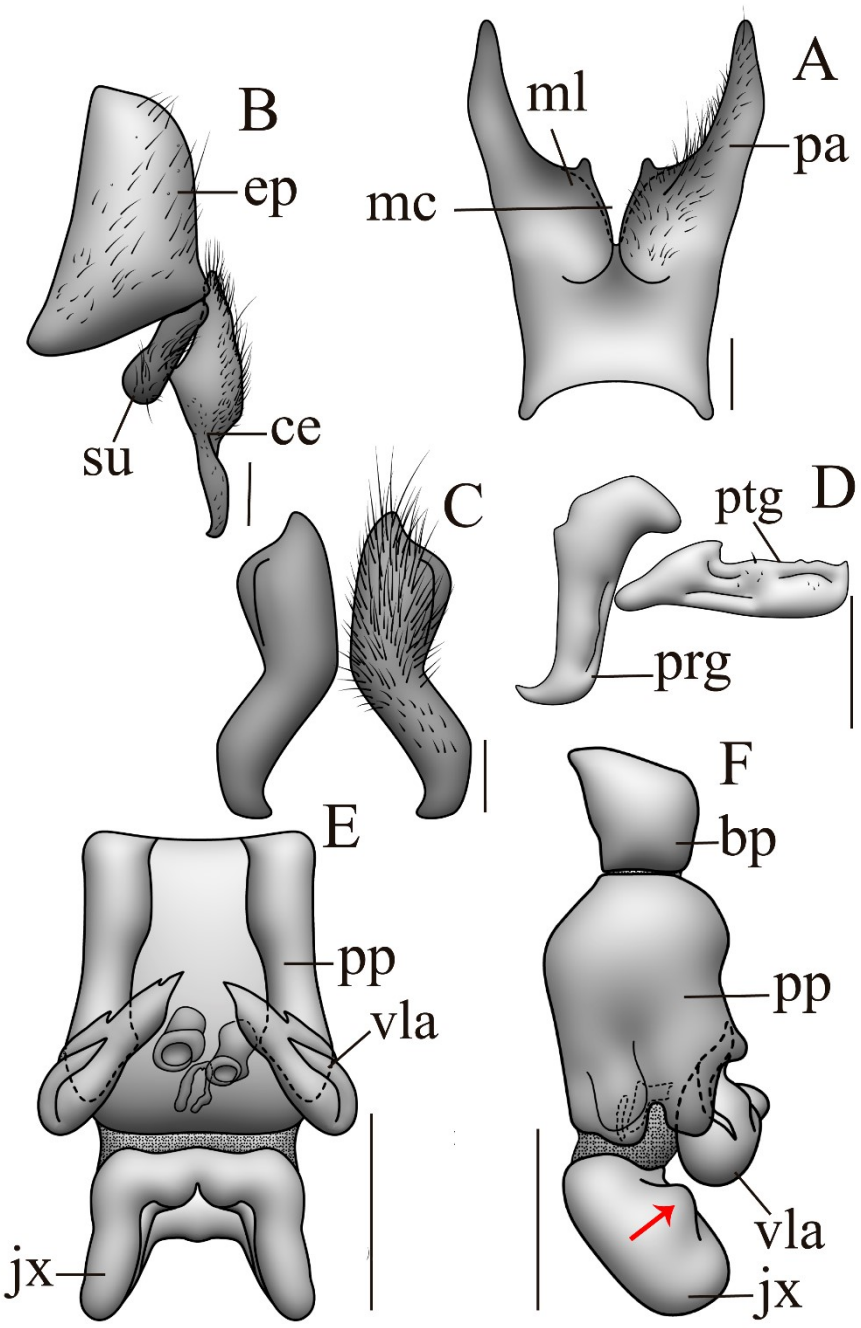

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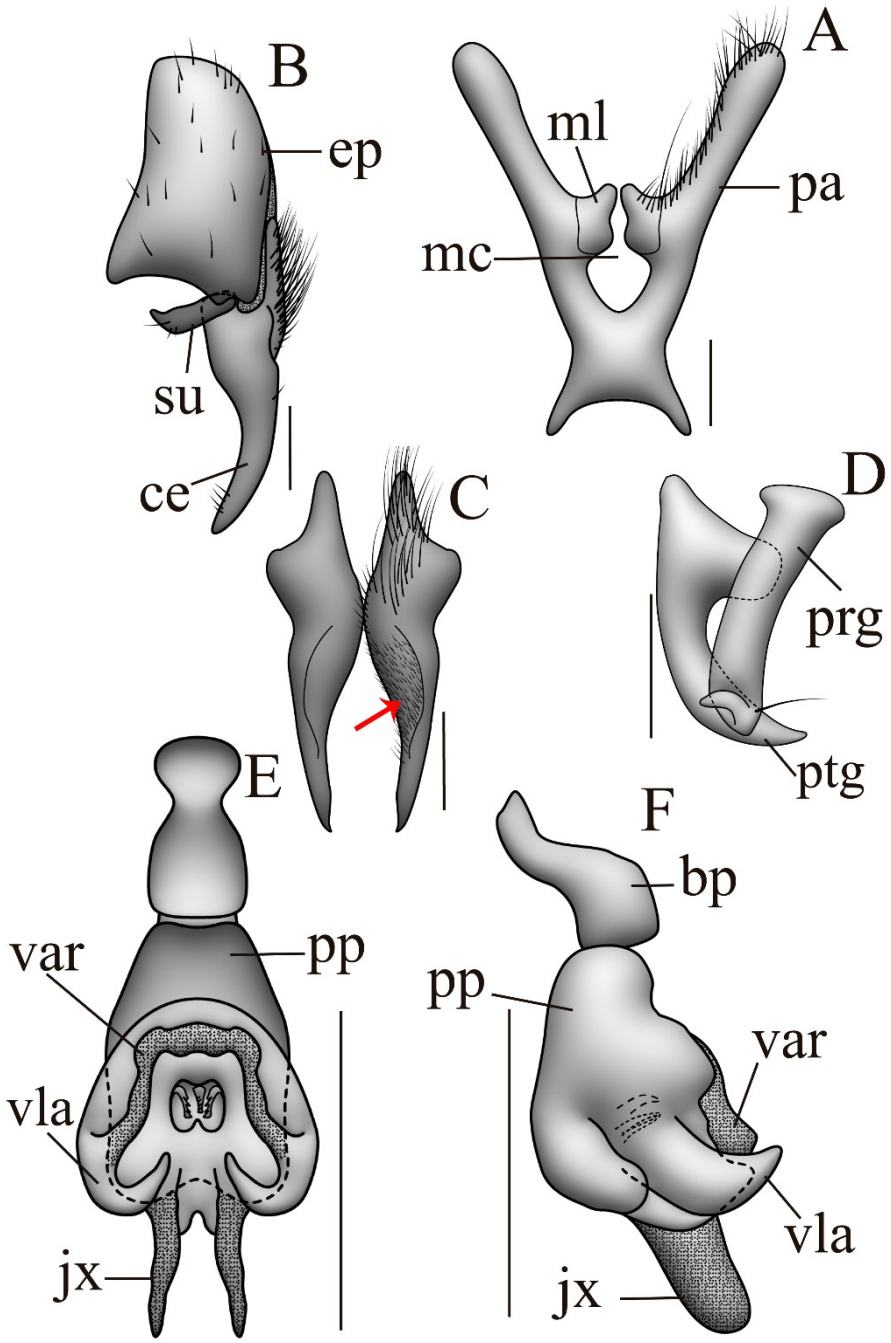

