

Programa de Pós-graduação em Diversidade Animal

Universidade Federal da Bahia

Fábio Batagini Quinteiro

**Sistemática de *Oecetis* McLachlan, 1877  
(Trichoptera: Leptoceridae): novas espécies,  
registros para o Brasil e homologia da venação  
alar**

Salvador

2012

Fábio Batagini Quinteiro

**Sistemática de *Oecetis* McLachlan, 1877  
(Trichoptera: Leptoceridae): novas espécies,  
registros para o Brasil e homologia da venação  
alar**

Dissertação apresentada ao Instituto de Biologia da Universidade Federal da Bahia para a obtenção do título de Mestre em Zoologia pelo Programa de Pós-graduação em Diversidade Animal.

Orientador: Adolfo Ricardo Calor

Salvador

2012

Sistema de Bibliotecas - UFBA

Quinteiro, Fábio Batagini.

Sistemática de *Oecetis* MacLachlan, 1877 (Trichoptera: Leptoceridae) : novas espécies, registros para o Brasil e homologia da venação alar / Fábio Batagini Quinteiro. - 2012. 81 f. : il.

Inclui anexo.

Orientador: Prof. Dr. Adolfo Ricardo Calor.

Dissertação (mestrado) - Universidade Federal da Bahia, Instituto de Biologia, Salvador, 2012.

1. Inseto aquático - Brasil, Nordeste. 2. Entomologia. I. Calor, Adolfo Ricardo.  
II. Universidade Federal da Bahia. Instituto de Biologia. III. Título.

CDD - 595.7097

CDU - 595.70



# Programa de Pós-Graduação em DIVERSIDADE ANIMAL

Instituto de Biologia  
Universidade Federal da Bahia



## ATA DA SESSÃO PÚBLICA DO COLEGIADO DO PROGRAMA DE PÓS-GRADUAÇÃO EM DIVERSIDADE ANIMAL - INSTITUTO DE BIOLOGIA, UFBA

### DEFESA DE DISSERTAÇÃO

Título da Dissertação: **Sistemática de *Oecetis McLachlan, 1877* (Trichoptera: Leptoceridae): novas espécies, registros para o Brasil e homologia da venação alar**

Mestrando: Fábio Batagini Quinteiro

Orientador: Dr. Adolfo Ricardo Calor

De acordo com o regimento geral da UFBA e com o regimento interno deste programa de pós-graduação, foram iniciados os trabalhos da Comissão Examinadora, composta pelos professores Dr. Adolfo Ricardo Calor (presidente), Dr. Ralph Wayne Holzenthal e Dr. Humberto Fonseca Mendes às 14 horas do dia 02 de Março de 2012.

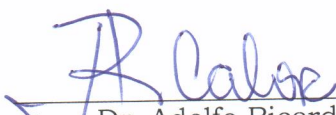
O mestrando fez a apresentação oral da dissertação durante 36 minutos. Após o encerramento das arguições, às 15:30 horas, a Comissão Examinadora pronunciou-se pela sua APROVAÇÃO, conforme parecer em anexo.

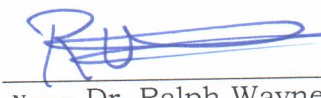
Esta Ata será assinada pelos membros da Comissão Examinadora e deste Colegiado, para compor o processo de emissão do diploma.

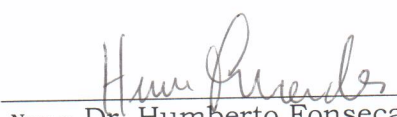
Salvador, 02 de MARÇO de 2012.

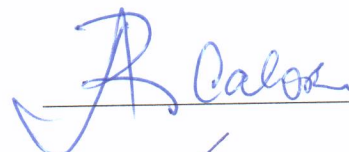
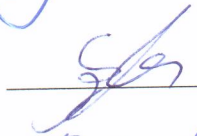
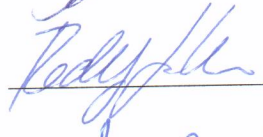
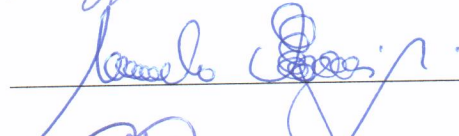
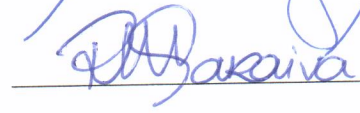
COMISSÃO EXAMINADORA

COLEGIADO

  
Nome: Dr. Adolfo Ricardo Calor  
Instituição: Universidade Federal da Bahia

  
Nome: Dr. Ralph Wayne Holzenthal  
Instituição: University of Minnesota

  
Nome: Dr. Humberto Fonseca Mendes  
Instituição: Universidade Federal do ABC

# Agradecimentos

---

Inicialmente, agradeço aos meus pais Cláudio e Rosângela e à minha irmã pelo incondicional suporte. Esse trabalho não seria possível sem o apoio de vocês em todas as vertentes possíveis.

À Leticia, pelo apoio, ajuda, paciência, carinho e compreensão, que foram importantíssimos no desenvolver desse trabalho e desse período longe.

Agradeço imensamente ao Adolfo Calor, professor, amigo e orientador, pela enorme paciência e pelos preciosos ensinamentos, tanto pessoalmente, quanto profissionalmente. Sua ajuda foi fundamental e condição *sin equa non* para a realização dessa dissertação. Um grande exemplo de pessoa e pesquisador e grande amigo.

Aos professores do Programa de Pós-graduação em Diversidade Animal pelos ensinamentos e convívio durante as disciplinas e mesmo fora de sala de aula. O formato desse programa de pós-graduação e a competência do cerne que o compõe, faz com que eu seja eternamente grato pelo conhecimento em mim investido.

Aos companheiros de laboratório (indissociável LEAq-LIS) e amigos que se tornaram: Professora Ângela Zanata, Anne Costa, Byanca Sardeiro, Diogo França, Everton Dias (que me ensinou também), Hamilton Barreto, Ítalo Garcia, Maria Santana, Priscila Camelier, Rafael Burger, Rosemeire Machado, Tácio Duarte e Victor Gomes, pelas discussões, ajuda no laboratório e em campo, pelas boas risadas e mesmo pelos atritos, os quais acabam ajudando-nos a crescer de uma maneira menos convencional, mas nos fazem crescer. Foram pessoas muito importantes, cuja convivência me ensinou muito nesses dois anos.

Aos amigos Lucas Lecci, Rodolfo Mariano e Luiz Carlos de Pinho pelas parcerias, coletas e pela ajuda, mesmo à distância.

Aos amigos e colegas do PPGDA: Anaíra Lamas, Cristiana Castello Branco, Daniela Coelho, Daniela Ventura, Igor Rosário, Luciana Martins, Marlla Matos, Rafael Abreu, Roberta Canário, Thiago Prado, Ueslei Gonçalves, pelo companheirismo, disciplinas compartilhadas e ensinamentos.

Agradeço a todos amigos do LABPOR na pessoa da Prof. Carla Menegola pelo auxílio durante o desenvolvimento dos desenhos, e pela amizade. A fauna associada agradece imensamente.

Àos Profs. Drs. Adriana Lanfredi Rangel, Cláudio Pereira Figueira e Maria Lúcia Vieira Moreno, do Instituto de Pesquisas Gonçalo Moniz (CPqGM – FIOCRUZ) pela ajuda e ensinamentos durante o uso do microscópio eletrônico de varredura da FIOCRUZ.

Ao Prof. Dr. Ralph Holzenthal e a Dra. Desiree Robertson do Insect Museum de Minnesota, pelo auxílio no empréstimo de material biológico.

Ao Dr. Victor Becker, Dona Clemira e ao Ronilson por todo apoio na Reserva Serra Bonita.

Ao Prof. Dr. Freddy Bravo e integrantes do Laboratório de Sistemática de Insetos da UEFS pelo auxílio e companheirismo em campo, pelo PPBIO, bem como pelo material biológico fornecido nessa profícua parceria.

Ao ICMBio (20938-1 e 25528-1) e a SEMA-BA pelas licenças que permitiram a coleta de material biológico.

Por fim agradeço à Fundação de Amparo à Pesquisa do Estado da Bahia pela bolsa concedida (processo 1668/2010), pelo financiamento ao projeto (processo 5716/2009). Agradeço também ao Conselho Nacional de Pesquisa e Desenvolvimento pelo financiamento aos projetos (processos 473703/2010-6; 552525/2010-3; e PPBIO semi-árido 558317/2009-0), a CAPES/PROAP via PPGDA.

# Índice

---

<b>Resumo</b> .....	1
<b>Introdução geral</b> .....	2
<b>Capítulo 1: Systematics, distribution and vein homology discussion of <i>Oecetis McLachlan, 1877 (Trichoptera: Leptoceridae)</i> with emphasis on Northeast Brazilian region species</b> .....	5
Abstract .....	6
Introduction .....	7
Material and methods .....	9
Taxonomy .....	10
Additional species records and synopsis of Brazilian species .....	24
Key to males of <i>Oecetis</i> from Brazil .....	43
Venation homology .....	45
References .....	47
Figures .....	52
<b>Capítulo 2: A new species of <i>Oecetis McLachlan, 1877 (Trichoptera: Leptoceridae)</i> from Southeast Brazil</b> .....	65
Abstract .....	66
Introduction .....	67
Material and methods .....	68
Taxonomy .....	68
References .....	72
Figure .....	74
<b>Considerações Finais</b> .....	75
<b>Referências bibliográficas (gerais)</b> .....	76
<b>Anexo I</b> .....	80

## Resumo

---

Trichoptera Kirby é a maior e mais diversa ordem de insetos exclusivamente aquática, contando com aproximadamente 13500 espécies descritas no mundo, dessas, 2562 ocorrem na Região Neotropical e 479 no Brasil, distribuídas em 61 gêneros e 16 famílias. Leptoceridae Leach possui distribuição cosmopolita e conta, atualmente, com aproximadamente 1800 espécies descritas divididas em 48 gêneros, dentre os quais se podem destacar como mais especiosos *Oecetis* McLachlan e *Triaenodes* McLachlan com 400 e 230 espécies descritas, respectivamente. Na Região Neotropical a família é representada por 149 espécies divididas em 13 gêneros viventes e, dentre eles, *Oecetis* que possui 28 espécies descritas, sendo oito registradas para o Brasil, mas apenas uma para a Região Nordeste. Analisando o registro dessas espécies é possível observar a escassez de estudos no nordeste do Brasil e concentração de conhecimento em algumas regiões, como Sul e Sudeste do país. O gênero *Oecetis* foi erigido por McLachlan abrangendo oito espécies antes consideradas *Setodes*, com base no único caráter veia M, aparentemente, sem ramificações na asa anterior. Porém, com relação a ramificação da veia M, há controvérsias na literatura. Alguns autores descrevem-na como não ramificada, enquanto outros afirmam que ela se ramifica em  $M_{1+2}$  e  $M_{3+4}$ . Com o objetivo de suprir a lacuna taxonômica da região Nordeste, material biológico do gênero *Oecetis* coletado desta região foi comparado com de outras localidades e com literatura especializada. O material foi coletado com o uso de armadilhas luminosas e do tipo Malaise e conservado, parte alfinetado e parte em álcool 80%. Para a descrição das novas espécies, as genitálias dos machos foram clareadas com o auxílio de KOH 10% ou Ácido Lático 85%. Desta forma, foram descritas seis novas espécies para o gênero *Oecetis*, além de sete novos registros para a região Nordeste do Brasil, espécies de diagnose confusa foram submetidas a Microscopia Eletrônica de Varredura, revelando diferenças significativas em sua morfologia e as duas hipóteses vigentes a respeito da ramificação ou não da veia M na asa anterior foram discutidas. Dessa maneira, suprimos parte da lacuna taxonômica do gênero para o Brasil, como parte de um esforço maior no conhecimento da entomofauna aquática.



## Introdução geral

---

Trichoptera Kirby, 1813 é a maior e mais diversa ordem de insetos exclusivamente aquática (HOLZENTHAL *et al.*, 2007b), contando com aproximadamente 13500 espécies descritas no mundo (MORSE, 2012), dessas, 2562 ocorrem na Região Neotropical (MORSE, 2012) e 479 no Brasil (CALOR, 2011)., distribuídas em 62 gêneros e 16 famílias.

São insetos holometábolos que possuem imaturos vivendo no ambiente aquático, tanto em corpos d'água lênticos quanto lóticos, ou até mesmo temporários, além de algumas espécies consideradas semi-aquáticas (MUÑOZ-QUESADA; HOLZENTHAL, 1997).

Os adultos possuem uma antena proeminente e, com algumas exceções, palpos maxilares e labiais desenvolvidos (DE MOOR; IVANOV, 2008). Possuem um lábio diferenciado em haustelo, usado na absorção de líquidos (MORSE, 2004). Esse é um dos poucos grupos de insetos aquáticos (além de alguns grupos de dípteros e coleópteros, por exemplo) que também possuem representantes em ambientes marinhos, como a família Chathamidae, que ocorre na Austrália e Nova Zelândia (GRIMALDI; ENGEL, 2005).

