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Article

Everything is similar, everything is different! *Trichorhina* Budde-Lund, 1908 (Oniscidea, Platyarthridae) from Brazilian caves, with descriptions of 11 new species

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Abstract: The present work describes 11 new species of the genus *Trichorhina* from Brazilian caves in the states of Bahia, Mato Grosso do Sul, Minas Gerais, Pará, and São Paulo. Moreover, the distribution of *T. tomentosa* has been expanded to include the states of Mato Grosso and Minas Gerais. Additionally, a distribution map and a key for all Brazilian species of *Trichorhina*, including epigean ones, are provided.
Keywords: *Terrestrial isopods; cave-dwellers; subterranean environments; Neotropics.*

Tudo é parecido, tudo é diferente! *Trichorhina* Budde-Lund, 1908 (Oniscidea, Platyarthridae) de cavernas brasileiras, com descrições de 11 novas espécies

Resumo: O presente trabalho descreve 11 novas espécies do gênero *Trichorhina* de cavernas brasileiras nos estados da Bahia, Mato Grosso do Sul, Minas Gerais, Pará e São Paulo. Além disso, a distribuição de *T. tomentosa* foi ampliada para incluir os estados de Mato Grosso e Minas Gerais. Adicionalmente, são fornecidos um mapa de distribuição e uma chave para todas as espécies brasileiras de *Trichorhina*, incluindo as epígeas.
Palavras-chave: *Isópodes terrestres; habitantes de cavernas; ambientes subterrâneos; Neotrópicos.*

Introduction

Terrestrial isopods (Oniscidea) comprise about 4,000 species in 38 or 39 families distributed in almost all types of terrestrial habitats (Schmalfuss 2003, Javidkar et al. 2015, 2017, Sfenthourakis & Taiti 2015, Dimitriou et al. 2019, Campos-Filho & Taiti 2021). The cave-dwelling Oniscidea includes over 400 species, predominantly from northern regions of the globe (*e.g.*, Vandel 1981, Taiti 2004, Taiti & Gruber 2008, Taiti & Xue 2012, Tabacaru & Giurginca 2013, Taiti et al. 2018, Bedek et al. 2019a, 2019b, 2019c).

In all of South America, only 2% of the territory has suitable lithology for the development of karst systems, of which Brazil has the highest number of systems and caves, approximately 23,000 caves in 19 karst areas (Auler 2002, 2017, CECAV 2018, Rubbioli et al. 2019). In recent years, numerous surveys conducted in these karst systems have revealed a significant potential for the occurrence of Oniscidea (*e.g.*, Gallão & Bichuette 2015, 2018, Silva & Ferreira 2015, Pellegrini & Ferreira 2016, Fernandes et al. 2019), and a high diversity of obligatory species has been described (Campos-Filho et al. 2011, 2014, 2015a, 2016, 2017a, 2017b, 2019, 2020, 2022a, 2022b, 2023a, 2023b, 2023c, Souza et al. 2006, 2010, 2015, Bastos-Pereira et al. 2017, 2022, Fernandes et al. 2018, Cardoso et al. 2020a, 2020b, 2021, 2022a, 2022b, 2023, Cardoso & Ferreira 2023).

To date, more than 230 species of terrestrial isopods have been identified in Brazil (Campos-Filho et al. 2018a, 2018b, 2019, 2020, Cardoso et al. 2020a, 2020b, 2021, Cardoso & Ferreira 2023), of which 93 have been recorded in subterranean environments (see Campos-Filho et al. 2022c, 2023c, Cardoso & Ferreira 2023).

The family Platyarthridae comprises 130 species in the genera *Cephaloniscus* Ferrara & Taiti, 1989, *Echinochaetus* Ferrara & Schmalfuss, 1983, *Gerufa* Budde-Lund, 1909, *Lanceochaetus* Schmalfuss & Ferrara, 1978, *Manibia* Barnard, 1932, *Niambia* Budde-Lund, 1908, *Papuasoniscus* Vandel, 1973, *Platyarthrus* Brandt, 1833, and *Trichorhina* Budde-Lund, 1908 (Schmalfuss 2003, Taiti & Ferrara 2004, Boyko et al. 2008, Taiti & Checcucci 2009, Souza et al. 2011, Campos-Filho et al. 2018a, Taiti et al. 2018, Carpio-Díaz et al. 2021). Currently, the family is primarily found in tropical areas and is considered paraphyletic (Schmidt 2002, 2003, Javidkar et al. 2015, Dimitriou et al. 2019).

After examining a large collection of terrestrial isopods from several caves in the Brazilian states of Bahia, Mato Grosso, Mato Grosso do Sul, Minas Gerais, Pará, and São Paulo, 12 species of *Trichorhina* were recognized, 11 of which are considered new to science: *T. acrux* Campos-Filho, Sfenthourakis & Bichuette sp. nov., *T. jurai* Campos-Filho, Gallão & Bichuette sp. nov., *T. quadriocellata* Campos-Filho, Borja-Arrieta & Bichuette sp. nov., and *T. yakupyrang* Campos-Filho, Carpio-Díaz & Bichuette sp. nov. from the state of São Paulo, *T. alphard* Campos-Filho, Sfenthourakis & Taiti sp. nov. from Mato Grosso do Sul, *T. araguaia* Campos-Filho, López-Orozco & Taiti sp. nov. from the state of Pará, *T. baiana* Campos-Filho, Gallão & Bichuette sp. nov. from the state of Bahia, *T. bessiae* Campos-Filho, Carpio-Díaz & Bichuette sp. nov., *T. crucis* Campos-Filho, López-Orozco & Sfenthourakis sp. nov., *T. mineira* Campos-Filho, Carpio-Díaz & Taiti sp. nov., and *T. marianae* Campos-Filho, Gallão & Bichuette sp. nov. from the state of Minas Gerais. Additionally, the distribution of *T. tomentosa* has been expanded to include caves in the states of Mato Grosso and Minas Gerais. Lastly, a distribution map of the subterranean representatives of the genus is given, as well as an identification key for all Brazilian species, including epigean species.

Material and Methods

Specimens have been collected manually and preserved in 70% ethanol. Descriptions are based on morphological characters, utilizing micropreparations in Hoyer's medium (Anderson 1954). For each new species, the type material, description, etymology, and remarks are provided. Distribution and additional remarks for already known species are given as necessary. The synonym list includes the original publication, along with citations limited to records from Brazil. Complete references are available in Schmalfuss (2003) and Campos-Filho et al. (2018a). The taxa were illustrated with the aid of a camera lucida mounted to a CH2 Olympus microscope. The final illustrations were prepared using GIMP software (v. 2.8) following the method proposed by Montesanto (2015, 2016). The collected material is deposited in the Brazilian scientific collections of the Laboratório de Estudos Subterrâneos (LES), Universidade Federal de São Carlos, São Carlos, São Paulo, and Museu de História Natural de Capão da Imbuia (MHNCI), Paraná.

1. Study area

The specimens were collected across a vast area of Brazilian territory (Fig 1). Some notable aspects of the regional climate, vegetation, geomorphology, and potential threats to the hypogean environments are provided.

1.1. Alto Ribeira karst area, state of São Paulo

The Alto do Ribeira karst area is located in the southern part of São Paulo state. This region encompasses one of the largest and best-preserved fragments of continuous Atlantic Forest within the boundaries of Conservation Units (SEMA 1997, Ab'Saber 1977). According to Köppen's criteria, the region exhibits a humid subtropical climate with no dry season. Lowlands experience hot summers (Cfa), while highlands have temperate summers (Cfb) (Alvares et al. 2013, Bedek et al. 2018, 2020). Sampling was conducted within the boundaries of two Conservation Units of Integral Protection: Parque Estadual Intervales (PEI) and Parque Estadual Turístico do Alto Ribeira (PETAR). These parks encompass multiple municipalities, resulting in a vast area. The region's exceptional biodiversity is attributed to its lush vegetation, primarily the Atlantic Forest, and the hydrographic basins that traverse the entire territory (SEMA 1997). This diverse habitat supports numerous endangered and endemic subterranean and epigean species. The region features several magnificent cave systems formed in Precambrian metasedimentary limestone outcrops, intercalated with insoluble rocks discontinuously (Fig. 2A) (Karmann & Sánchez 1979).

While the Atlantic Forest's epigean biodiversity is typically high, the Alto Ribeira karst area stands out due to unique isolation processes, resulting in one of Brazil's richest subterranean fauna (Trajano et al. 2016). Since the establishment of Conservation Units in both regions, the main socio-conservation challenges have been land conflicts and pollution of subterranean water sources due to illegal mining and agriculture. Furthermore, unregulated tourism has exacerbated these conflicts (Gallão & Bichuette 2018). A plan for private concessions and entrepreneurial ventures has been under discussion for the region, with the primary aim of increasing tourism rates. However, if this scenario becomes a reality, it will inevitably lead to greater impacts on cave systems, posing a serious threat to the subterranean fauna.

1.2. Parque Estadual do Rio Turvo (PERT), state of São Paulo

The Parque Estadual do Rio Turvo (PERT) is a Conservation Unit of Integral Protection, established by law following the fragmentation of the former Parque Estadual do Jacupiranga. This expansion incorporated new territories, resulting in the dissolution of the Jacupiranga Mosaic (state law 12.810 of 21 February 2008) as a response to land and social demands (Bim & Furlan 2013). The mosaic encompassed various ecosystems within the Atlantic Forest domain, including mangroves, sandbanks, highlands, subterranean environments, and the forest itself. The PERT is part of this mosaic, situated in the Ribeira Valley and encompassing the boundaries of Barra do Turvo, Cajati, and Jacupiranga municipalities (Ab'Saber 1977, Bim & Furlan 2013). According to Köppen's criteria, the PERT exhibits a humid subtropical climate (Cfa) with no dry seasons and hot summers (Alvares et al. 2013, Bedek et al. 2018, 2020).

The Oniscidea specimens were collected from Capelinha Cave, which has an approximate length of 174 meters and is composed of calcite marble with few karst features. The cave is traversed by a stream, and guano is abundant. Presently, industrial and agricultural activities, including aerial spraying on banana plantations, pose concerns in the PERT. However, these activities are not in close proximity to the river beds. Furthermore, unregulated tourism could potentially become a threat to the cave systems, although no studies have been conducted to assess the consequences of this practice thus far (SEMA 2007).

1.3. Pains, state of Minas Gerais

The municipality of Pains is located in the central-western region of the state of Minas Gerais, southeastern Brazil, approximately

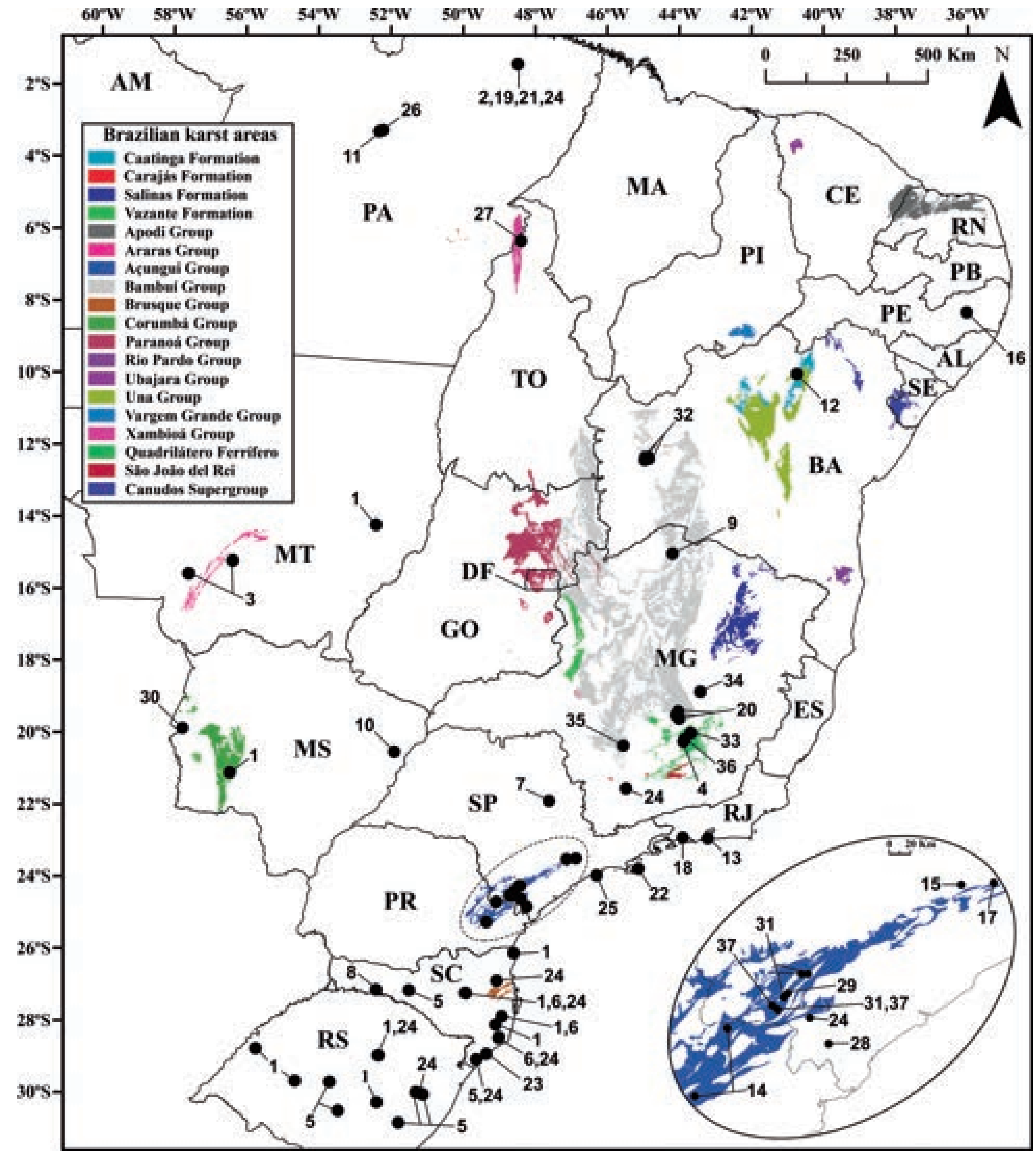

Figure 1. Distribution map of *Trichorhina* from Brazil. **1**, *T. acuta* Araujo & Buckup, 1994, **2**, *T. amazonica* Souza-Kury, 1997, **3**, *T. amplitelson* Campos-Filho, Carpio-Díaz & Borja-Arrieta, 2023, **4**, *T. anhanguera* Campos-Filho, Araujo & Taiti, 2014, **5**, *T. argentina* Vandel, 1963, **6**, *T. bicolor* Araujo & Buckup, 1996, **7**, *T. biumbonata* Souza, Araújo & Campos-Filho, 2011, **8**, *T. brasilensis* Andersson, 1960, **9**, *T. cipoensis* Campos-Filho, Bichuette & Taiti, 2016, **10**, *T. crassisetae* Souza, Araújo & Campos-Filho, 2011, **11**, *T. curupira* Campos-Filho, Araujo & Taiti, 2014, **12**, *T. guanophila* Souza-Kury, 1993, **13**, *T. heterophthalma* Lemos de Castro, 1964, **14**, *T. kaingangi* Campos-Filho, 2015, **15**, *T. lenkoi* Souza, Araújo & Campos-Filho, 2011, **16**, *T. macrops* Souza-Kury, 1993, **17**, *T. myrmecophila* Souza, Araújo & Campos-Filho, 2011, **18**, *T. orensis* Souza, Araújo & Campos-Filho, 2011, **19**, *T. paraensis* Souza-Kury, 1997, **20**, *T. pataxosi* Campos-Filho, Bichuette & Taiti, 2016, **21**, *T. pittieri* (Pearse, 1921), **22**, *T. sexdens* Souza, Araújo & Campos-Filho, 2011, **23**, *T. tatianae* Araujo & Almerao, 2007, **24**, *T. tomentosa*, **25**, *T. tropidocerata* Souza, Araújo & Campos-Filho, 2011, **26**, *T. yiara* Campos-Filho, Araujo & Taiti, 2014, **27**, *T. araguaia* Campos-Filho, Montesanto & Taiti sp. nov., **28**, *T. yakupyrang* sp. nov., **29**, *T. quadriocellata* sp. nov., **30**, *T. alphard* sp. nov., **31**, *T. acrux* sp. nov., **32**, *T. baiana* sp. nov., **33**, *T. crucis* sp. nov., **34**, *T. mineira* sp. nov., **35**, *T. marianae* sp. nov., **36**, *T. bessiae* sp. nov., **37**, *T. jurai* sp. nov. Legend: AM, Amazônia, AL, Alagoas, BA, Bahia, CE, Ceará, DF, Distrito Federal, ES, Espírito Santo, GO, Goiás, MA, Maranhão, MG, Minas Gerais, MT, Mato Grosso, MS, Mato Grosso do Sul, PA, Pará, PB, Paraíba, PE, Pernambuco, PI, Piauí, PR, Paraná, RJ, Rio de Janeiro, RN, Rio Grande do Norte, RS, Rio Grande do Sul, SC, Santa Catarina, SE, Sergipe, SP, São Paulo, TO, Tocantíns.

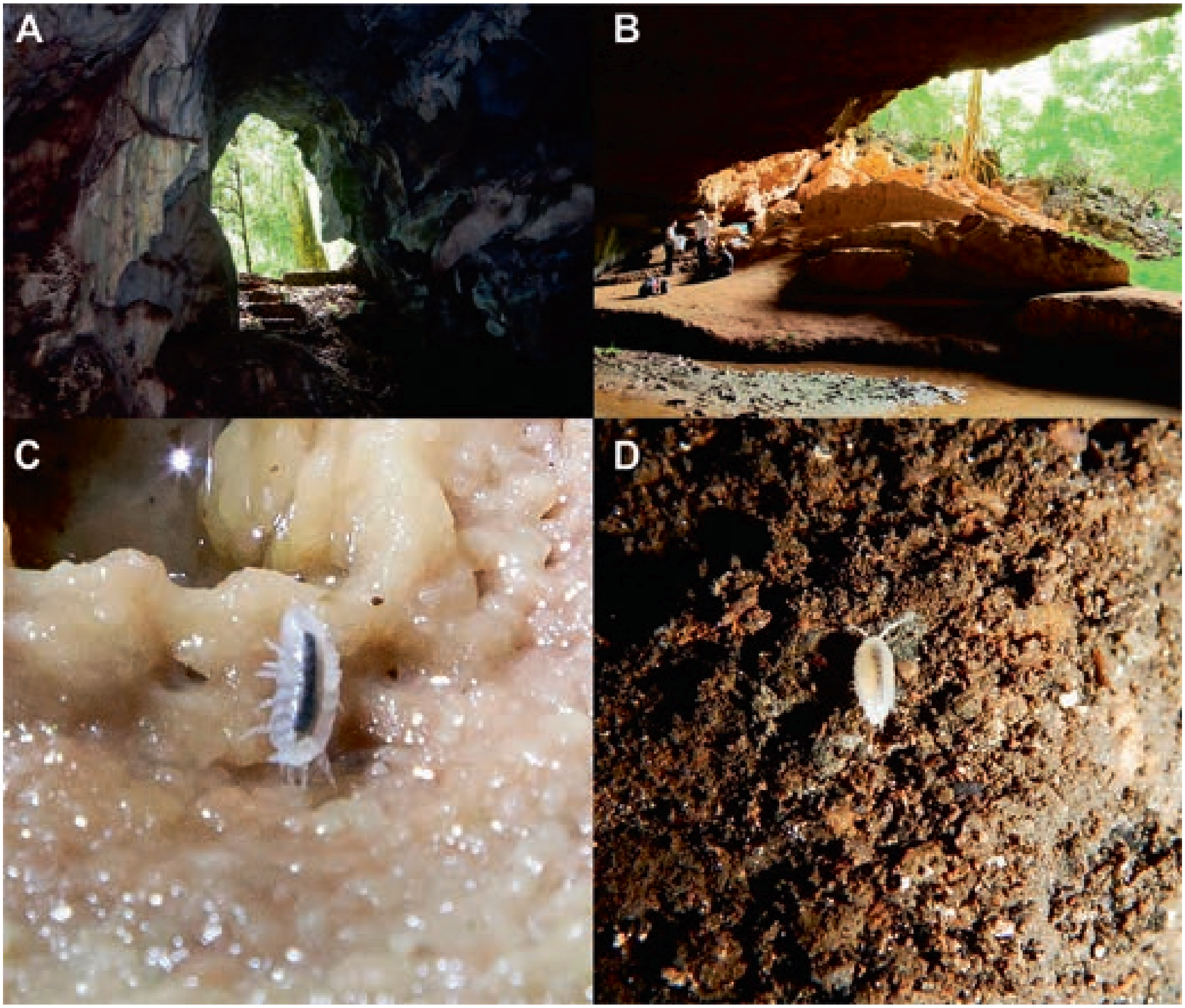

Figure 2. **A**, Ressurgência das Areias de Água Quente (PETAR), entrance, **B**, Gruta do Capão, São Desidério, entrance, **C**, *Trichorhina alphard* Campo-Filho, Sfenthourakis & Taiti sp. nov., **D**, *Trichorhina baiana* Campos-Filho, Gallão & Bichuette sp. nov.

330 km from its capital, Belo Horizonte. According to Köppen's criteria, the region exhibits a humid subtropical climate (Cwa) (Alvares et al. 2013, Bedek et al. 2018, 2020). The primary vegetative cover in the area is the Cerrado domain with transitional patches of Atlantic Forest (Ab'Saber 1977). The karst landscape in Pains is formed within isolated massifs of the Bambuí geomorphological group, characterized by uniform limestone formations and an eroded karst relief. This geological configuration has given rise to numerous caves with significant geological, paleontological, archaeological, and faunal value (Teixeira & Dias 2003).

Mining activities, conducted on a large scale, predominantly drive the local economy. However, these activities have had a significant impact on the subterranean environment, which is one of the most affected ecosystems in the region (Teixeira & Dias 2003, Gallão & Bichuette 2018).

1.4. Quadrilátero Ferrífero, Conceição Speleological Unit, state of Minas Gerais

The Quadrilátero Ferrífero is situated in the center of the state of Minas Gerais, and its name derives from the quadrangular shape delineated by the distribution of metasedimentary rocks from the Minas Supergroup, predominantly composed of iron ore deposits (Oliveira et al. 2011). It is the largest iron ore producer in Brazil, attracting the interest of numerous transnational mining companies (Bichuette et al. 2015). Based on temporal correlation, the region of Conceição do Mato Dentro is considered part of the same Speleological Unit. The caves in the Quadrilátero Ferrífero, specifically the Conceição Speleological Unit, are formed in three types of rocks: lateritic rocks of iron ore (comprising approximately 15% of their composition), siliciclastic rocks including quartzite, and limestone (Oliveira et al. 2011).

Sampling was conducted in three subregions of the Quadrilátero Ferrífero: Caeté, Conceição do Mato Dentro, and Morro do Pilar, which will be described in detail ahead.

1.5. Caeté, state of Minas Gerais

Caeté is part of the metropolitan sprawl of Belo Horizonte. According to Köppen's criteria, the region exhibits a humid subtropical climate (Cwb), characterized by temperate summers with hot and humid conditions, and cold and dry winters (Alvares et al. 2013, Bedek et al. 2018, 2020). The landscape is a combination of the Cerrado Domain with transitional areas of the Atlantic Forest (Ab'Saber 1977).

In iron-rich landscapes like Caeté, there is often a covering of "canga," an erosion-resistant conglomerate that protects the underlying soft bedrock from weathering. This canga layer may be among the longest exposed surfaces on the planet. Canga is highly porous, with interconnected voids that facilitate the movement of subterranean fauna between the surface soil and the caves (Auler et al. 2019). Consequently, remarkable subterranean fauna has been discovered in these environments in recent years, although only a few taxa have been taxonomically described (Bichuette et al. 2015, Ferreira et al. 2015).

Currently, in Caeté, iron ore mining poses a significant threat to the subterranean fauna and its habitats (Gallão & Bichuette 2018).

1.6. Conceição do Mato Dentro and Morro do Pilar, state of Minas Gerais

Conceição do Mato Dentro and Morro do Pilar are situated in the southeastern region of the state of Minas Gerais. Both locations are approximately 150 kilometers away from the state capital, Belo Horizonte. According to Köppen's criteria, the region exhibits a humid subtropical climate with hot summers (Cwa) prevailing (Alvares et al. 2013, Bedek et al. 2018, 2020). The landscape consists of the Cerrado Domain with transitional areas of the Atlantic Forest (Ab'Saber 1977).

In both regions, the caves were formed within Proterozoic quartzite or hematite rocks from the Serra da Serpentina and Serra da Ferrugem Formations. Iron ore and quartzite caves tend to be of limited size, but the iron caves are more susceptible to epigean influences in terms of food sources and fauna movement, as previously discussed (Bichuette et al. 2015, Auler et al. 2019a, Auler & Sauro 2019). Similar to Caeté, mining activities have also had an impact on the subterranean fauna and habitats in these regions.

1.7. São Desidério, state of Bahia

The municipality of São Desidério is located in the western part of the state of Bahia. According to Köppen's criteria, the region exhibits a tropical humid climate (AW) (Alvares et al. 2013, Bedek et al. 2018, 2020). The primary vegetative cover is the Cerrado (Ab'Saber 1977).

The cave systems in São Desidério are nationally renowned due to their extensive drainage by the João Rodrigues River and its tributaries, resulting in large subterranean lakes and karst aquifers (Fig. 2B). These unique geological features include rare spelaeothems, cyclic variations in water levels, unusual sinking streams and springs, and siphons (Galvão et al. 2012). São Desidério has also been found to possess high subterranean biodiversity (Bichuette et al. 2013).