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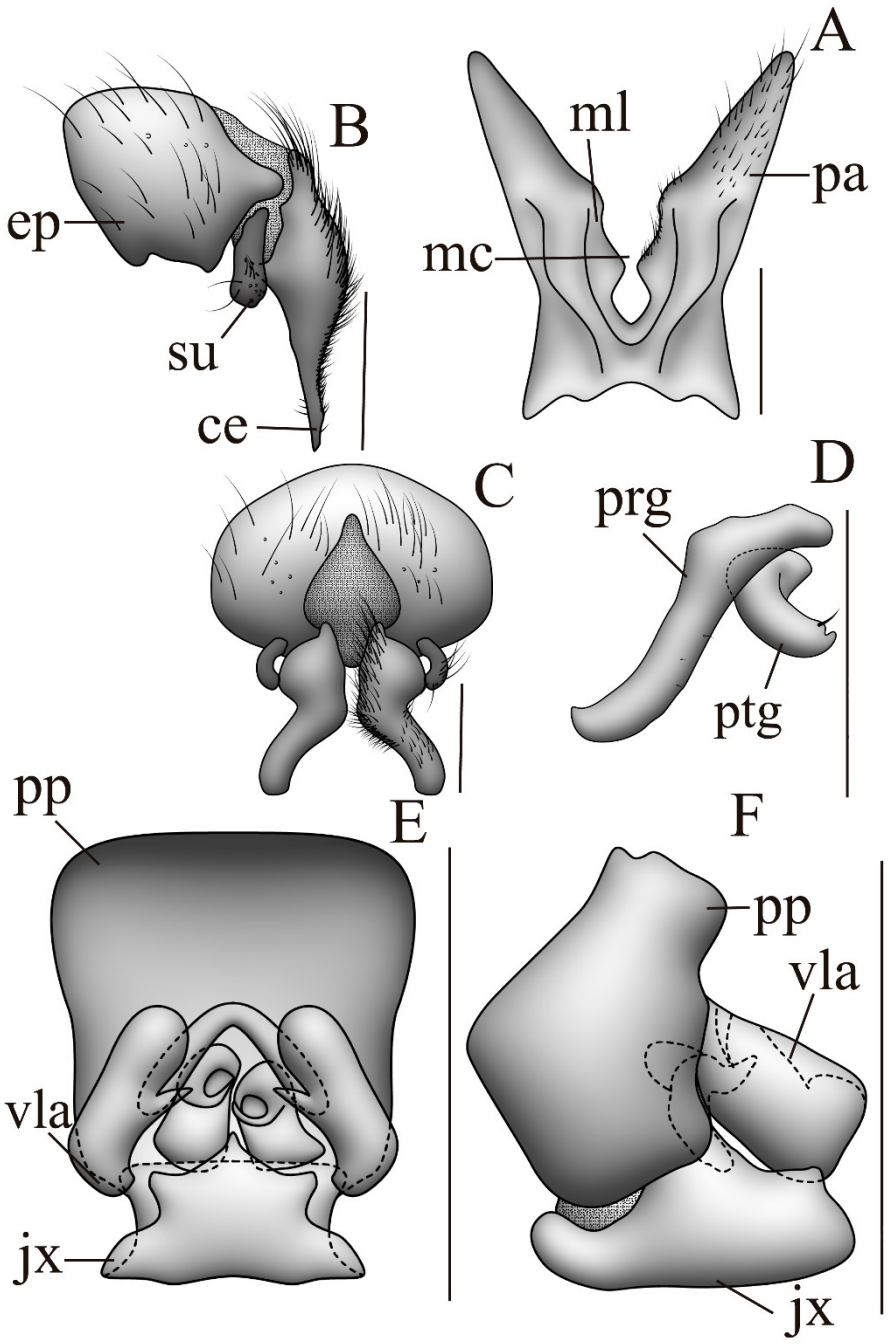