O *Liadotaulius maior*, o primeiro registro da ordem (Jurássico Inferior da Alemanha; 180 a 185 milhões de anos), já possuía a veia CuP ligeiramente desesclerotizada e com uma dobra acentuada em seu ápice, característica distintiva de Trichoptera (GRIMALDI; ENGEL, 2005).

Os tricópteros são divididos em quatro subordens, de acordo com Eskov & Sukatcheva (1997): Annulipalpia Martynov, 1924, Integripalpia Martynov, 1924, Spicipalpia Weaver, 1984 e Protomeropina Tillyard, 1926, esta apenas com representantes fósseis. Esta classificação tem sido alvo de discussões intensas desde Ross (1967), Weaver (1984), Wiggins; Wichard (1989), Ivanov (1997), Frania; Wiggins (1997), Kjer *et al.* (2001, 2002), entre outros. Nesse contexto, atualmente, Annulipalpia, Integripalpia e o clado Integripalpia + “Spicipalpia” são propostos como monofiléticos, enquanto “Spicipalpia” é inferido como um grupo parafilético (HOLZENTHAL *et al.*, 2007a). A subordem Integripalpia apresenta espécies com larvas construtoras de casas portáteis. O clado é sustentado por várias sinapomorfias, dentre elas a ausência de veia transversal *m* e de cercos no abdome das fêmeas (ROSS, 1967). Integripalpia compreende duas infraordens:

Plenitentoria Weaver, 1984 e Brevitentoria Weaver, 1984. Brevitentoria, que inclui os Leptoceroidea Leach, 1815, apresenta quatro sinapomorfias (adultos com tentório dorsal atrofiado; ausência de ocelos; ausência de espículas em todos os segmentos abdominais das larvas, exceto no VIII; capacidade da fêmea carregar a massa de ovos durante o voo) propostas por Weaver (1984) e corroboradas por Kjer *et al.* (2002).

A superfamília Leptoceroidea compreende oito famílias: Atriplectididae Neboiss, Odontoceridae Wallengren, Philorheithridae Mosely, Kokiriidae McFarlane, Limnocentropodidae Tsuda, Calamoceratidae Ulmer, Leptoceridae Leach e Molannidae Wallengren (MORSE, 1997; KJER *et al.*, 2001, 2002; HOLZENTHAL *et al.*, 2007b). Tanto a monofilia da superfamília, como as relações entre os membros desse grupo é, ainda, alvo de muitas controvérsias.

Leptoceridae possui distribuição cosmopolita (FLINT *et al.*, 1999) e é tradicionalmente dividida em duas subfamílias: Leptocerinae Leach, 1815 e Triplectidinae Ulmer, 1906. As sinapomorfias de Triplectidinae são a perda dos parâmeros fálcos primitivos e a redução da *phallicata* apical, enquanto, as de Leptocerinae são a perda da ramificação da veia mediana e da veia transversal setorial na asa posterior e a redução da fórmula de esporões tibiais de 2,4,4 para 2,2,4 nos adultos (MORSE, 1981; HOLZENTHAL, 1986; MORSE; HOLZENTHAL, 1987; CALOR; HOLZENTHAL, 2008).

As larvas de Leptoceridae constroem casas bastante diversas tanto em forma como nos materiais empregados, talvez as de maior diversidade da ordem. Entretanto, as casas são fundamentalmente tubulares e sua constituição varia desde seda pura até essa agregada à areia, pedaços de madeira, pedras, folhas, gravetos, entre outros materiais do substrato (HOLZENTHAL *et al.*, 2007b).

Leptoceridae conta, atualmente, com aproximadamente 1800 espécies descritas classificadas em 48 gêneros (HOLZENTHAL *et al.*, 2007b), dentre os quais, *Oecetis* McLachlan, 1877 é o mais especioso com 400 espécies descritas. Na Região Neotropical, de acordo com DE MOOR; IVANOV (2008), há 143 espécies de leptocerídeos, dentre os quais, nos gêneros *Nectopsyche* e *Oecetis*, inúmeras espécies aguardam descrições (FLINT *et al.*, 1999).

O gênero *Oecetis* foi erigido para as espécies *O. furva* (Rambur), *O. intima* McLachlan, *O. lacustris* (Pictet), *O. notata* (Ramura), *O. ochracea* (Curtis), *O. paula* (McLachlan), *O.*

*testacea* (Curtis) e *O. tripunctata* (Fabricius), antes consideradas *Setodes* Rambur, sendo o único caráter diagnóstico a veia M aparentemente sem ramificações na asa anterior (CHEN, 1993). Entretanto, não foi estabelecida uma espécie tipo, o que Ross (1944) fez determinando *O. ochracea*. O gênero *Oecetis*, que possui distribuição mundial, possui algumas características bastante singulares, como a veia M, na asa anterior, sem ramificações, a extremidade anterior do labro com dois feixes de longas cerdas e os palpos maxilares da larva bastante alongados (CHEN, 1993).

Não há interpretações conclusivas acerca da ramificação ou não da veia M na literatura. Alguns autores descrevem-na como não ramificada (*e.g.*, MCLACHLAN, 1877; FLINT, 1982; WELLS, 2004), enquanto outros afirmam que ela se ramifica em  $M_{1+2}$  e  $M_{3+4}$  (*e.g.*, MORSE, 1975; BUENO-SORIA, 1981; CHEN, 1993). De fato, a provável ramificação é, em algumas espécies, confusa de determinar. Essa controvérsia tem grande influência na inferência de homologias primárias e conseqüentemente, pode levar a disparidades significativas no entendimento da evolução do gênero.

A Região Neotropical conta com 28 espécies descritas de *Oecetis* (FLINT *et al.*, 1999), sendo oito registros no Brasil (PAPROCKI *et al.*, 2004, DUMAS *et al.*, 2010): *O. amazonica* (Banks) (Amazonas), *O. connata* Flint (Amazonas e Pará), *O. excisa* Ulmer (Brasil), *O. iguazu* Flint (Espírito Santo, Rio de Janeiro, Santa Catarina e São Paulo), *O. inconspicua* (Walker) (Minas Gerais e Paraná), *O. paranensis* Flint (Minas Gerais), *O. punctipennis* (Ulmer) (Bahia e Minas Gerais) e *O. rafaelli* Flint (Roraima).

Neste contexto, é visível a concentração do conhecimento acerca dos *Oecetis* em algumas regiões do país, restando lacunas como as regiões Nordeste e Centro-Oeste. Este trabalho constitui um exame minucioso do material biológico depositado em coleções científicas do Brasil e exterior, principalmente no que concerne aos táxons ocorrentes na região Nordeste do Brasil.

Assim, os objetivos deste trabalho foram: descrever novas espécies; inventariar a fauna de *Oecetis* da região Nordeste, de forma a entender os padrões distribucionais das espécies; entender e resolver o problema de espécies muito semelhantes morfológicamente; e propor um consenso a respeito das hipóteses de homologia da venação da asa anterior em *Oecetis*.

# Capítulo 1

---

Este capítulo apresenta o manuscrito intitulado “Systematics, distribution and vein homology discussion of *Oecetis* McLachlan, 1877 (Trichoptera: Leptoceridae) with emphasis on Northeast Brazilian region species” a ser submetido ao periódico científico *Zootaxa*.

**Systematics, distribution and vein homology discussion of *Oecetis*  
McLachlan, 1877 (Trichoptera: Leptoceridae) with emphasis on  
Northeast Brazilian region species**

**FABIO B. QUINTEIRO<sup>1,2</sup> & ADOLFO R. CALOR<sup>1,3</sup>**

<sup>1</sup>*Universidade Federal da Bahia, Instituto de Biologia, Departamento de Zoologia, PPG  
Diversidade Animal, Laboratório de Entomologia Aquática (LEAq). Rua Barão de  
Jeremoabo, 147, campus Ondina, Ondina, CEP 40170-115, Salvador, Bahia, Brazil.*

*E-mail: <sup>2</sup>fabiobquinteiro@gmail.com; <sup>3</sup>acalor@gmail.com*

**Abstract**

Within the family Leptoceridae, the genus *Oecetis* McLachlan, 1877 contains about about 400 species around the world, including 34 in the Neotropics and 22 in South America. In Brazil, there are only eight recorded species of *Oecetis* and the majority of these records are from the Northern and Southeastern regions. The genus is distinguished from other leptocerids by the apparently unbranched M vein of the fore wing. The homology of the M vein of *Oecetis* fore wings is controversial and no consensus has been achieved yet. The species that occur in Brazil have were described over several decades by numerous authors such that descriptions are not comparable and diagnosis are incomplete. The revision in the thesis by Chen (1993) was never published, such the information and proposed taxa are not available according to the ICZN. In attempt to learn about the genus for the Northeast region in Brazil, we analyzed specimens collected and compared these with literature descriptions and *Oecetis* from other regions. We provide herein, five new species

descriptions, the addition of new characters to the eight recorded species in Brazil, and a dichotomous key. *Oecetis achantostema*, new species, is easily recognized by its widely enlarged dorsolateral process on segment IX and the presence of a spine-like projection on the phallic apparatus. *Oecetis martinae*, new species, can be distinguished from the others by its quadrate inferior appendages bearing thick setae apically and an acute dorsal lobe. *Oecetis clavicornia*, new species, has a quadrate inferior appendage dorsal lobe and a clavate process over tergum X. *Oecetis furcata*, new species, shows a bilobate dorsolateral process on segment IX. Finally, *Oecetis froehlichii*, new species, has a thumb like projection on the inferior appendages and a long upward curved paramere spine.

**Key words:** Aquatic Insects, long-horned caddisflies, Neotropic, adults.

## **Introduction**

Leptoceridae is one of the three largest families of Trichoptera with more than 1800 described species (Holzenthal *et al.*, 2007). The family comprises 46 extant genera traditionally in two subfamilies, Triplectidinae Ulmer and Leptocerinae Leach, the former recorded from Australasian and Neotropical regions, while the latter shows a cosmopolitan distribution (Malm & Johanson, 2011). Recently, Malm & Johanson (2011) raised Grumichellini Morse, with Neotropical and Australian distribution (Morse 2012), and Leptorussini Morse, with Australian distribution (Morse, 2012), to subfamily status, dividing the family into four subfamilies.

Within Leptocerinae, the genus *Oecetis* McLachlan, 1877 contains about 400 species around the world (Holzenthal *et al.*, 2007), including 34 in Neotropics and 22 in South America (Martín *et al.*, 2011). The genus was erected by McLachlan from *Setodes* Rambur

by the apparently unbranched median vein of the forewing (Chen, 1993). The origin of the M vein has been subject of discussion through the years (Betten, 1934). Although McLachlan did not establish a type species, Ross (1944) selected *O. ochracea* (Curtis, 1825).

The majority of original descriptions of *Oecetis* species are not detailed, and include few diagnostic characters. The latest comprehensive attempt to work on the genus, including the Brazilian species was by Chen (1993), in his unpublished PhD thesis. He proposed a classification of the genus into four subgenera: *Pleurograpta* Wallengren, 1891

*Pseudosetodes* Ulmer, 1905, *Oecetis* McLachlan, 1877, and *Quaria* Milne, 1934. The two former names were first proposed as genera by Wallengren and Ulmer but synonymized. The last one was proposed by Milne (1934) as a subgenus of *Oecetis*.

These four subgenera show very distinctive male genitalia characteristics and are easily recognizable. According to Chen (1993), *Pseudosetodes* is the only subgenus that has a symmetrical phallus without paramere spines. *Oecetis* has only one paramere spine, and an asymmetrical phallus. *Pleurograpta* has a short tergum IX and a long sternum IX, and males of *Quaria* are easily distinguishable by the presence of a pair of prominent dorsolateral processes on tergum IX.

In Brazil, eight species of *Oecetis* are recorded: *O. amazonica* (Banks, 1924) (Amazonas State), *O. excisa* Ulmer, 1907 (Brazil), *O. iguazu* Flint, 1983 (Espírito Santo, Rio de Janeiro, Santa Catarina, and São Paulo States), *O. incospicua* (Walker, 1852) (Minas Gerais and Paraná States), *O. paranensis* Flint, 1982 (Minas Gerais State), *O. punctipennis* (Ulmer, 1905) (Bahia and Minas Gerais States) and *O. rafaelli* Flint, 1991 (Roraima State) (Paprocki *et al.*, 2004). Dumas *et al.* (2010) recorded *O. connata* Flint, 1974 from Amazonas and Pará States. In this way, the concentration of the knowledge is evident in

some regions of the country, but not in Northeast region (biogeographical components NEBr, MGBa and SBa *sensu* Amorim, 2001).

In this paper, we provide a preview of Brazilian *Oecetis* species, describe five new species, and provide a synopsis of the previously described *Oecetis*, improving the descriptions with new characters and illustrations. We also present a dichotomous key for all the Brazilian known species.

Additionally, it is known that some species within *Oecetis* are difficult to diagnose (Smith & Lehmkuhl, 1980). In Brazil, we have records of four of these species: *Oecetis excisa* and *Oecetis inconspicua*, which are stated as possible synonyms by some authors (*e.g.*, Martín *et al.*, 2011; Flint, 1982b); and *Oecetis iguazu* and *Oecetis punctipennis*. To explore additional morphological characters to improve the diagnosis of these species, they were examined by using a Sweeping Electron Microscope and the micrographs and discussion of results are herein presented.