Despite its national significance, São Desidério has been inadequately protected by conservation efforts. In terms of Brazilian legislation, the region falls within the boundaries of a Conservation Unit of Sustainable Use (SNUC, Law No. 9985/2000), known as Área de Proteção Ambiental (APA) de São Desidério. However, in practice, the region and its subterranean environments face multiple threats, including the excessive use of groundwater for domestic purposes, intensive agriculture, mining activities on the outskirts of the APA, and the potential construction of roads and pollution of subterranean water sources (Gallão and Bichuette 2018, Dantas 2019).

1.8. São Geraldo do Araguaia, state of Pará

São Geraldo do Araguaia is a small town located in southeastern Pará, near the border of the state of Tocantins, on the western bank of the Araguaia River. The local economy primarily relies on extensive livestock breeding and agriculture (SECTAM 2006). According to Köppen's criteria, the climate of the region can be classified as Tropical with Dry Winters (Aw) (Alvares et al. 2013, Bedek et al. 2018, 2020). The vegetative cover is typical of the Equatorial Amazonian Domain, with transitional areas of Cerrado (Ab'Saber 1977, SECTAM 2006).

In the context of speleology, the caves in the state of Pará are notable for their lithology, as most of them are formed in insoluble rocks, particularly iron ore and sandstone caves or their weathering derivatives. These formations are favored by the humid tropical climate of northwestern Brazil. The São Geraldo do Araguaia caves are formed in quartzites from Serra dos Martírios, part of the Speleological Province of Serra dos Martírios-Andorinhas (Pinheiro et al. 2015). Although no study has evaluated the threats to subterranean environments in the area, activities related to illegal deforestation for pasture, illegal tourism, and vandalism have been reported in the region (SECTAM 2006).

1.9. Corumbá, Forte Coimbra, state of Mato Grosso

Forte Coimbra is a district within the municipality of Corumbá, located in the state of Mato Grosso do Sul. It shares borders with Porto Suarez, Bolivia. This region is part of the world's largest tropical floodplain, known as the Pantanal. The Pantanal is internationally recognized as one of the most significant regions in terms of biodiversity, encompassing lowlands that are part of the Equatorial Amazonian, Cerrado, Bolivian, and Peruvian Chaco Domains (Ab'Saber 1977, IBAMA 2003, Alho 2011, Pott et al. 2011). According to Köppen's criteria, the Pantanal has a Tropical Climate with dry winters (Aw), with annual rainfall ranging from 1,800 to 2,300 mm (Alvares et al. 2013, Bedek et al. 2018, 2020).

The limestone and dolomites from the Corumbá Group, dating back to the Upper Proterozoic Age, are highly favorable for karst development. They are exposed as extensive outcrops and influenced by a humid climate (Auler & Farrant 1996). The evolution of the landscape in this region has been relatively slower due to the predominance of dolomites interspersed with insoluble rocks (Karmann & Sanchez 1979). The Oniscidea specimens were collected in Gruta Ricardo Franco cave, which holds historical significance and has undergone human interventions. Despite the presence of well-preserved vegetation outside the cave, there were observations of hematophagous bat-guano deposits, likely due to increased availability of prey resulting from the presence of domestic animals, indicating that the cave's pristine condition has been altered (Cordeiro et al. 2014).

Results

Suborder **Oniscidea** Latreille, 1802
Family **Platyarthridae** Verhoeff, 1949
Genus ***Trichorhina*** Budde-Lund, 1908
Type species: *Bathytropa thermophila* Dollfus, 1896 [= *Trichorhina tomentosa* (Budde-Lund, 1893)] by original designation (see Schmidt & Leistikow 2004).

Diagnosis

See Carpio-Díaz et al. (2018).

Remarks

To date, the genus *Trichorhina* comprises 72 species and three subgenera: *Burmarhina* Verhoeff, 1946 from Burma, *Cubarhina* Verhoeff, 1937 from Cuba, and *Trichorhinella* Verhoeff, 1937 from Venezuela (Boyko et al. 2008, Schmidt & Leistikow 2004, Carpio-Díaz et al. 2021). In Brazil, the genus includes 36 species, with nine recorded from subterranean environments (Campos-Filho et al. 2018a, 2023c, Fernandes et al. 2019). The genus was morphologically re-defined by Carpio-Díaz et al. (2018). However, molecular data show that the genus is paraphyletic (Javidkar et al. 2015, Dimitriou et al. 2019).

As noted by Campos-Filho et al. (2023c), *Trichorhina micros* and *T. minutissima*, described by Budd-Lund (1913) from Mauritius and Cargados Carajos Shoals, respectively, exhibit pectinate teeth on the outer endite of the maxillula. The authors mentioned that the shape of buccal pieces is consistent within congeneric species and suggested that both species should be reexamined to clarify their taxonomy. Consequently, morphological comparisons with these taxa will be avoided from now on.

Trichorhina acuta Araujo & Buckup, 1994
Fig. 1
Trichorhina acuta Araujo & Buckup 1994: 130, figs 1–12, Souza et al. 2011: 255, Tab. 1, Campos-Filho et al. 2018a: 21, Campos-Filho et al., 2023c: 560.

Distribution

Epigean species recorded from the states of Rio Grande do Sul and Santa Catarina (Campos-Filho et al. 2018a). In the subterranean environment, it has been recorded from Toca do Tamanduá in the state of Mato Grosso do Sul (Souza et al. 2011).

Trichorhina amplitelson Campos-Filho, Carpio-Díaz & Borja-Arrieta, 2023
Trichorhina amplitelson Campos-Filho, Carpio-Díaz & Borja-Arrieta, in Campos-Filho et al., 2023c: 555, figs 2D, 19–21B.

Distribution

Troglophilic species recorded from Caverna do Jabuti, Curvelandia, and Gruta do Isopoda and Caverna Labirinto in Mirassol do Oeste, all located in the state of Mato Grosso do Sul (Campos-Filho et al. 2023).

Trichorhina anhanguera Campos-Filho, Araujo & Taiti, 2014
Fig. 1
Trichorhina anhanguera Campos-Filho, Araujo & Taiti, in Campos-Filho et al. 2014: 408, figs 34–36, 40, Campos-Filho et al. 2015a: 112, Campos-Filho et al. 2016: 12, Campos-Filho et al. 2018a: 21, Fernandes et al. 2019: 1114, Tab. 1, Campos-Filho et al. 2023c: 560.

Distribution

Troglophilic species recorded only from Gruta MP-10 cave in Morro do Pilar, state of Minas Gerais (Campos-Filho et al. 2014, Fernandes et al. 2019).

Trichorhina cipoensis Campos-Filho, Bichuette & Taiti, 2016
Fig. 1
Trichorhina cipoensis Campos-Filho, Bichuette &Taiti 2016: 7, figs 8–10, 14, Campos-Filho et al. 2018a: 22, Fernandes et al. 2019: 1114, Tab. 1, Campos-Filho et al. 2023c: 560.

Distribution

Trogophilic species recorded only from Lapa do Cipó cave, state of Minas Gerais (Campos-Filho et al. 2016, Fernandes et al. 2019).

Trichorhina curupira Campos-Filho, Araujo & Taiti, 2014
Fig. 1
Trichorhina curupira Campos-Filho, Araujo & Taiti, in 2014: 405, figs. 32, 33, 40, Campos-Filho et al. 2015a: 112, Campos-Filho et al. 2016: 12, Campos-Filho et al. 2018a: 22, Fernandes et al. 2019: 1114, Tab. 1, Campos-Filho et al. 2023c: 560.

Distribution

Troglophilic species recorded only from Pedra da Cachoeira cave in Altamira region, state of Pará (Campos-Filho et al. 2014, Fernandes et al. 2019).

Trichorhina guanophila Souza-Kury, 1993
Fig. 1
Trichorhina guanophila Souza-Kury 1993: 198, figs. 11–27, Pinto-da-Rocha 1995: 98, Campos-Filho et al. 2014: 408, fig. 40, Campos-Flho et al. 2015a: 112, Campos-Filho et al. 2016: 2, Trajano et al. 2016: 1815, Angarten et al. 2017: 17, Bastos-Pereira et al. 2017: 292, Campos-Filho et al. 2017b: 70, Campos-Filho et al. 2018a: 22, Cavalcanti 2017: 49, Tab. 2, Fernandes et al. 2019: 1114, Tab. 1, Campos-Filho et al. 2023c: 560.

Distribution

Troglophilic species recorded only from Lapa do Convento cave in Campo Formoso, state of Bahia (Souza-Kury 1993).

Trichorhina kaingangi Campos-Filho, 2015
Fig. 1
Trichorhina kaingangi Campos-Filho, in Campos-Filho et al. 2015a: 114, figs. 2–4, Campos-Filho et al. 2016: 12, Campos-Filho et al. 2017c: 18, Campos-Filho et al. 2018a: 22, Campos-Filho et al. 2023c: 560.

Distribution

Troglophilic species recorded from Ermida Paiol do Alto and Água Boa caves, state of Paraná (Campos-Filho et al. 2017c).

Trichorhina pataxosi Campos-Filho, Bichuette & Taiti, 2016

Fig. 1

Trichorhina pataxosi Campos-Filho, Bichuette & Taiti, in Campos-Filho et al. 2016: 13, figs 11–14, Campos-Filho et al. 2018a: 23, Fernandes et al. 2019: 1115, Tab. 1, Campos-Filho et al. 2023c: 560.

Distribution

Troglophilic species recorded from Gruta do Sufoco and Gruta do Nei caves in Lagoa Santa, and BM cave system in Matozinhos, all located in the Bambuí karst region, state of Minas Gerais (Campos-Filho et al. 2016, Fernandes et al. 2019).

Trichorhina tomentosa (Budde-Lund, 1893)

Fig. 1

Alloniscus tomentosa Budde-Lund, 1893: 126.

Trichorhina tomentosa, Campos-Filho et al. 2018a: 23, Fernandes et al. 2019: 1115, Tab. 1.

Material examined

Minas Gerais, Pains: 2♀ (LES 5467), S2-AM-004 cave, 21 February 2014, leg. M. Souza. Goiás, Mambaí: 3♂♀ (LES 10290), 1♀ (LES 10291), Gruta da Judite cave, 14º24’26.16”S 46º11’43.78”W, 01 May 2013, leg. M.E Bichuette, J.E. Gallão, D.M von Schimonsky, P.P. Rizzato & R. Borghezan. São Paulo, Jacupiranga/Eldoraldo: 1♀ (LES 3056), PECD, Gruta da Tapagem (Caverna do Diabo), 24º38’17”S 48º24’04”W, 16-20 September 2009, leg. F. Pellegatti-Franco. Mato Grosso, Primavera do Leste: 1♀ (LES 5441), 1♀ (LES 5444), PEA0433, 20-24 March 2014, leg. Spelayon team.

Distribution

Pantropical species (Schmalfuss 2003). In Brazil, it has been recorded in the states of Minas Gerais, São Paulo, and Rio Grande do Sul outside caves (Campos-Filho et al. 2018a). Within caves, it has been recorded from Gruta da Tapagem (Caverna do Diabo) in Eldorado, state of São Paulo (Fernandes et al. 2019). The present work expands the knowledge of its distribution.

Trichorhina yiara Campos-Filho, Araujo & Taiti, 2014

Fig. 1

Trichorhina yiara Campos-Filho, Araujo & Taiti, in Campos-Filho et al. 2014: 401, figs. 29–31, 40, Campos-Filho et al. 2015a: 112. – Campos-Filho et al. 2016: 12, Campos-Filho et al. 2018a: 24, Fernandes et al. 2019: 1115, Tab. 1, Campos-Filho et al. 2023c: 560.

Distribution

Troglophilic species recorded only from Abrigo do Sismógrafo and Abrigo do Abutre caves, state of Pará (Campos-Filho et al. 2014, Fernandes et a. 2019).

Trichorhina araguaia Campos-Filho, López-Orozco & Taiti sp. nov.

Figs 1, 3, and 4

Zoobank

urn:lsid:zoobank.org:act:724D7699-C14D-4D9A-88AC-DE83833D8493

Type material

Holotype Pará, São Geraldo do Araguaia: 1♂ (parts in micropreparations) (LES 28729), Gruta SI 07, 06º22’03”S 48º23’40”W, 22 February – 2 March 2011, leg. F. Franco. *Paratypes* 1♂ juvenile (LES 28730), same data as holotype.

Description

Maximum body length: 2.5 mm. Colorless body, pale yellowish spots on typical muscle insertions. Body (Fig. 3A) robust, pereonite 1 epimera slightly directed frontwards, 2–7 gradually directed backwards. Dorsum covered with fan-shaped scale-setae (Fig. 3B). One line of *noduli laterales* inserted near posterior margins of pereonites and more or less at same distance from lateral margins (Fig. 3B). Cephalon (Fig. 3C) with lateral lobes not well developed, suprantennal line slightly bent downwards in middle, eyes composed of three small ommatidia. Pleon (Fig. 3A, D) outline continuous with that of pereonite 7, pleonites 3–5 epimera well developed and directed backwards. Telson (Fig. 3D) triangular, lateral sides concave, right-angled apex with pointed appearance. Antennula (Fig. 3E) with proximal and distal articles subequal in length, distal article bearing apical tip and eight apically and sub-apically aesthetascs. Antenna (Fig. 3F) when extended posteriorly surpassing posterior margin of pereonite 1, flagellum as long as fifth article of peduncle, second article about three times as long as first, apical organ short with long free sensilla. Mandibles with molar penicil dichotomized, bearing at least four branches, left mandible (Fig. 3G) with 2 + 1 penicils, right mandible (Fig. 3H) with 1 + 1 penicils. Maxillula (Fig. 3I) inner endite with two setose penicils, outer endite with 4 + 4 teeth, three of them clef at apex. Maxilla (Fig. 3J) with setose and bilobate apex, outer lobe about three times as wide as inner lobe, subquadrate and distal margin slightly rounded. Maxilliped (Fig. 3K) basis rectangular bearing sparse scale-setae, palp with two distinct setae on basal article, endite subrectangular, medial seta surpassing distal margin, distal margin bearing two hook-like setae. Uropod (Fig. 4A) protopod and exopod with outer margin grooved bearing glandular pores, exopod twice as long as endopod, endopod inserted almost at same level as exopod. Pereopod 1 (Fig. 4B) merus and carpus bearing brushes of setae apically cleft on sternal margin, carpus bearing transverse antennal grooming brush, and distal seta with double-fringed apex, pereopod 7 (Fig. 4C) merus and carpus bearing sparse setae on sternal margin. Dactylus (Fig. 4B) with short inner claw, ungual seta simple not surpassing outer claw, dactylar seta simple slightly surpassing outer claw basis. Genital papilla (Fig. 4D) with triangular ventral shield and subapical orifices. Pleopod 1 (Fig. 4D) exopod subquadrangular, outer margin straight, endopod about twice as long as exopod, distal portion tapering and bearing small setae on medial margin. Pleopod 2 (Fig. 4E) exopod triangular, outer margin concave bearing six setae, endopod longer than exopod. Pleopod 3 and 4 exopods as in Fig. 4F, G, respectively. Pleopod 5 exopod (Fig. 4H) triangular, outer margin slightly convex bearing six setae.

Etymology

The new species is named after the Araguaia River, which runs near the municipality of São Geraldo do Araguaia. The word “Araguaia” has its origin in the general Amazon language and means ‘maracanã’, a typical parrot bird of the family Psittacidae that occurs in the region.

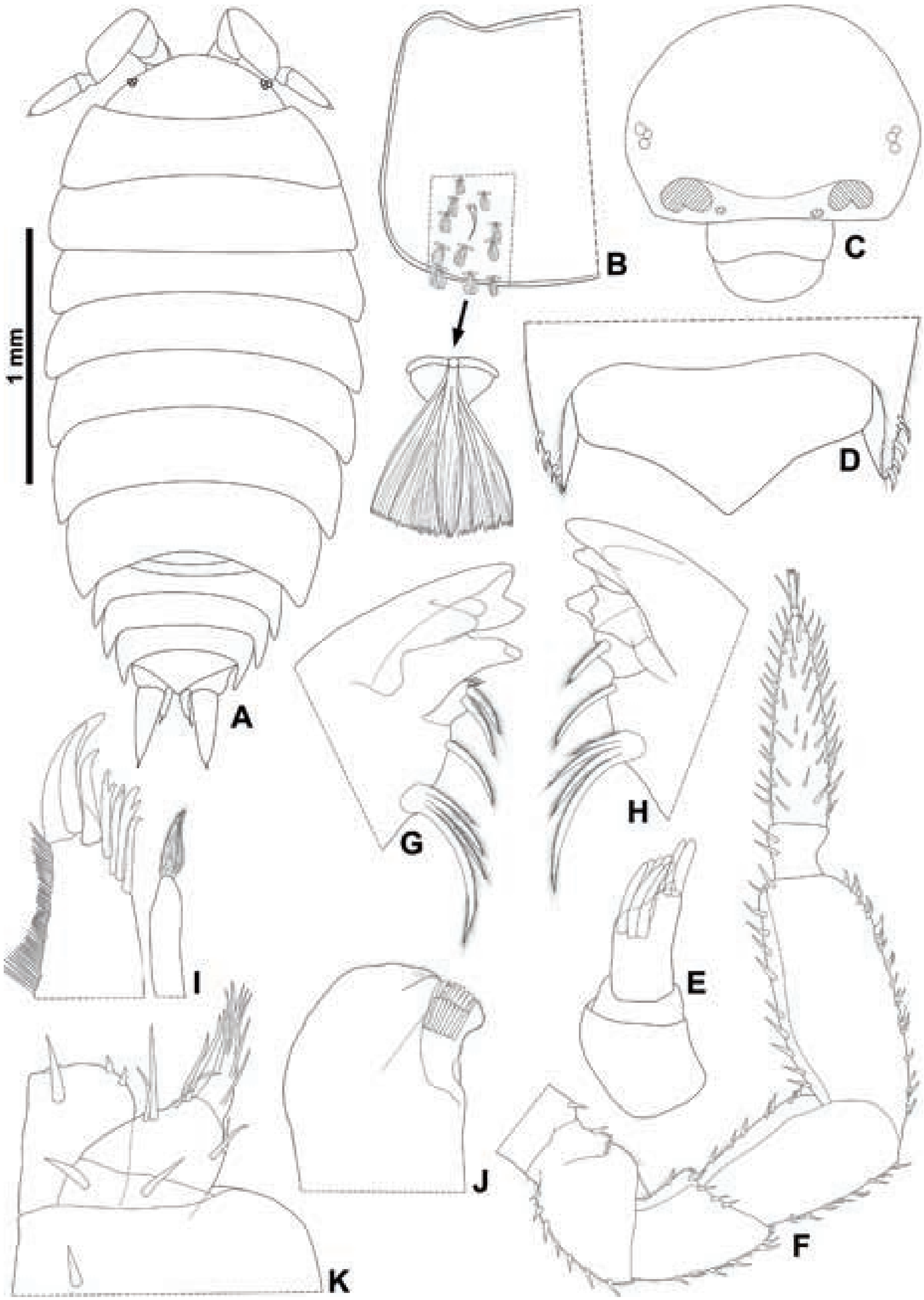

Figure 3. *Trichorhina araguaia* Campos-Filho, López-Orozco & Taiti sp. nov., ♂ holotype, LES 28729: **A**, habitus, dorsal view.: **B**, pereonite 1, dorsal view, **C**, cephalon, frontal view, **D**, pleonite 5 and telson, **E**, antennula, **F**, antenna, **G**, left mandible, **H**, right mandible, **I**, maxillula, **J**, maxilla, **K**, maxilliped.

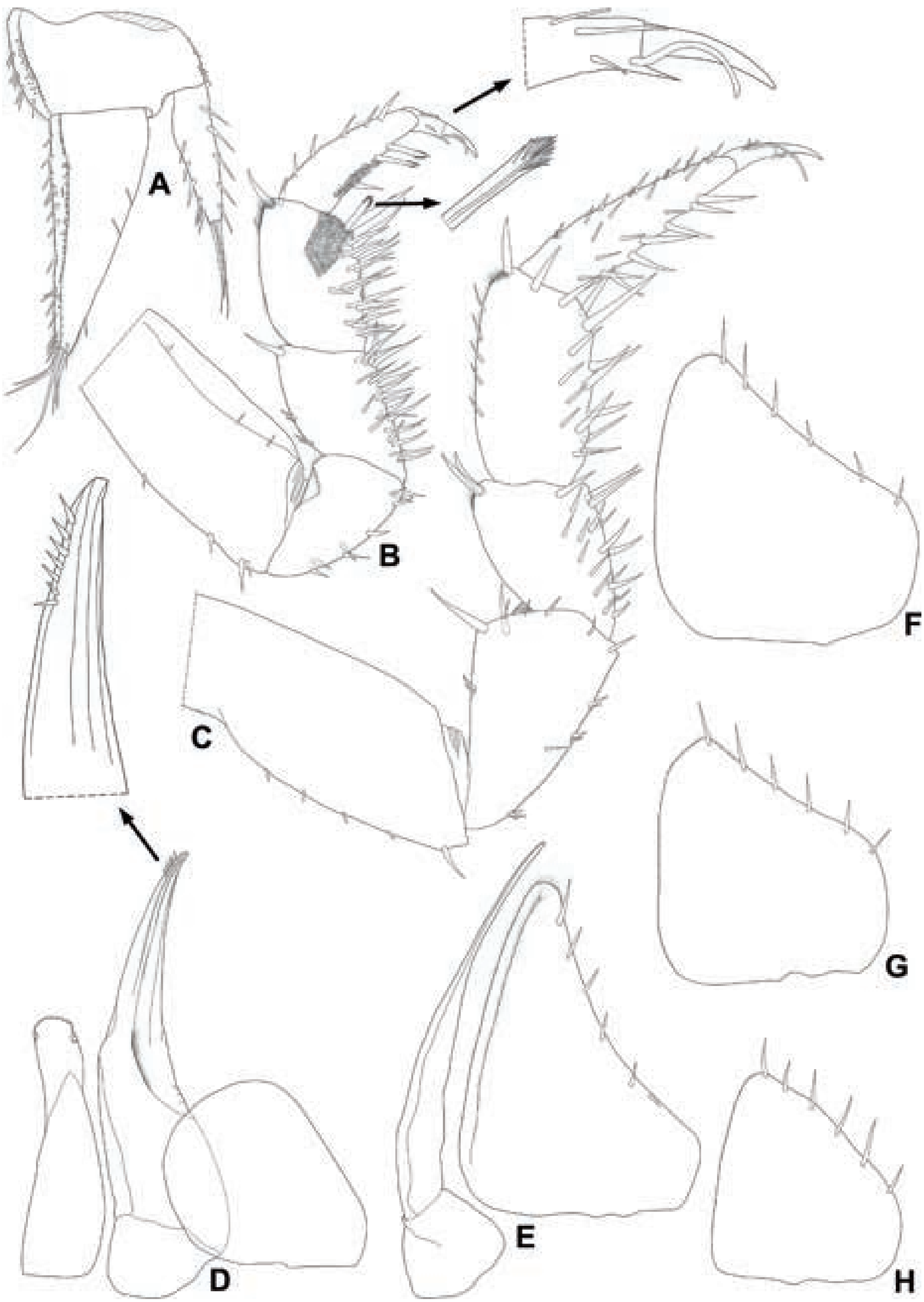

Figure 4. *Trichorhina araguaia* Campos-Filho, López-Orozco & Taiti sp. nov., ♂ holotype, LES 28729: **A**, uropod, **B**, pereopod 1, **C**, pereopod 7, **D**, genital papilla and pleopod 1, **E**, pleopod 2, **F**, pleopod 3 exopod, **G**, pleopod 4 exopod, **H**, pleopod 5 exopod.

Remarks

In having the eyes composed of three ommatidia, *Trichorhina araguaia* sp. nov. resembles *T. curupira* Campos-Filho, Araujo & Taiti, 2014 (Brazil: state of Pará), *T. mulaiki* Schmalfuss, 2003 (Mexico: province of Chiapas), *T. triocellata* Ferrara & Taiti, 1985 (Aldabra Is.), and *T. triocis* Mulaik & Mulaik, 1943 (USA: Texas) (Schmalfuss 2003, Campos-Filho et al. 2014). The new species differs from all these species in the different shape of the male pleopod 1 exopod. Moreover, it differs from *T. curupira* in having the maxilliped endite with two hooks on the distal margin (vs. absent), the male pleopod 4 exopod with an outer margin that is distinctily concave (vs. slightly convex), and the shape of the male pleopod 5 exopod with a proximal inner margin that is right-angled (vs. rounded). It differs from *T. mulaiki* in the telson with concave lateral sides (vs. straight), the distal article of the antennula bearing eight aesthetascs (vs. two), and the uropod branches inserted almost at the same level (vs. endopod distinctly inserted proximally). In comparison to *T. triocellata*, it differs in the telson with concave lateral sides and a pointed apex (vs. slightly concave sides and a rounded apex), the maxillula outer endite bearing the outer set of teeth apically entire and cleft (vs. simple), and the dactylar seta simple (vs. plumose). Lastly, it differs from *T. triocis* in the telson being twice as wide as long (vs. longer than wide), the uropod branches inserted almost at the same level (vs. endopod distinctly inserted proximally), and the male pleopod 2 exopod triangular (vs. sub-rectangular) (Budde-Lund 1913, Mulaik & Mulaik 1943, Mulaik 1960, Ferrara & Taiti 1985, Campos-Filho et al. 2014).

Trichorhina yakupyrang Campos-Filho, Carpio-Díaz & Bichuette sp. nov.
Figs 1, 5, 6, and 25A

Zoobank

urn:lsid:zoobank.org:act:6E857EB5-4005-4858-8887-32BEB9E99CC2

Type material: *Holotype* São Paulo, Jacupiranga: 1♂ (LES 28731), Gruta Capelinha, Parque Estadual do Rio Turvo (PERT), 24º51’06”S 48º14’34”W, 13-20 April 2009, leg. F. Pellegatti-Franco. *Paratypes* 4♀ (LES 0632), 1♂ (parts in micropreparations), 3♀ (one in micropreparations) (LES 0648), same data as holotype.