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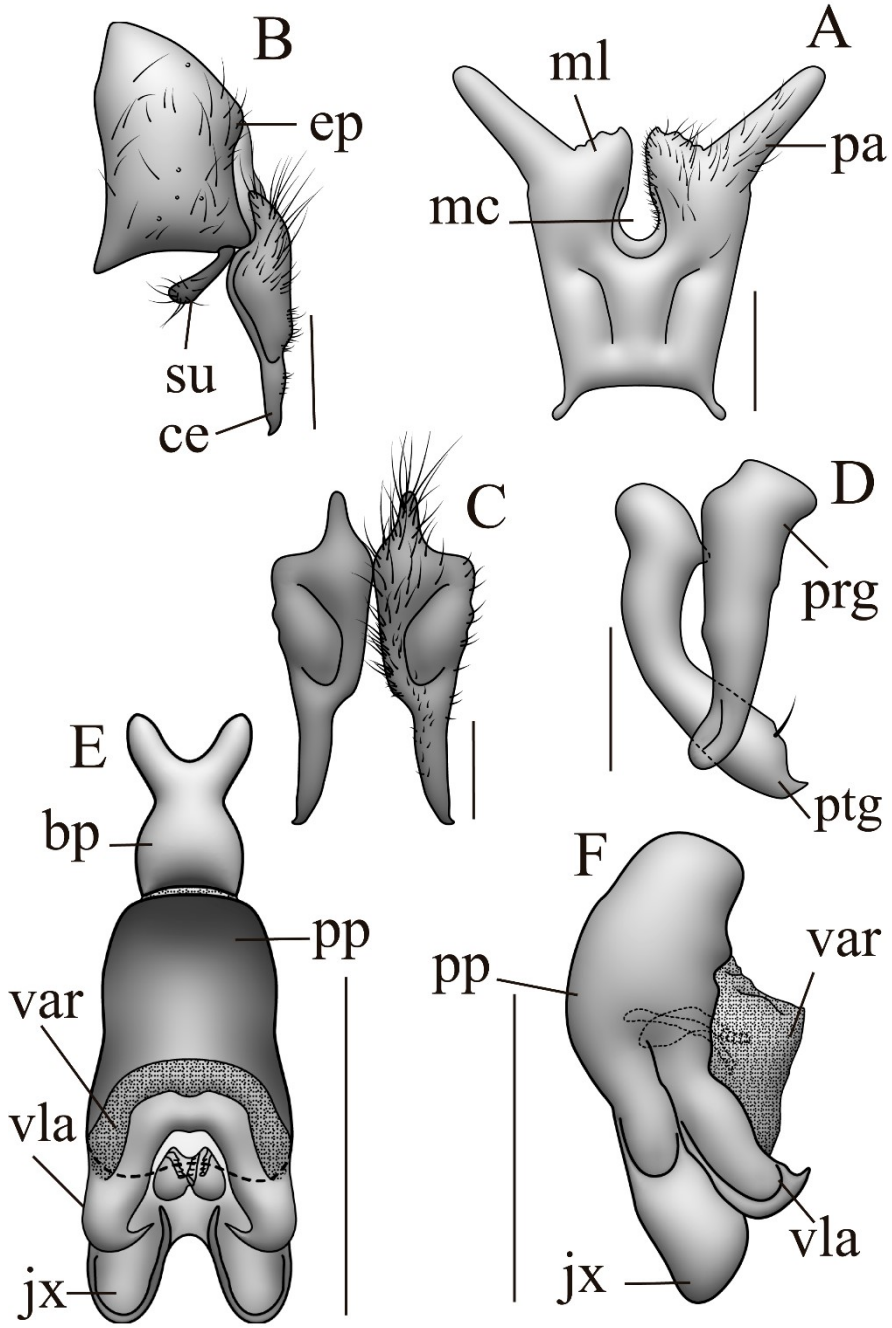