Finally, in the literature, there are two divergent interpretations of *Oecetis* fore wing venation homology: M vein in forewings does not branch *versus* M vein branches in  $M_{1+2}$  and  $M_{3+4}$ . Based on a preview of the literature and observation of specimens, our evidences support the first interpretation: M is unbranched.

### **Material and methods**

Specimens were collected using light traps and pan light traps (Calor & Mariano, 2012 *in press*) with incandescent and fluorescent lamps placed next to water bodies. In addition, Malaise traps were also used, over low order streams. The specimens collected were stored in 80% alcohol or pinned. Genitalia were removed together with 4 to 5 abdominal segments, cleared for identification using 85% lactic acid solution as described by Blahnik *et al.* (2007) or 10% KOH and stored in microvials containing glycerin, as discussed by



Holzenthal & Andersen (2004) and Blahnik & Holzenthal (2004). Illustrations were made using microscope with drawing tube attached. Improvements on illustrations were made using the software Adobe® Photoshop® CS and Adobe® Illustrator® CS 5. Morphological terminology followed Snodgrass (1956) and Schmid (1998), as implemented by Holzenthal & Andersen (2004) and Calor *et al.* (2006). To write the species descriptions and the dichotomous key, the DELTA System (Dallwitz *et al.*, 1993; 1995; 1999) was used. Type material will be deposited at Museu de Zoologia, Universidade de São Paulo (MZUSP), Museu de Zoologia, Universidade Federal da Bahia (UFBA) and the University of Minnesota Insect Collection (UMSP), as indicated in material examined.

The specimens examined through Sweeping Electron Microscope (SEM) had their genitalia cut off with a pair of iris scissors, positioned on a carbon tape, metalized, and then the photos were taken in a JEOL JSM 6390LV microscope.

Acronyms for the Brazilian States are the following: Amazonas (AM), Bahia (BA), Ceará (CE), Espírito Santo (ES), Mato Grosso (MT), Minas Gerais (MG), Pará (PA), Paraíba (PB), Paraná (PR), Pernambuco (PE), Piauí (PI), Rio de Janeiro (RJ), Rio Grande do Norte (RN), Rondônia (RO), Roraima (RR), Santa Catarina (SC) and São Paulo (SP).

## **Taxonomy**

### ***Oecetis acanthostema* Quinteiro & Calor, new species (Fig. 1)**

**Diagnosis:** The new species can be distinguished from others of the subgenus *Quaria* (*sensu* Chen, 1993) by the following characters: presence of a sclerotized projection on the mesoventral region of the phallic apparatus and the distal 1/3 of the dorsolateral process enlarged in width and flattened dorsoventrally; this process is cylindrical in other in other species in the subgenus.

**Male:** body length 5 mm (n=12). Forewing length 5.6 mm (n=12).

Head: color pale yellowish-brown (alcohol). Antennae very long, about 3.5 length of the forewings. Maxillary palps yellow, densely covered by setae, 5-segmented, all segments sub equal in length and width. Labial palps pale yellow, 4-segmented.

Thorax: Pterothorax yellowish brown in dorsal region and pale yellow in lateral and ventral regions. Forewings hyaline, yellowish brown, with 4 dark transversal bands over crossveins  $r_2-r_3$ ,  $r-m$  and  $m-cu$ ; wing vein pattern as in fig. 1A-B. Hind wings with row of setae along the posterior margin; forks I and V present (Fig. 1B). Legs yellowish-brown. Mid leg with a longitudinal row of spines from distal half of femur to the first tarsal segment. Tibial spurs formula 1,2,2. Apical spur of fore tibia very small.

Abdomen: membranous, with sclerotized terga and sterna. Segments sub equal. Segment IX bearing pair of dorsolateral processes slender, bent ventrad, tapering posteriorly and extending beyond the length of the phallic apparatus (Fig. 1C); 2/3<sup>rd</sup> of process enlarged in width, flattened, dorsal view (Fig. 1C); four long setae on posterior margin of segment IX, near the basis of dorsolateral processes, (Fig. 1D). Preanal appendage long, digitate with short setae. Presence of rod-like mesodorsal process above tergum X, with few short setae on apex (Fig. 1C). Tergum X membranous, divided medially, forming two lobes, broad basally and acute apically, with shallow cleft between them in dorsal view (Fig. 1C).

Inferior appendage 1-segmented, broad basally, covered with setae over its base and mid portion; upper portion digitate, covered with small setae on top; apex rounded in lateral view (Fig 1D); presence of small spine-like setae on inner portion in ventral view (Fig. 1E). Phallic apparatus long, bent ventrad, with spine-like projection on ventral mid portion, sclerotized on apex (Fig. 1F); two small, digitate mesolateral projections in dorsal view (Fig. 1G).

**Material examined. Holotype: Brazil: Bahia:** Senhor do Bonfim, Serra Santana , 28.xi.2006, Souza, Monteiro, Alvim, Rocca – 1 male (alcohol; MZUSP). **Paratypes:** same data as holotype – 3 males (alcohol; UFBA, UMSP); same except 21–22.vii.2009, Zacca, T., Lopes, P., Mota, E., Menezes, E. – 1 male (alcohol; MZUSP); same except Pindobaçú, Cachoeira da Fumaça, 10°28'43"S, 40°12'27.6"W, 16.xii.2009, Zacca, T – 1 male (alcohol; UFBA); same except 17.xii.2009 – 3 males, 2 females (alcohol; MZUSP, UMSP); same except Palmeiras, Capão, Pousada Capão, 12°37'21.7"S, 41°29'11.7"W, 938m, 21.vi.2011, Calor, A.R., Camelier, P., Burger, R. – 1 male, 1 female (alcohol; MZUSP).

**Etymology:** from Greek *acanthus* = spine; *stemum* = penis. The species name is in reference to the presence of a spine-like projection on the mesoventral region of the phallic apparatus.

**Taxonomic remarks:**

*Oecetis acanthostema* is clearly a member of the subgenus *Quaria* by bearing the two long dorsolateral processes on segment IX of the male genitalia. The new species has two characteristics that no other species in the genus presents: the presence of a spine-like process on the mesoventral portion of the phallic apparatus and distal 1/3 of the dorsolateral processes enlarged in width and flattened dorsoventrally, like the neck of a cobra. *Oecetis acanthostema* is similar to a species named by Chen (1993), *Oecetis fibra*, by the shared presence of a long phallic apparatus, short and digitate preanal appendage and similar shape of the inferior appendage, but *O. acanthostema* has a broad basis inferior appendage. The shape of tergum X is digitate apically on Chen's species, while in the new species tergum X is similar to *O. rafaelli* [tergum X "divided into long, slender, lateral

lobes, pointed apicad and overlaying phallic apparatus dorsolaterally”, in original description of Flint (1991b, p.74)]. However, *O. rafaeli* has short and straight dorsolateral processes and no rod-like process above tergum X.

**Distribution:** Brazil (BA).

***Oecetis martinae* Quinteiro & Calor, new species (Fig. 2)**

**Diagnosis:** This species is similar to *Oecetis chipiriri* Martín, Gibon & Molina, 2011, and *Oecetis knutsoni* Flint, 1981. This new species has a quadrate inferior appendage longer than in *O. knutsoni* Flint and without a digitate projection on top. *Oecetis martinae* also has a dorsal projection on the inferior appendage basis. The inferior appendage of *O. knutsoni* has small digitate projections on top and a ventral acute lobe, which are absent in *Oecetis martinae*. Moreover, *O. knutsoni* has a short, symmetrical phallic apparatus, with a U-shaped mesodorsal portion, while the new species has a long, asymmetrical, basally wide phallic apparatus, with sinuous mesodorsal portion, which resembles the phallic apparatus of *O. chipiriri*. However, *O. chipiriri* has a rounded, thumb-like, inferior appendage, while *Oecetis martinae* has a quadrat one.

**Male:** body length 4.5 mm (n=30). Forewing length 6.5 mm (n=30).

Head: Pale yellow (alcohol). Antennae long, about 3 times length of forewings. Maxillary palps yellow, 5-segmented, all segments sub equal in length and width, densely covered by setae. Labial palps pale yellow, 4-segmented.

Thorax: Pterothorax yellow in dorsal and pale yellow in lateral and ventral regions.

Forewings hyaline, yellow with brownish dots over forks, junctions and end of veins; dark bands over crossveins absent; wing vein pattern as in fig. 2A–B; crossvein *m-cu* reaching  $Cu_{1a}$  (after ramification of *Cu* into  $Cu_{1a}$  and  $Cu_{1b}$ ). Hind wings with basal brush; forks I, III

and V present (Fig. 2B). Legs yellowish-brown, with a row of spines over distal half of femur, all along tibia and the first tarsal segment. Tibial spurs formula 1,2,2; apical spur of fore tibia very small.

Abdomen: membranous, sclerotized sterna and terga. Segments sub equal. Segment IX annular and narrow (Fig. 2D). Preanal appendage slightly longer than wide, ovoid, apex covered by setae (Figs. 2C–D). Tergum X membranous, divided mesally, forming two lobes broad basally, tapering apically, with V-shaped incision in dorsal view (Fig. 2C). Inferior appendage 1-segmented, broad basally; dorsal lobe absent; ventral lobe absent; distal portion broad, quadrat, setose, with small curlings and 5 rough setae on top and smaller ones next to those (Fig. 2D); row of spine like setae present on inner surface (Fig. 2E). Phallic apparatus slightly asymmetrical in dorsal view (Fig. 2G); long, broad basally, bent ventrad, membranous apicad; apex quadrat, with sinuous mesodorsal portion, lateral view (Fig. 2F).

**Material examined. Holotype: Brazil: Bahia:** Wenceslau Guimarães, Estação Ecológica Estadual Wenceslau Guimarães, Riacho Serra Grande, near Station headquarters, 13°35'43"S, 38°43'12"W, 08.x.2010, pan light trap U.V./white lights, PPGDA team (alcohol; MZUSP). **Paratypes:** same data as holotype – 2 males, 2 females (alcohol; UFBA); same data as holotype except 13°35'42"S, 39°43'12"W, 561m, 07.x.2010, pan light trap U.V./white lights, PPGDA team – 2 males (alcohol; UMSP); same data as holotype except 09.x.2010 – 1 male, 1 female (alcohol; MZUSP); same data as holotype except light trap/ U.V./white lights – 1 male (pinned; UFBA); same except 10.x.2010, pan light trap U.V./white lights – 27 males, 1 female (alcohol; UFBA); same except upstream waterfall, pan light trap 2/U.V./white lights – 2 males (alcohol; UMSP); same except Senhor do Bonfim, Serra Santana, light trap, 01.x.2005, Almeida, Alvim – 1 male (alcohol;

MZUSP); same except Santa Teresinha, Serra da Jibóia, Torres stream, 06.xi.2010, light trap U.V./white lights, Calor, A.R., Quinteiro, F.B., Mariano, R., França, D., Costa, A.M. – 1 male (alcohol; MZUSP); same except Pedra Branca, Serra da Jibóia, Lajedo waterfall, 12°51'00"S, 39°28'48"W, 678m, 09.vii.2008, light trap, U.V./white lights, Calor, A.R., Lecci, L.S., Pinho, L.C., Moretto, R.A – 1 male (pinned; UMSP), 1 male (alcohol; UMSP); same except 27.x.2008, Calor, A.R., Mariano, R., Mateus, S. – 1 male (pinned; UFBA); same except Camacan, Fazenda Altamira, 15° 25' 18.6"S, 39° 33' 59.3"W, 309m, 28.iii.2011, pan light trap U.V./white lights, Calor, A.R., Quinteiro, F.B., França, D., Barreto, H. – 2 males (alcohol; UMSP); same except Fazenda Paris, Rio Branco do Sul, 03.iv.2011, Quinteiro, F.B., França, D., Barreto, H. – 2 females; same except stream after the dam supply, 15°25'16"S, 39°33'57"W, 300m, 05.vii.2008, light trap U.V./white lights, Calor, A.R., Lecci, L.S., Pinho, L.C., Moretto, R.A. – 1 male (pinned; MZUSP); same except Serra Bonita, stream 3, path, 15°23'03"S, 39°34'00"W, 723m, 29.x.2008, light trap U.V./white lights, Calor, A.R., Mariano, R., Mateus, S. – 2 males, 3 females (pinned; UMSP); same except 01.viii.2008, Calor, A.R., Lecci, L.S., Pinho, L.C., Moretto, R.A. – 1 female (pinned; UFBA); same except Fazenda Altamira, 15°25'3.05"S, 39°33'9.89"W, 319m, 30.x.2008, Calor, A., Mariano, R., Mateus, S. – 1 male, 4 females (pinned; MZUSP), 2 males (alcohol; UFBA).

**Etymology:** this specific epithet honors Dr. Paola Rueda Martín (Facultad de Ciencias Naturales e Instituto Miguel Lillo, San Miguel de Tucumán, Argentina) who strongly supported this study.