Description

Maximum body length: male 3 mm, female 3.5 mm. Color pale yellow, some specimens without body pigments. Body (Fig. 5A) robust, pereonites 1 and 2 epimera slightly directed frontwards, 3–7 gradually backwards. Dorsum covered with fan-shaped scale-setae (Fig. 5B). One line of *noduli laterales* inserted close to posterior margins and more or less at same distance from lateral margins of pereonites (Fig. 5B), b/c and d/c coordinates as in Fig. 5C, D, respectively. Cephalon (Fig. 5E) with well-developed lateral lobes, suprantennal line bent downwards in middle, eyes composed of four small ommatidia arranged in two rows. Pleon (Fig. 5A) outline continuous with that of pereonite 7, pleonites 3–5 epimera well developed and directed backwards. Telson (Fig. 5F) triangular, lateral margins concave and acute apex. Antennula (Fig. 5G) with proximal and distal articles subequal in length, distal article bearing 17 apical and sub-apical aesthetascs. Antenna (Fig. 5H) when extended posteriorly surpasses posterior margin of pereonite 1, flagellum as long as fifth article of peduncle, second article about three times as long as first with two sets of lateral aesthetascs on distal portion, apical organ short with long free sensilla. Buccal pieces (Fig. 5I–M) as in *T. araguaia* sp. nov.: mandibles with molar penicil of six branches, maxillula outer endite with outer set of teeth apically entire, maxilla outer lobe about twice as wide as inner lobe, maxilliped endite bearing one hook-like seta on distal margin. Uropod (Fig. 6A) protopod and exopod outer margin grooved bearing glandular pores, exopod slightly longer than endopod, endopod inserted proximally. Pereopods 1–7 merus and carpus bearing sparse setae cleft at apex on sternal margin, carpus 1 bearing transverse antennal grooming brush, dactylus with short inner claw, ungual and dactylar setae simple not surpassing outer claw.

Male: Pereopods 1 and 7 without sexual dimorphism (Fig. 6B, C). Genital papilla (Fig. 6D) with triangular ventral shield and subapical orifices. Pleopod 1 (Fig. 6E) exopod sub-rectangular, twice as broad as long, distal margin straight, medial margin rounded, endopod about three times as long as exopod, distal portion tapering and slightly bent outwards. Pleopod 2 (Fig. 6F) exopod triangular, outer margin concave bearing four setae, endopod stout, slightly longer than exopod. Pleopod 3 and 4 exopods as in Fig. 6G and H, respectively. Pleopod 5 exopod (Fig. 6I) rhomboid, outer margin sinuous bearing four setae.

Etymology

Tupi language: “*yaku*” means jacu and “*pyrang*” means red. In Tupi, the toponym “Jacupiranga” refers to a turkey-like species of the genus *Penelope* (Cracidae) that inhabit forests in Central and South Americas.

Remarks

In having the eyes composed of four ommatidia *Trichorhina yacupyrang* sp. nov. resembles *T. acuta* Araujo & Buckup, 1994 (Brazil: states of Rio Grande do Sul and Santa Catarina), *T. aethiopica* Arcangeli, 1941 (Ethiopia), *T. giannellii* Arcangeli, 1929 (Cuba and ?Costa Rica), *T. hospes* Silvestri, 1918 (Nigeria and ?São Tomé Island), *T. minima* Schmalfuss & Ferrara, 1978 (Togo), *T. paraensis* Souza-Kury, 1997 (Brazil: state of Pará), *T. sexdens* Souza, Araújo & Campos-Filho, 2011 (Brazil: state of São Paulo), *T. silvestri* Arcangeli, 1936 (Spain), and *T. vandeli* Rioja, 1955 (Mexico) (Schmalfuss 2003, Campos-Filho et al. 2018a). The new species differs from all these species in the different shape of the male pleopod 1 exopod. Additionally, it differs from *T. acuta* in the distal article of the antennula bearing the aesthetascs inserted apically and sub-apically and the maxillula outer endite bearing the outer set of teeth apically entire (vs. aesthetascs inserted apically and outer set with two teeth apically cleft). It also differs from *T. aethiopica* and *T. giannellii* in the telson with concave lateral sides (vs. almost straight on both species). From *T. hospes* and *T. paraensis*, it differs in the molar penicil of mandibles being dichotomized, the maxillula outer endite bearing the outer set of teeth apically entire, and the male pleopod 5 exopod being rhomboid (vs. molar penicil simple and outer set with two teeth apically cleft on both species, and pleopod 5 exopod triangular in *T. paraensis*). It differs from *T. minima* in the cephalon lacking a bulbous frons (vs. frons strongly bulbous). From *T. sexdens*, it differs in the molar penicil of mandibles being dichotomized, the male pereopod

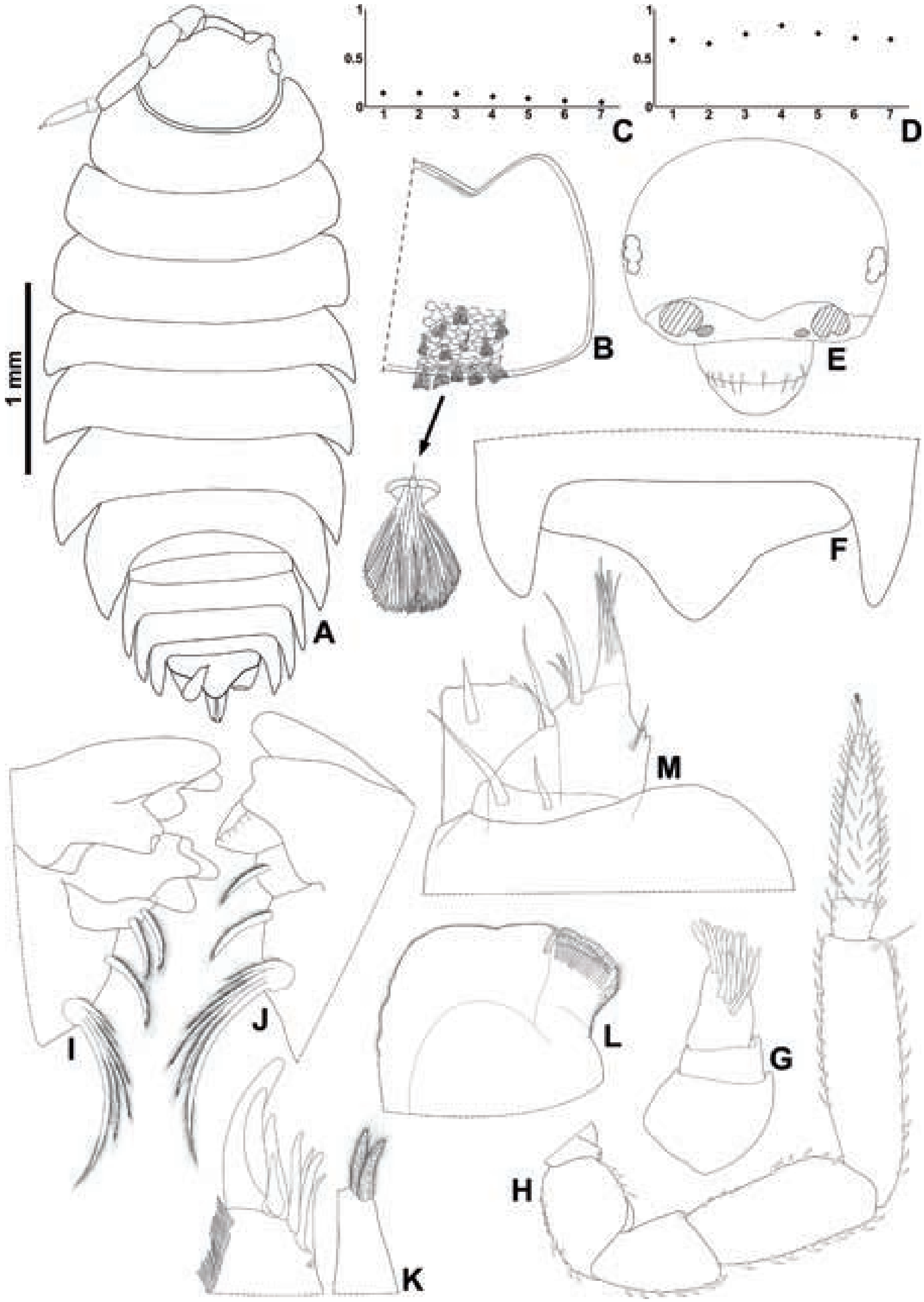

Figure 5. *Trichorhina yakupyrang* Campos-Filho, Carpio-Díaz & Bichuette sp. nov., ♀ paratype, LES 0648: **A**, habitus, dorsal view, **B**, pereonite 1, dorsal view, **C**, b/c coordinates, **D**, d/c coordinates, **E**, cephalon, frontal view, **F**, pleonite 5 and telson, **G**, antennula, **H**, antenna, **I**, left mandible, **J**, right mandible, **K**, maxillula, **L**, maxilla, **M**, maxilliped.

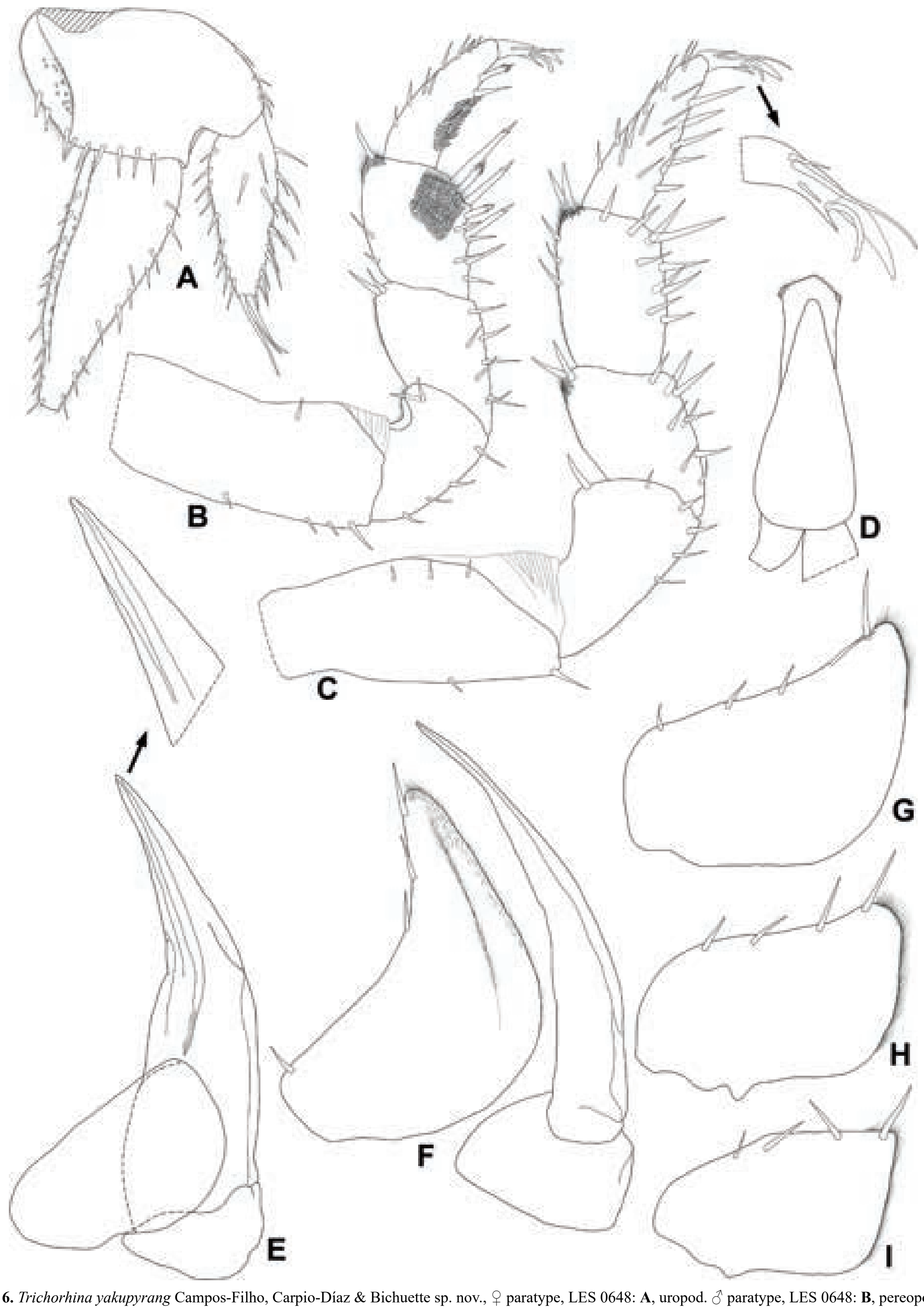

Figure 6. *Trichorhina yakupyrang* Campos-Filho, Carpio-Díaz & Bichuette sp. nov., ♀ paratype, LES 0648: **A**, uropod. ♂ paratype, LES 0648: **B**, pereopod 1, **C**, pereopod 7, **D**, genital papilla, **E**, pleopod 1, **F**, pleopod 2, **G**, pleopod 3 exopod, **H**, pleopod 4 exopod, **I**, pleopod 5 exopod.

1 merus and carpus bearing sparse setae on the sternal margin, the male pleopod 1 endopod having a straight apex, and the male pleopod 2 endopod having a thick distal portion (vs. molar penicil simple, male pereopod 1 merus and carpus bearing a brush of setae on the sternal margin, male pleopod 1 endopod with the apex slightly bent outwards, and male pleopod 2 endopod with a slender distal portion). It differs from *T. silvestri* in the molar penicil of mandibles having six branches and the maxillula outer endite bearing the outer set of teeth apically entire (vs. molar penicil of three branches and outer set with two teeth apically cleft). Lastly, it differs from *T. vandeli* in the telson with concave lateral sides, mandibles with a molar penicil of six branches, and the male pereopod 1 merus and carpus bearing sparse setae on the sternal margin (vs. telson with slightly concave lateral sides, molar penicil of several branches, and male pereopod 1 merus and carpus bearing brushes of setae) (Budde-Lund 1913, Silvestri 1918, Arcangeli 1936a, 1941, Van Name 1936, Mulaik 1960, Araujo & Buckup 1994, Souza-Kury 1997).

Trichorhina quadriocellata Campos-Filho, Borja-Arrieta & Bichuette sp. nov.
Figs 1, 7, 8, and 25B

Zoobank

urn:lsid:zoobank.org:act:21099689-3C27-4006-81DF-A9155114E1D1

Type material

Holotype São Paulo, Iporanga: 1♂ (parts in micropreparations) (LES 1897), near Gruta Chapéu (outside cave), Parque Estadual Turístico Alto do Ribeira (PETAR), Caboclos 1, 24º26’06”S 48º35’25”W, 15 Jun 2008, leg. M.E. Bichuette. *Paratypes* 1♀ (in micropraparations) (LES 0643), same locality as holotype (inside cave), 26-30 March 2009, leg. F. Pellegatti-Franco, 1♀ (LES 28732), Caverna Alambari de Baixo, PETAR, 2 October 2012, leg. M.E. Bichuette.

Description

Maximum body length: male 2 mm, female 4 mm. Colorless body. Body (Fig. 7A) slender, pereonite 1 epimera slightly directed frontwards, 3–7 gradually directed backwards. Dorsum covered with fan-shaped scale-setae (Fig. 7B). One line of distinct *noduli laterales* inserted more or less at same distance from lateral margins of pereonites, epimera 1 with *noduli* slightly shifted from posterior margin, 2–7 close to posterior margin (Fig. 7B), b/c and d/c coordinates as in Fig. 7C, D, respectively. Cephalon (Fig. 7A, E) with lateral lobes not well-developed, suprantennal line bent downwards in middle, eyes composed of four ommatidia. Pleon (Fig. 7A, F) slightly narrower than pereonite 7, pleonites 3–5 epimera directed backwards, epimera 3 short, 4 and 5 epimera appressed to pleon. Telson (Fig. 7F) triangular, lateral margins almost straight, right-angled apex. Antennula (Fig. 7G) with proximal article longest, distal article bearing seven apical and sub-apical aesthetascs. Antenna (Fig. 7H) when extended posteriorly reaching posterior margin of pereonite 1, flagellum as long as fifth article of peduncle, second article about three times as long as first with two set of aesthetascs on distal portion, apical organ short with long free sensillae. Mandibles with molar penicil simple, left mandible (Fig. 7I) with 2 + 1 penicils, right mandible (Fig. 7J) with 1 + 1 penicils. Maxillula (Fig. 7K) inner endite with two penicils; outer endite with 4 + 4 teeth apically entire. Maxilla (Fig. 7L) inner lobe rounded, covered with thick and thin setae; outer lobe three times as wide as inner lobe covered with thin setae. Maxilliped (Fig. 7M) endite subrectangular, medial seta surpassing distal margin, distal margin bearing two hook-like setae, ventral longitudinal ridge bearing dense setae ending with one short triangular seta. Uropod (Fig. 8A) protopod grooved on outer margin bearing glandular pores, endopod inserted proximally, exopod lacking in all specimens. Pereopods 1–7 merus and carpus bearing sparse setae apically cleft on sternal margin, carpus 1 bearing transverse antennal grooming brush, dactylus with short inner claw, ungual and dactylar setae simple not surpassing outer claw (Fig. 8B).

Male: Pereopd 1 without sexual dimorphism (Fig. 8B). Pereopod 7 (Fig. 8C) merus bearing proximal rounded lobe on sternal margin. Genital papilla (Fig. 8D) with triangular ventral shield and subapical orifices. Pleopod 1 (Fig. 8E) exopod sub-ovoid, almost as long as wide, distal margin straight, endopod about three times as long as exopod, distal portion stout, bent outwards and bearing small setae on median margin. Pleopod 2 (Fig. 8F) exopod triangular, outer margin concave bearing two setae, endopod stout, slightly longer than exopod. Pleopod 3 and 4 exopods as in Fig. 8G and H, respectively. Pleopod 5 exopod (Fig. 8I) triangular, outer margin straight bearing five setae.

Etymology

Latin: *quadri* = four + *ocellata* = having eyes. The name refers to the eye consisting of four ommatidia.

Remarks

Trichorhina quadriocellata sp. nov. differs from all previously mentioned species in having a sternal tooth-shaped lobe on the male pereopod 7 merus. Moreover, it differs from *T. yakupyrang* sp. nov. in the slender dorsal habitus (vs. robust), telson with the lateral sides almost straight (vs. concave), distal article of the antennula bearing seven aesthetascs (vs. 17 aesthetascs), simple molar penicil of the mandibles (vs. dichotomized), presence of a triangular seta at the end of the ventral longitudinal ridge on the maxilliped endite (vs. absent), sub-ovoid male pleopod 1 exopod (vs. sub-rectangular), stout distal portion of the male pleopod 1 endopod (vs. tapering), and triangular male pleopod 5 exopod (vs. rhomboid).

Trichorhina alphard Campo-Filho, Sfenthourakis & Taiti sp. nov.
Figs 1, 2C, 9, 10, and 25C

Zoobank

urn:lsid:zoobank.org:act:E00F17F0-80F5-4A67-A123-EEFAADA25892

Type material

Holotype Mato Grosso do Sul, Corumbá: 1♂ (LES 28733), Gruta Ricardo Franco, Região Forte Coimbra, 19º53’14”S 57º47’31”W, 4 April 2000, leg. E. Trajano and N. Moracchioli. *Paratypes* 5♂ (one in micropreparations), 3♀, 2 juveniles (LES 0085), same data as holotype.

Description

Maximum body length: male and female 3.5 mm. Colorless body. Body (Fig. 9A) slightly robust, pereonite 1 epimera slightly directed frontwards, 2–7 gradually directed backwards. Dorsum covered

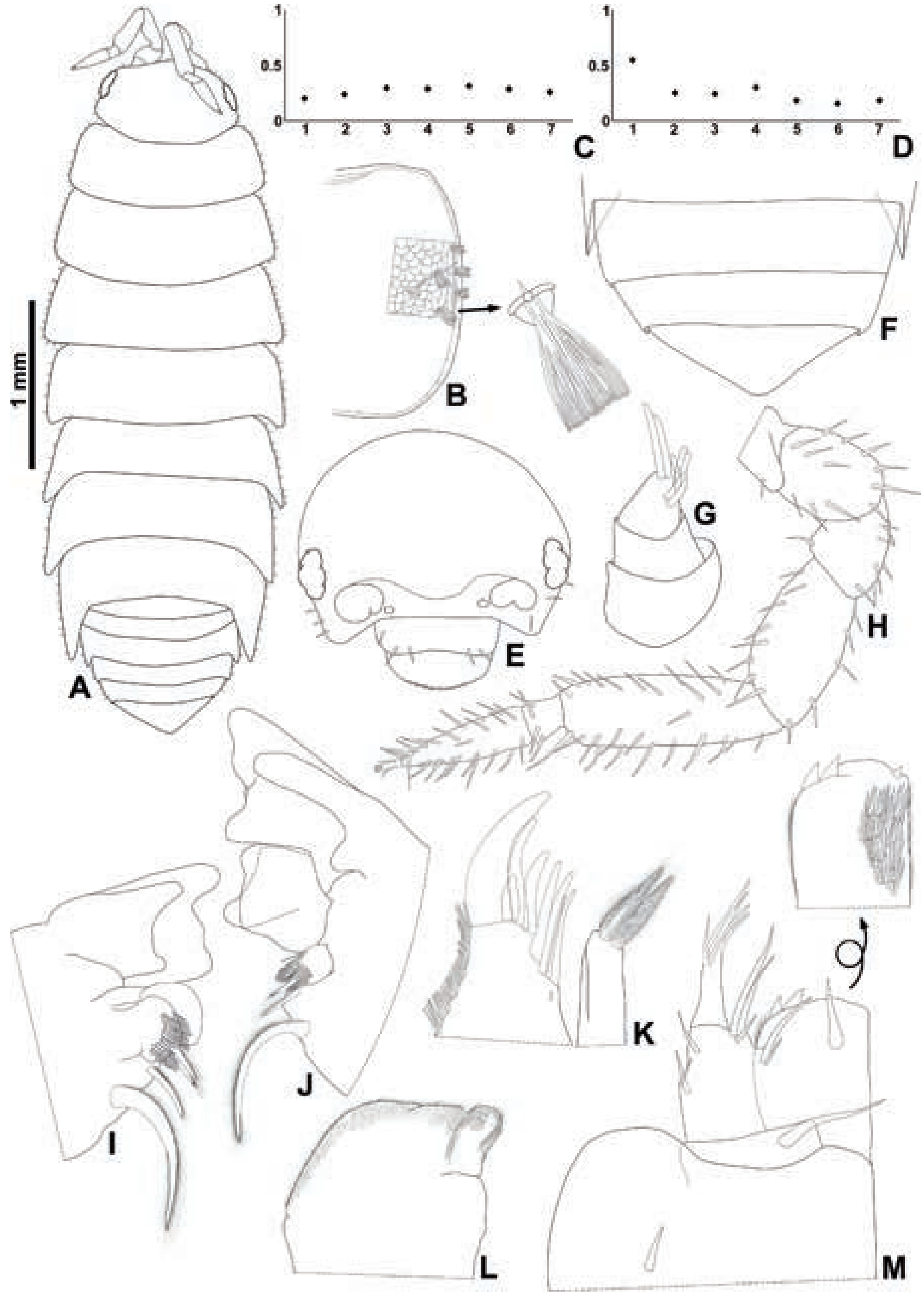

Figure 7. *Trichorhina quadriocellata* Campos-Filho, Borja-Arrieta & Bichuette sp. nov., ♀ paratype, LES 0643: **A**, habitus, dorsal view, **B**, pereonite 1, dorsal view, **C**, d/c coordinates, **D**, b/c coordinates, **E**, cephalon, frontal view, **F**, pleonites 3–5 and telson, **G**, antennula, **H**, antenna, **I**, left mandible, **J**, right mandible, **K**, maxillula, **L**, maxilla, **M**, maxilliped.