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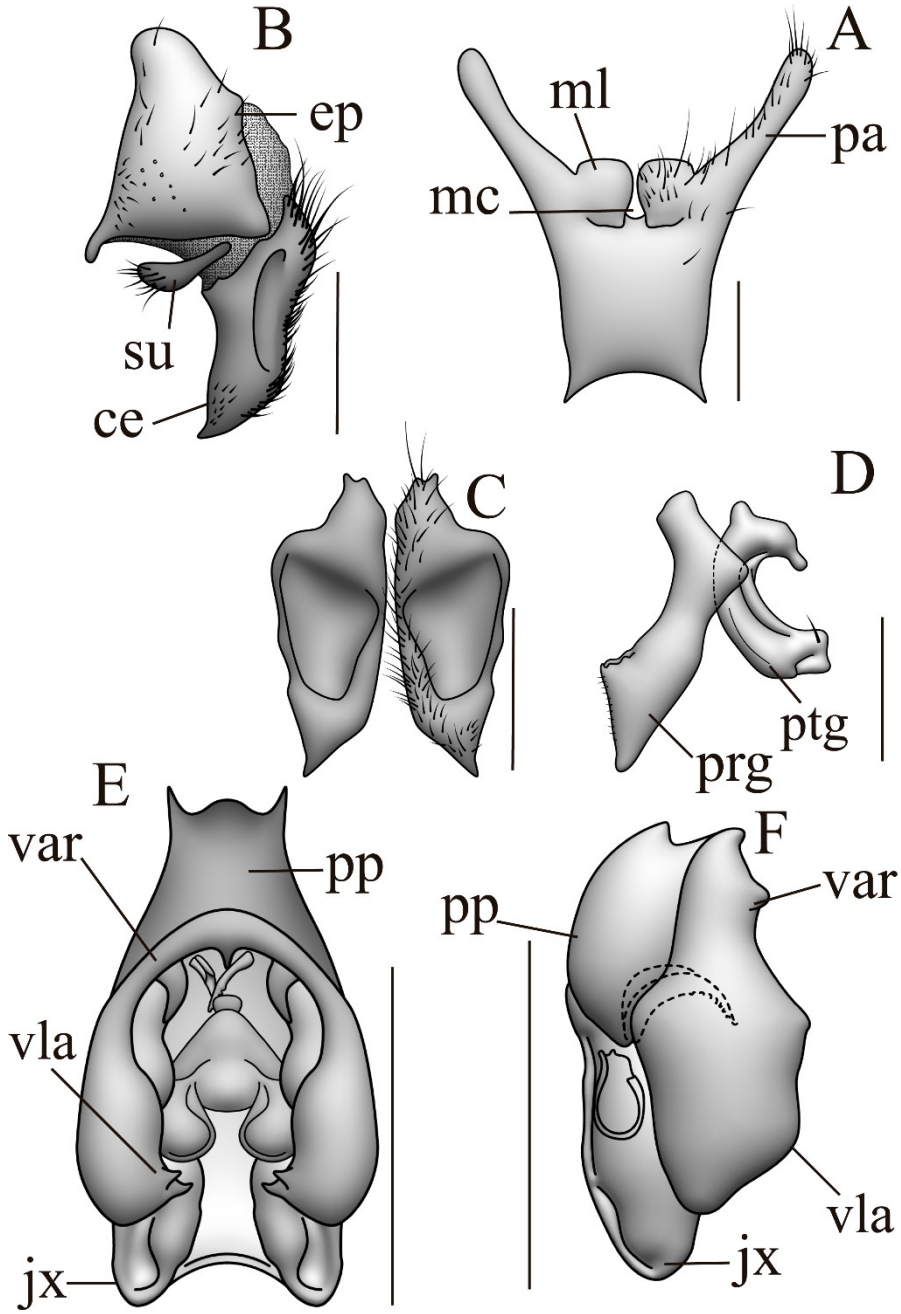