**Taxonomic remarks:** This new species is similar to *O. knutsoni*, *O. chipiriri*, and *O. punctata*. The major differences are in the inferior appendages. Although *O. martinae* has

the thick spines, as do *O. knutsoni* and *O. punctata*, on the inferior appendage, it is very different among them. *Oecetis knutsoni* has a longer, but narrow inferior appendage and *O. punctata* shows an upward curved process on the distal portion of the inferior appendage. The new species does not have this process and its appendage is not narrow, but it is quadrate as in *O. chipiriri*. The phallic apparatus is similar to *O. chipiriri* also, but *O. knutsoni* and *O. punctata* have a shorter one. The preanal appendages are very similar among the three species and the new one. The wing spots are also similar among *O. martinae*, n. sp., *O. chipiriri* and *O. knutsoni*.

This species was collected at dusk, attracted by light, in low order coldwater streams, with rocks and rough sand in bed. The vegetation around is dense, composed by rainforest, where the light traps were set and the adults captured. They are typical from high altitudes (above 500m). However, in some collection sites, such as Santa Teresinha and Pedra Branca, they can be found in lower altitudes and the streams are slightly different. It is very shallow and intercalates floorings and small pools. The vegetation is composed by smaller and sparser trees than the rainforest. The immature stages and the female of this species are unknown.

**Distribution:** Brazil (BA).

***Oecetis clavicornia*, Quinteiro & Calor, new species (Fig. 3)**

**Diagnosis:** The new species is similar to *Oecetis scoparia* Flint, 1974, except for the inferior appendage. It has a small quadrate process on the dorsal region of the appendage's base, which is absent in *O. scoparia*. Moreover, the new species has a dorsal process above tergum X with a clavate apex while *O. scoparia* has only a slightly clavate process as described by Flint (1974). An additional character is that *O. scoparia* has a slight dorsal

hump on the mesal third of the inferior appendage, while the new species has this hump on the proximal third.

**Male:** body length 4.8 mm (n=10). Forewing length 6.0 mm (n=10).

Head: brown (alcohol). Antennae long, about 2.5 times the length of the forewings.

Maxillary palps yellowish brown, 5-segmented, all segments sub equal in length and width, densely covered by setae. Labial palps yellow, 4-segmented, first segment very small.

Thorax: Pterothorax yellowish brown in dorsal region and yellow in lateral and ventral regions. Forewings hyaline, yellowish brown with dark bands over the cord; tuft of dark long setae present on basis of M vein (Fig. 3A); wing vein pattern as in fig.3A–B; crossvein *m-cu* reaching  $Cu_{1a}$  (after branching of Cu into  $Cu_{1a}$  and  $Cu_{1b}$ ). Hind wings with basal brush; forks I and V present (Fig. 3B). Legs yellowish brown, middle and posterior legs with row of small spines over distal half of femur, all along the tibia and the tarsus. Tibial spurs formula 0,2,2.

Abdomen: membranous, sclerotized sterna and terga. Segments sub equal. Segment IX annular and narrow. Preanal appendage longer than wide, ovoid, apex digitate and covered by setae (Figs. 3C–D). Tergum X membranous, divided mesally by a V-shaped incision on the distal 1/3 portion, forming two lobes broad basally, rounded apically (Fig. 3C); clavate process above tergum X present, longer than tergum X in lateral view (Fig. 3D). Inferior appendage 1-segmented, broad basally, constricted mesally and rounded apically (Fig. 3E); dorsal lobe present, quadrate, covered by small setae (Fig. 3D); ventral lobe absent; row of spine like setae present on inner surface (Fig. 3E). Phallic apparatus asymmetrical, enlarged on mid portion in dorsal view (Fig. 3G); long, slightly broad on basis, bent ventrad, membranous apicad; endotheca quadrate on basis (Fig. 3F).



**Material examined. Holotype: Brazil: Bahia:** Wenceslau Guimarães, Riacho Serra Grande, Rio Patioba, 13°34'50.3"S, 39°42'17"W, 432m, 09.x.2010, pan light trap U.V./white lights, PPGDA team (alcohol; MZUSP). **Paratypes:** same as holotype – 1 male (alcohol; UFBA); same as holotype except, near the Station headquarters, 13°35'43.5"S, 39°43'11.9"W, 531m, v.2011, Malaise trap – 2 males, 1 female (alcohol; UMSP); same except, 10.x.2010 – 1 male (alcohol; UFBA); same except Uruçuca, Córrego Samambaia, 07.iv.2011, pan light trap, U.V./white lights – 1 male, 1 female (alcohol; MZUSP); same except Ilhéus, around Parque Estadual da Serra do Conduru, 12.vii.2011, pan light trap U.V./white lights, Calor, Mariano, Quinteiro – 2 males (alcohol; UFBA).

**Etymology:** from Latin *clavos* = club, *cornus* = horn. The epithet is in reference to the club-shaped process over tergum X.

**Taxonomic remarks:** this species seem to be morphologically related to *Oecetis peruviana* (Banks, 1924), *O. scoparia* Flint, 1974 and *O. traini* Martin, Gibon, Molina, 2011. Tergum X is similar among the four species, as well as the preanal appendages, and, except for the small quadrate process on its base, in the new species, the inferior appendages of these species are also very similar. However, the phallic apparatus seems to be different among all these species and the new species is more similar to the phallic apparatus of *Oecetis scoparia*. However, the clavate process with a ventral hump is an exclusive character of *Oecetis clavicornia* (*O. scoparia* has a clavate process, but the hump is dorsal). Additionally, *Oecetis peruviana*, *O. scoparia* and the new species share the setae brush on the base of the M vein.

This species was collected in the same conditions of *Oecetis martinae*, as well as same collecting site. The only exception is for the specimens collected in Uruçuca, around the Conduru Mountains State Park, where the specimens were collected in shallow streams surrounded by a sparser rainforest than those in Wenceslau Guimarães. This species, as *Oecetis martinae*, seems to be typical from higher altitudes. The immature stages and female of this species are unknown.

**Distribution:** Brazil (BA).

***Oecetis furcata*, Quinteiro & Calor, new species (Fig. 4)**

**Diagnosis:** *Oecetis furcata*, new species, can be diagnosed from its congeners by its dorsolateral processes on segment IX divided into ventral and dorsal lobes, with the ventral one shorter than the dorsal one. Also, the inferior appendages have a singular shape among species in the genus, with a long and terete dorsal lobe and a very acute, spine like distal lobe. The new species seems to be morphologically similar to *Oecetis falcia* Denning & Sykora, 1966, although the dorsal lobe on the dorsolateral process on *O. falcia* is very short and the distal lobe on the inferior appendage is not acute.

**Male:** body length 4.55 mm (n=3). Forewing length 5.85 mm (n=3).

Head: yellowish brown (alcohol). Antennae long, about 3 times length of the forewings; scape stout, same length of the other flagellomeres; pedicel short and stout. Maxillary palps yellowish brown, 5-segmented, all segments sub equal in length and width, densely covered by setae. Labial palps yellow, 4-segmented, first segment very small.

Thorax: pterothorax yellowish brown in dorsal region and pale yellow in lateral and ventral regions. Forewings yellowish brown with the cord crossveins slightly thickened; wing vein

pattern as fig. 4A–B; crossvein *m-cu* reaching  $Cu_{1a}$  (after branching of *Cu* into  $Cu_{1a}$  and  $Cu_{1b}$ ). Hind wings with basal brush; forks I and V present (Fig. 4B). Legs yellowish brown, mid and hind legs with a row of small spines over the tibia and tarsus. Tibial spurs formula 1,2,2, fore tibia spur very small.

Abdomen: membranous, sclerotized terga and sterna. Segments sub equal. Segment IX annular and narrow; dorsolateral process present, long and bilobated, ventral lobe shorter than dorsal, with apex acute, dorsal lobe with apex rounded. Preanal appendage long and narrow, rod-like, with apex digitate and covered by setae (Fig. 4C). Tergum X divided mesally by a V-shaped incision with half of its length, forming two lobes broad basally, tapering apically, apex acuminate; rod-like process above tergum X present, apex slightly enlarged, with few small setae (Fig. 4C). Inferior appendage 1-segmented, broad basally; ventral lobe absent; dorsal lobe long, cylindrical, apex rounded, with setae along its length (Fig. 4D), small hump present on mid inner portion (Fig. 4E); distal lobe reduced, broad, with apex acute and covered by setae (Figs. 4D–E). Phallic apparatus asymmetrical, broad on basis, tapering apicad, spoon-shaped, bent ventrad (Fig. 4F); endotheca longer than phallobase (Figs. 4F–G).

**Material examined. Holotype: Brazil: Bahia:** Camacan, Reserva Particular do Patrimônio Natural Serra Bonita, stream 1, 31.iii.2011, pan light trap U.V./white lights, Quinteiro, F.B., França, D., Barreto, H. (alcohol; MZUSP). **Paratypes:** same data as holotype except 30.iii.2011 – 1 male (alcohol; UFBA); same except Malaise trap 2, i.2009 – 1 male (alcohol; UMSP).

**Etymology:** from Latin *furcus* = fork. The epithet refers to the forked dorsolateral process on segment IX.

**Taxonomic remarks:** based on the presence of the dorsolateral processes on segment IX, this new species is a member of subgenus *Quaria* (*sensu* Chen, 1993). There are a few species recognized in this subgenus, such as *Oecetis falcia* Denning, *Oecetis morsei* Bueno-Soria and *Oecetis rafaeli* Flint, although Chen included additional undescribed species in his unpublished thesis. Within *Quaria*, only *O. acanthostema* and *O. furcata* have an apically enlarged process over tergum X. All the others within the subgenus have a rod-like, homogeneous process. Regarding the shape of the phallic apparatus, the new species is similar to *O. falcia*, but it seems that the former shows a shorter phallobase when compared to the latter. This shape of phallic apparatus seems to be very common in *Quaria*.

This species is known only from Serra Bonita, south of Bahia State. It was collected under the conditions already mentioned before, around coldwater low order streams with dense rainforest surrounded. The immature stages and female of this species are unknown.

**Distribution:** Brazil (BA).

***Oecetis froehlichii* Quinteiro & Calor, new species (Fig. 5)**

**Diagnosis:** this species seems to be very remarkable, showing some singular features. The inferior appendages are similar to *O. scoparia* Flint, 1974, although the former is thumb-like dorsal lobe with spines over the surface, not found in any other species in the genus. Also, the inferior appendages are thinner than *O. scoparia*. The new species shows an acuminate lateral projection on segment IX, as in *Oecetis osteni* Milne, 1934, but the new species projection is shorter. Moreover, the new species has a long paramere spine, as in

Chen's (1993) *O. excisa* (Fig. 5 De, p. 587), but this spine is curved upward. The phallic apparatus shape is very different from *O. excisa*.

**Male:** body length 4.0 mm (n=4). Forewing length 6.0 mm (n=4).

Head: yellowish brown (alcohol). Antennae long, about 3 times length of the forewings; scape stout; pedicel rounded. Maxillary palps yellowish brown, 5-segmented, all segments sub equal in length and width, densely covered by setae. Labial palps yellow, 4-segmented. Thorax: Pterothorax brown in dorsal region and pale yellow in lateral and ventral regions. Forewings hyaline, yellowish brown with dark bands over the cord and dark spots over the basis of M, fork of Cu<sub>1</sub> and Cu<sub>2</sub> and at the ends of M, Cu<sub>1a</sub>, Cu<sub>1b</sub> and Cu<sub>2</sub> (Fig. 5A); wing vein pattern as figs. 5A–B; vein M-Cu reaching Cu<sub>1a</sub> (after branching of Cu into Cu<sub>1a</sub> and Cu<sub>1b</sub>). Hind wings with basal brush; forks I and V present; fork I very shallow (Fig. 5B). Legs yellow, mid legs with row of small spines over the tibia and the tarsus. Tibial spurs formula 0,2,2.

Abdomen: membranous, sclerotized sterna and terga. Segments sub equal. Segment IX annular and narrow; process present latero-distally, acuminate (Figs. 5C–D); mesodorsal process present, rod-like, apex covered by small setae. Preanal appendage small, slightly longer than wide, ovoid, apex rounded and covered by setae (Fig. 5C). Tergum X membranous, divided mesally by a V-shaped incision on the distal third, forming two lobes broad basally, rounded apically (Fig. 5C). Inferior appendage 1-segmented, broad basally, with a small hump ventrally, tapering distally, acuminate apically (Fig. 5D); dorsal lobe present, thumb-like, projected distally, with apex rounded, covered by small strong setae (Figs. 5D–E); ventral lobe absent; row of spine like setae on inner surface absent (Fig. 5E). Phallic apparatus asymmetrical, slightly enlarged on basis in dorsal view (Fig.

5G); slightly bent ventrad, membranous apically; endotheca bilobate when everted (Fig. 5F); presence of long paramere spine, curved upward in lateral view.

**Material examined. Holotype: Brazil: Bahia:** Wenceslau Guimarães, Estação Ecológica Estadual Wenceslau Guimarães, Riacho Serra Grande, pan light trap U.V./white lights, 10.x.2010, PPGDA team –1 male (alcohol; MZUSP). **Paratypes:** same as holotype – 2 males (alcohol; UFBA); same except 13°35'38"S, 39°42'50"W, 08.x.2010, light trap U.V./white lights, PPGDA team – 1 male (pinned; UMSP).