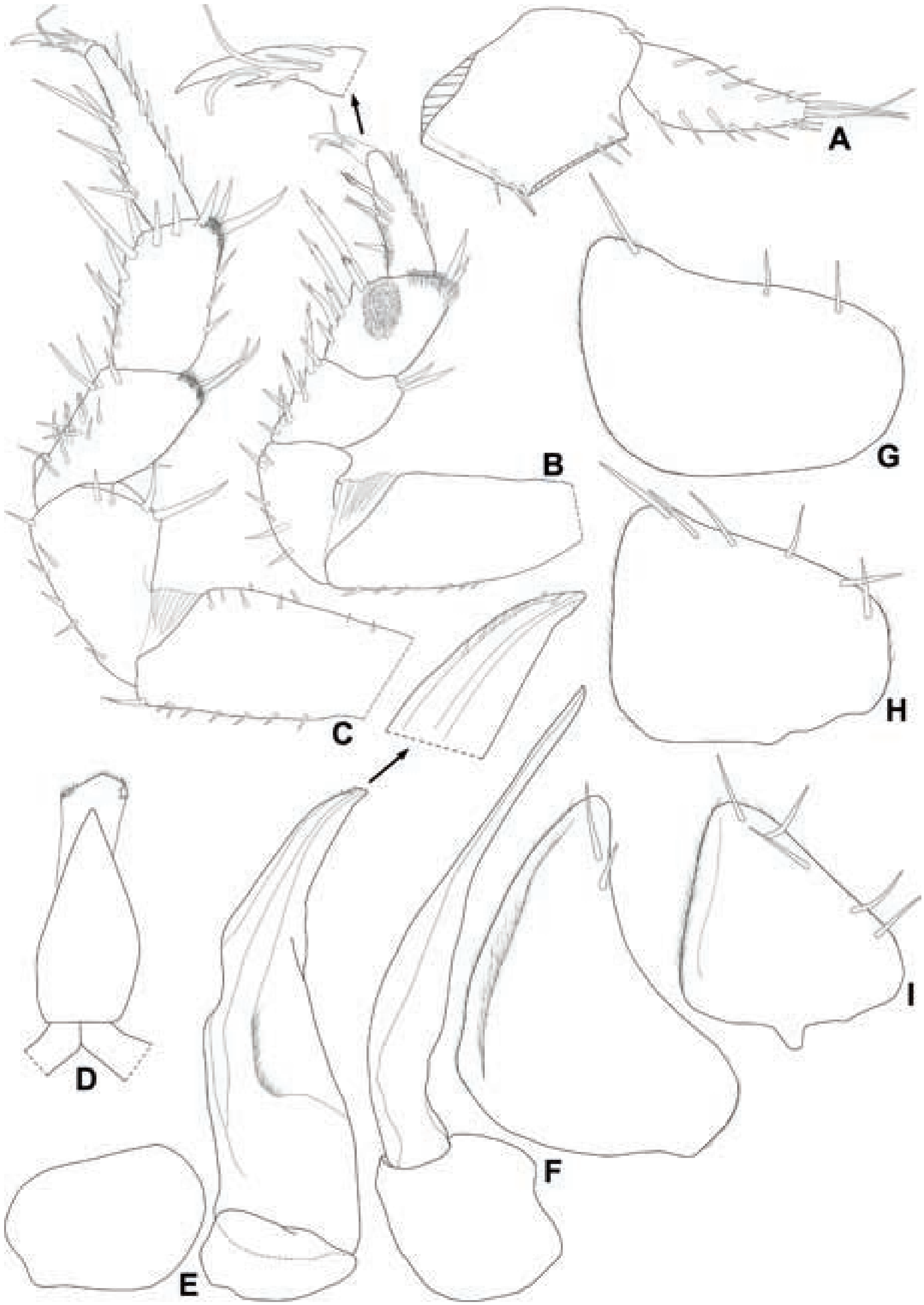

Figure 8. *Trichorhina quadriocellata* Campos-Filho, Borja-Arrieta & Bichuette sp. nov., ♀ paratype, LES 0643: **A**, uropod. ♂ holotype, LES 1897: **B**, pereopod 1, **C**, pereopod 7, **D**, genital papilla, **E**, pleopod 1, **F**, pleopod 2, **G**, pleopod 3 exopod, **H**, pleopod 4 exopod, **I**, pleopod 5 exopod.

with fan-shaped scale-setae (Fig. 9B). One line of distinct *noduli laterales* inserted more or less at same distance from lateral margins of pereonites, and close to posterior margins (Fig. 9B), b/c and d/c coordinates as in Fig. 9C and D, respectively. Cephalon (Fig. 9A, E) with lateral lobes well-developed, suprantennal line bent downwards in middle, eyes reduced composed of four ommatidia arranged in two rows. Pleon (Fig. 9A, F) outline continuous with that of pereonite 7, pleonites 3–5 epimera well-developed and directed backwards. Telson (Fig. 9F) triangular, lateral sides concave, apex rounded. Antenna (Fig. 9G) when extended posteriorly reaching posterior margin of pereonite 1, flagellum as long as fifth article of peduncle, second article about twice as long as first with two set of lateral aesthetascs on distal portion, apical organ short with long free sensilla. Buccal pieces as in *T. araguaia* sp. nov.: mandibles with molar penicil of at least five branches, maxillula outer endite with 3 + 3 teeth, two of them clef at apex, maxilliped endite without hook-like seta on distal margin. Uropod (Fig. 9H) protopod and exopod grooved on outer margin bearing glandular pores, endopod inserted proximally, exopod longer than endopod. Pereopods 1 carpus 1 bearing transverse antennal grooming brush, dactylus with long inner claw, ungual and dactylar setae simple not surpassing outer claw.

Male: Pereopods 1–4 merus and carpus with brushes of setae on sternal margin (Fig. 9I). Pereopod 7 without any sexual dimorphism (Fig. 9J). Genital papilla (Fig. 10A) with triangular ventral shield and two subapical orifices. Pleopod 1 (Fig. 10B) exopod ovoid, twice as long as wide, distal margin bearing one seta, endopod about three times as long as exopod, distal portion tapering. Pleopod 2 (Fig. 10C) exopod triangular, outer margin concave bearing five setae, endopod about twice as long as exopod. Pleopod 3 and 4 exopods as in Fig. 10D and E, respectively. Pleopod 5 exopod (Fig. 10F) triangular, outer margin sinuous bearing five setae.

Etymology

The new species is named after the Alpha Hydrae star, also known as Alphard. The Alphard star is the brightest star of the Hydra constellation and it represents the state of Mato Grosso do Sul in the Brazilian flag.

Remarks

Trichorhina alphard sp. nov. differs from all previously mentioned species with four ommatidia in the different shape of the male pleopod 1. Moreover, it differs from *T. yakupyrang* sp. nov. and *T. quadriocellata* sp. nov. in having the telson with concave lateral sides (vs. straight in *T. quadriocellata* sp. nov.), mandibles with a molar penicil of five branches (vs. simple in *T. quadriocellata* sp. nov.), maxillula outer endite composed of 3 + 3 teeth with two of them cleft at the apex (vs. 4 + 4 simple teeth in both species), maxilliped endite without any ornamental setae (vs. distal hook-like setae in both species), male pereopod 1–4 merus and carpus bearing brushes of setae on the sternal margin (vs. sparsed on both species), male pleopod 2 endopod flagelliform and elongated (vs. stout and shorter in both species), and male pleopod 5 exopod triangular (vs. rhomboid in *T. yakupyrang* sp. nov.).

Trichorhina acrux Campos-Filho, Sfenthourakis & Bichuette sp. nov.
Figs 1, 11, and 12

Zoobank

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Type material

Holotype São Paulo, Iporanga: 1♂ (parts in micropreparations) (LES 1776), Gruta Água Sumida, Parque Estadual Turístico Alto do Ribeira (PETAR), 24º27'42"S 48º36'44"W, 8-13 November 2009, leg. F. Pellegatti-Franco. *Paratypes* São Paulo, Iporanga: 1♀ (LES 28763), Gruta Colorida, Parque Estadual Intervales (PEI), 24º16'25"S 48º25'11"W, 26-30 March 2009, leg. F. Pellegatti-Franco, 2♀ (one in micropreparations) (LES 1781), Gruta Minotauro, PEI, 24º16'34"S 48º27'22"W, 26-30 March 2009, leg. F. Pellegatti-Franco, 1♀ (LES 1790), Gruta do Chapéu, PETAR, Caboclos 1, 24º26'06"S 48º35'25"W, 8-13 November 2009, leg. F. Pellegatti-Franco.

Description

Maximum body length: male 2 mm, female 2.5 mm. Colorless body. Body (Fig. 11A) robust, pereonites 1 and 2 epimera slightly directed frontwards, 3–7 gradually directed backwards. Dorsum covered with fan-shaped scale-setae (Fig. 11B). One line of *noduli laterales* inserted close to posterior margins and more or less at same distance from lateral margins of pereonites (Fig. 10B), b/c and d/c coordinates as in Fig. 11C and D, respectively. Cephalon (Fig. 11A, E) with lateral lobes slightly developed, suprantennal line slightly bent downwards in middle, eyes composed of five ommatidia. Pleon (Fig. 11A, F) outline continuous with that of pereonite 7, epimera of pleonites 3–5 well-developed and directed backwards. Telson (Fig. 11F) triangular, lateral sides concave, obtuse apex. Antennula (Fig. 10G) with proximal and distal articles subequal in length, distal article bearing seven subapical aesthetascs. Antenna (Fig. 10H) when extended posteriorly surpassing posterior margin of pereonite 1, flagellum as long as fifth article of peduncle, second article about three times as long as first with two aesthetascs on distal portion, apical organ short with long free sensilla. Buccal pieces (Fig. 11I–K) as in *T. quadriocellata* sp. nov.: maxillula outer endite of 3 + 4 teeth, maxilliped endite without distal ventral seta on longitudinal ridge. Uropod (Fig. 12A) protopod and exopod with outer margin grooved bearing glandular pores, exopod twice as long as endopod, endopod inserted proximally. Pereopod 1 carpus with transverse antennal grooming brush reaching median portion, distal seta with apex double-fringed, dactylus with short inner claw, ungual and dactylar setae simple reaching distal portion of outer claw (Fig. 12B).

Male: Pereopods 1 and 7 (Fig 12B, C) without sexual dimorphism. Genital papilla (Fig. 12D) with triangular ventral shield and subapical orifices. Pleopod 1 (Fig. 12E) exopod subrectangular, distal margin bearing three small setae, endopod about three times as long as exopod, distal portion slightly bent outwards and bearing small setae on median margin. Pleopod 2 (Fig. 12F) exopod subrectangular, outer margin slightly sinuous bearing six setae, endopod slender, distal portion elongated. Pleopod 3 and 4 exopods as in Fig. 12G and H, respectively. Pleopod 5 exopod (Fig. 12I) subrectangular, distal margin slightly convex bearing six setae.

Etymology

The new species is named after the Alpha Crucis star, also known as Acrux, the brightest star of the Crux constellation. This star represents the state of São Paulo in the Brazilian flag.

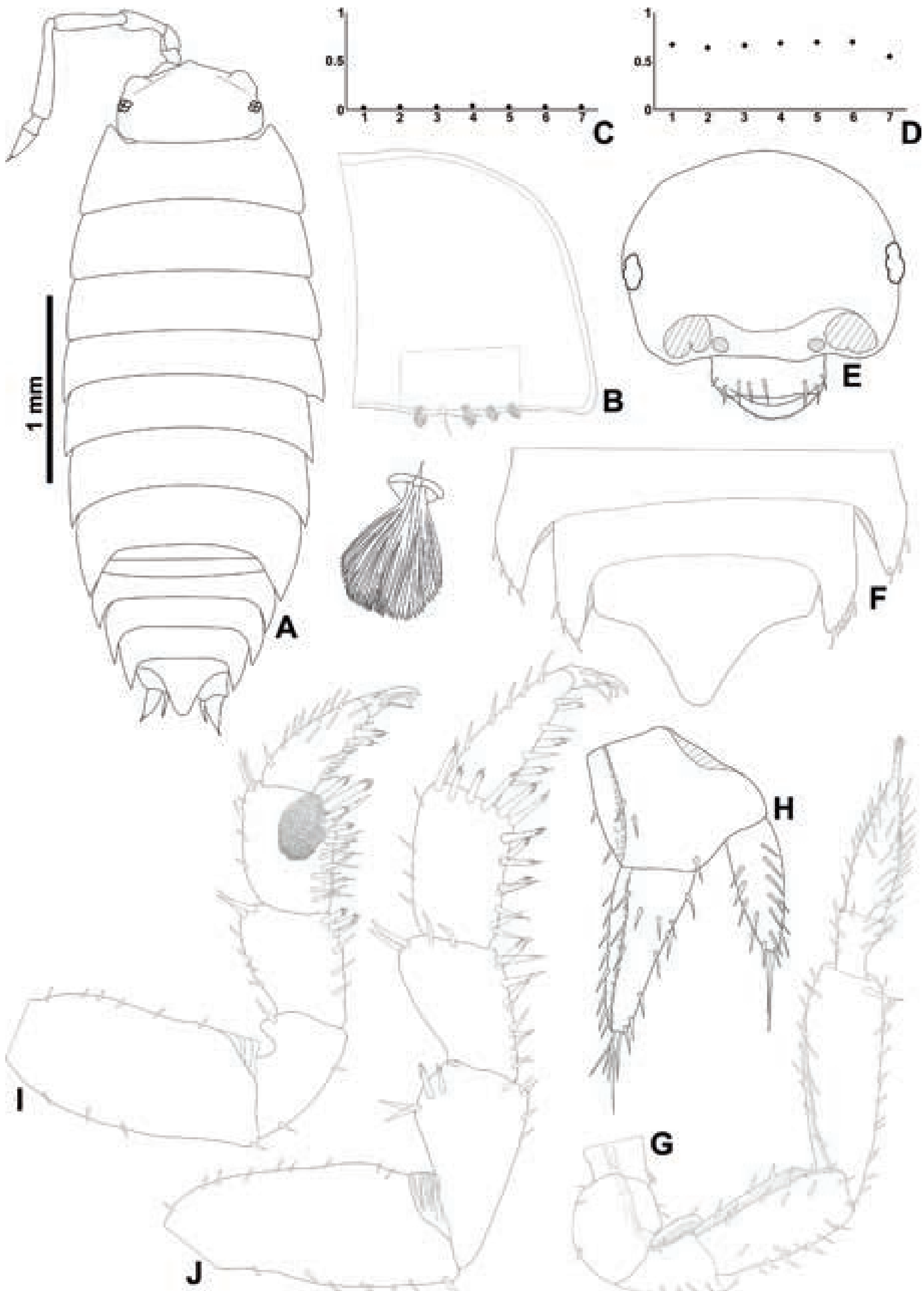

Figure 9. *Trichorhina alphard* Campos-Filho, Sfenthourakis & Taiti sp. nov., ♂ paratype, LES 0085: **A**, habitus, dorsal view, **B**, pereonite 7, dorsal view, **C**, b/c coordinates, **D**, d/c coordinates, **E**, cephalon, frontal view, **F**, pleonites 4, 5 and telson, **G**, antenna, **H**, uropod, **I**, pereopod 1, **J**, pereopod 7.

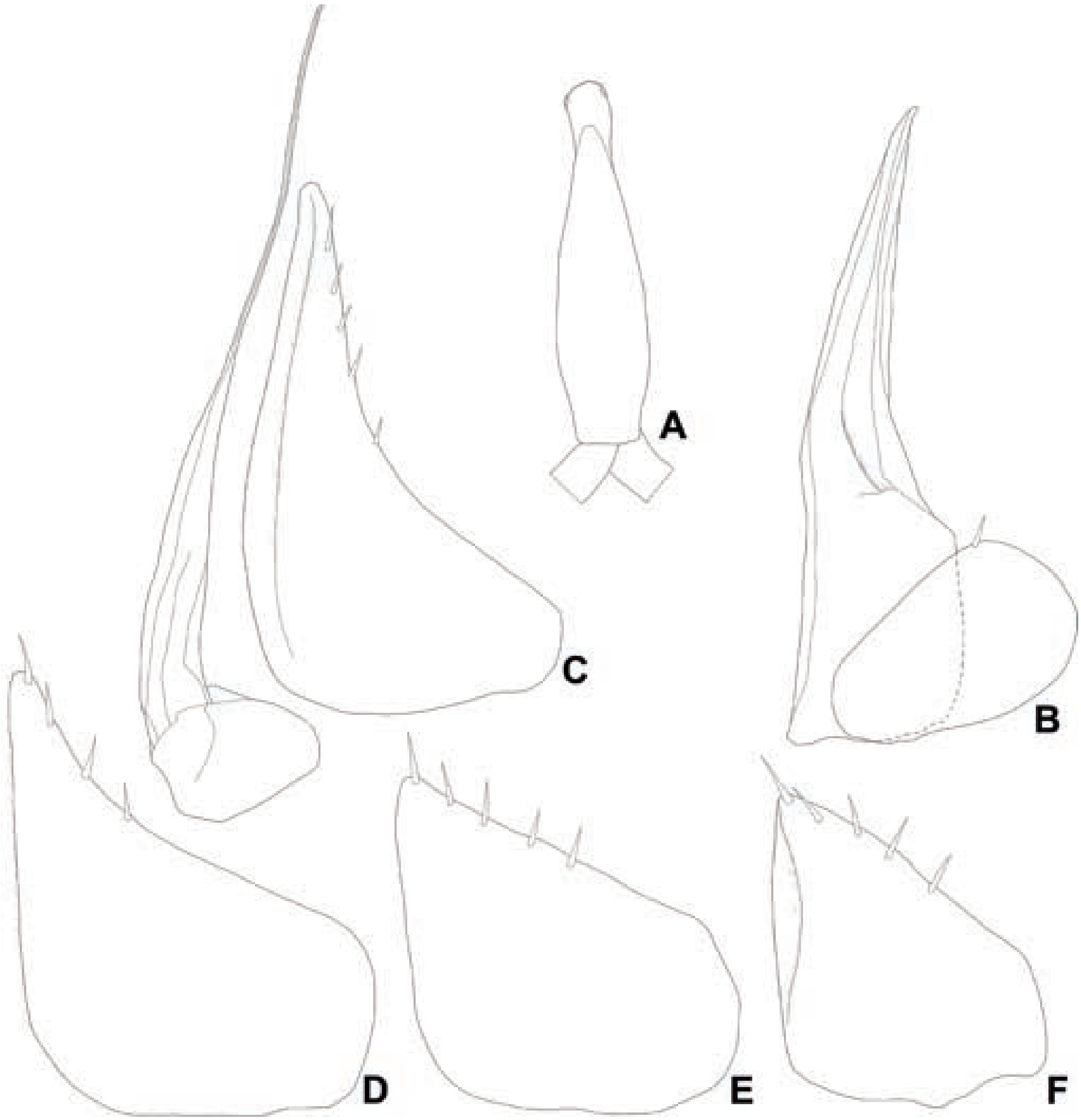

Figure 10. *Trichorhina alphard* Campos-Filho, Sfenthourakis & Taiti sp. nov., ♂ paratype, LES 0085: **A**, genital papilla, **B**, pleopod 1, **C**, pleopod 2, **D**, pleopod 3 exopod, **E**, pleopod 4 exopod, **F**, pleopod 5 exopod.

Remarks

In having the eyes composed of five ommatidia *Trichorhina acrux* sp. nov. resembles *T. albida* Budde-Lund, 1908 (Madagascar), *T. argentina* Vandel, 1963 (Brazil: states of Rio Grande do Sul and Santa Catarina, Argentina: La Plata), *T. biumbonata* Souza, Araújo & Campos-Filho, 2011 (Brazil: state of São Paulo), *T. dobrogica* Radu, 1960 (Romania), *T. giannellii*, *T. guanophila* Souza-Kury, 1993 (Brazil: state of Bahia), *T. lenkoi* Souza, Araújo & Campos-Filho, 2011 (Brazil: state of São Paulo), *T. lobata* Verhoeff, 1946 (Burma), *T. myrmecophila* Souza, Araújo & Campos-Filho, 2011 (Brazil: state of São Paulo), *T. orensis* Souza, Araújo & Campos-Filho, 2011 (Brazil: state of Rio de Janeiro), *T. pallida* Barnard, 1960 (Mozambique), and *T. papillosa* (Budde-Lund, 1893) (Venezuela: Los Tejes) (Schmalfuss 2003, Souza et al. 2011, Campos-Filho et al. 2018a). The new species differs from all these species in the different shape of the male pleopod 1 and 2 exopods. Moreover, it differs from *T. albida* in the molar penicil of

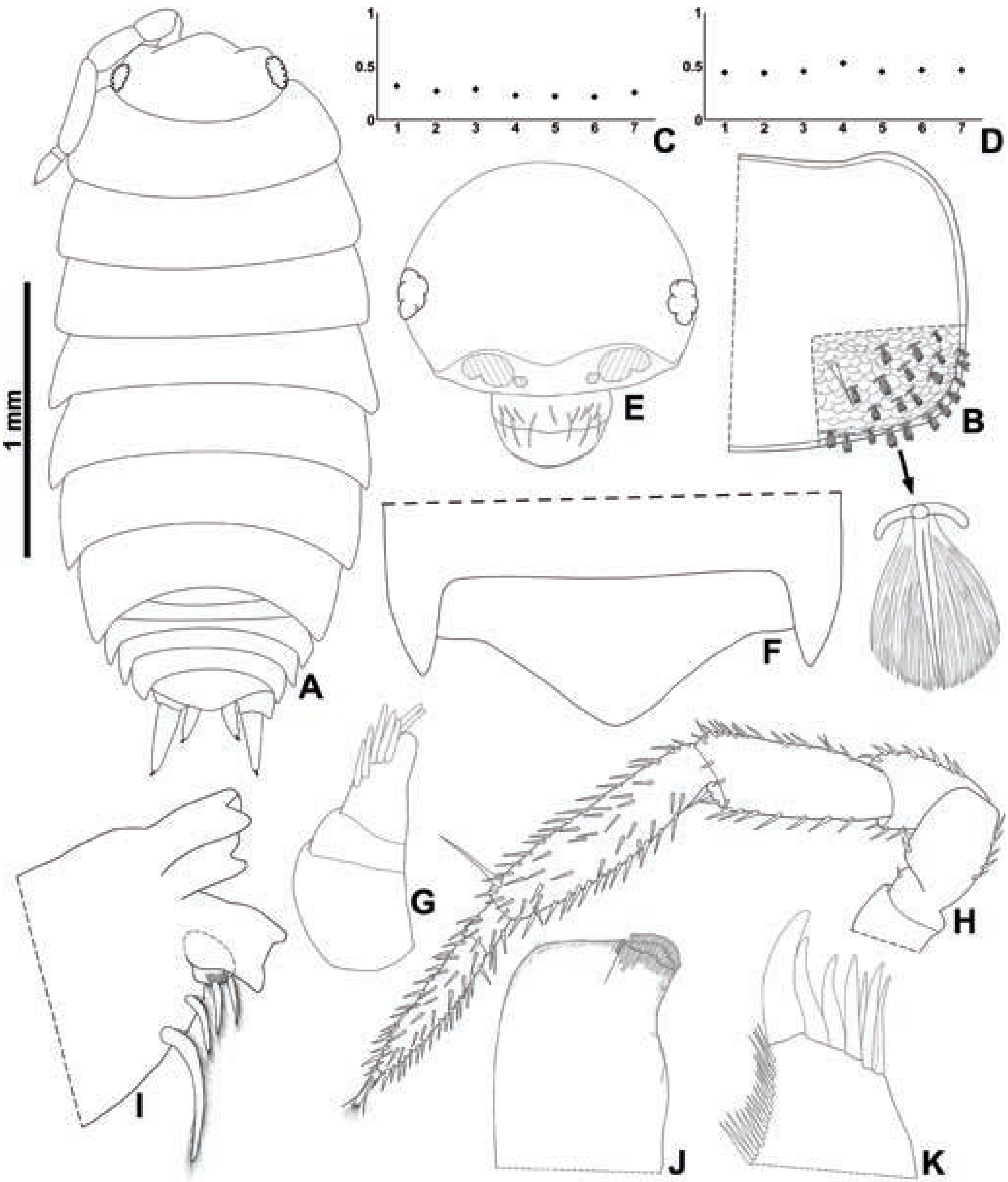

Figure 11. *Trichorhina acrux* Campos-Filho, Sfenthourakis & Bichuette sp. nov., ♀ paratype, LES 1781: **A**, habitus, dorsal view, **B**, pereonite 1, dorsal view, **C**, b/c coordinates, **D**, d/c coordinates, **E**, cephalon, frontal view, **F**, pleonite 5 and telson, **G**, antennula, **H**, antenna, **I**, left mandible, **J**, maxilla, **K**, maxillula.