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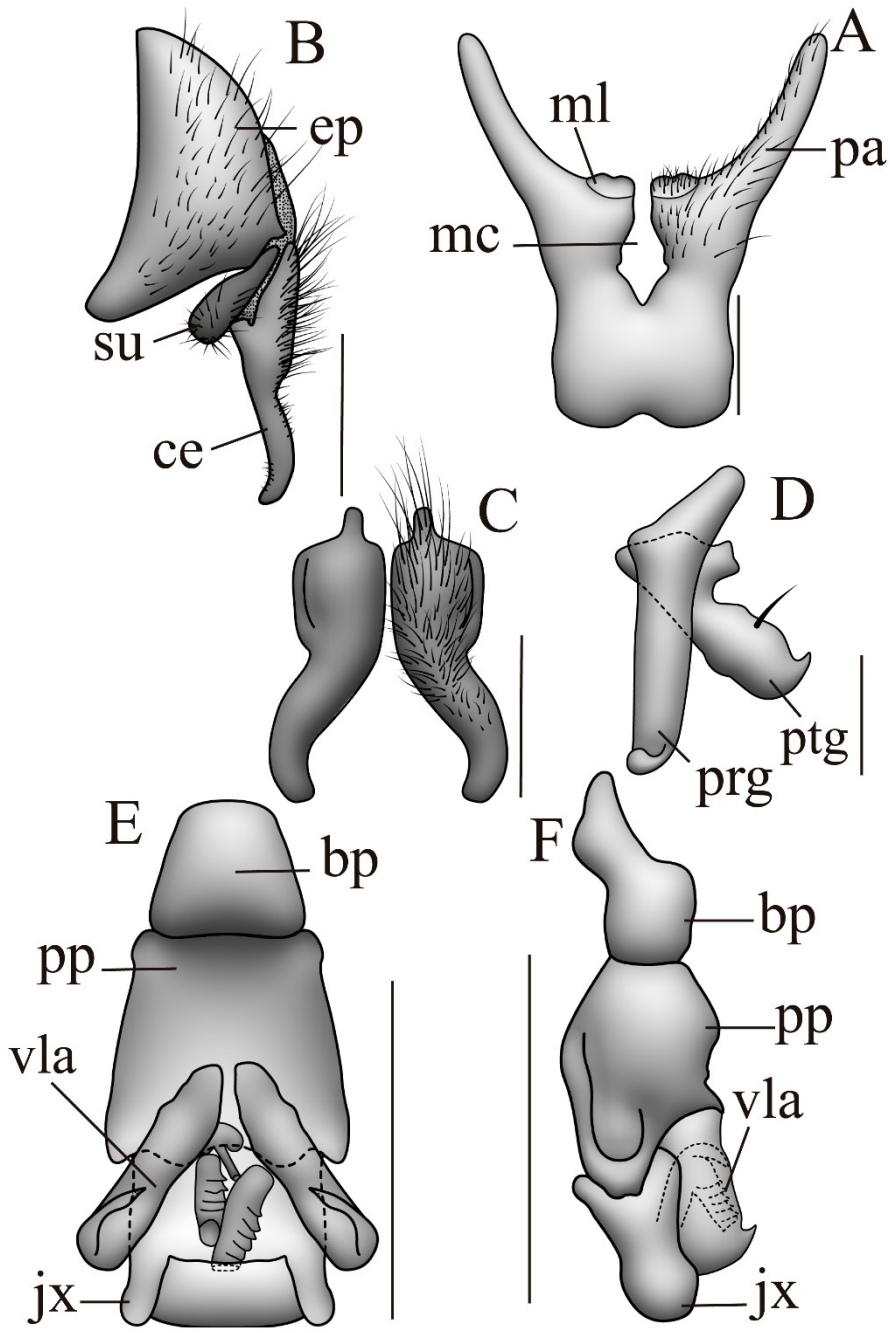

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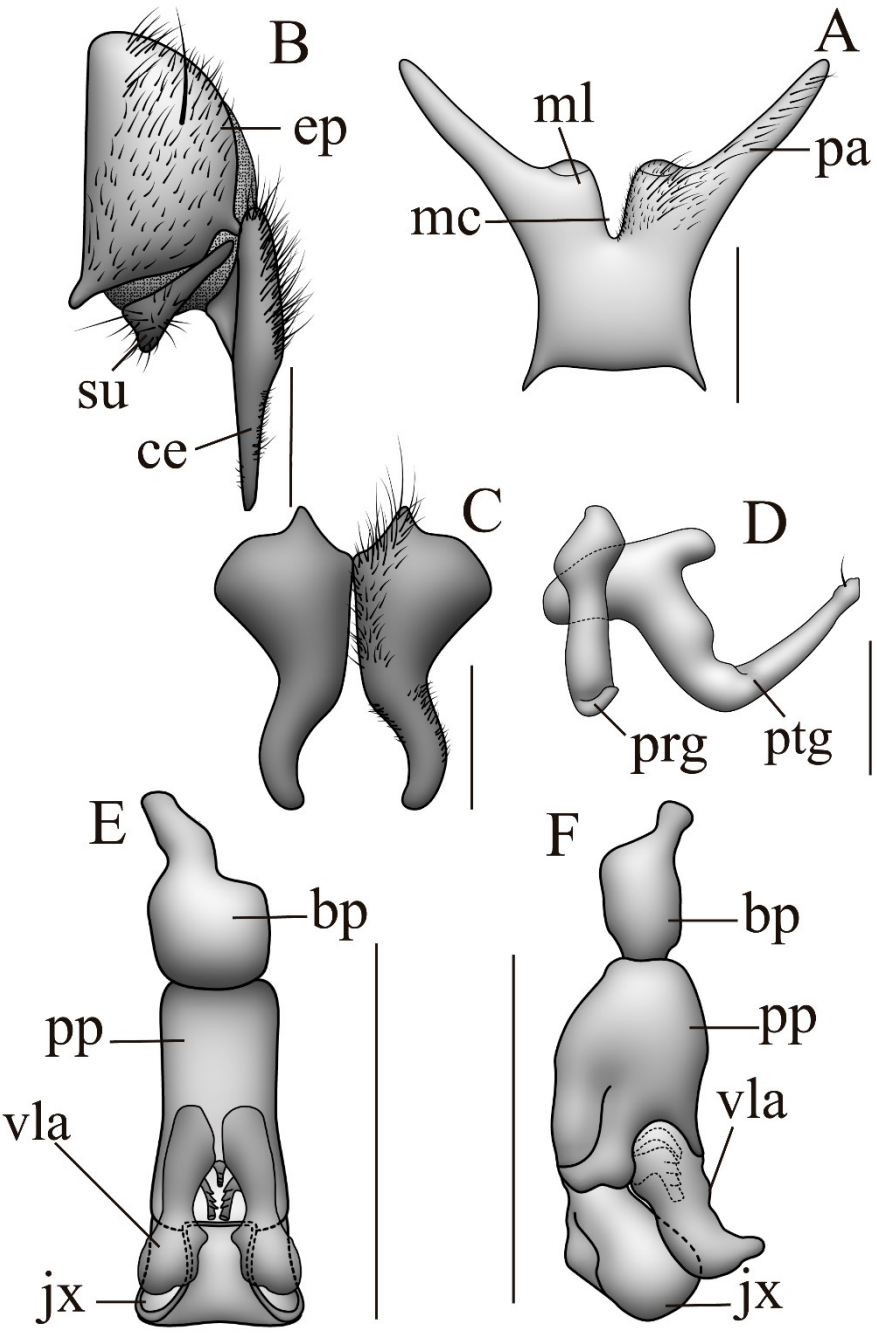