**Etymology:** this species epithet honors Prof. Dr. Claudio G. Froehlich (Universidade de São Paulo), a great Brazilian entomologist, who has been instrumental in contributing to our knowledge of Neotropical aquatic insects.

**Taxonomic remarks:** this new species shares a few characters with other *Oecetis*. Its tergum X is similar to *O. scoparia*, *O. traini* and *Oecetis clavicornia*, as is the inferior appendage shape. However, its phallic apparatus shape and paramere spine is unique. In addition, the bilobate endotheca is not common in *Oecetis*. This more complex endotheca seems to be present more often in members of subgenus *Quaria*. In spite of the acuminate lateral process on segment IX, the new species does not have a dorsolateral process as well developed as in other *Quaria*. However, the presence of a parameral spine, the complex endotheca, and the presence of a mesodorsal process may indicate an affinity with this subgenus. Additionally, a n-shaped mark can be seen after the clearing process on the base of the mesodorsal process above the tergum X. This mark was not found in any other species of *Oecetis*. This species is known only from Wenceslau Guimarães Ecological Station and the adults were collected with light traps. The environmental conditions are the

same for *Oecetis martinae*, *Oecetis clavicornia* and *Oecetis furcata*. The immature stages and female of this species are unknown.

**Distribution:** Brazil (BA).

### **Additional species records and synopsis of Brazilian species**

As already discussed, the majority of the *Oecetis* descriptions date from a century ago, and some of them lack description of genitalia characters and many are poorly illustrated. New records for the country are also presented. The primary distributions were based on Flint *et al.* (1999), Blahnik *et al.* (2004), Paprocki *et al.* (2004), Dumas *et al.* (2010), Martín *et al.* (2011). The new records are highlighted in bold. The examined material is deposited in UFBA.

### ***Oecetis amazonica* (Banks, 1924)** (Fig. 6)

*Oecetina amazonica* Banks, 1924: 447 (male, original description); Fischer, 1966: 109 (catalog); Flint, 1967a: 22–23 (male lectotype); Flint, 1972: 244–245 (distribution); Flint, 1982b: 49 (male, distribution); Flint *et al.*, 1999: 134 (catalog); Paprocki *et al.*, 2004: 13 (distribution); Martín *et al.*, 2011: 21 (male, distribution).

Male: Forewing length 8–10 mm (Flint, 1982).

Head: color yellowish brown (Banks, 1924). Antennae long, about 3 times the length of the forewings; scape stout, same length of the flagellum segments; pedicel short and stout.

Maxillary palps brown, 5-segmented, all segments sub equal in length and width, densely covered by setae. Labial palps yellow, 4-segmented, first segment very small, covered by brown setae.

Thorax: pterothorax dorsal yellowish brown (Banks, 1924); yellowish brown in lateral and ventral view. Forewings brown (Banks, 1924; Flint, 1982b); dark bands over  $R_3$ - $R_{4+5}$ , R-M and *m-cu* (chord); area around the chord hyalinized; dark spots absent; M-Cu crossvein reaching fork V (Fig. 6A). Hind wings with forks I and V (Banks, 1924); basal brush present (Fig. 6B). Legs yellowish brown; mid legs with row of spines over distal half of femur, over the tibia and tarsus; hind legs with row of spines over the tarsus. Tibial spurs formula 0,2,2.

Abdomen: membranous, sclerotized terga and sterna. Segment IX annular and narrow; acrotergite present mesodorsally. Preanal appendages fused between them, short and rounded (Chen, 1993), setose (Figs. 6D). Rod-like process above tergum X absent. Tergum X membranous, undivided, dorsal view, composed of a single elongated lobe, broad basally, with a shallow depression distad (Fig. 6C). Inferior appendages broad basally (Chen, 1993; Flint, 1982b), covered by setae; dorsal lobe broad and rounded; ventral lobe absent; distal portion broad (Flint, 1982b), acuminate, forming with dorsal lobe an L-shaped incision (Fig. 6D); spine-like small setae absent (Fig. 6E). Phallic apparatus curved downward, short (Chen, 1993) (Fig. 6F); apple-shaped (Chen, 1993), in dorsal view; phallic paramere present, curved downward (Chen, 1993); phallosomal sclerite sickle-shaped (Fig. 6G).

**Material examined: Brazil: Bahia:** Curaçá, Recanto Campestre, Rio São Francisco, 08°59'57.6"S, 39°54'47.2"W, 06.v.2011, Silva-Neto, A.M. – 3 males, 4 females (alcohol); same except light trap, França, D. – 4 males (pinned); same except Pilão Arcado, Barra do Brejo, 03.iv.2008, light trap U.V./white lights, Alvim, Silva-Neto, Rebouças, Rezende – 1 male (alcohol); same except **São Paulo:** Populina, Rio Grande, Porto Amaral, 19°20'49"S, 50°31'25.23"W, 335m, 12.vii.2010, light trap U.V./white lights, Calor, A.R. – 3 males, 2 females (alcohol).



**Remarks:** the only divergence between the original description (Banks, 1924) and the characteristics added by Chen (1993) and Flint (1982b) is the body color. Banks (1924) pointed out that the specimens have a yellowish brown head and body. The analyzed specimens have a well defined brown color for both characters.

**Distribution:** Argentina, Peru, Venezuela, Bolivia, Brazil [AM, BA (**new record**), SP (**new record**)].

***Oecetis connata* Flint, 1974** (Fig. 7)

*Oecetis connata* Flint, 1974: 122 (male, original description); Flint *et al.*, 1999: 134 (catalog); Dumas *et al.*, 2010: 8 (distribution).

Male: Forewing length 6.5 mm (Flint, 1974).

Head: color yellowish brown (Flint, 1974). Antennae long, about 3 times the length of the forewing; scape stout, same length of the flagellum segments; pedicel short and stout.

Maxillary palps yellow, 5-segmented, all segments sub equal in length and width, covered by brown setae. Labial palps yellow, 4-segmented, first segment very small, covered by brown setae.

Thorax: pterothorax dorsal yellowish brown (Flint, 1974), pale yellow, lateral and ventral view. Forewings yellowish brown (Flint, 1974); dark bands over  $R_3$ - $R_{4+5}$ ,  $r-m$  and  $m-cu$  (chord) (Flint, 1974); dark spots on forks, junctions and end of veins (Flint, 1974); crossvein  $m-cu$  reaching fork V or  $Cu_{1a}$  (after branching into  $Cu_{1a}$  and  $Cu_{1b}$ ) (Fig. 7A).

Hind wings with fork I (Flint, 1974); basal brush present (Fig. 7B). Legs yellowish brown; mid legs with row of spines over the femur, tibia and tarsus; hind legs with row of spines over the tarsus. Tibial spur formula 1,2,2, fore tibia spur very small.

Abdomen: membranous, sclerotized terga and sterna. Segment IX annular and narrow (Flint, 1974); two small acrotergites present dorsolaterally. Preanal appendages fused with tergum X, forming a hoodlike structure (Flint, 1974), dorsal view (Fig. 7C). Rod-like process above tergum X absent. Inferior appendages slightly enlarged basally (Flint, 1974); dorsal lobe absent; ventral lobe absent; distal portion narrow (Flint, 1974), tapering posteriorly with apex acuminate (Fig. 7D); spine-like small setae absent (Fig. 7E). Phallic apparatus curved downward, short, comma-shaped, with a ventral elongated tip (Flint, 1974), constricted in middle line (Chen, 1993), lateral view (Fig. 7F); phallic paramere absent (Chen, 1993); phallosomal sclerite horseshoe shaped (Fig. 7G).

**Material examined. Brazil: Bahia:** Andaraí, Igatu, Rio Coisa Boa, 12°53'27.7"S, 41°19'0.0"W, 673m, 12.iii.2011, pan light trap 2, U.V./white lights, Calor, A.R., Camelier, P. – 5 males, 7 females (alcohol); same except 12°53'33.7"S, 41°18'58.3"W, 664m, light trap U.V./white lights, 11.iii.2011, Calor, A.R., Camelier, P., Zanata, A. – 1 male, 3 females (alcohol); same except Mucugê, Parque Sempre Vivas, Rio Piabinha, 12°59'34"S, 41°20'27"W, 921m, 25.vii.2010, pan light trap U.V./white lights, Calor *et al.* – 1 male (alcohol); same except Parque Nacional da Chapada Diamantina, Cachoeira da Garapa, 17°44'80.7"S, 41°20'87.7"W, 340m, 25.x.2008, light trap U.V./white lights, Calor, A.R., Mariano, R., Mateus, S. – 2 males (pinned); same except Barreiras, rio de Janeiro, Cachoeira Acaba Vidas, 11°53'67.3"S, 45°36'09.6"W, 722m, 14.x.2008, light trap U.V./white lights, Calor, A.R., Mariano, R., Mateus, S. – 3 males (pinned); same except Nova Redenção, Fazenda Moreno, Rio Paraguaçu, 12°46'44"S, 41°09'08"W, 26.vii.2010, light trap U.V./white lights, Calor *et al.* – 1 male, 6 females (alcohol); same except **Mato Grosso:** Nova Xavantina, Córrego Benedito Ferreira, 06.xii.2006, light trap U.V./white lights, Calor, Mariano, Mateus – 6 males, 10 females (alcohol); same except Fazenda Buriti, 06.i.2000, light trap U.V./white, Mendes, H.F. – 1 male (alcohol); same except

Ribeirão Cascalheira, Posto de Saúde road, 2<sup>nd</sup> bridge, 26.xi.2006, pan light trap U.V./white lights, Calor, A.R., Silva, R.M, Mateus, S. – 3 males, 6 females (alcohol); same except Fazenda Campina Verde, Rio Suiamissu, 28.xi.2006, pan light trap U.V./white lights, Calor, A.R., Silva, R.M., Mateus, S. – 6 males, 7 females (alcohol); same except Fazenda Canguru road, stream of the dam, 27.xi.2006, pan light trap U.V./white lights, Calor, A.R., Silva, R.M., Mateus, S. – 9 males, 26 females (alcohol).

**Remarks:** according to Chen (1993), *Oecetis connata*, *O. punctipennis* and *O. iguazu* form a small group within *Oecetis* with the comma-shaped phallic apparatus as a grouping character. *Oecetis connata* is easily separated from the other two species by its preanal appendages fused between them and also fused with tergum X, forming, according to Flint (1974) a single, hood-like structure. No other described species in the genus has this characteristic. Also *O. connata* is the only one that does not have fork V in hind wings (Fig. 7B). Moreover, the position of the *m-cu* crossvein is variable in the examined material.

**Distribution:** Guyana, Surinam, Brazil [AM, BA (**new record**), MT (**new record**), PA].

***Oecetis excisa* Ulmer, 1907** (Fig. 8)

*Oecetis excisa* Ulmer 1907: 15 (male, female, original description); Flint 1982b: 50 (male, distribution); Flint *et al.*, 1999: 135 (catalog); Paprocki *et al.* 2004: 13 (distribution); Martín *et al.*, 2011: 25–26 (male, distribution).

*Oecetis mutila* Navás 1918: 22 (male); Schmid 1949: 382 (to synonymy).

*Oecetis castilleja* Navás 1920a: 134 (female); Schmid 1949: 382 (possible synonym of *O. excisa*); Flint 1972: 244 (to synonymy).

*Oecetis muhnia* Navás 1920b: 28 (male); Flint 1972: 244 (to synonymy).

*Oecetis apicata* Navás 1931: 323 (female); Flint 1982b: 50 (to synonymy).

Male: body length 5–6 mm. Forewing length 8 mm (Ulmer, 1907).

Head: color yellowish brown. Antennae long, about 2.5 times the length of the forewings; scape stout, same length of the flagellum segments; pedicel small and stout. Maxillary palps brown, covered by setae, 5-segmented, segments sub equal (Ulmer, 1907). Labial palps yellow, 4-segmented, first segment very small.

Thorax: pterothorax yellowish-brown (Ulmer, 1907), dorsal view. Forewings yellowish brown, hyaline (Ulmer, 1907); dark bands over  $R_3$ - $R_{4+5}$ ,  $r-m$  and  $m-cu$  (chord) (Flint, 1982b); dark spots absent;  $m-cu$  crossvein reaching fork V (Fig. 8A). Hind wings with forks I and V (Ulmer, 1907; Martín *et al.*, 2011) (Fig. 8B). Legs light yellow (Ulmer, 1907); tibial spur formula 1,2,2 (Ulmer, 1907).

Abdomen: membranous, sclerotized terga and sterna. Segment IX annular and narrow; one small acrotergite present mesodorsally. Preanal appendages short and rounded, setose. Rod-like process above tergum X absent. Tergum X membranous, undivided (Martín *et al.*, 2011), dorsal view; composed of a single elongated lobe, broad basally, digitated apically, abruptly narrowed, dorsal view (Fig. 8C). Inferior appendages broad basally, covered by setae (Ulmer, 1907); dorsal lobe acute, narrow basally; ventral lobe absent; distal portion narrow, tapering posteriorly with apex acuminate; forming with dorsal lobe a deep C-shaped incision (Fig. 8D); spine-like small setae absent (Fig. 8E). Phallic apparatus curved downward, short, apple-shaped (Chen, 1993), occupying great part of segment IX width (Fig. 8F); phallic paramere present, curved (“downward” in Chen, 1993), helicoidally, counter clockwise (Fig. 8G).