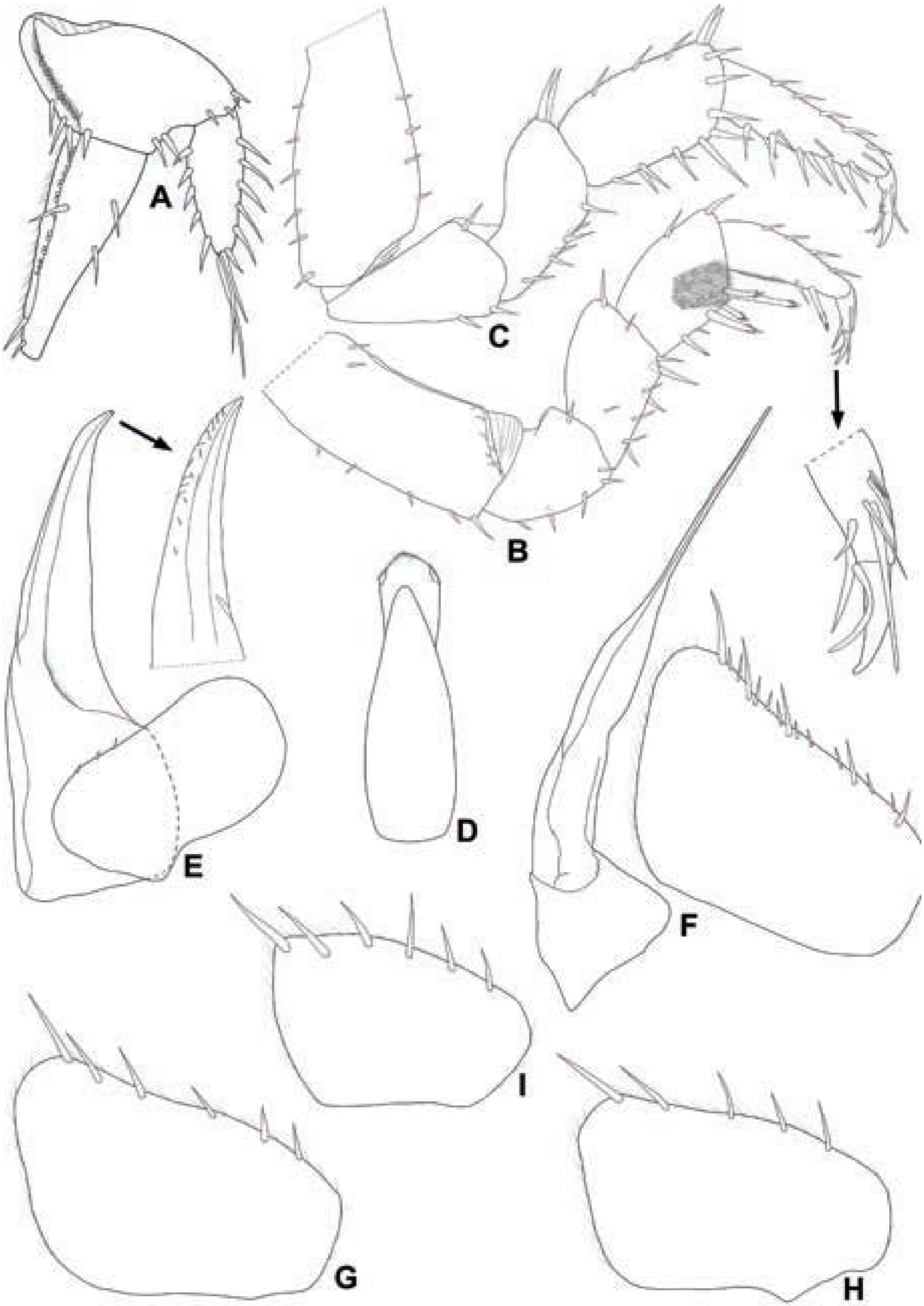

Figure 12. *Trichorhina acrux* Campos-Filho, Sfenthourakis & Bichuette sp. nov., ♀ paratype, LES 1781: **A**, uropod. ♂ holotype, LES 1776: **B**, pereopod 1, **C**, pereopod 7, **D**, genital papilla, **E**, pleopod 1, **F**, pleopod 2, **G**, pleopod 3 exopod, **H**, pleopod 4 exopod, **I**, pleopod 5 exopod.

mandibles being simple (vs. molar penicil of two branches); from *T. argentina* in the telson with concave lateral sides (vs. almost straight), antennula with rounded distal margin (vs. pointed), molar penicil of the mandibles being simple (vs. dichotomized), maxillula outer endite composed of 3 + 4 teeth, all apically entire (vs. 4 + 4 teeth, outer set with two cleft teeth), and male pleopod 2 exopod subrectangular (vs. triangular); from *T. biumbonata* in the telson with concave lateral sides (vs. almost straight), distal article of antennula bearing the aesthetascs apically and sub-apically inserted (vs. apically), molar penicil of the mandibles being simple (vs. dichotomized); from *T. dobrogica* in the telson with concave lateral sides (vs. straight), and antennula with distal article bearing seven aesthetascs sub-apically and apically inserted (vs. nine apical aesthetascs); from *T. giannellii* in the cephalon with lateral lobes not developed and supranntenal line present (vs. lateral lobes well-developed and absence of supranntenal line), telson with concave lateral sides (vs. almost straight), and male pereopod 7 ischium with the sternal margin straight (vs. slightly concave); from *T. guanophila* in the antennula bearing the aesthetascs sub-apically and apically inserted (vs. apically), molar penicil of the mandibles being simple (vs. dichotomized), outer endite of maxillula composed of 3 + 4 teeth, all apically entire (vs. 4 + 4, outer set with two cleft teeth), and male pereopod 1 merus and carpus bearing sparse setae on the sternal margin (vs. brush of setae); from *T. lenkoi* in the maxillula outer endite bearing the outer set apically entire (vs. outer set with one cleft tooth); from *T. lobata* in the dorsum covered with fan-shaped scale-setae (vs. triangular scale-setae), cephalon with the lateral lobes not developed (vs. lateral lobes strongly developed), telson twice as wide as long and distal margin right-angled (vs. as long as wide and distal margin acute), and male pereopod 7 ischium triangular with the sternal margin straight (vs. rounded and sternal margin slightly concave); from *T. myrmecophila* in the telson with lateral sides concave (vs. almost straight), and antennula bearing seven aesthetascs (vs. five); from *T. orensis* in a robust habitus (vs. slender), maxillula outer endite bearing the outer set of teeth apically entire (vs. outer set with one cleft tooth), male pereopod 1 merus and carpus bearing sparse setae on sternal margin (vs. brushes of setae), and male pleopod 1 endopod with straight apex (vs. apex slightly bent outwards); from *T. pallida* in having the molar penicil of mandibles being simple (vs. two branches) and maxillula outer endite bearing the outer set of teeth apically entire (vs. outer set with two cleft teeth); and from *T. papillosa* in the antennula bearing seven aesthetascs (vs. four or five), molar penicil of the mandibles being simple (vs. dichotomized), maxillula outer endite bearing the outer set of teeth apically entire (vs. outer set with two cleft teeth), and male pereopod 7 ischium with the sternal margin straight (vs. sternal margin concave) (Budde-Lund 1908, Arcangeli 1929, Van Name 1936, Vandel 1952, Barnard 1960, Radu 1960, Souza-Kury 1993, Araujo & Buckup 1996, Souza et al. 2011).

Trichorhina baiana sp. nov. Campos-Filho, Gallão & Bichuette sp. nov.
Trichorhina sp. 4 Fernandes et al. 2019: 1117.
Figs 1, 2D, 13, and 14

Zoobank
urn:lsid:zoobank.org:act:397B4170-54BF-49BD-9E8B-23CF287D9A32

Type material
Holotype Bahia, São Desidério: 1♂ (LES 28734), Buraco da Sopradeira, 12°26’56”S 44°57’57”W, 23 April 2012, leg. D.M. Schimonsky, J.E. Gallão and C.S. Fernandes. *Paratypes* 1♂ (parts in micropreparations), 3♀ (one in micropreparations) (LES 6289), 1♂ (LES 6290), same data as holotype, 2♂, 2♀ (MHNCI), Gruta do Jorjão, 12º22’36”S 44º57’18”W, 22 March 2019, leg. K.M. Mise, AM 56, 1♀ (LES 6296), Gruta do Capão (Epigean), 12º22’06”S 44º52’03”W, 3 November 2012, leg. D.M. Schimonsky, J.E. Gallão and C.S. Fernandes, 2♂, 4♀ (MHNCI), Buraco do Inferno da Lagoa do Cemitério, 12º23’32”S 44º55’33”W, 23-26 March 2019, leg. T. Kardush, AM 27, many ♂ and ♀ (MHNCI), same data as previous, AM 104, 1♂ (MHNCI), same data as previous, AM 25, 4♂, 5♀ (MHNCI), same data as previous, AM 04, 1 juvenile (LES 6283), Gruta do Juraci, 12º24’52”S 44º51’01”W, 3 November 2011, leg. M.E. Bichuette, J.E. Gallão, C.S. Fernandes and D. Pedroso, 1♂, 2♀ (LES 6273), 2♂, 3♀ (LES 6274), Lapa do Manga I, 12º22’17.8”S 44º59’38.4”W, 5 November 2008, leg. M.E. Bichuette, T. Scatolini and D. Pedroso, 1♀ (LES 6272), Gruta Baixa Fria, 12º22’55.6”S 44º56’12.0”W, 4 November 2008, leg. M.E. Bichuette, T. Scatolini and D. Pedroso.

Description
Maximum body length: male 3.5 mm, female 4 mm. Colorless body. Body outline as in Fig. 13A, habitus slender, pereonites 1–7 lateral sides almost parallel, pereonites 1–4 with posterior margins straight, 5–7 progressively more arched. Dorsum surface covered with fan-shaped scale setae (Fig. 13B). One line of *noduli laterales* inserted close to posterior margins and more or less at same distance from lateral margins of pereonites (Fig. 13B), b/c and d/c coordinates as in Fig. 13C and D, respectively. Cephalon (Fig. 13A, E) with lateral lobes not developed, suprantennal slightly bent downwards in middle, eyes absent. Pleon (Fig. 13A, F) with outline almost continuous with that of pereonite 7, pleonites 3–5 epimera well-developed and directed backwards. Telson (Fig. 13F) triangular, lateral margins concave and narrowly rounded apex. Antennula (Fig. 13G) bearing six stout aesthetascs. Antenna (Fig. 13H) when extended posteriorly, reaching posterior margin of pereonite 1, flagellum as long as fifth article of peduncle, second article about twice as long as first with two sets of lateral aesthetascs on distal portion, apical organ short with long free sensilla. Buccal pieces (Fig. 13I–M) as in *T. araguaia* sp. nov.: mandibles with molar penicil of about six branches, maxilliped endite without distal hook-like setae. Uropod (Fig. 14A) protopod and exopod outer margin grooved bearing glandular pores, exopod longer than endopod and inserted almost at same level as endopod. Pereopods 1–7 merus and carpus bearing sternal setae apically cleft, carpus 1 bearing transverse antennal grooming brush, distal seta with double-fringed apex, dactylus with long inner claw, ungual seta simple slightly surpassing outer claw, dactylar seta simple reaching outer claw basis.

Male: Pereopod 1 (Fig. 14B) merus and carpus bearing brushes of setae on sternal margin. Pereopod 7 (Fig. 14C) without sexual dimorphism. Genital papilla (Fig. 14D) with triangular ventral shield and two subapical orifices. Pleopod 1 (Fig. 14E) exopod ovoid, twice as broad as long, endopod about three times as long as exopod, distal portion tapering and slightly directed outwards. Pleopod 2 (Fig. 14F) exopod triangular, outer margin concave bearing three setae, endopod slender, almost twice as long as exopod, distal portion slender. Pleopod

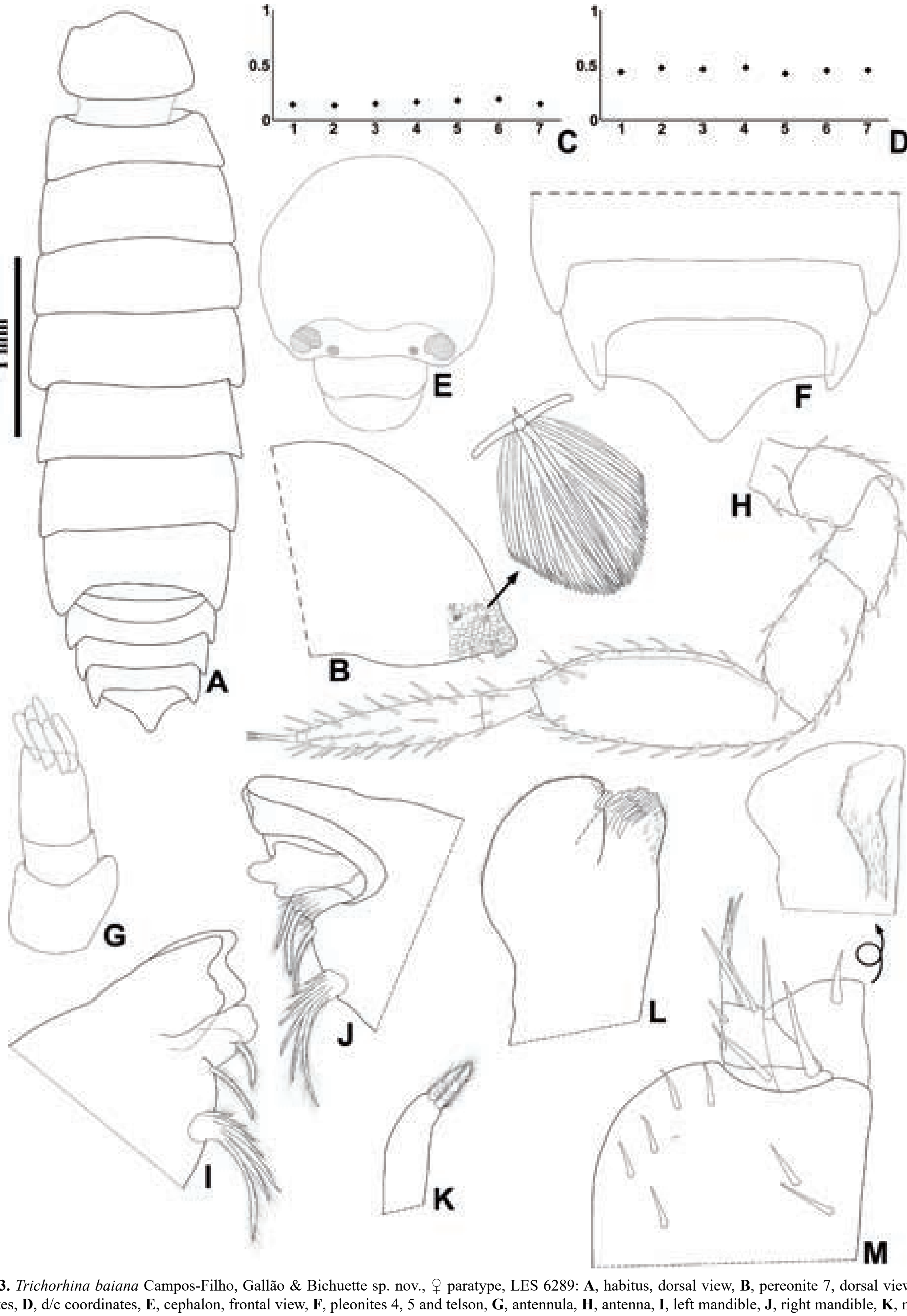

Figure 13. *Trichorhina baiana* Campos-Filho, Gallão & Bichuette sp. nov., ♀ paratype, LES 6289: **A**, habitus, dorsal view, **B**, pereonite 7, dorsal view, **C**, b/c coordinates, **D**, d/c coordinates, **E**, cephalon, frontal view, **F**, pleonites 4, 5 and telson, **G**, antennula, **H**, antenna, **I**, left mandible, **J**, right mandible, **K**, maxillula inner endite, **L**, maxilla, **M**, maxilliped.

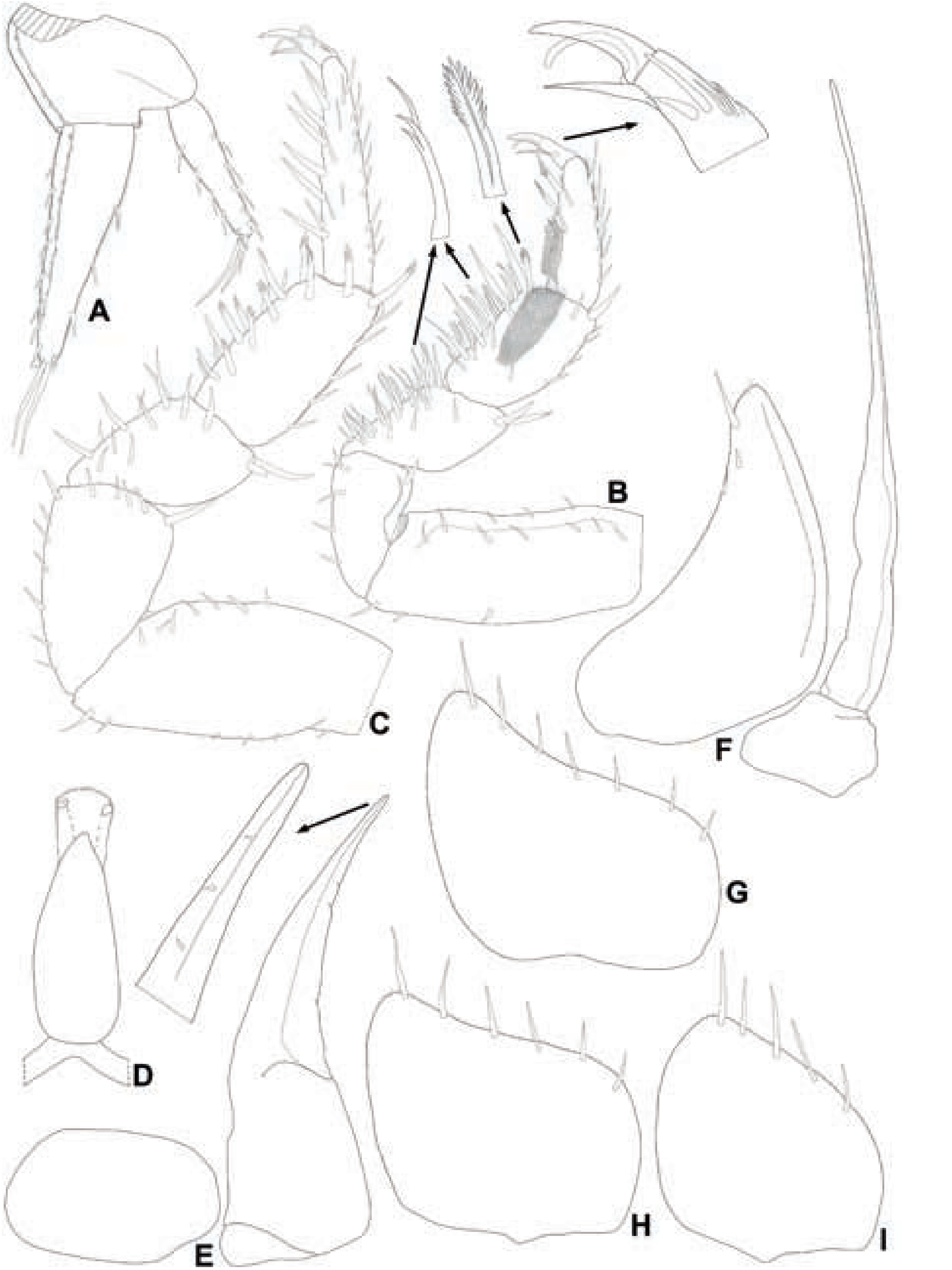

Figure 14. *Trichorhina baiana* Campos-Filho, Gallão & Bichuette sp. nov., ♀ paratype, LES 6289: **A**, uropod. ♂ paratype, LES 6289: **B**, pereopod 1, **C**, pereopod 7, **D**, genital papilla, **E**, pleopod 1, **F**, pleopod 2, **G**, pleopod 3 exopod, **H**, pleopod 4 exopod, **I**, pleopod 5 exopod.

3 and 4 exopods as in Fig. 14G and H, respectively. Pleopod 5 exopod (Fig. 14I) triangular, outer margin straight bearing five setae.

Etymology

The new species is named after the native women from Bahia named 'Baiana do Acarajé', also known as 'Baiana'. These women are known for their profession of selling 'Acarajé' and other foods of African-Bahia cuisine.

Remarks

In the shape of the male pleopod 1 exopod, *Trichorhina baiana* sp. nov. resembles *T. anhanguera* Campos-Filho, Araujo & Taiti, 2014 (Brazil: state of Pará). However, it is distinguished in having a slender dorsal habitus (vs. robust), a suprantennal line bent downwards in the middle (vs. straight), a maxillula outer endite of 4 + 4 teeth (vs. 4 + 5), mandible with a dichotomized molar penicil (vs. simple), male pereopods 1–7 bearing sparse setae on the sternal margin (vs. brush of setae on pereopods 1–3 merus and carpus), and male pleopod 2 endopod that is much longer than exopod (vs. slightly longer) (see figs 34–36 in Campos-Filho et al. 2014).

In a comparison with the blind species within the genus, *Trichorhina baiana* sp. nov. resembles *T. anophthalma* Arcangeli, 1936 (Portugal), *T. atoyacensis* Mulaik, 1960 (Mexico: province of Veracruz), *T. boneti* Rioja, 1956 (Mexico: province of San Luis Potosí), *T. brasilensis* Andersson, 1960 (Brazil: state of Santa Catarina), *T. buchnerorum* (Verhoeff, 1942) (France, Italy and Menorca), *T. caeca* Vandel, 1952 (Venezuela: El Junquito), *T. cipoensis* Campos-Filho, Bichuette & Taiti, 2016 (Brazil: state of Minas Gerais), *T. hoestlandti* Vandel, 1960 (Madeira), *T. kaingangi* Campos-Filho, 2015 (Brazil: state of Paraná), *T. paolae* Caruso, 1978 (Italy: Sicily, Malta), *T. pataxosi* Campos-Filho, Bichuette & Taiti, 2016 (Brazil: state of Minas Gerais), *T. pittieri* (Pearse, 1921) (Brazil: state of Pará, Guyana and Venezuela), *T. simoni* (Dollfus, 1893) (Venezuela: Colonie Tovar), *T. xoltunae* Mulaik, 1960 (Mexico: province of Veracruz), and *T. zimpanensis* Mulaik, 1960 (Mexico: province of Hidalgo) (Schmalfuss 2003, Campos-Filho et al. 2018a). It differs from *T. anophthalma* in the telson with concave lateral sides (vs. straight), and male pleopod 1 endopod with the distal part slightly bent outwards (vs. distal part straight); from T. *boneti* in the telson with concave lateral sides (vs. almost straight), mandibles with molar pencil of six branches (vs. three branches), and outer endite of the maxillula bearing the outer set of teeth apically entire (vs. outer set with two teeth cleft); from *T. brasilensis* in the cephalon with lateral lobes not developed (vs. lateral lobes well-developed), mandibles with molar penicil of six branches (vs. several branches), and male pleopod 1 exopod ovoid (vs. subquadrangular); from *T. buchnerorum* in the telson triangular (vs. rounded), maxillula outer endite bearing the outer set of teeth apically entire (vs. outer set with all teeth apically cleft), male pleopod 1 exopod ovoid (vs. heart-shaped); from *T. caeca* in the telson triangular (vs. rounded), molar penicil of mandibles of six branches (vs. three branches), and maxillula outer endite bearing the outer set of teeth apically entire (vs. outer set with two teeth cleft); from *T. cipoensis* in the telson with concave lateral sides (vs. slightly concave), antennula bearing six apical aesthetascs (vs. several sub-apically and apically aesthetascs), mandibles with dichotomized molar penicil (vs. simple), outer endite of maxillula bearing the outer set of teeth apically entire (vs. outer set with two teeth cleft), and male pleopod 1 exopod ovoid (vs. triangular); from *T. hoestlandti* in the telson with concave lateral sides (vs. straight), and male pleopod 1 endopod slightly directed outwards (vs. directed downwards); from *T. kaingangi* in the slender dorsal habitus (vs. robust), cephalon with lateral lobes not developed (vs. lateral lobes well-developed), dactylar seta not surpassing outer claw (vs. surpassing outer claw), male pleopod 1 exopod ovoid (vs. subtriangular), and male pleopod 2 endopod much longer than exopod (vs. slightly longer); from *T. pataxosi* in the slender dorsal habitus (vs. robust habitus), cephalon with suprantennal line and lateral lobes not developed (vs. suprantennal line absent and lateral lobes well-developed), mandibles with dichotomized molar penicil (vs. simple), male pereopod 7 merus and carpus bearing sparse setae on the sternal margin (vs. merus and carpus 7 bearing a brush of setae), and male pleopod 1 exopoid ovoid (vs. subtriangular); from *T. pittieri* in the cephalon with lateral lobes not developed (vs. lateral lobes well-developed), and telson with concave lateral sides (vs. almost straight); from *T. simoni* in the telson triangular (vs. rounded); and from *T. xoltunae* and *T. zimpanensis* in the cephalon with lateral lobes not developed (vs. lateral lobes well-developed on both species), telson with concave lateral sides (vs. slightly concave in *T. xoltunae*), and male pleopod 2 endopod much longer than exopod (vs. subequal on both species) (Van Name 1936, Andersson 1960, Mulaik 1960, Vandel 1952, 1953, 1960, 1962, Caruso 1978, Taiti & Ferrara 1980, Campos-Filho et al. 2014, 2015a, 2016, Reboleira et al. 2015).

Trichorhina crucis Campos-Filho, López-Orozco & Sfenthourakis sp. nov.
Figs 1, 15, and 16

Zoobank

urn:lsid:zoobank.org:act:24E45B11-E00D-4274-9AB1-769854754242

Type material

Holotype Minas Gerais, Caeté: 1♂ (LES 28735), Gruta AP-51, 20°01'42"S 43º41'35"W, 13-17 April 2010, leg. R. Bessi. *Paratypes* 1♀ (LES 28736), 1♂, 2♀ (LES 28737), same data as holotype, 1♂ (LES 28738), same locality and collector as holotype, 12-21 November 2009, Minas Gerais, Santa Bárbara: 1 juvenile (LES 28739), Gruta AP-09, 20º01'34"S 43º40'55"W, 19-23 July 2008, leg. R. Bessi, 6♂, 4♀ (LES 28740), Gruta AP-25, 20º02'S 43º40'W, 19-23 July 2008, leg. R. Bessi, 4♂ (one with parts in micropreparations), 7♀ (one in micropreparations), 1 juvenile (LES 28741), Gruta AP-26, 20º02'42"S 43º40'48"W, 14-21 November 2009, leg. R. Bessi, 2♂, 3♀ (LES 28742), Gruta AP-33, 20º02'16"S 43º40'40"W, 9-13 January 2012, leg. R. Bessi, 1♂, 1♀, 1 juvenile (LES 28743), Gruta AP-52, 20º02'02"S 43º40'19"W, 13-17 April 2010, leg. R. Bessi, 1 specimen without pleon (LES 28744), same locality and collector as previous, 12-21 November 2009, 6♂, 7♀, 2 juveniles (LES 28745), Serra do Gandarela, GAND-119, 11-13 March 2013, leg. R. Bessi, 1♂ (LES 28746), same locality and collector as previous, 17-19 October 2012, 4♀ (LES 28747), GAND-149, 17-19 October 2012, leg. R. Bessi, 1♂, 1♀ (LES 28748), SPD-33, 9-13 January 2012, lacking collector data, 1♂, 1♀ (LES 28749), SPD-038 cave, 9-13 January 2012, leg. R. Bessi.

Description

Maximum body length: male 4 mm, female 4.5 mm. Colourless body. Body (Fig. 15A) slender, pereonites 1 and 2 epimera slightly directed frontwards, 3–7 gradually directed backwards. Dorsum covered with fan-shaped scale-setae, posterior margin bearing triangular scale-setae (Fig. 15B). One line of *noduli laterales* inserted close to posterior margins and more or less at same distance from lateral margins of pereonites (Fig. 15B), b/c and d/c coordinates as in Fig. 15C and D, respectively. Cephalon (Fig. 15A, E) with lateral lobes well-developed, suprantennal line slightly concave, eyes absent. Pleon (Fig. 15A, F) outline continuous with that of pereonite 7, pleonites 3–5 epimera elongated and directed backwards. Telson (Fig. 15F) triangular, lateral sides almost straight, slightly concave near apex. Antennula (Fig. 15G) distal article bearing 11 apical aesthetascs. Antenna (Fig. 15H) when extended posteriorly surpasses posterior margin of pereonite 1, flagellum as long as fifth article of peduncle, second article about three times as long as first with two lateral aesthetascs on distal portion, apical organ short with long free sensilla. Buccal pieces (Fig. 15I–M) mostly as in *T. quadriocellata* sp. nov.: maxillula outer endite of 3 + 4 teeth, maxilliped endite without distal seta on ventral longitudinal ridge. Uropod (Fig. 16A) protopod and exopod outer margin grooved bearing glandular pores, exopod twice as long as endopod, endopod inserted proximally. Pereopods 1–7 merus and carpus bearing sternal setae apically cleft, carpus 1 bearing transverse antennal grooming brush, distal seta double-fringed at apex, dactylus with short inner claw, ungual seta simple not surpassing outer claw, dactylar seta simple reaching median portion of outer claw (Fig. 16C).