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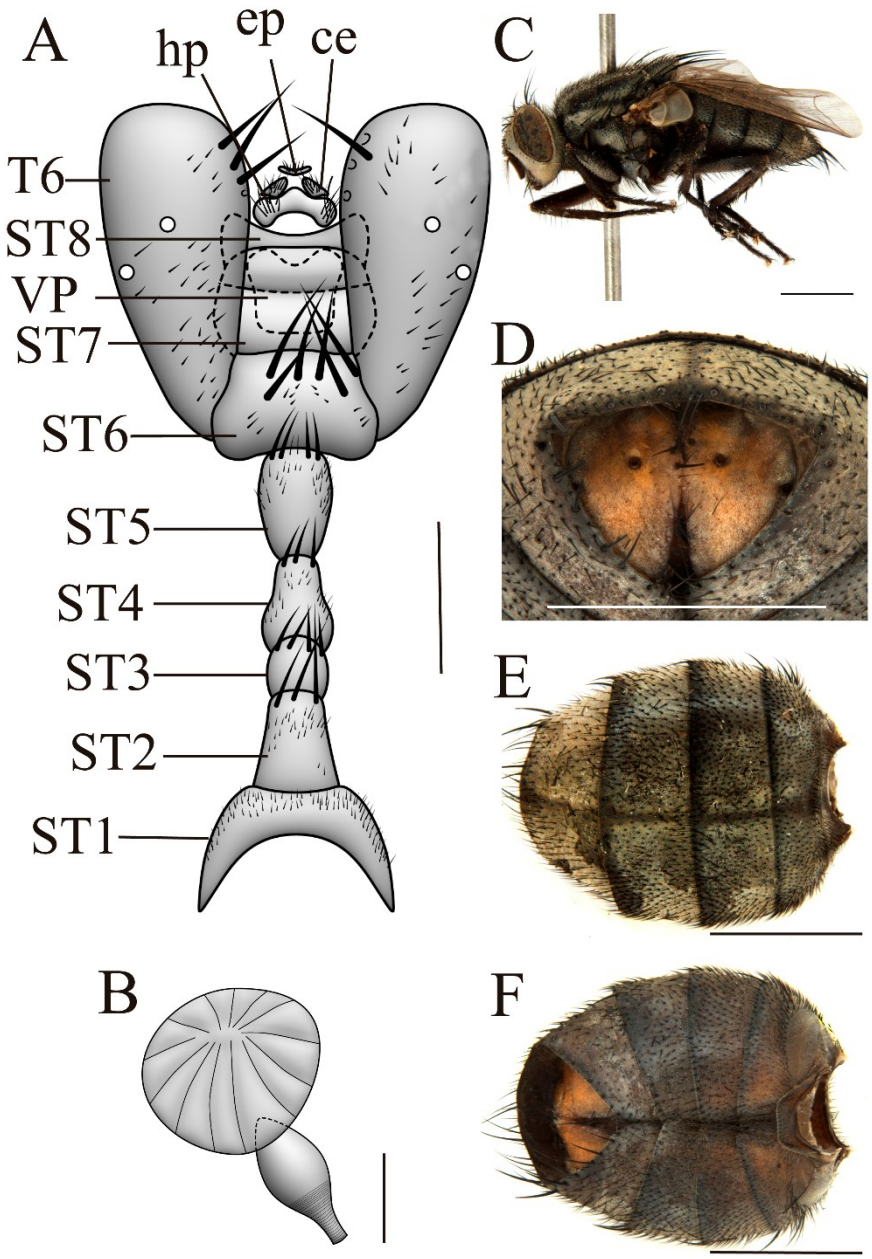