**Material examined. Brazil: Bahia:** Curaçá, Rio Buracão, 09°08'02.1"S, 39°58'43.6"W, 362m, 06.v.2011, pan light trap U.V./white lights, França, D. – 1 male, 5 females (alcohol); same except River São Francisco, Pousada Recanto Campestre, 08°59'58.7"S,

39°54'48.3"W, 415m, 03.v.2011, pan light trap U.V./white lights, França, D. – 1 male, 2 females (alcohol); same except 06.v.2011, light trap U.V./white lights, França, D. – 1 male (pinned); same except Rancho do Tio Zé, tributary of Rio Buracão, 09°07'48.1"S, 39°58'45.7"W, 362m, 05.v.2011, pan light trap U.V./white lights, França, D. – 1 male (alcohol); same except Rio Barra Grande, under the bridge, 09°06'53.5"S, 39°56'13.4"W, 415m, 05.v.2011, light trap U.V./white lights, França, D. – 1 male, 3 females (alcohol), 1 male (pinned); same except 04.v.2011, light trap U.V./white lights, França, D. – 1 male (pinned/SEM); same except 08°59.960'S, 39°54.787'W, 347m, 06.v.2011, light trap U.V./white lights, Silva-Neto, A.M – 2 males, 3 females (alcohol); same except Iaçú, Rio Paraguaçu, 12°41'11"S, 40°07'08"W, 15.v.2010, light trap U.V./white lights – 1 male (alcohol); same except França, D., Burger, R. – 1 male (pinned/ SEM); same except Mucugê, Parque Nacional da Chapada Diamantina, Rio Piabinha, 25.vii.2010 – 1 male (alcohol); same except Igatu, Rio Coisa Boa, 12°53'33"S, 41°19'0"W, 12.v.2010, light trap U.V./white lights, França, D., Burger, R. – 1 male (pinned); same except Pindobaçu, Cachoeira da Fumaça, 16.xii.2009, 10°28'43"S, 40°12'17.6"W, Zacca, T – 1 male (alcohol); same except **Ceará:** Crato, Sítio Fundão, Rio Batateiras, 07°13'47.7"S, 39°26'08.4"W, 436m, 07.ii.2011, light trap U.V./branca, Quinteiro, F.B. & Costa, A.M. – 1 male, 2 females (alcohol), 1 male (pinned); same except **Mato Grosso:** Ribeirão Cascalheira, Fazenda Campina Verde, Rio Suiamissu, light trap U.V./white lights, 28.xi.2006, Calor, A.R., Mariano, R., Mateus, S. – 1 male; same except **Paraíba:** Barra de Santana, Rio Paraíba, bridge BR-104, 07°31'44.3"S, 35°59'55"W, 336m, 31.vii.2009, light trap U.V./white lights, Calor, A.R., Lecci, L.S. – 5 males, 5 females (pinned); same except **Rio Grande do Norte:** Serra Negra, Estação Ecológica do Seridó, Represa dos Campos, 06°34'50.8"S, 37°15'20"W, 205m, 27.vii.2009, light trap U.V./white lights, Calor, A.R. & Lecci, L.S. – 5 males, 3 females (alcohol); same except Caicó, Rio Sabugi, bridge,

06°26'52.7"S, 37°08'23.8"W, 141m, 27.vii.2009, light trap U.V./white lights, Calor, A.R., Lecci, L.S. – 5 males, 17 females (pinned).

**Remarks:** Ulmer's description matches with the specimens examined, except for one character: the tibial spur formula on the specimens observed was 0,2,2. No fore tibial spur was present, even in small ones. *Oecetis excisa* and *Oecetis inconspicua* are easily recognized by their large, apple-shaped phallic apparatus bearing a curved paramere spine. However, the distinction between them is difficult because of the morphological similarities between their genitalia. Flint (1982b) and Martín *et al.* (2011) stated it is possible that these species may be synonymous. However, comparing identified material from UMSP (see material examined section) it was possible to find some small differences between the two species. They have a similar tergum X, preanal appendages and phallic apparatus, but the inferior appendages are different.

*Oecetis excisa* has a dorsal lobe thinner than the thumb-like in *O. inconspicua*. Also, the C-shaped incision formed between the dorsal lobe and the distal lobe of the inferior appendages is posteriorly displaced in *O. inconspicua* because of the broad dorsal lobe. These character differences were easily recognizable when both species were compared using Sweeping Electron Microscopy (Figs. 13A-B). The morphological differences pointed out by Martín *et al.* (2011) concerning the shape of tergum X (digitate in *O. excisa* and trapezoidal in *O. inconspicua*) and hind wing venation (*O. excisa* has fork I and *O. inconspicua* does not) were not observed. Both species had fork I and the specimens examined had digitate as well as trapezoidal tergum X.

**Distribution:** Argentina, Bolivia, Mexico, Paraguay, Venezuela, Brazil [BA (**new record**), CE (**new record**), MT (**new record**), PB (**new record**), RN (**new record**)].

***Oecetis iguazu* Flint, 1983** (Fig. 9)

*Oecetis iguazu* Flint, 1983: 70 (male, original description); Flint *et al.*, 1999: 135 (catalog); Blahník *et al.*, 2004: 5 (distribution); Paprocki *et al.*, 2004: 13 (distribution).

Male: body length 5.2 mm (n=5). Forewing length 8 mm (Flint, 1983).

Head: color yellow (Flint, 1983). Antennae long, about 3 times the length of the forewing; scape stout, same length and width of the flagellum segments; pedicel short and stout.

Maxillary palps yellowish brown, 5-segmented, all segments sub equal in length and width, densely covered by setae. Labial palps yellow, 4-segmented, first segment very small.

Thorax: pterothorax dorsal yellowish brown (Flint, 1983); yellow in lateral and ventral view. Forewings yellowish brown, hyaline (Flint, 1983); dark bands over the chord absent; dark spots on forks, junctions and end of veins (Flint, 1983); *m-cu* crossvein reaching Cu or fork V (Fig. 9A). Hind wings with forks I and V (Flint, 1983); basal brush present (Fig. 9B). Legs yellow; mid legs with row of spines over the tibia and tarsus; hind legs with row of spines over the tarsus. Tibial spur formula 1,2,2, fore tibia spur very small.

Abdomen: segment IX annular and narrow (Flint, 1983); acrotergite absent. Preanal appendages slightly longer than wide (ovoid) (Flint, 1983), with setae. Rod-like process above tergum X absent. Tergum X membranous, divided mesally, with V-shape incision, broad basad and acute apicad, dorsal view, covered by setae (Fig. 9C). Inferior appendage not enlarged basally, setose; dorsal lobe absent; ventral lobe absent; distal portion broad (Flint, 1983), apex acuminate (Fig. 9D); spine-like small setae absent (Fig. 9E). Phallic apparatus curved downward, short, comma-shaped, with a ventral elongated tip, constricted in middle line (Flint, 1983), lateral view (Fig. 9F); phallic paramere absent (Chen, 1993); phallosomal sclerite horseshoe shaped (Fig. 9G).

**Material examined. Brazil: Bahia:** Lençóis, Parque Nacional da Chapada Diamantina, Rio Santo Antônio, 12°29.579'S, 41°19.752'W, 340m, 26.x.2008, light trap U.V./white lights, Calor, A.R., Mariano, R., Mateus, S. – 2 males, 1 female (alcohol), 1 male (pinned); same except Abaíra, Rio Toborô, 13°17'35"S, 41°44'47"W, 28.vii.2010, light trap U.V./white lights, Calor *et al.* – 1 male (alcohol), 4 males (pinned); same except Abaíra-Piatã, Ouro Verde old road, Rio Toborô, 28.vii.2010, pan light trap U.V./white lights, Calor *et al.* – 3 males, 1 female (alcohol); same except Andaraí, Cachoeira da Garapa, 17°44'80.7"S, 41°20'87.7"W, 340m, 25.x.2008, light trap U.V./white lights, Calor, A.R., Mariano, R., Mateus, S. – 1 male (pinned), 1 male (pinned; SEM); same except Mucugê, Parque Sempre Vivas, Rio Piabinha, 12°59'34"S, 41°20'29"W, 14.v.2010, light trap U.V./white lights, França, D., Burger, R. – 3 males (pinned), 1 male (pinned/ SEM); same except Iaçú, Fazenda Touros, Rio Paraguaçu, 12°41'11"S, 40°07'08"W, 15.v.2010, light trap U.V./white lights, França, D., Burger, R. – 1 male, 4 females (pinned).

**Remarks:** comparing the examined specimens with the description provided by Flint (1983), the general color of the Bahia specimens was darker than that Flint reported by. The head is yellowish brown and the pterothorax is almost brown, in dorsal view.

As mentioned above, *Oecetis iguazu*, *O. connata* and *O. punctipennis* form a small group within *Oecetis* sharing the comma-shaped phallic apparatus as one of the most conspicuous diagnostic characters (Chen, 1993). Because of the differences between *Oecetis iguazu* and *Oecetis punctipennis* are very subtle, the diagnosis of these two species is frequently difficult.

Both of them have identical preanal appendages, in dorsal and lateral views. Tergum X is also identical in dorsal view. However, in lateral view, *O. iguazu* has the tergum X apex slightly acute, while *O. punctipennis* shows a rounded one. However, these differences are



seen only when both species are compared side-by-side. The phallic apparatus is comma-shaped and, as already mentioned, identical in these three species.

Thus, the best character to distinguish *Oecetis iguazu* and *Oecetis punctipennis* is the shape of the inferior appendages, in lateral view (Figs. 9D; 12D). *Oecetis iguazu* shows the inferior appendages without lobes or with a smooth hump dorsally. In *O. punctipennis*, a pronounced dorsal expansion on the inferior appendages is noticeable and the apex is more acute than *O. iguazu*. These differences are clearly seen with an Electron Sweeping Microscope (Figs. 13C-D).

**Distribution:** Argentina, Paraguay, Brazil [BA (**new record**), ES, MG, SC, SP].

***Oecetis inconspicua* (Walker, 1852) (Fig. 10)**

*Leptocerus inconspicuus* Walker, 1852: 71–72 (male, original description); Milne, 1934: 19 (synonym); Ross, 1938: 24–25 (synonyms); Betten & Mosely, 1940: 67 (male, redescription); Ross, 1944: 242 (male, female, larva, pupa, synonymy, distribution); Hagen, 1861: 275–276 (redescribed as *Molanna inconspicua*); Denning, 1947: 656 (distribution); Wolcott, 1948: 93 (distribution); Flint, 1964: 64 (male, female); Fisher, 1966: 149 (catalog); Flint, 1967a: 23 (synonymy); Flint, 1967b: 174 (distribution); Bueno-Soria & Flint, 1980: 213 (distribution); Flint, 1981: 32; Flint, 1991a: 97 (distribution); 1996: 421 (distribution); Flint *et al.*, 1999 (catalog); Blahnik *et al.*, 2004: 5 (distribution); Paprocki *et al.*, 2004: 13 (distribution); Martín *et al.*, 2011: 27 (male, distribution).

*Setodes flaveolata* Hagen, 1861: 282 (male, female); Ross 1938: 24 (synonymy; determined by Milne).

*Setodes micans* Hagen, 1861: 283 (male, female); Ross, 1938: 25 (synonymy; determined by Milne).

*Setodes sagitta* Hagen, 1861: 284 (female); Banks, 1907: 46 (in *Oecetina*); Ross, 1938: 25 (synonymy; determined by Milne); Betten, 1934: 274.

*Oecetina parvula* Banks, 1899:215 (female); Ross, 1938: 25 (synonymy; determined by Milne).

*Leptocerus flaveolatus* Banks, 1899: 214; Banks, 1904: 213 (in *Oecetina*); Betten, 1934: 269 (to *Oecetis*).

*Oecetina flavida* Banks, 1899: 216; Ulmer, 1907: 144; Ross, 1938: 24 (synonymy; determined by Milne). *Oecetina inornata* Banks, 1907: 128; Milne, 1934: 19 (to synonymy).

*Oecetina apicalis* Banks, 1907: 129 (male); Milne, 1934: 19 (to synonymy); Betten, 1934: 274.

*Oecetina antillana* Banks, 1938: 298 (male); Flint, 1967a: 23 (lectotype, to synonymy).

Male: body length 5.29 mm (2.5 lines in Walker, 1852:). Forewing length 7–7.5 mm (Chen, 1993).

Head: color brown (Ross, 1944). Antennae long, 3 times the length of the body (Walker, 1852); scape stout, same length of the flagellum segments; pedicel short and rounded.

Maxillary palps brown, covered by setae (Walker, 1852); 5-segmented, all segments subequal in length and width. Labial palps yellow, 4-segmented, first segment very small, covered by brown setae.

Thorax: pterothorax dorsal brown (Walker, 1852), dorsal view, yellowish brown in lateral and ventral view. Forewings brown (Walker, 1852); dark bands over  $R_3$ - $R_{4+5}$ ,  $r-m$  and  $m-cu$  (chord) (Ross, 1944); dark spots absent (Fig. 10A);  $m-cu$  crossvein reaching different positions on Cu vein (Ross, 1944). Hind wings with forks I and V (Schmid, 1998, although Martín *et al.*, 2011 say that fork I is absent); basal brush present (Fig. 10B). Legs brown (testaceous for Walker, 1852); mid legs with row of spines over distal half of femur, over the tibia and tarsus; hind legs with a inner row of spines over the tibia and tarsus. Tibial spurs formula 1,2,2, fore tibia spur very small.