Male: Pereopd 1 (Fig. 16B) merus and carpus bearing brushes of setae on sternal margin. Pereopod 7 (Fig 16C) without sexual dimorphism. Genital papilla (Fig. 16D) with triangular ventral shield and subapical orifices. Pleopod 1 (Fig. 16E) exopod triangular, distal margin bearing two small setae, endopod about twice as long as exopod, distal portion slightly bent outwards and bearing small setae on median margin. Pleopod 2 (Fig. 16F) exopod triangular, outer margin concave bearing seven small setae, endopod slender, longer than exopod. Pleopod 3 and 4 exopods as in Fig. 16G and H, respectively. Pleopod 5 exopod (Fig. 16I) triangular, outer margin slightly convex bearing seven setae.

Etymology

The new species is named after the Delta Crucis star, which is located in the Crux constellation in the southern sky. In the Brazilian flag, it represents the state of Minas Gerais.

Remarks

Trichorhina crucis sp. nov. differs from *T. baiana* sp. nov. in several characters: the telson with the lateral sides almost straight (vs. concave), the distal article of the antennula bearing six aesthetascs (vs. 11 aesthetascs), mandibles with simple molar penicil (vs. dichotomized), the maxiliped endite with two hook-like setae on the distal margin (vs. absent), the male pleopod 1 exopod triangular (vs. ovoid), and the male pleopod 2 endopod elongated (vs. shorter).

Trichorhina mineira Campos-Filho, Carpio-Díaz & Taiti sp. nov.
Figs 1, 17, and 18

Zoobank

urn:lsid:zoobank.org:act:A17967CA-7CAA-48A9-98D0-852422018990

Type material

Holotype Minas Gerais, Conceição do Mato Dentro: 1♂ (LES 28750), Gruta CAI-03, 18º53’01”S 43º25’02”W, 3-13 May 2011, leg. R. Bessi. *Paratypes* 1♂ (parts in micropreparations), 1♀ (in micropreparations), (LES 28751), same data as holotype.

Description

Maximum body length: male 4 mm, female 4.5 mm. Colorless body. Body (Fig. 17A) robust, pereonite 1 epimera slightly directed frontwards, 2–7 gradually directed backwards. Dorsum covered with fan-shaped scale-setae (Fig. 17B). One line of *noduli laterales* inserted close to posterior margins and more or less at same distance from lateral margins of pereonites (Fig. 17B), b/c and d/c coordinates as in Fig. 17C and D, respectively. Cephalon (Fig. 17E) with lateral lobes slightly developed, suprantennal line slightly bent downwards in middle, eyes absent. Pleon (Fig. 17A, F) narrower than pereon, pleonites 3–5 epimera well developed and directed backwards. Telson (Fig. 17F) triangular, lateral sides slightly concave, right-angled apex. Antennula (Fig. 17G) bearing many aesthetascs inserted apically. Antenna (Fig. 17H) when extended posteriorly surpassing posterior margin of pereonite 1, flagellum as long as fifth article of peduncle, second article about three times as long as first bearing two lateral sensilla, apical organ short with long free sensilla. Buccal pieces (Fig. 17I–M) as in *T. quadriocellata* sp. nov.: maxillula outer endite with 3 + 4 teeth, maxilliped endite without distal seta on ventral longitudinal ridge. Uropod (Fig. 18A) protopod and exopod outer margin grooved bearing glandular pores, exopod twice as long as endopod, endopod inserted almost at same level as exopod. Pereopods 1–7 merus and carpus bearing sternal setae apically cleft, carpus 1 bearing transverse antennal grooming brush, distal seta with double-fringed apex, dactylus with long inner claw, ungual and dactylar setae simple not surpassing outer claw.

Male: Pereopod 1 (Fig. 18B) 1–3 merus and carpus with brushes of setae on sternal margin. Pereopod 7 without sexual dimosrphism (Fig. 18C). Genital papilla (Fig. 18D) with triangular ventral shield and subapical orifices. Pleopod 1 (Fig. 18E) exopod ovoid, endopod three times as long as exopod, distal portion tapering bearing small setae on median margin. Pleopod 2 (Fig. 18F) exopod triangular, outer margin concave bearing three setae, endopod longer than exopod. Pleopod 3 and 4 exopods as in Fig. 18G and H, respectively. Pleopod 5 exopod (Fig. 18I) triangular, outer margin almost straight bearing six setae.

Etymology

The new species is named after the native people of the state of Minas Gerais, called ‘mineiros’. The female designation is applied in agreement with the gender of the genus.

Remarks

In the shape of the male pleopod 1 exopod *T. mineira* sp. nov. resembles *T. baiana* sp. nov., from which it differs in having the telson with slightly concave lateral sides (vs. concave), the uropod endopod inserted proximally (vs. almost at the same level), the dactylar seta reaching the median portion of the outer claw (vs. reaching the outer claw basis), the male pleopod 1 endopod with the distal portion stout (vs. slender), and the male pleopod 2 endopod longer than exopod (vs. twice as long).

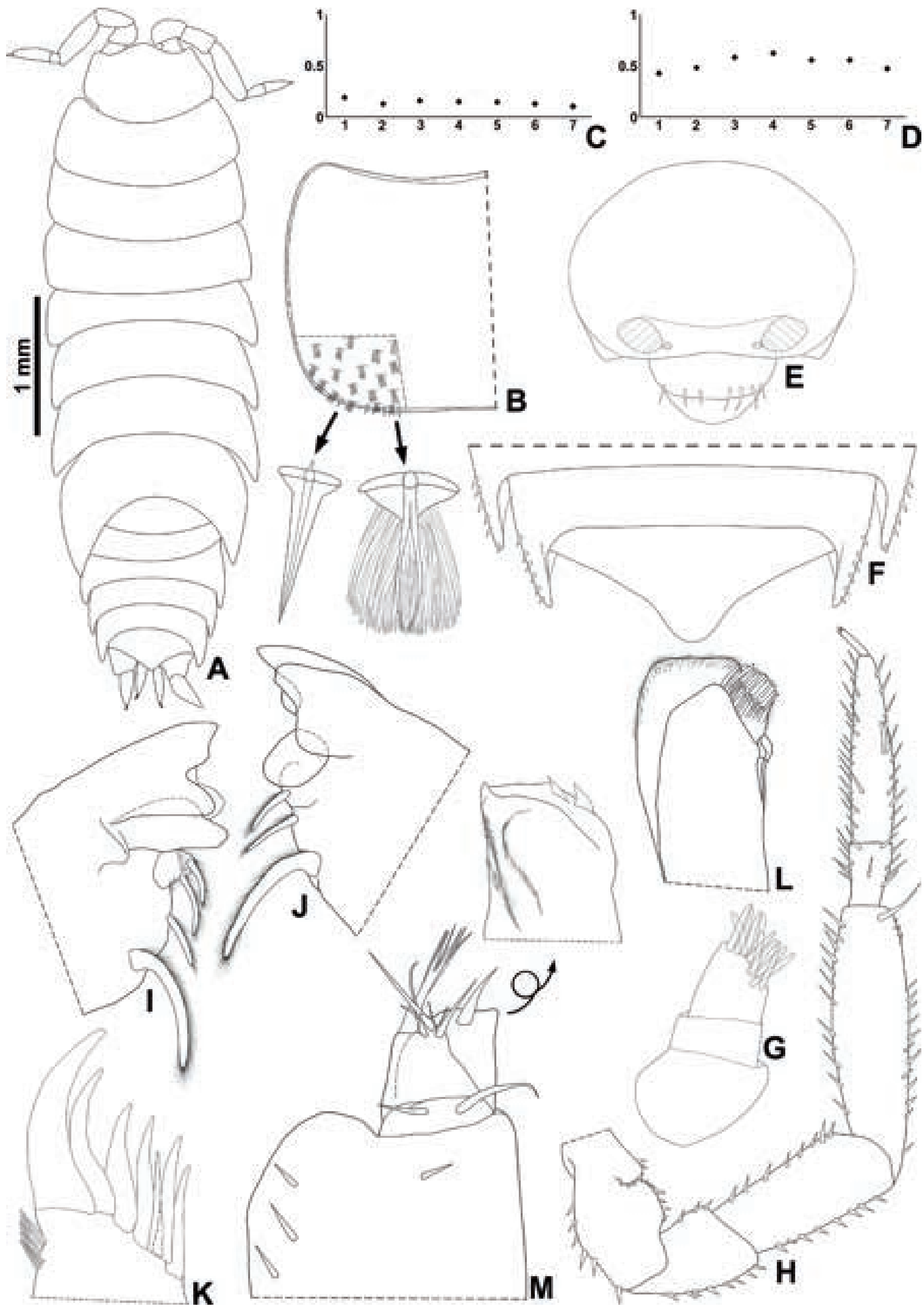

Figure 15. *Trichorhina crucis* Campos-Filho, López-Orozco & Sfenthourakis sp. nov., ♀ paratype, LES 28741: **A**, habitus, dorsal view, **B**, pereonite 1, dorsal view, **C**, b/c coordinates, **D**, d/c coordinates, **E**, cephalon, frontal view, **F**, pleonites 4, 5 and telson, **G**, antennula, **H**, antenna, **I**, left mandible, **J**, right mandible, **K**, maxillula outer endite, **L**, maxilla, **M**, maxilliped.

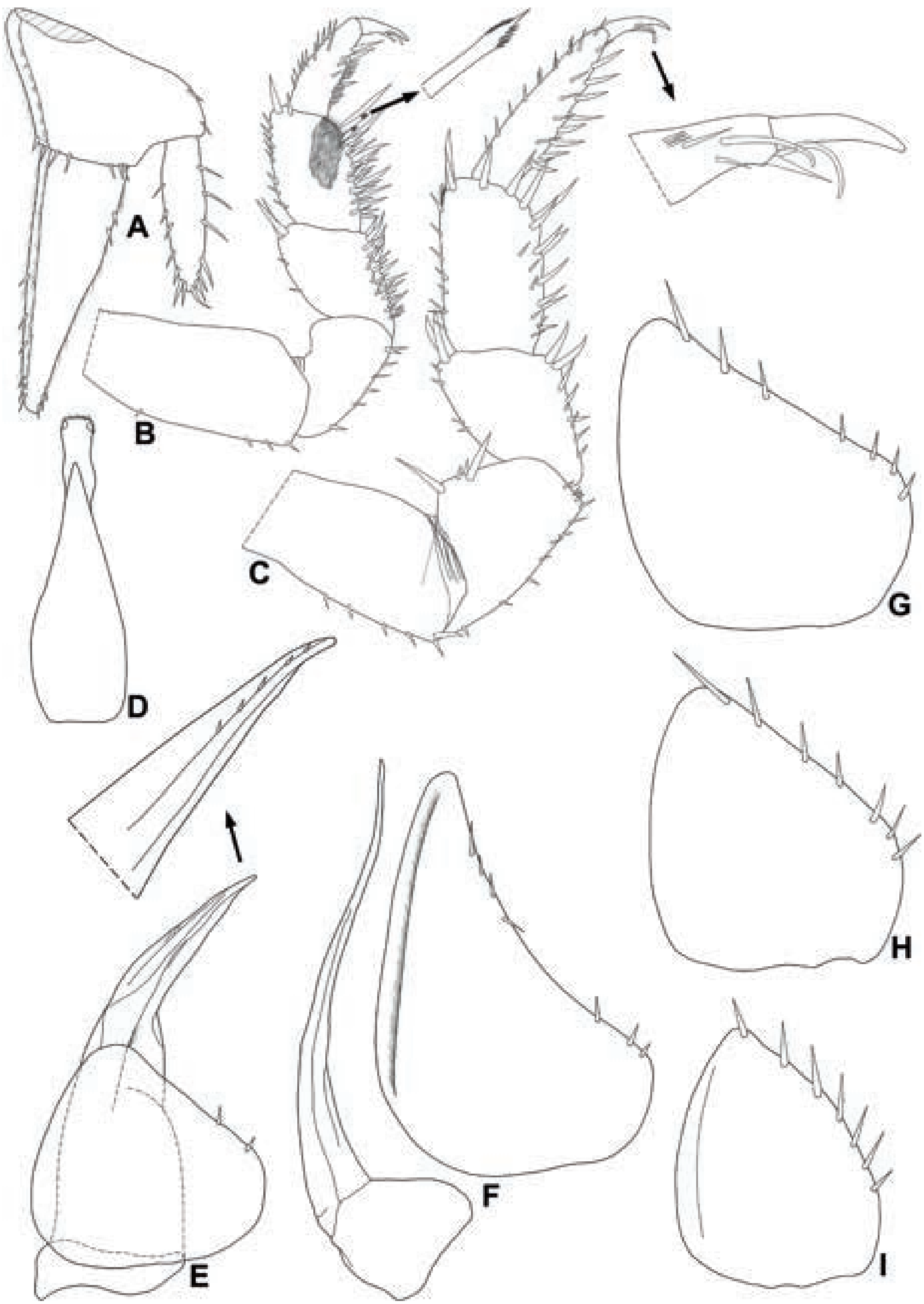

Figure 16. *Trichorhina crucis* Campos-Filho, López-Orozco & Sfenthourakis sp. nov., ♀ paratype, LES 28741: **A**, uropod. ♂ paratype, LES 28741: **B**, pereopod 1, **C**, pereopod 7, **D**, genital papilla, **E**, pleopod 1, **F**, pleopod 2, **G**, pleopod 3 exopod, **H**, pleopod 4 exopod, **I**, pleopod 5 exopod.

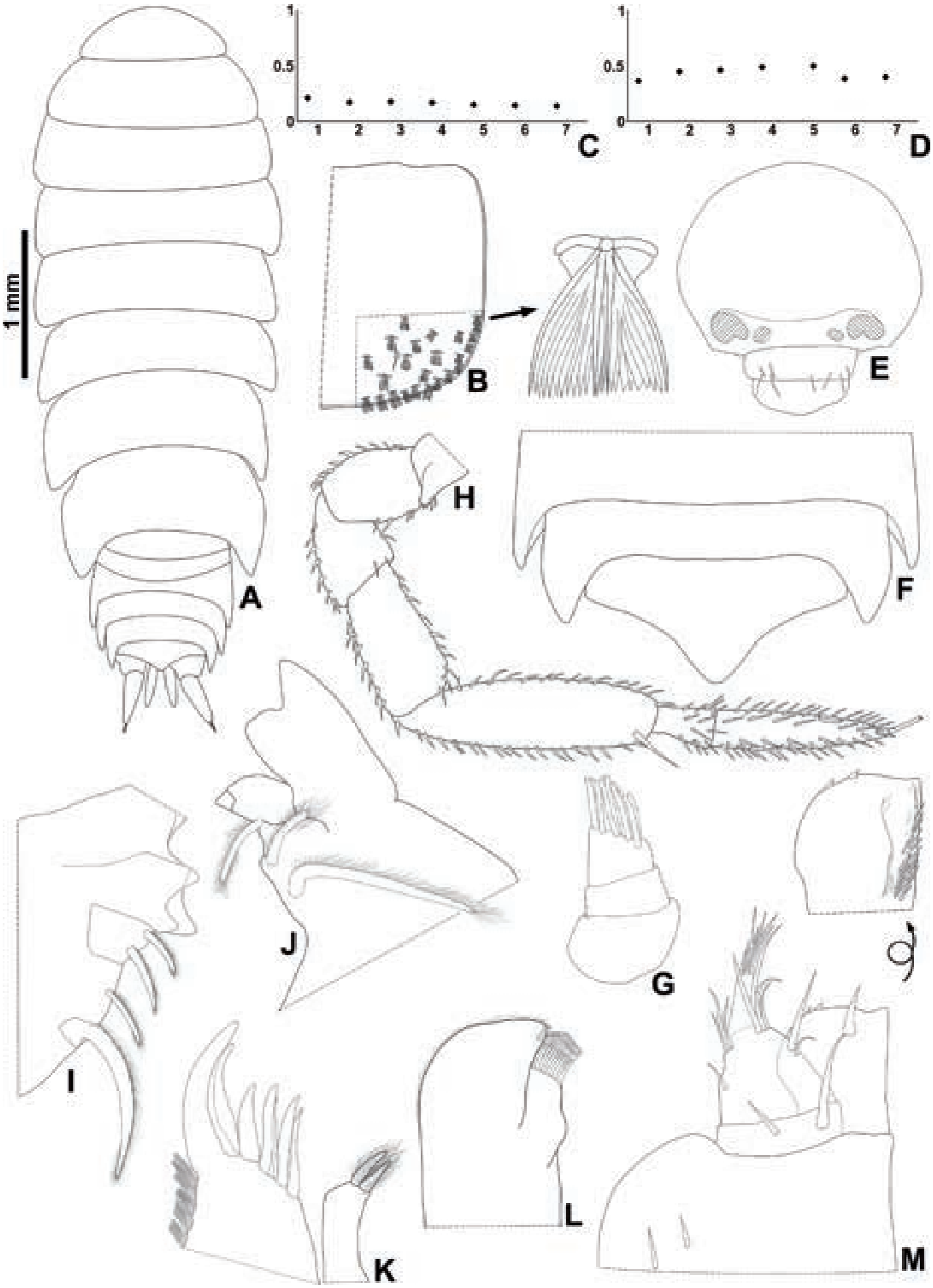

Figure 17. *Trichorhina mineira* Campos-Filho, Carpio-Díaz & Taiti sp. nov., ♀ paratype, LES 28751: **A**, habitus, dorsal view, **B**, pereonite 1, dorsal view, **C**, b/c coordinates, **D**, d/c coordinates, **E**, cephalon, frontal view, **F**, pleonites 4, 5 and telson, **G**, antennula, **H**, antenna, **I**, left mandible, **J**, right mandible, **K**, maxillula, **L**, maxilla, **M**, maxilliped.

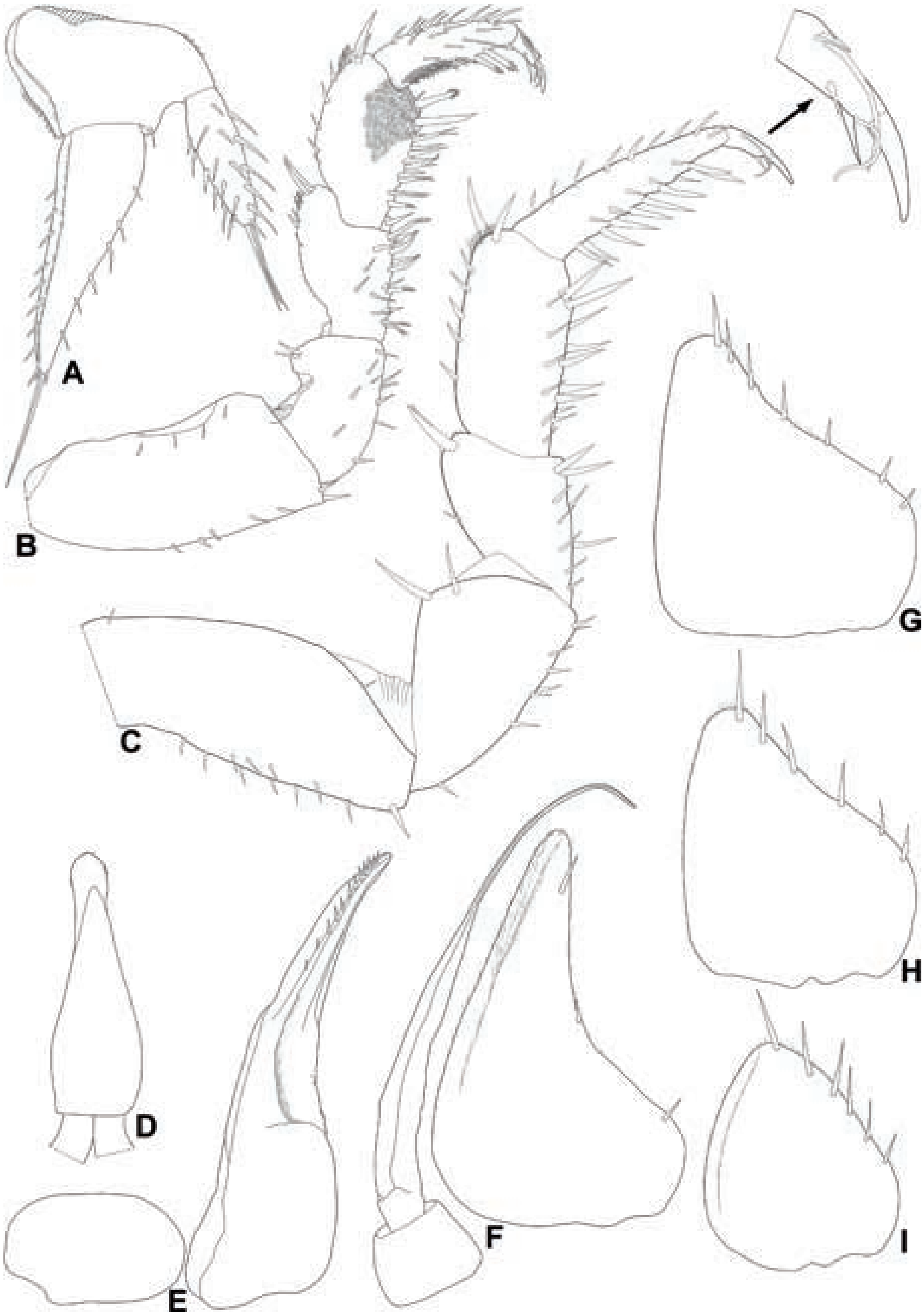

Figure 18. *Trichorhina mineira* Campos-Filho, Carpio-Díaz & Taiti sp. nov., ♀ paratype, LES 28751: **A**, uropod. ♂ paratype, LES 28751: **B**, pereopod 1, **C**, pereopod 7, **D**, genital papilla, **E**, pleopod 1, **F**, pleopod 2, **G**, pleopod 3 exopod, **H**, pleopod 4 exopod, **I**, pleopod 5 exopod.

Trichorhina marianae Campos-Filho, Gallão & Bichuette sp. nov.
Figs 1, 19, 20, and 25D

Zoobank
urn:lsid:zoobank.org:act:97C9F817-954D-4BA4-BC46-A7B8BC6D071B

Type material
Holotype Minas Gerais, Pains: 1♂ (parts in micropreparations) (LES 28752), Caverna C10, 20º22'47"S 45º33'29"W, 4 November 2005, leg. M.E. Bichuette. *Paratypes* 1♀ (in micropreparations) (LES 339), same data as holotype, 1♀ (LES 342), Caverna C6A, 4 November 2005, leg. M.E. Bichuette.

Description
Maximum body length: male 2 mm, female 3 mm. Color pale yellowish. Body (Fig. 19A) slender, pereonite 1 epimera slightly directed frontwards, 2–7 gradually directed backwards. Dorsum covered with fan-shaped scale-setae (Fig. 19B). One line of *noduli laterales* inserted close to posterior margins and more or less at same distance from lateral margins of pereonites (Fig. 19B), b/c and d/c coordinates as in Fig. 19C and D, respectively. Cephalon (Fig. 19A, E) with lateral lobes well-developed, suprantennal line slightly bent downwards in middle, eyes absent. Pleon (Fig. 19A, F) slightly narrower than pereon, pleonites 3–5 epimera well-developed and directed backwards. Telson (Fig. 19F) triangular, lateral sides slightly concave, right-angled apex. Antennula (Fig. 19G) with several aesthetascs inserted apically and sub-apically. Antenna (Fig. 19H) when extended posteriorly surpassing posterior margin of pereonite 1, flagellum as long as fifth article of peduncle, second article about three times as long as first bearing two lateral aesthetascs, apical organ short with long free sensilla. Buccal pieces (Fig. 19I–M) as in *T. quadriocellata* sp. nov.: maxillula inner endite bearing distal outer tip, outer endite composed of 3 + 4 teeth, maxilliped endite without distal seta on ventral longitudinal ridge. Uropod (Fig. 20A) protopod and exopod outer margin grooved bearing glandular pores, exopod slightly longer than endopod, endopod inserted almost at same level as exopod. Pereopods 1–7 merus and carpus bearing sternal setae apically cleft, carpus 1 bearing transverse antennal grooming brush, distal seta with double-fringed apex, dactylus with long inner claw, ungual and dactylar setae simple not surpassing outer claw.

Male: Pereopods 1 and 7 (Fig. 20B, C) without sexual dimorphism. Genital papilla (Fig. 20D) with triangular ventral shield and subapical orifices. Pleopod 1 (Fig. 20E) exopod ovoid, endopod four times as long as exopod, distal portion stout, directed outwards and bearing small setae on median margin. Pleopod 2 (Fig. 20F) exopod triangular, outer margin concave bearing four setae, endopod longer than exopod. Pleopod 3 and 4 exopods as in Fig. 20G and H, respectively. Pleopod 5 exopod (Fig. 20I) triangular, outer margin slightly concave bearing six setae.

Etymology
The new species is named after the speleologist Dr. Mariana Barbosa Timo, who has made significant contributions to the field through her work in Pains and her efforts in the conservation of Brazilian caves.