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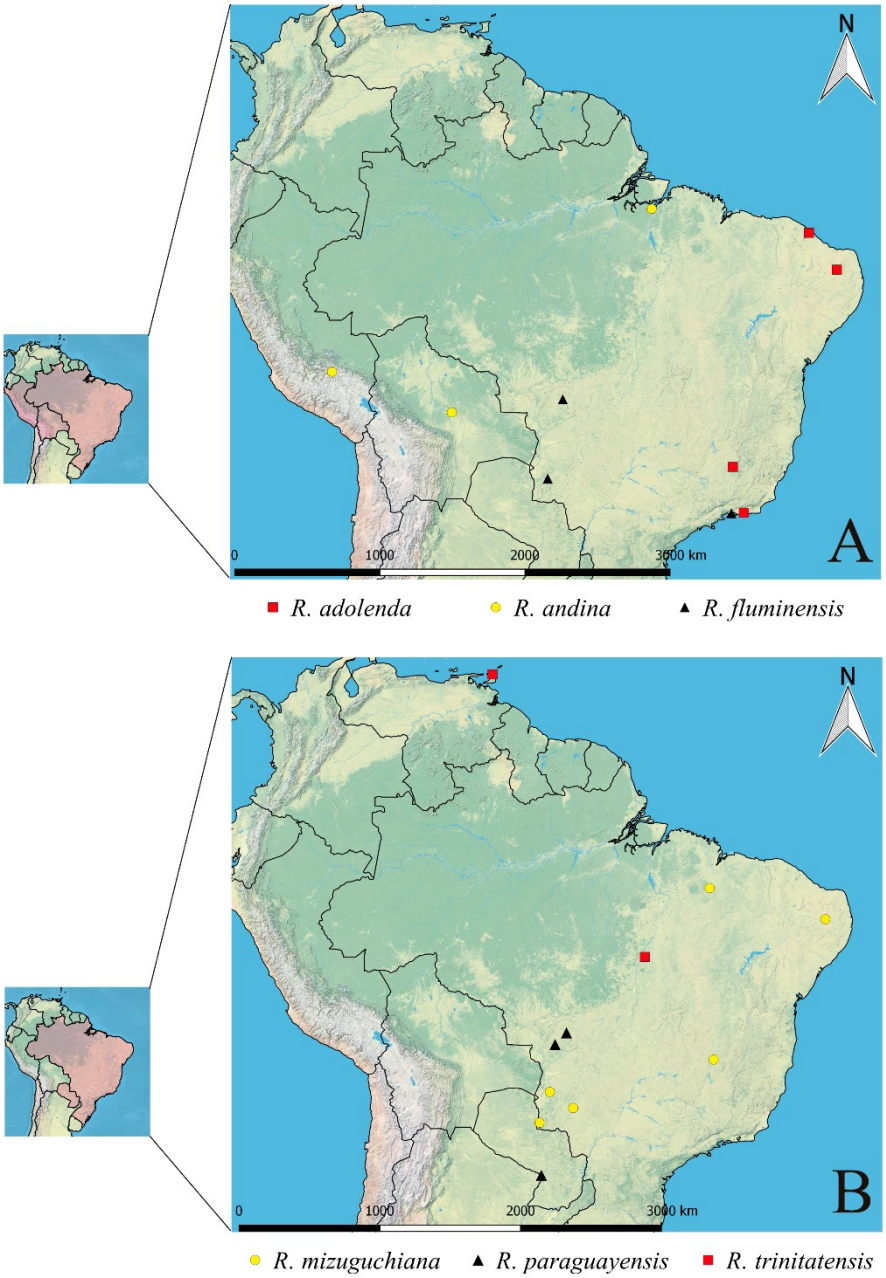
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0
1000
2000
3000 km
R. adolenda
R. andina
R. fluminensis
N
B
0
1000
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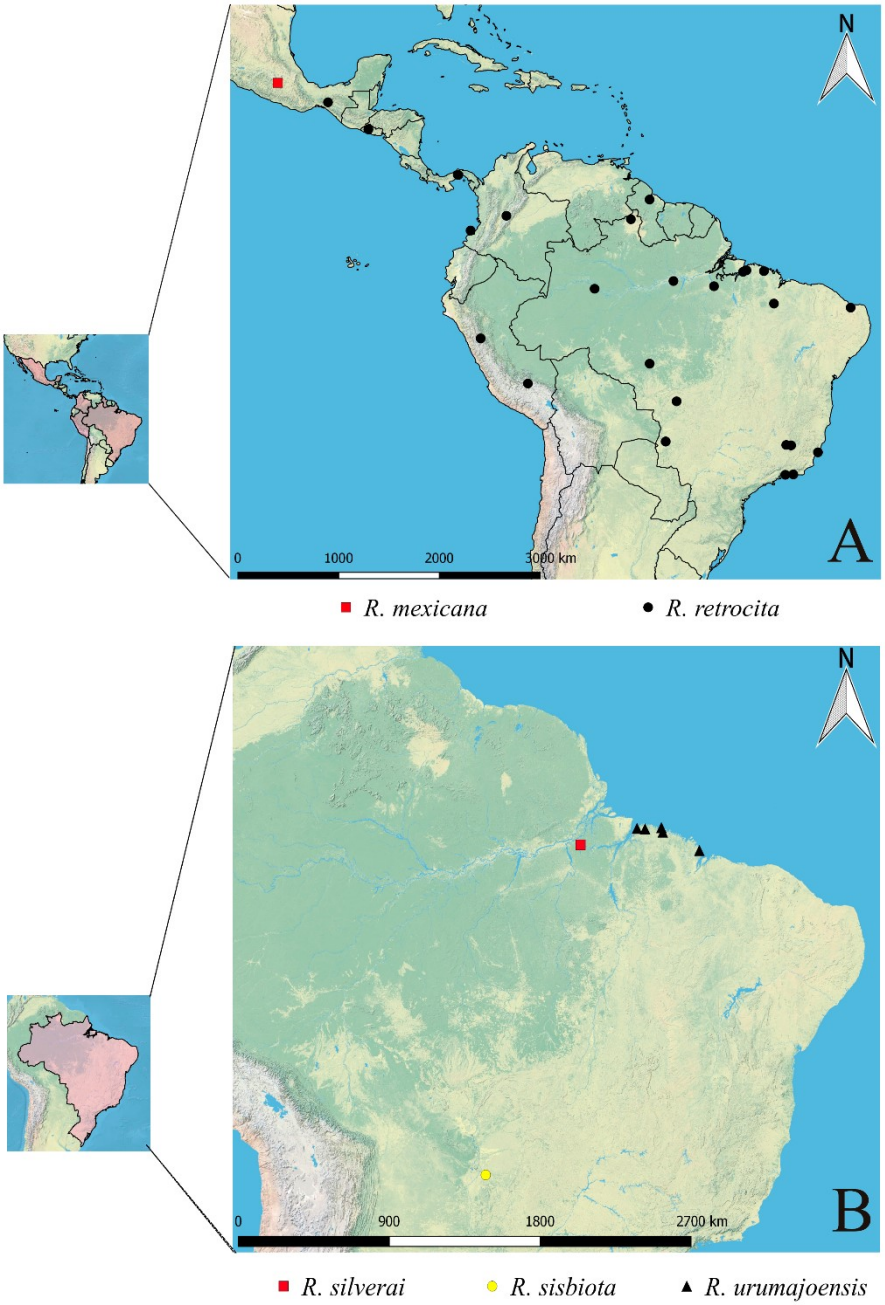
3000 km
R. mizuguchiana
R. paraguayensis
R. trinitatensis