Abdomen: membranous, sclerotized terga and sterna. Segment IX annular and narrow; acrotergite present dorsomesally. Preanal appendages short and rounded (Ross, 1944), setose. Rod-like process above tergum X absent. Tergum X membranous, undivided (Ross, 1944; Martín *et al.*, 2011), dorsal view; composed of a single elongated lobe, broad basally, rounded apically, slightly narrowed (Fig. 10C). Inferior appendages broad basally, covered by setae; dorsal lobe acuminate, broad basally; ventral lobe absent; distal portion narrow, tapering posteriorly with apex acuminate (Fig. 10D); spine-like small setae absent (Fig. 10E). Phallic apparatus curved downward, short; apple-shaped, occupying great part of segment IX width (Chen, 1993) (Fig. 10F); phallic paramere present, curved (Chen, 1993), helicoidally, counter clockwise (Fig. 10G).

**Material examined. Brazil: Bahia:** Curaçá, Recanto Campestre, Rio São Francisco, 08°59'56.7"S, 39°54'56.0"W, 357m, 04.v.2011, pan light trap U.V./white lights, França, D. – 1 male, 8 females (alcohol); same except Riacho do Tio Zé, tributary of Rio Buracão, 09°07'48.1"S, 39°58'45.7"W, 362m, 05.v.2011, pan light trap U.V./white lights, França, D. – 4 males, 21 females (alcohol); same except Pilão Arcado, Baixa do Brejo, 03.xii.2005, light trap U.V./white lights, Vieira, R., Alvim – 1 male (alcohol); same except Lagoa do Morro, 26.iii.2006, light trap U.V./white lights, Alvim, Cordeiro – 1 male, 2 females

(alcohol); same except Buriti-Dunas, 04.x.2006, light trap U.V./white lights, Vieira, R. – 1 male, 4 females (alcohol); same except **Paraíba:** Barra de Santana, Rio Paraíba, bridge BR-104, 07°31'44.3"S, 35°59'55"W, 336m, 31.vii.2009, pan light trap U.V./white lights, Calor, A.R., Lecci, L.S. – 1 male, 5 females (alcohol); same except Areia, dam, 09°59'27.5"S, 35°45'06.5"W, 527m, 29.ix.2011, pan light trap U.V./white lights, Calor, A.R., Quintero, F.B., Gomes, V. – 1 male (alcohol); same except **Pernambuco:** Afrânio, 08°31'53"S, 41°02'59"W, 550m., 16.v.2007, light trap U.V./white lights, Rafael, J.A., Xavier, F.F. – 3 males, 9 females (pinned); same except **Piauí:** Caracol, Parque Nacional da Serra das Confusões, waterhole in Riacho dos Bois, 09°13'14.9"S, 43°29'20.4"W, 603m, 15.xii.2010, light trap U.V./white lights, França, D., Costa, A.M. – 3 males (pinned), 1 male (pinned; SEM); same except Santa spring, 09°13'8.8"S, 43°29'25.6"W, 558m, 11.xii.2010, light trap U.V./white lights, França, D., Costa, A.M – 4 males, 3 females (pinned); same except 14.xii.2010, light trap U.V./white lights, França, D., Costa, A.M – 5 males, 6 females (pinned), 1 male (pinned/ SEM); same except **São Paulo:** São Carlos, córrego Fazzari, 21.iii.2007, light trap U.V./white lights, Lecci, L.S., Roque, F.O. – 1 male (alcohol); same except Santa Rosa de Viterbo, Fazenda Águas Claras, 23.ix.2000, light trap U.V./white lights, Mendes, H.F., Andersen, T. – 1 male (alcohol); same except Pedregulho, Furnas de São Pedro, 22.vi.2010, Mateus, S., Lecci, L.S. – 1 male, 1 female (alcohol).

**Remarks:** Ross (1944) stated that the position of the crossvein *m-cu* in the fore wing of this species is variable. The examined material showed two degrees of this variation: *m-cu* reaching fork V and *m-cu* reaching  $Cu_{1a}$  (after branching of  $Cu_1$  into  $Cu_{1a}$  and  $Cu_{1b}$ ). Diagnostic characters for this species are discussed in the discussion of *O. excisa*.

**Distribution:** Bahamas, Bolivia, Canada, Colombia, Costa Rica, Cuba, El Salvador, Guatemala, Honduras, Jamaica, Mexico, Nicaragua, Panama, Peru, Puerto Rico,

U.S.A., Venezuela, Brazil [BA (**new record**), MG, PB (**new record**), PE (**new record**), PI (**new record**), PR, SP (**new record**)].

***Oecetis paranensis* Flint, 1982** (Fig. 11)

*Oecetis paranensis* Flint, 1982a: 46 (male, original description); 1982b: 52 (distribution); 1996: 421 (distribution); Paprocki *et al.* 2004: 13 (distribution); Martín *et al.*, 2011: 29 (male, distribution).

Male: body length 6.2 (n=6). Forewing length 6–9 mm (Flint, 1982a).

Head: color brown (Flint, 1982a). Antennae long, 3 times the length of the forewing; scape stout, same length of the flagellum segments; pedicel small and stout. Maxillary palps brown, 5-segmented, all segments sub equal in length and width, densely covered by setae. Labial palps brown, 4-segmented, first segment very reduced.

Thorax: pterothorax brown in dorsal view and yellow brownish in lateral and ventral view. Forewings with golden-brown setae (Flint, 1982a); dark bands over the chord absent; dark spots on forks, junctions and end of veins (Flint, 1982a); *m-cu* crossvein reaching Cu<sub>1a</sub> (after branching of Cu into Cu<sub>1a</sub> and Cu<sub>1b</sub>) (Fig. 11A). Hind wings with forks I and V (Flint, 1982a); basal brush present (Fig. 11B). Legs yellowish brown, mid and hind legs with a inner row of small spines over the tarsus. Tibial spur formula 1,2,2, fore tibia spur very small.

Abdomen: membranous. Segment IX annular and narrow (Flint, 1982a); one acrotergite present, dorsomesally. Preanal appendages short and rounded (Flint, 1982a), with setae. Tergum X membranous, deeply divided mesally, forming two lobes (Flint, 1982a; Chen, 1993), dorsal view (Fig. 11C). Inferior appendages broad basally, covered by setae; dorsal

lobe broad and rounded (Flint, 1982a); ventral lobe quadrate; distal portion narrow, tapering posteriorly (Flint, 1982a), apex rounded (Fig. 11D); spine-like small setae absent (Fig. 11E). Phallic apparatus slightly curved downward, short, straight with a ventral elongated tip (Flint, 1982a), constricted in middle line, lateral view (Fig. 11F); phallic paramere present (Flint, 1982a), straight; phallosomal sclerite U-shaped and a small membranous lobe capped by a cluster of spicules on tip (Flint, 1982a) (Fig. 11G).

**Material examined. Brazil: Bahia:** Curaçá, 08°59'57.6"S, 39°54'47.2"W, 06.v.2011, light trap U.V./white lights, Silva-Neto, A.M. – 2 males, 1 female (alcohol); same except Recanto Campestre, Rio São Francisco, 08°59'56.7"S, 39°54'56.0"W, 357m, 06.v.2011, pan light trap U.V./white lights, França, D. – 1 male, 1 female (alcohol); same except Pilão Arcado, Buriti-Dunas, 04.x.2006, light trap U.V./white lights, Vieira, R. – 1 male, 2 females (alcohol); same except Ilhéus, around Parque Estadual da Serra do Conduru, farm, 14°28'12.6"S, 39°04'41.1"W, 04.vii.2010, light trap U.V./white lights, Calor, A.R., Quinteiro, F.B., França, D., Mariano, R. – 1 male (pinned); same except **São Paulo:** Ribeirão Preto, *campus* USP, Lago Monte Alegre, 14.viii.2007, pan light trap U.V./white lights, Calor, A.R., Mariano, R., Pinho, L.C., Moretto, R.A. – 3 males, 5 females (alcohol).

**Remarks:** the description provided by Flint matches the specimens examined, although the colors have small changes when comparing dry and alcohol preserved specimens. This is specially related to the forewing setae. They tend to fall off in alcohol, so it was not possible to see the golden brown setae and the dark setae over the forks, junctions and ends of veins.

This species is diagnosed from its congeners by the shape of tergum X, inferior appendage and the phallic apparatus. Tergum X is divided basally, forming two terete processes with digitate apices. The only similar species is *Oecetis oberdoffi* Martín, Gibon, Molina, 2011,

that has an inferior appendage similar to *O. inconspicua* with a C-shaped incision between the thumb-like dorsal lobe and the elongated and rounded distal lobe. The inferior appendage of *Oecetis paranensis* shows a broad dorsal lobe and a digitate distal lobe, with an almost 90° angle between them. Also, *O. paranensis* has a broad ventral lobe on the inferior appendage, which is absent in *O. oberdorffi*. Finally, *O. paranensis* shows a character that no other *Oecetis* has: a cluster of spicules on the tip of the endotheca.

**Distribution:** Argentina, Bolivia, Paraguay, Peru, Brazil [BA (**new record**), MG, SP (**new record**)].

***Oecetis punctipennis* (Ulmer, 1905)** (Fig. 12)

*Pseudosetodes punctipennis* Ulmer, 1905: 77 (female, original description); Flint, 1966: 10 (female, lectotype, male); Flint, 1982b: 53 (distribution); Flint, 1996: 421 (distribution); Maes & Flint, 1988: 6 (distribution); Holzenthal, 1988: 74 (distribution); Aguila, 1992: 544 (distribution); Paprocki *et al.*, 2004: 13 (distribution); Martín *et al.*, 2011: 31 (male, distribution).

*Oecetina parishi* Banks, 1915: 631 (male); Flint, 1966: 10 (to synonymy).

*Oecetis bridarollina* Navás, 1933 (male); Flint, 1972: 245 (to synonymy).

Male: body length 5.4 mm (n=12). Forewing length 5–8 mm (Flint, 1982b).

Head: color pale yellow (Ulmer, 1905). Antennae long, about 3.5 times the length of the forewings; scape stout, same length of the flagellum segments; pedicel stout and rounded.

Maxillary palps yellow, covered by setae (Ulmer, 1905); brown setae; 5-segmented, all segments sub equal in length and width. Labial palps pale yellow, 4 segmented, first segment very small.

Thorax: pterothorax dorsal yellow (Ulmer, 1905); scutellum brown; ventral view pale yellow (Ulmer, 1905). Forewings yellowish brown, hyaline (Ulmer, 1905); dark bands absent; dark spots on forks, junctions and end of veins (Ulmer, 1905; Flint, 1982b); M-Cu crossvein reaching Cu (before branching into  $Cu_{1a}$  and  $Cu_{1b}$ ), or fork V (Fig. 12A). Hind wings with forks I and V; basal brush present (Fig. 12B). Legs light yellow (Ulmer, 1905); mid legs with row of spines over tibia and tarsus; hind legs with row of spines over the tarsus; tibial spur formula 1,2,2; apical spur of fore tibia very small (Ulmer, 1905).

Abdomen: membranous, sclerotized terga and sterna. Segment IX annular and narrow; two small acrotergites present dorsolaterally. Preanal appendages long and digitate (Chen, 1993), with setae. Rod-like process above tergum X absent. Tergum X membranous, divided near posterior end (Chen, 1993), dorsal view (Fig. 12C). Inferior appendages broad basally, covered by setae (Chen, 1993); dorsal lobe rounded, smooth (Flint, 1982b); ventral lobe absent; distal portion narrow, tapering posteriorly with apex acute (Flint, 1982b) (Fig. 12D); spine-like small setae absent (Fig. 12E). Phallic apparatus curved downward, short (Chen, 1993); comma-shaped with a ventral elongated tip, constricted in middle line (Chen, 1993), lateral view (Fig. 12F); phallic paramere absent (Chen, 1993); phallosomal sclerite U-shaped (Fig. 12G).

**Material examined. Brazil: Bahia:** Wenceslau Guimarães, Estação Ecológica Estadual Wenceslau Guimarães, Riacho Serra Grande, 13°35'43"S, 38°43'12"W, 531m, 08.x.2010, pan light trap U.V./white lights, PPGDA team – 5 males, 2 females (alcohol); same except 13°35'34"S, 39°42'52"W, 482m, 09.x.2010 – 1 male (alcohol); same except 10.x.2010 – 1 male, 1 female (alcohol); same except Mata de São João, Reserva Sapiranga, 12°33'41.7"S, 38°02'42.9"W, 22-25.vii.2001, Malaise trap, Tavares, M.T.*et al.* – 3 males (alcohol); same except Senhor do Bonfim, Serra Santana, 28.xi.2006, Souza, Monteiro, Alvim, Zacca – 2 males (alcohol); same except Lençóis, Parque Nacional da Chapada



Diamantina, Rio Santo Antônio, 12°29'57.9"S, 41°19'75.2"W, 340m, 26.x.2008, light trap U.V./white lights, Calor, A.R., Mariano, R., Mateus, S. – 5 males (pinned), 1 male (Pinned; SEM); same except **Ceará**: Barbalha, Geosítio Riacho do Meio, Riacho do Meio, 07°21'59.4"S, 39°19'48.8"W, 04.ii.2011, light trap U.V./white lights, Quinteiro, F.B & Costa, A.M. – 1 male (alcohol), 2 males (pinned), 1 male (pinned/ SEM); same except Distrito de Arajara, Arajara Park, Gruta do Farias, 24.vii.2009, light trap U.V./white lights, Calor, A.R., Lecci, L.S. – 3 males (alcohol).