Remarks
In the shape of the male pleopod 1 exopod *T. marianae* sp. nov. ressembles *T. baiana* sp. nov and *T. mineira* sp. nov.. However, it differs in having the cephalon with well-developed lateral lobes (vs. slightly developed in *T. baiana* sp. nov. and *T. mineira* sp. nov.), antennula bearing several distal aesthetascs (vs. six in *T. baiana* sp. nov.), mandibles with simple molar penicil (vs. dichotomized in *T. baiana* sp. nov.), uropod exopod slightly longer than endopod (vs. exopod longer than endopod in *T. baiana* sp. nov. and *T. mineira* sp. nov.), male pereopod 1 merus and carpus with sparse setae along the sternal margin (vs. dense in *T. baiana* sp. nov. and *T. mineira* sp. nov.), and male pleopod 2 endopod that is slightly longer than exopod (vs. distinctly longer in *T. baiana* sp. nov.).

Trichorhina bessiae Campos-Filho, Carpio-Díaz & Bichuette sp. nov.
Figs 1, 21, and 22

Zoobank
urn:lsid:zoobank.org:act:0FC3464A-6379-4475-A9C4-6F55533444F1

Type material
Holotype Minas Gerais, Morro do Pilar: 1♂ (LES 28753), Gruta MP-01A, 20º12'31"S 43º51'28"W, 28 February 2012, leg. R. Bessi. *Paratypes* Minas Gerais, Morro do Pilar: 1♀ (LES 28754), same data as holotype, 3♂ (LES 28755), Gruta MP-01, same coordinates as holotype, 3-6 October 2011, leg. R. Andrade, 2♂, 2♀ (one in in micropreparations) (LES 28756), Gruta MP-01B, same data as previous, 1♂ (parts in micropreparations), 1♀ (LES 28757), Gruta MP-10, 20º15'57"S 43º53'16"W, 13-17 February 2012, leg. R. Bessi;1♂ (LES 28758), Gruta MP-13, 20º13'30"S 43º51'42"W, same date and collector as previous; 1♂ juvenile (LES 28759), Gruta MP-14, 20º13'41"S 43º51'47"W, 12–24 November 2011, leg. R. Andrade; 1♂, 2♀ (LES 28760), Gruta MP-16, 20º14'34"S 43º52'01"W, 13-17 February 2012, leg. R. Bessi.

Description
Maximum body length: male 4.5 mm, female 3.5 mm. Colourless body. Body (Fig. 21A) slender, pereonites 1 and 2 epimera slightly directed frontwards, 3–7 gradually directed backwards. Dorsum covered with fan-shaped scale-setae (Fig. 21B). One line of *noduli laterales* inserted close to posterior margins and more or less at same distance from lateral margins of pereonites (Fig. 21B), b/c and d/c coordinates as in Fig. 21C and D, respectively. Cephalon (Fig. 21E) with lateral lobes not well-developed, suprantennal line bent downwards in middle, eyes absent. Pleon (Fig. 21A, F) outline continuous with that of pereonite 7, pleonites 3–5 epimera directed backwards. Telson (Fig. 21F) triangular, lateral sides slightly concave, right-angled apex. Antennula (Fig. 21G) with proximal and distal article subequal in length, distal article bearing at least 16 apical aesthetascs. Antenna (Fig. 21H) when extended posteriorly surpassing posterior margin of pereonite 1, flagellum slightly shorter than fifth article of peduncle, second article about three times as long as first bearing two sets of lateral aesthetascs on distal portion, apical organ short with long free sensilla. Buccal pieces (Fig. 21I–L) as in *T. quadriocellata* sp. nov.: maxillula outer endite with 3 + 4 teeth, maxilliped endite without distal seta on ventral

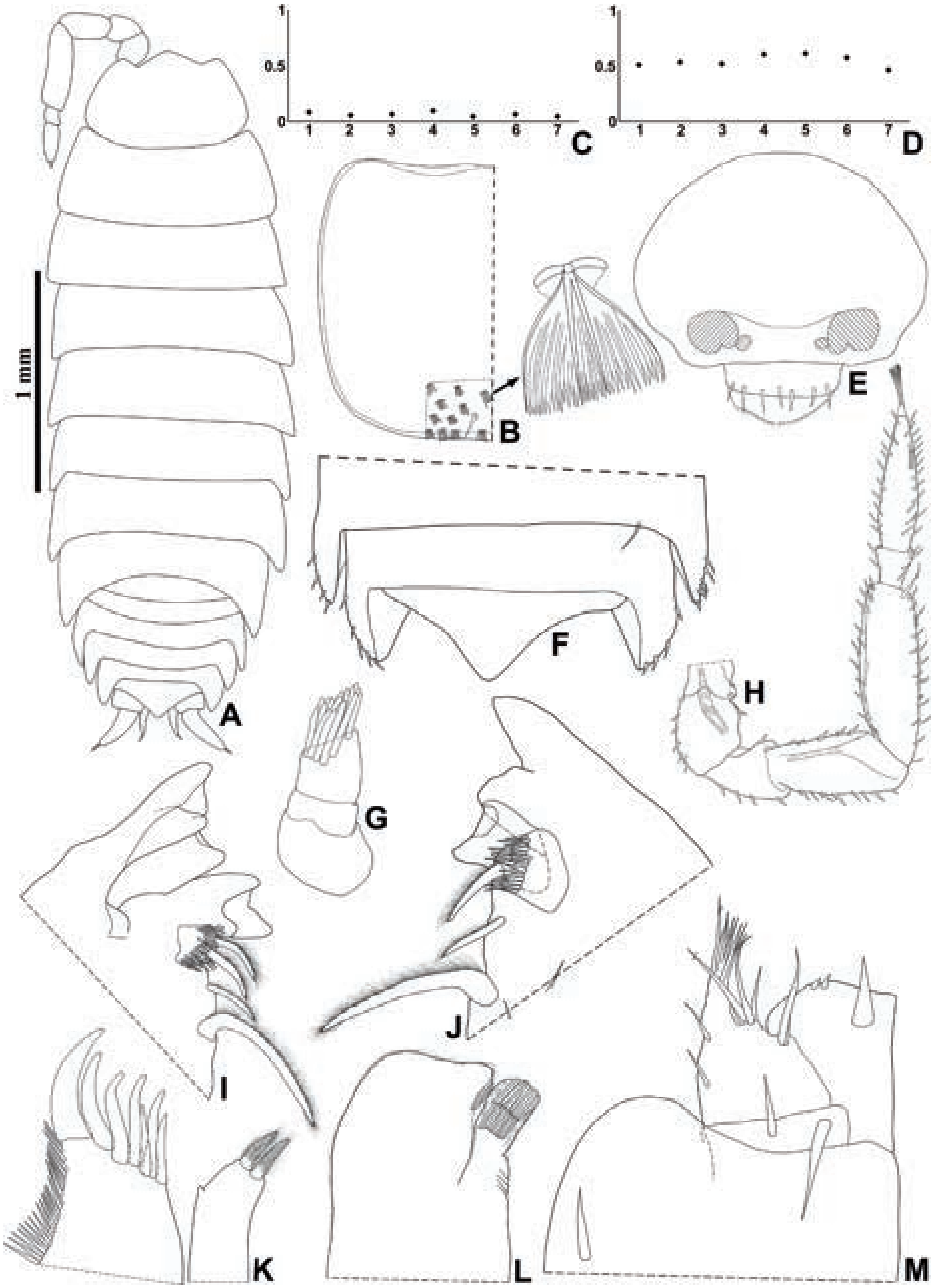

Figure 19. *Trichorhina marianae* Campos-Filho, Gallão & Bichuette sp. nov., ♀ paratype, LES 0339: **A**, habitus, dorsal view, **B**, pereonite 1 epimeron, dorsal view, **C**, b/c coordinates, **D**, d/c coordinates, **E**, cephalon, frontal view, **F**, pleonites 4, 5 and telson, **G**, antennula, **H**, antenna, **I**, left mandible, **J**, right mandible, **K**, maxillula, **L**, maxilla, **M**, maxilliped.

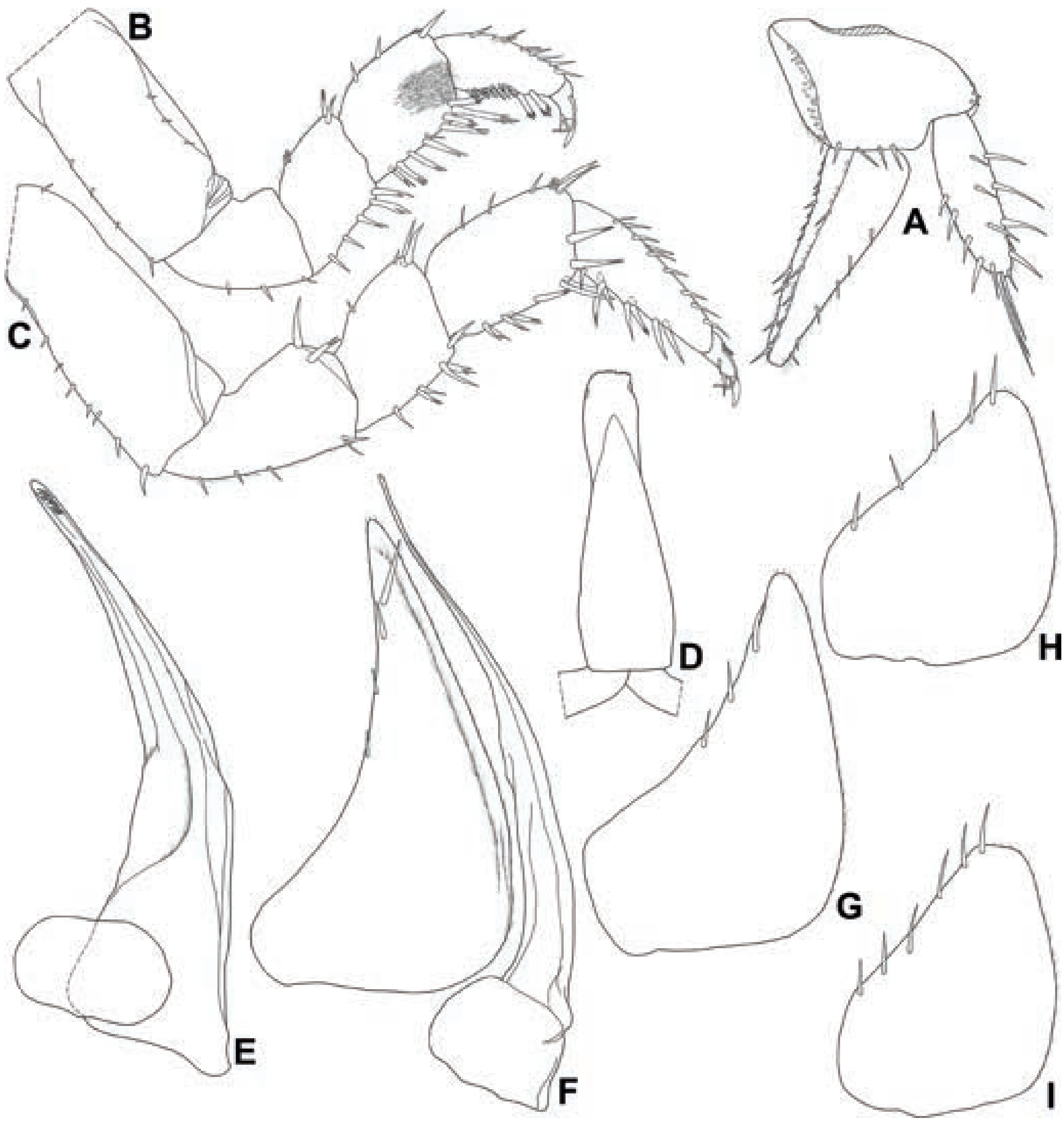

Figure 20. *Trichorhina marianae* Campos-Filho, Gallão & Bichuette sp. nov., ♀ paratype, LES 0339: **A**, uropod. ♂ holotype, LES 0339: **B**, pereopod 1, **C**, pereopod 7, **D**, genital papilla, **E**, pleopod 1, **F**, pleopod 2, **G**, pleopod 3 exopod, **H**, pleopod 4 exopod, **I**, pleopod 5 exopod.

longitudinal ridge. Uropod (Fig. 22A) protopod and exopod with outer margin grooved bearing glandular pores, exopod longer than endopod, endopod inserted almost at same level as exopod. Pereopods 1–7 merus and carpus bearing sternal setae cleft at apex, carpus 1 bearing transverse antennal grooming brush, distal seta double-fringed at apex, dactylus with long inner claw, ungual and dactylar setae simple not surpassing outer claw.

Male: Pereopod 1 (Fig. 22B) merus and carpus bearing brush of setae on sternal margin. Pereopod 7 (Fig. 22C) without sexual dimorphism. Genital papilla (not drawn) with triangular ventral shield and subapical orifices. Pleopod 1 (Fig. 22D) exopod sub-rectangular, twice as broad as long, distal margin rounded, outer margin straight, inner margin slightly concave, endopod about three times as long as exopod, distal portion tapering, slightly bent outwards and bearing small

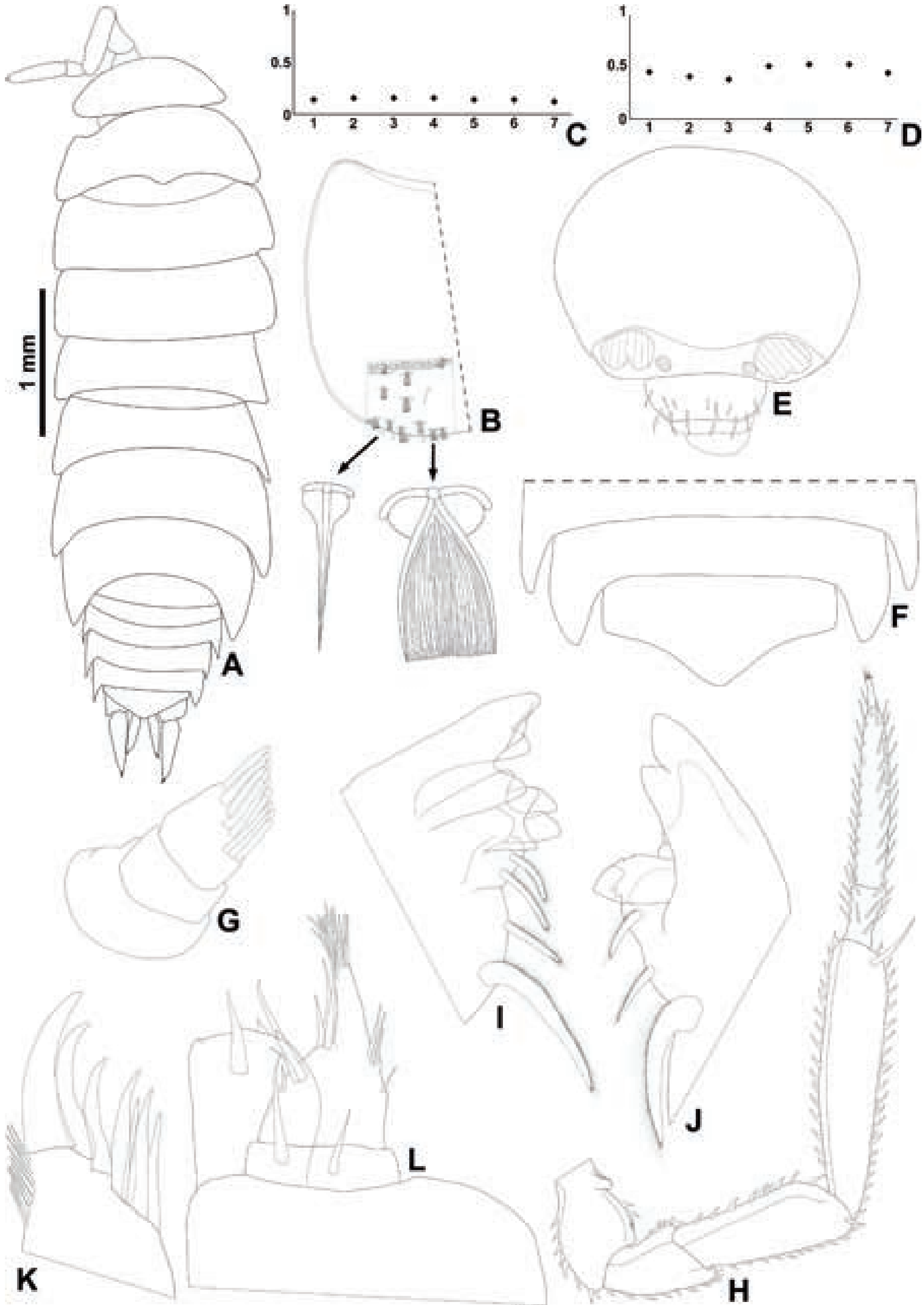

Figure 21. *Trichorhina bessiae* Campos-Filho, Carpio-Díaz & Bichuette sp. nov., ♀ paratype, LES 28756: **A**, habitus, dorsal view, **B**, pereonite 1 epimeron, dorsal view, **C**, b/c coordinates, **D**, d/c coordinates, **E**, cephalon, frontal view, **F**, pleonites 4, 5 and telson, **G**, antennula, **H**, antenna, **I**, left mandible, **J**, right mandible, **K**, maxillula outer endite, **L**, maxilliped.

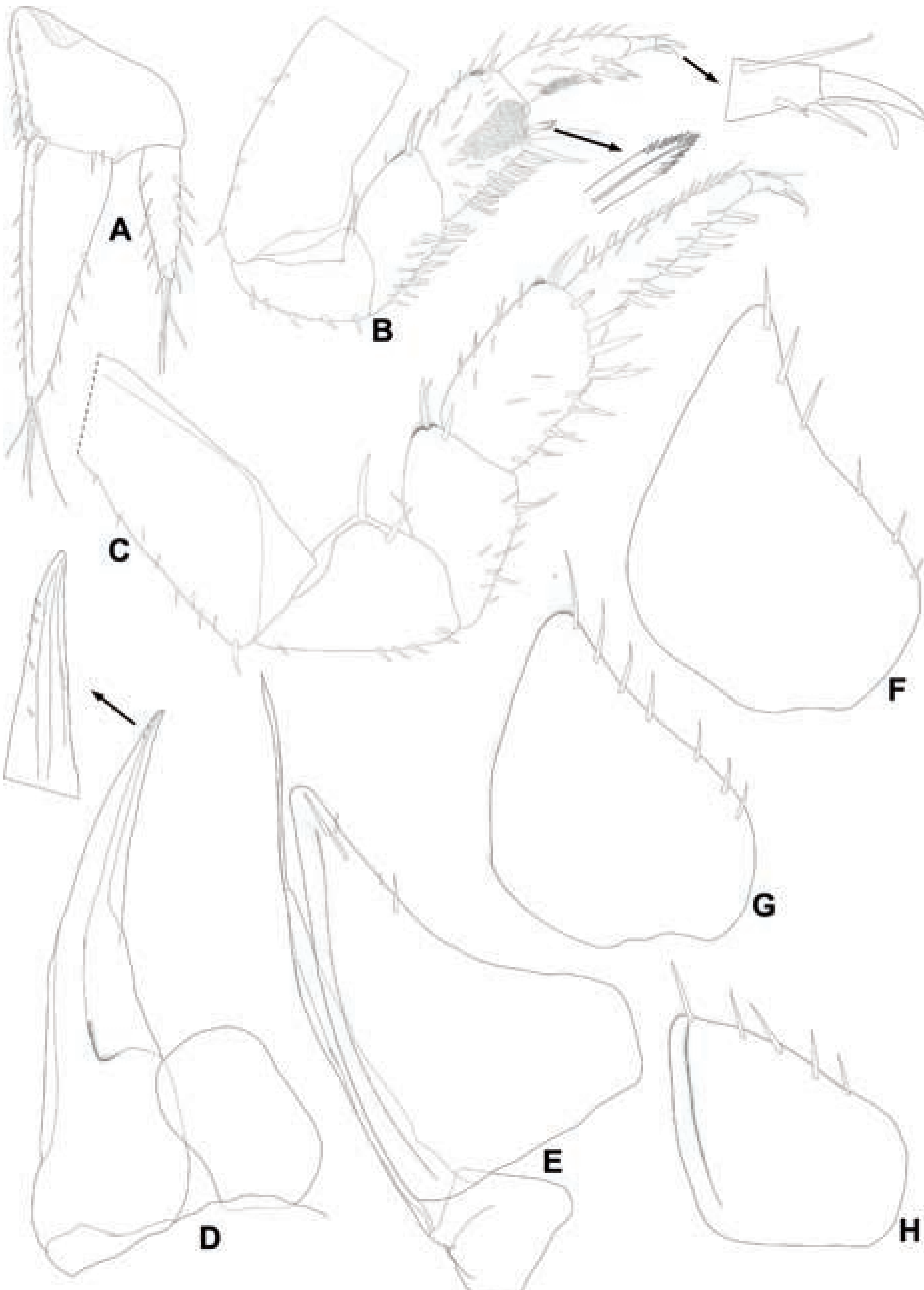

Figure 22. *Trichorhina bessiae* Campos-Filho, Carpio-Díaz & Bichuette sp. nov., ♂ paratype, LES 28757: **A**, uropod, **B**, pereopod 1, **C**, pereopod 7, **D**, pleopod 1, **E**, pleopod 2, **F**, pleopod 3 exopod, **G**, pleopod 4 exopod, **H**, pleopod 5 exopod.

setae on median margin. Pleopod 2 (Fig. 22E) exopod triangular, outer margin concave bearing three setae, endopod slender and longer than exopod. Pleopod 3 and 4 exopods as in Fig. 22F and G, respectively. Pleopod 5 exopod (Fig. 22H) triangular, outer margin slightly sinuous bearing five setae.

Etymology

The new species is named after Dr. Regina Bessi, who collected part of the specimens described in this study and made significant contributions to the collection of Oniscidea from Brazilian caves.

Remarks

Trichorhina bessiae sp. nov. differs from all blind species of the genus in the different shape of the male pleopod 1 exopod. Moreover, it differs in the telson with slightly concave lateral sides (vs. concave in *T. baiana* sp. nov.), antennula with distal article bearing 16 aethestascs (vs. six in *T. baiana* sp. nov., seven in *T. crucis* sp. nov.), mandibles with simple molar penicil (vs. dichotomized in *T. baiana* sp. nov.), maxiliped endite bearing two setae on distal margin (vs. absent in *T. baiana* sp. nov.), uropod branches inserted almost at the same level (vs. distinct levels in *T. crucis* sp. nov.), dactylar seta reaching the median portion of the outer claw (vs. reaching the basis of the outer claw in *T. baiana* sp. nov.), male pleopod 2 endopod longer than exopod (vs. twice as long as exopod in *T. baiana* sp. nov.), and male pleopod 5 exopod with the outer margin slightly sinuous (vs. straight in *T. baiana* sp. nov., slightly convex in *T. crucis* sp. nov.).

Trichorhina jurai Campos-Filho, Gallão & Bichuette sp. nov.
Figs 1, 23, 24, and 25E, F

Zoobank

urn:lsid:zoobank.org:act:AAB5742B-E569-45DD-BBF0-0D0911F8AA51

Type material

Holotype São Paulo, Iporanga, PETAR: 1♂ (parts in micropreparations) (LES 28761), Ressurgência das Areias de Água Quente, 24º33’45”S 48º40’18”W, 29 September 2012, leg. M.E. Bichuette. *Paratypes* 1♂, 1♀ (in micropreparations) (LES 28762), same data as holotype, 2♂ (one with parts in micropreparations), 3♀ (LES 0654), Caverna de Santana, PETAR, 24º32’0.87”S 48º42’30”W, 13-20 April 2009, leg. F. Pellegatti-Franco.

Description

Maximum body length: male 4.5 mm, female 4 mm. Colourless body. Body (Fig. 23A) robust, lateral sides almost parallel, epimera 1 directed frontwards, 2–7 directed backwards. Dorsum covered with fan-shaped scale-setae (Fig. 23B). One line of *noduli laterales* inserted close to posterior margins and more or less at same distance from lateral margins of pereonites (Fig. 23B), b/c and d/c coordinates as in Fig. 23C and D, respectively. Cephalon (Fig. 23A, E) with lateral lobes strongly developed, suprantennal line bent downwards in middle, eyes absent. Pleon (Fig. 23A, F) outline continuous with that of pereonite 7, pleonites 3–5 epimera well-developed and directed backwards. Telson (Fig. 23F) triangular, lateral margins concave, distal portion sub-quadrate with distal margin rounded. Antennula (Fig. 23G) with proximal and distal articles subequal in length, distal article bearing 6–9 apical aesthetascs, distal margin rounded or pointed. Antenna (Fig. 23H) when extended posteriorly surpassing posterior margin of pereonite 1, flagellum as long as fifth article of peduncle, second article about three times as long as first bearing two sets of lateral aesthetascs on distal portion, apical organ short with long free sensilla. Buccal pieces (Fig. 23I–M) as in *T. araguaia* sp. nov.: mandibles with molar penicil of six or seven branches, maxillula outer endite with 3 + 4 teeth apically entire, maxilliped endite bearing one hook-like seta on distal margin. Uropod (Fig. 24A) protopod and exopod outer margin grooved bearing glandular pores, exopod slightly longer than endopod, endopod inserted proximally. Pereopods 1–7 merus and carpus bearing sternal setae cleft at apex, carpus 1 bearing transverse antennal grooming brush, distal seta with double-fringed apex, dactylus with long inner claw, ungual and dactylar setae simple not surpassing outer claw.

Male: Pereopods 1–4 merus and carpus with brush of setae on sternal margin (Fig. 24B). Pereopod 7 (Fig. 24C) without sexual dimosphism. Genital papilla (Fig. 24D) with triangular ventral shield and subapical orifices. Pleopod 1 (Fig. 24E) exopod sub-ovoid, twice as broad as long, distal outer margin almost straight, endopod more three times as long as exopod, distal portion tapering. Pleopod 2 (Fig. 24F) exopod triangular, outer margin concave bearing two to four setae, endopod longer than exopod. Pleopod 3 and 4 exopods as in Fig. 24G and H, respectively. Pleopod 5 exopod (Fig. 24I) triangular, outer margin slightly convex bearing eight setae.