Figure 20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2000
3000 km
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R. retrocita
N
B
0
900
1800
2700 km
R. silverai
R. sisbiota
R. urumajoensis

Figure 21

List of morphological characters for phylogenetic analysis

1. Proclinate fronto-orbital setae
0 present
1 absent

2. Postgenal setulae, length relative to genal setulae
0 equal
1 much longer than genal setulae

3. Genal and postgenal setulae, color
0 black
1 white

4. Abdominal ST4, setosity
0 uniformly setose
1 two posterior patches of dense, erect, black setae

5. Abdominal ST5, posterior arm orientation
0 divergent
1 convergent

6. Abdominal ST5, posterior arm size
0 short
1 long

7. Abdominal ST5, median cleft
0 short
1 long

8. Abdominal ST5, shape of median lobe
0 pointed
1 rounded

9. Abdominal ST5, protruding median lobe
0 absent
1 present

10. Cercus, central-median tuft of setae in posterior view
0 absent
1 present

11. Cercus, dorsal concavity in posterior view
0 absent
1 present

12. Cercal prong, in posterior view
0 non-flattened
1 flattened

13. Postgonite, orientation
0 parallel to body axis
1 perpendicular to body axis

14. Vesica composed by
0 vesical arch and vesical lateral arm
1 only vesical lateral arm

15. Vesical arch, format in anterior view
0 undivided
1 divided

16. Vesical lateral arms, orientation in anterior view
0 parallel between then
1 convergent between then

17. Vesical lateral arms, distal region
0 sclerotized
1 membranous

18. Vesical lateral arms, distal region in lateral view
0 non-tapering
1 tapering

19. Juxta, orientation
0 perpendicular to apical margin of distiphallus
1 parallel to apical margin of distiphallus

Table 1. Data matrix. Matrix of morphological characters. - = inapplicable data.

Taxa	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Duckemyia latifrons	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Peckiamyia abnormalis	1	1	0	1	0	0	1	0	0	0	0	0	1	0	1	0	0	0
Peckiamyia minutipenis	1	1	0	1	0	0	1	0	0	0	0	0	1	0	1	0	0	0
Retrocitomyia adolenda	1	0	1	0	0	1	0	1	1	1	0	0	1	0	0	0	0	1
Retrocitomyia andina	1	0	0	0	0	1	0	1	1	0	0	1	1	1	-	0	0	0
Retrocitomyia fluminensis	1	0	0	0	0	1	0	1	1	0	1	1	1	1	-	0	1	0
Retrocitomyia mexicana	1	0	0	0	1	1	0	1	1	0	0	1	1	1	-	0	0	0
Retrocitomyia mizuguchiana	1	0	0	0	0	1	0	1	1	0	1	0	1	0	0	0	0	0
Retrocitomyia paraguayensis	1	0	0	0	0	1	0	1	1	0	0	1	1	1	-	1	0	0
Retrocitomyia retrocita	1	0	1	0	0	1	0	1	1	0	1	0	1	0	0	0	0	0
Retrocitomyia silverai	0	0	1	0	0	1	0	1	1	0	1	0	1	0	0	0	0	0
Retrocitomyia sisbiota	1	0	0	0	0	0	0	1	1	0	0	1	1	1	-	1	0	0
Retrocitomyia trinitatensis	1	0	0	0	1	1	0	1	1	0	0	1	1	1	-	0	0	0
Retrocitomyia urumajoensis	1	0	0	0	0	1	0	1	1	0	0	1	1	1	-	1	0	0