Etymology

The new species is named after Jurandir Aguiar dos Santos, also known as Jura, for his invaluable assistance during the collection in the caves of the PETAR region.

Remarks

Trichorhina jurai sp. nov. differs from all blind species of the genus in the shape of the male pleopod 1 exopod. Moreover, it differs from *T. baiana* sp. nov., *T. crucis* sp. nov., and *T. bessiae* sp. nov. in having a robust dorsal habitus (vs. slender in all species), telson with rounded distal margin (vs. triangular in all species), cephalon with the lateral lobes strongly developed and suprantennal line bent downwards in the middle (vs. lateral lobes not developed in *T. baiana* sp. nov. and *T. bessiae* sp. nov., slightly developed in *T. crucis* sp. nov., suprantennal line slightly bent downwards in *T. crucis* sp. nov.), antennula with the distal article bearing six to nine aesthetascs (vs. 11 in *T. crucis* sp. nov., several in *T. bessiae* sp. nov.), mandibles with molar penicil dichotomized (vs. simple in *T. crucis* sp. nov. and *T. bessiae* sp. nov.), maxillula outer endite with 3 + 4 teeth and outer set apically entire or two teeth cleft at the apex (vs. 3 + 4 apically entire in *T. crucis* sp. nov. and *T. bessiae* sp. nov.), maxiliped endite with one seta on distal margin (vs. absent in *T. baiana* sp. nov., two setae in *T. crucis* sp. nov. and *T. bessiae* sp. nov.), male pleopod 2 endopod slightly longer than exopod (vs. twice as long as exopod in *T. baiana* sp. nov.).

In the wide shape of the telson, the new species resembles *T. amplitelson*, but it can be distinguished by the absence of eyes (vs. eyes composed of four ommatidia in *T. amplitelson*), cephalon with lateral lobes subrectancular (vs. subquadrangular in *T. amplitelson*), and telson with lateral sides concave (vs. slightly concave in *T. amplitelson*).

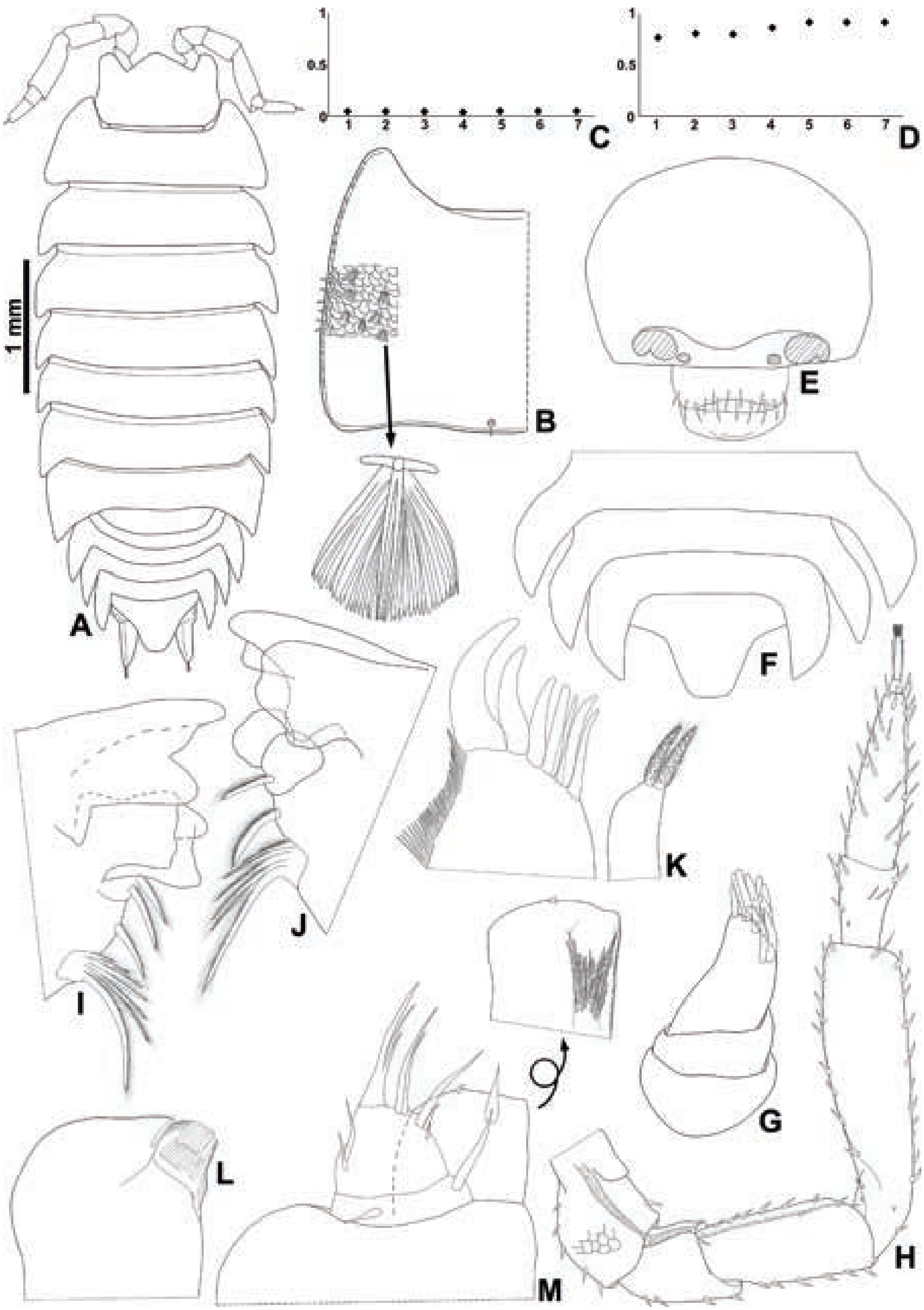

Figure 23. *Trichorhina jurai* Campos-Filho, Gallão & Bichuette sp. nov., ♀ paratype, LES 0654: **A**, habitus, dorsal view, **B**, pereonite 1 epimeron, dorsal view, **C**, b/c coordinates, **D**, d/c coordinates, **E**, cephalon, frontal view, **F**, pleonites 3–5 and telson, **G**, antennula, **H**, antenna, **I**, left mandible, **J**, right mandible, **K**, maxillula, **L**, maxila, **M**, maxilliped.

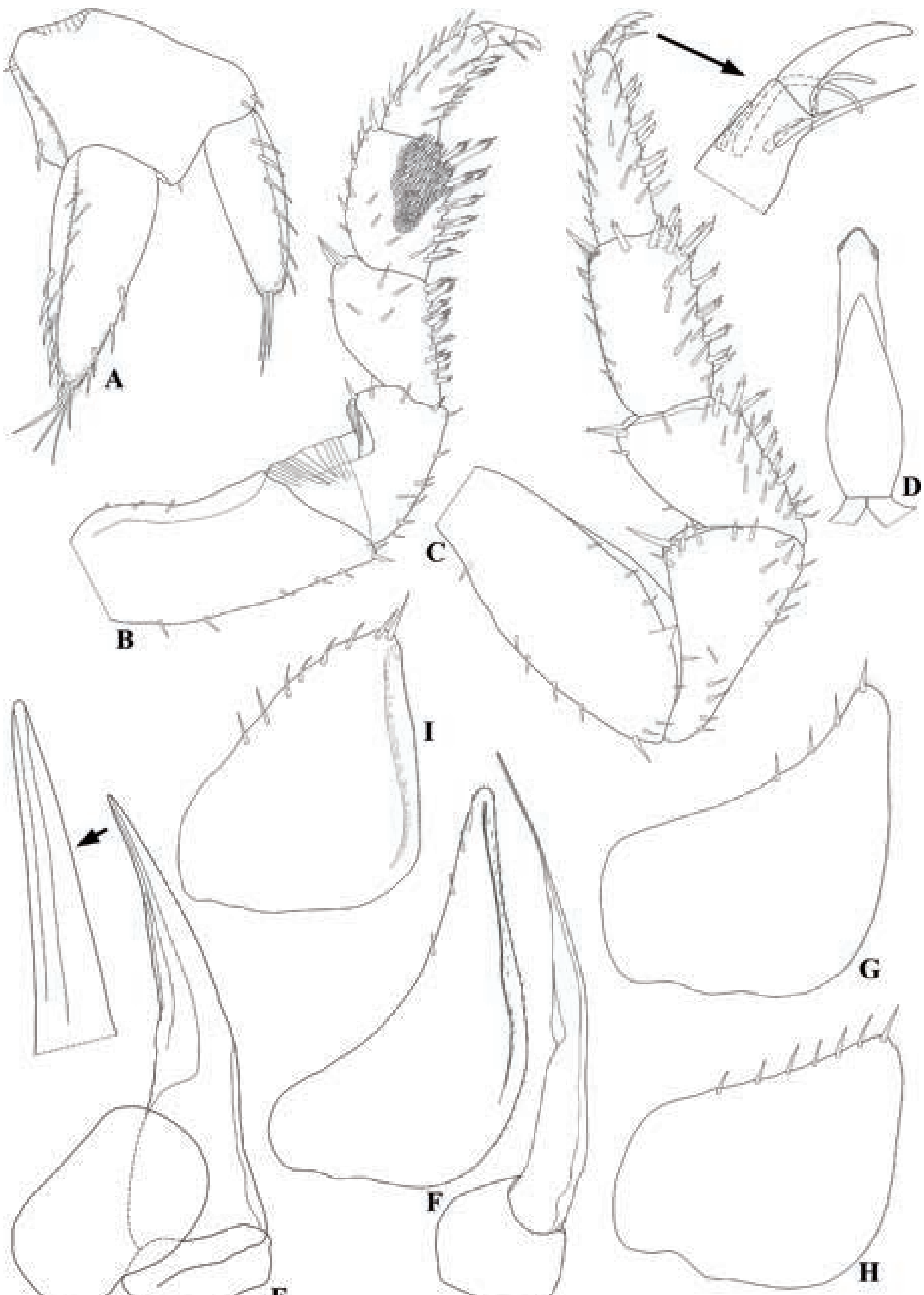

Figure 24. *Trichorhina jurai* Campos-Filho, Gallão & Bichuette sp. nov., ♀ paratype, LES 0654: **A**, uropod. ♂ holotype, LES 0654: **B**, pereopod 1, **C**, pereopod 7, **D**, genital papilla, **E**, pleopod 1, **F**, pleopod 2, **G**, pleopod 3 exopod, **H**, pleopod 4 exopod, **I**, pleopod 5 exopod.

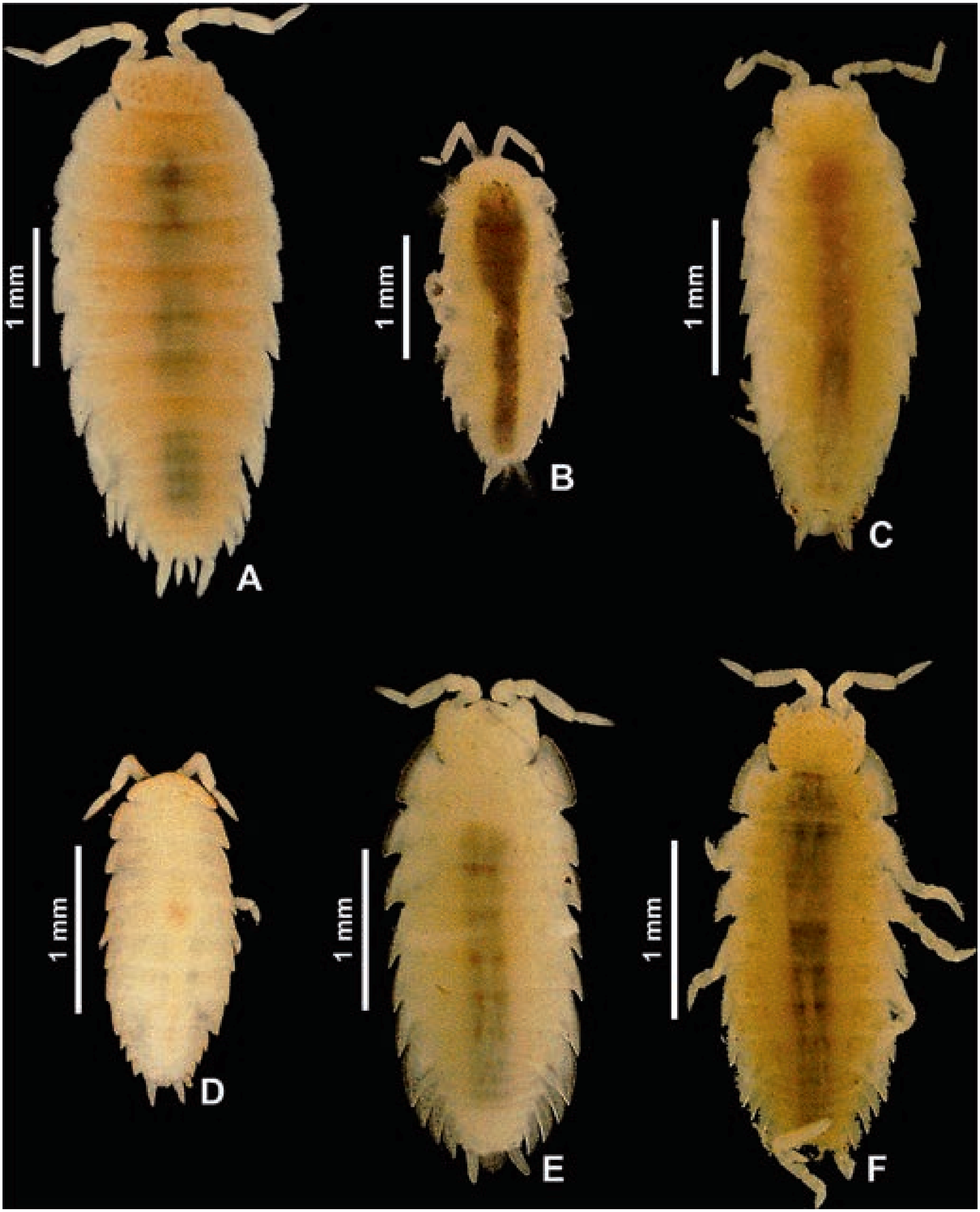

Figure 25. Photographs of the new species of *Trichorhina*: **A**, *Trichorhina yakupyrang* Campos-Filho, Carpio-Díaz & Bichuette sp. nov., **B**, *Trichorhina quadriocellata* Campos-Filho, Borja-Arrieta & Bichuette sp. nov., **C**, *Trichorhina alphard* Campos-Filho, Sfenthourakis & Taiti sp. nov., **D**, *Trichorhina marianae* Campos-Filho, Gallão & Bichuette sp. nov., **E**, **F**, *Trichorhina jurai* Campos-Filho, Gallão & Bichuette sp. nov.

Discussion

Despite the large number of Brazilian caves, the complete scenario regarding cave-dwelling species of the Oniscidea is still far from being known. The taxonomic impediment remains the main factor hindering progress in the recognition of specimens (Campos-Filho et al. 2014).

Regarding the diversity and distribution of *Trichorhina* (see Fig. 1), the genus demonstrates a high endemic rate and likely has a strong relationship with the geological history of its localities. This is also true for other diverse members of South American Oniscidea, such as Philosciidae and Scleropactidae (Schmidt et al. 2007, Campos-Filho et al. 2018a). This study describes 11 new species of the genus, highlighting its diversity, which is clearly far from being complete.

The subterranean classification, *sensu* Trajano and Carvalho (2017), for the representatives of *Trichorhina* remains uncertain, even when species lacks eyes and body pigments, which are considered classical troglomorphic characters. Species of the genus exhibit a dorsal surface covered with fan-shaped scale-setae, which is advantageous in an endogean life. This structure facilitates the movement of the animal in non-consolidated substrate, as it prevents particles from sticking to the dorsal surface of the body during locomotion (see Schmalfuss 1984, Wood et al. 2017). The presence of a dorsal surface covered with scale-setae is also observed in other members of Oniscidea, such as Philosciidae (*Caraiboscia* Vandel, 1968, *Leonardoscia* Campos-Filho, Araujo & Taiti, 2014 and *Metaprosekia* Leistikow, 2000), *Chileoniscus* Taiti, Ferrara & Schmalfuss, 1986 (incertae sedis) (Leistikow 2000, Schmidt 2007, Campos-Filho *et al.* 2014). As mentioned by Campos-Filho *et al.* (2014, 2017b), this structure likely evolved through convergence or parallel evolution to accommodate the endogean way of life (see Schmalfuss 1984), which is a common behavior among members of Platyarthridae.

It is well known that cave sampling is planned and carried out during specific periods to avoid hazardous environmental conditions, such as heavy rainfall. Additionally, assessing the localities might present some difficulties due to the location of the caves. Thus, in order to support a reliable classification, sampling efforts outside caves must also be conducted.

Additional information, such as geological formation, biome inclusion, and surrounding vegetation, is useful for classifying subterranean Oniscidea. In the present study, only *T. baiana* sp. nov. can be classified as troglobitic. This species is described from caves located within the Caatinga biome, a xeric domain in Brazil (Ab'Saber 1977, Morrone et al. 2022), while the remaining species are considered troglophilic. Therefore, the number of troglobiont for the country is now about 50 species.

The current Brazilian legislation, Decree No. 10.935, published on January 12, 2022, exposes subterranean habitats to an unprecedented threat, which could lead to the complete loss of both unknown and already known biodiversity (Ferreira et al. 2022, Oliveira et al. 2022). Most of the Brazilian caves are located outside of conservation units (SNIF 2018), and these caves are currently facing critical threats, such as deforestation of surrounding vegetation for cattle grazing and establishment of monocultures, mining, urban expansion, and others (Trajano 2000; Gallão & Bichuette 2018).

As mentioned by Campos-Filho et al. (2023c), cave habitats are extremely important for their overall fauna and surrounding communities because of their favorable environmental conditions, such as stability in humidity and temperature (Fernandes et al. 2016). Regarding its location and topography, a cave may act as potential refuge for surrounding or migrating taxa. Conservation efforts and sustainable strategic plans, including the surrounding inhabitants of the cave, are necessary to preserve these habitats.

Key to the Brazilian species of *Trichorhina*

To date, the best character to distinguish *Trichorhina* species is the number of ommatidia. Therefore, the present key is an attempt to provide initial guidance for species identification. However, the original descriptions should be consulted to ensure accurate species identification. *Trichorhina pittieri* (Pearse, 1921), recorded from the state of Pará (Lemos de Vastro 1967) is not included in the present key. In Pearse's description of *Leptotrichus pittieri* (= *Trichorhina p.*) from Lake Valencia, Marakay department, Venezuela, he mentioned specimens with small eyes, but did not describe the number of ommatidia. In Lemos de Castro (1967) work, the specimens were eyeless. These specimens likely represent distinct taxa. Future examinantion of these species is needed to ensure their taxonomy.

1	Eyes present	2
1'	Eyes lacking	25
2	Eyes of one ommatidium	3
2'	Eyes of two or more ommatidia	4
3	Ommatidium large and black, males and females present	*T. macrops*
3'	Ommatidium small and brown, only females known	*T. tomentosa*
4	Eyes of two ommatidia, one reduced	*T. heterophthalma*
4'	Eyes of more than two ommatidia	5
5	Eyes of three ommatidia	6
5'	Eyes of four or more ommatidia	7
6	Maxilliped endite without setae on distal margin, and male pleopod 1 exopod ovoid	*T. curupira*

Continue...

...Continuation

6’	Maxilliped endite with setae on distal margin, male pleopod 1 exopod subquadrangular with outer margin straight	*T. alphard* sp. nov.
7	Eyes of four ommatidia	8
7’	Eyes of five or more ommatidia	13
8	Maxillula outer endite with 3 + 3 teeth	9
8’	Maxillula outer endite with 3 + 4 teeth	10
8”	Maxillula outer endite with 4 + 4 teeth	11
9	Maxillula outer endite with all teeth entire, mandibles with molar penicil simple	*T. sexdens*
9’	Maxillula outer endite with two teeth cleft at apex, mandibles with molar penicil dichotomized	*T. alphard* sp. nov.
10	Maxillula outer endite with two teeth cleft at apex, telson triangular with lateral sides concave, antennula with aesthetascs inserted apically	*T. acuta*
10’	Maxillula outer endite with all teeth entire, telson trapezoidal with lateral sides almost straight, antennula with aesthetascs inserted apically and subapically	*T. amplitelson*
11	Maxillula outer endite with teeth cleft at apex	*T. paraensis*
11’	Maxillula outer endite with all teeth entire	12
12	Body robust, cephalon with lateral lobes well-developed, antennula with distal article bearing several aesthetascs, mandibles with molar penicil dichotomized, male pereopod 7 merus without lobe on proximal sternal portion	*T. yakupyrang* sp. nov.
12’	Body slender, cephalon with lateral lobes not well-developed, antennula with distal article bearing few aesthetascs, mandibles with molar penicil simple, male pereopod 7 merus with lobe on proximal sternal portion	*T. quadriocellata* sp. nov.
13	Eyes of five ommatidia	14
13’	Eyes of six or more ommatidia	21
14	Mandibles with molar penicil simple	15
14’	Mandibles with molar penicil dichotomized	18
15	Maxillula outer endite with teeth apically cleft	16
15’	Maxillula outer endite with teeth apically entire	17
16	Antennula with five aesthetascs, maxillula outer endite with one tooth apically cleft, male pleopod 1 endopod with straight apical portion directed backwards, male pleopod 2 endopod as long as exopod	*T. lenkoi*
16’	Antennula with eight aesthetascs, maxillula outer endite with two teeth apically cleft, male pleopod 1 endopod with apical portion slightly bent outwards, male pleopod 2 endopod about twice as long as exopod	*T. orensis*
17	Cephalon with lateral lobes slightly surpassing median lobe, antennula with aesthetascs inserted apically, male pleopod 1 exopod subquadrangular (as wide as long), male pleopod 2 exopod triangular	*T. myrmecophila*
17’	Cephalon with lateral lobes not surpassing median lobe, antennula with aesthetascs inserted in rows sub- and apically, male pleopod 1 exopod subrectangular (twice as wide as long), male pleopod 2 exopod surectangular	*T. acrux* sp. nov.
18	Maxillula outer endite with 3 + 4 teeth, all entire	*T. biumbonata*
18’	Maxillula outer endite with 4 + 4 teeth, all entire or two cleft at apex	19
19	Maxillula outer endite with all teeth entire	*T. tatiane*
19’	Maxillula outer endite with two teeth cleft at apex	20
20	Male pereopod 1 merus and carpus densely covered with setae on sternal margin, male pleopod 1 exopod with distal margin slightly conave	*T. guanophila*
20’	Male pereopod 1 merus and carpus with sparse setae on sternal margin, male pleopod 1 exopod with distal margin slightly convex	*T. argentina*
21	Eyes of six ommatidia	*T. bicolor*

Continue...

...Continuation

21'	Eyes of eight or more ommatidia	22
22	Eyes of eigth ommatidia	*T. crassisetae*
22'	Eyes of ten or more ommatidia	23
23	Eyes of ten ommatidia	24
23'	Eyes of 15 ommatidia	*T. tropidocerata*
24	Antennula with aesthetascs inserted transversally on distal article, male pereopod 1 merus and carpus bearing sparse setae on sternal margin, male pleopod 1 exopod triangular	*T. amazonica*
24'	Antennula with aesthetascs inserted longitudinally on distal article, male pereopod 1 merus and carpus bearing dense setae on sternal margin, male pleopod 1 exopod sub-ovoid	*T. yiara*
25	Mandibles with molar penicil simple	26
25'	Mandibles with molar penicil dichotomized	31
26	Maxillula outer endite with 3 + 4 teeth (cleft and/or entire)	27
26'	Maxillula outer endite with 3 + 5 teeth (all entire)	*T. pataxosi*
26"	Maxillula outer endite with 4 + 5 teeth (all entire)	*T. anhanguera*
27	Maxillula outer endite with 3 + 4 teeth, all entire	28
27'	Maxillula outer endite with 3 + 4 teeth, two cleft at apex	*T. cipoensis*
28	Male pleopod 1 exopod triangular, heart-shaped	*T. crucis* sp. nov.
28'	Male pleopod 1 exopod subrectangular or ovoid	29
29	Uropod exopod twice as long as endopod, male pleopod 1 endopod slightly directed outwards, distal part tapering	30
29'	Uropod exopod slightly longer than endopod, male pleopod 1 endopod directed outwards, distal part stout	*T. marianae* sp. nov.
30	Male pleopod 1 exopod ovoid	*T. mineira* sp. nov.
30'	Male pleopod 1 exopod subrectangular	*T. bessiae* sp. nov.
31	Maxillula outer endite with 3 + 4 teeth, entire or cleft	32
31'	Maxillula outer endite with 4 + 4 teeth, three cleft at apex	*T. baiana* sp. nov.
31"	Maxillula outer endite with 4 + 5 teeth (all entire)	*T. kaingangi*
32	Telson triangular with narrow distal portion	*T. brasiliensis*
32'	Telson triangular with broad distal portion	*T. jurai* sp. nov.

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Conflicts of Interest

The authors declare they have no conflict of interest.

Data availability

All materials used in the present study are deposited in the scientific collections of the Laboratório de Estudos Subterrâneos (LES), Universidade Federal de São Carlos, São Carlos, state of São Paulo, and Museu de História Natural de Capão da Imbuia (MHNCI), state of Paraná. Supporting data are available at: SciELO Dataverse <https://doi.org/10.48331/scielodata.UZNSQA>, and Zoobank <urn:lsid:zoobank.org:pub:A4EFA1F6-6AAB-4254-8522-263087597C87>.

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