**Remarks:** see remarks for *O. iguazu*.

**Distribution:** Argentina, Bolivia, Costa Rica, Ecuador, Guyana, Nicaragua, Panama, Peru, Surinam, Venezuela, Brazil [BA (**new record**), CE (**new record**), MG, PA, RJ].

### ***Oecetis rafaeli* Flint, 1991**

Male: Forewing length 5 mm (Flint, 1991b). Head color yellowish brown (Flint, 1991b).

Forewings yellowish brown (Flint, 1991b), hyaline; dark bands absent; dark spots on forks, junctions and end of veins (Flint, 1991b); *m-cu* crossvein reaching fork V. Hind wings with forks I, and V (Flint, 1991b). Abdomen membranous, sclerotized terga and sterna.

Segment IX annular, narrow, bearing a pair of dorsolateral processes (Flint, 1991b; Chen, 1993), slender (Flint, 1991b), straight, cylindrical, tapering posteriorly, with the same

length as the phallus, apex truncate. Preanal appendages slightly longer than wide (ovoid), with setae (Flint, 1991b). Rod-like process above tergum X absent. Tergum X

membranous, divided into long, slender, lateral lobes (Flint, 1991b), pointed apicad, dorsal view. Inferior appendages broad basally (Flint, 1991b), covered by setae; dorsal lobe

absent; ventral lobe smooth, quadrate; distal portion narrow, tapering posteriorly (Flint, 1991b) with apex blunt; spine-like small setae absent. Phallic apparatus elongated,

cylindrical, membranous apically (Flint, 1991b), curved downward; phallic paramere absent; phallotremal sclerite ringlike, with central spine (Flint, 1991b).

**Remarks:** in spite of being recorded for Brazil this species was not collected in the Northeast region, so no biological material was examined.

**Distribution:** Bolivia, Brazil [RR].

### Key to males of *Oecetis* from Brazil

Herein is presented a dichotomous key based mainly on genitalia characters of male *Oecetis* species recorded for Brazil. It is highly recommended to complement this key with the synopsis and illustrations of the species to better distinguish among them since some are of very difficult diagnosis.

1. Segment IX with a pair of dorsolateral processes (Figs. 1D, 4D)..... 2  
 Segment IX without a pair of dorsolateral processes (Figs. 2D, 6D)..... 6
- 2(1). Dorsolateral processes on segment IX curved, bent ventrad (Fig. 1D)..... 3  
 Dorsolateral processes on segment IX straight (Fig. 5D) ..... 5
- 3(2). Dorsolateral processes on segment IX continuous (Fig. 1D)..... 4  
 Dorsolateral processes on segment IX divided into a ventral and dorsal lobes (Fig. 4D)..... *Oecetis furcata*, n. sp.
- 4(3). Dorsal lobe on inferior appendages present (Figs. 5D, 8D); dorsolateral process on segment IX cylindrical, tapering apicad (Fig. 4C); phallic apparatus without processes..... *Oecetis fibra* Chen & Morse in Quinteiro & Calor  
 Dorsal lobe on inferior appendages absent (Fig. 1D); dorsolateral process on segment IX Enlarged in width on 2/3 of its length (Fig. 1C); presence of a spine-like process on mesoventral portion of the phallic apparatus (Fig. 1F) .....  
 ..... *Oecetis achantostema*, n. sp.
- 5(2). Phallic apparatus with paramere spine (Figs 5F, 5G); dorsolateral processes short and acuminate, triangular (Fig 5D); rod-like process above tergum X present (Figs. 1C, 1D, 5C, 5D); inferior appendages with dorsal lobe (Figs 5C, 5D)..... *Oecetis froehlichii*, n. sp.

- Phallic apparatus without paramere spine; dorsolateral processes cylindrical, elongated, truncate on apex; rod-like process above tergum X absent; inferior appendages without dorsal lobe..... *Oecetis rafaeli* Flint
- 6(1). Phallic apparatus with paramere spine (Figs. 6F, 6G, 11F, 11G) ..... 7  
 Phallic apparatus without paramere spine (Figs. 2F, 2G, 7F, 7G) ..... 10
- 7(6). Phallic apparatus enlarged in width (Figs. 8G, 10G); inferior appendages elongated, tapering distally (Figs. 8D, 10D); paramere spine long, curved helicoidally (Figs. 10E, 10G) ..... 8  
 Phallic apparatus not as above (Figs. 6F, 11F); inferior appendages short (Figs. 6D, 11D); paramere spine short (Figs. 11F, 11G), if curved, not helicoidally (Fig. 6F) ..... 9
- 8(7). Dorsal lobe on inferior appendages thumb-like (not enlarged on base) (Figs. 8C, 8D)..... *Oecetis excisa* Ulmer  
 Dorsal lobe on inferior appendages enlarged on base (Figs. 10C, 10D)..... *Oecetis inconspicua* (Walker)
- 9(7). Preanal appendages fused between them, but not fused with tergum X (Figs. 6C, 6D); tergum X not divided (sometimes with only a small incision apicad) (Fig. 6C); paramere spine curved, bent ventrad (Fig. 6F, 6G)..... *Oecetis amazonica* Banks  
 Preanal appendages not fused, ovoid (Figs. 11C, 11D); tergum X divided mesally, forming two processes (Fig. 11C); paramere spine straight (Figs. 11F, 11G)..... *Oecetis paranensis* Flint
- 10(6). Dorsal lobe on inferior appendages present (discrete in *Oecetis punctipennis*) (Figs. 3D, 12D)..... 11  
 Dorsal lobe on inferior appendages absent (Figs. 2D, 9D, 7D) ..... 12
- 11(10). Rod-like process above tergum X present, clavate (Figs. 3C, 3D); fringe of long setae at the base of M vein on anterior wing present (Fig. 3A)..... *Oecetis clavicornia*, n. sp.  
 Rod-like process above tergum X absent (Figs. 12C, 12D); fringe of setae at the base of M vein on anterior wing absent (Fig. 12A).. *Oecetis punctipennis* (Ulmer)
- 12(10). Inferior appendages short, quadrat, with thick setae on tip (Figs. 2D, 2E); phallic apparatus elongated (Figs. 2F, 2G) ..... *Oecetis martinae*, n. sp.  
 Inferior appendages elongated, tapering distally, not as above (Figs. 7D, 9D); phallic apparatus coma shaped (Figs. 7F, 9F) ..... 13
- 13(12). Tergum X divided (Fig. 9C); preanal appendages not fused with tergum X (Figs. 9C, 9D); hindwing venation usual for the genus (Cu1 branches into Cu1a and Cu1b) (Fig. 9B) ..... *Oecetis iguazu* Flint

Tergum X undivided, fused with tergum X in a single hoodlike structure (Figs. 7C, 7D); hindwing venation reduced (Cu1 unbranched and small anal area) (Fig. 7B)..... *Oecetis connata* Flint

### **Venation homology**

The M vein has not been a main concern in literature on genus *Oecetis*. Although it seems to be a differential character because, according to Schmid (1998), no Trichoptera species shows an unbranched M vein on anterior wing.

Despite the controversial, it is possible to identify two main approaches to infer the homology pattern of the anterior wing veins on *Oecetis*: 1. “M vein branches” (e.g., Morse, 1975; Bueno-Soria, 1981; Chen, 1993), and 2. “M vein does not branch” (e.g., Betten, 1934; McLachlan, 1877; Flint, 1982a; Wells, 2004). The first approach postulates that M vein branches on anterior wing in  $M_{1+2}$  and  $M_{3+4}$ , while the second the “M vein does not branch”, postulates that the M vein remains unbranched until the end of the wing.

Observing the positioning of crossvein *m-cu* in some *Oecetis* species as *O. arcada* Mosely, 1953, *O. laustra* Mosely, 1953, *Oecetis parallela* Wells, 2000 and *Oecetis pseudoamazonica* Martín *et al.*, 2011, it seems noticeable that this crossvein varies its position along the Cu vein. Sometimes it reaches Cu vein anterior to the fork, other it reaches over the fork, and, in a third way, it reaches posterior to the fork. For example, in Curtis (1825) illustration of *Oecetis ochracea* (in *Leptocerus*), the type species of the genus, *m-cu* seems to reach over the fork. The last pattern is the most common on *Oecetis*, as in *Oecetis excisa* Ulmer, 1907, and may lead the false impression that M vein branches and Cu does not. This variety of positions of the crossvein *m-cu* may be seen even within a single species, as pointed by Ross, (1944, p. 243) for *O. inconspicua* “Position of crossveins forming the cord extremely variable, ranging from a condition in which the three crossveins form an almost straight line to one in which they are far removed and steplike.”

Comparing the branching patterns on *Oecetis* with other genera within Leptoceridae, it is noticeable that in all of them the fork V is present, *i.e.* the Cu vein branches in all cases in Cu<sub>1a</sub> and Cu<sub>1b</sub> and that applies also to *Oecetis*. If the “M vein branches” approach is accepted, we would have to assume that the Cu<sub>1</sub> does not branch in *Oecetis*, what seems very unlikely to happen when we observe the patterns of wings and compare them with the other leptocerid genera, they have the same shape, regarding the Cu<sub>1</sub> vein.

Observing the evidences listed above, it is possible to identify which one is the crossvein *m-cu* in *Oecetis* and see that the pattern of venation in which M does not branch seems to be the correct one.

A consensus can provide a single followed pattern on taxonomical studies and this may help us to position the genus among the other leptocerid genera and also understand relations among the species within the genus in the future.

### **Acknowledgments**

The authors would like to thank the curators Dr. Freddy Bravo (UEFS), Dr. Paola Rueda Martín (Facultad de Ciencias Naturales e Instituto Miguel Lillo), Dr. Ralph Holzenthal and Desiree Robertson (UMSP), Dr. Jorge Nessimian (UFRJ), Dr. Sonia Casari (MZUSP) for the loan of biological material, ICMBio for issuing collecting permits. We are grateful to Dr. Vitor Becker (Reserva Serra Bonita) for field support and good example. We are also grateful to Dr. Carla Menegola (LABPOR) for loan of optical equipment and to Dr. Adriana Lanfredi Rangel, Cláudio Pereira Figueira and Maria Lúcia Vieira Moreno at Centro de Pesquisas Gonçalo Moniz (FIOCRUZ) for their kind help on the Electron Sweeping Microscope. This work was supported by a FAPESB (process 1668/2010) fellowships and CAPES-PROAP/PPGDA to FBQ, FAPESB grant (process nº 5716/2009),

and CNPQ grants (process 473703/2010-6, process 552525/2010-3, PPBIO Semi-árido, process 558317/2009-0).

## References

- Amorim, D. (2001) Dos Amazonias. *In*: Llorente, J., Morrone, J.J. (Eds.) *Introducción a la biogeografía en Latinoamérica: teorías, conceptos, métodos y aplicaciones*. Universidad Nacional Autónoma de México, México, pp. 245–255.
- Banks, N. (1924) Descriptions of Neuropteroid insects. *Bulletin of the Museum of Comparative Zoology at Harvard College*, 65, 421–465.
- Betten, C. (1934) The caddisflies or Trichoptera of New York State. *New York State Museum Bulletin*, 292, 1–576.
- Betten, C. & Mosely M.E. (1940) *The Francis Walker Types of Trichoptera in the British Museum*. British Museum (Natural History), London, 248 pp.
- Blahnik, R.J. & Holzenthal, R.W. (2004) Collection and curation of Trichoptera, with an emphasis on pinned material. *Nectopsyche, the Neotropical Trichoptera Newsletter*, 1, 8–20. Available from: <http://www.entomology.umn.edu/museum/links/news.html> (accessed in January 24th, 2012)
- Blahnik, R.J., Holzenthal, R.W. & Prather, A. (2007) The lactic acid method for clearing Trichoptera genitalia. *In*: Bueno-Soria, J., Barba-Álvarez, R. & Armitage, B. (Eds.) *Proceedings of the XIIth International Symposium on Trichoptera*. Columbus, Ohio, The Caddis Press, pp. 9–14.
- Blahnik, R.J., Paprocki, H. & Holzenthal, R.W. (2004) New distribution and species records of Trichoptera from southern and southeastern Brazil. *Biota Neotropica*, 4, 1–6.
- Bueno-Soria, J. (1981) Estudios en insectos acuáticos de México I. Trichoptera (Leptoceridae). Cinco nuevas especies de *Oecetis* McLachlan. *Folia Entomologica Mexicana*, 49, 103–120.
- Bueno-Soria, J. & Flint O.S., Jr. (1980) Catálogo sistemático de los Tricópteros de México (Insecta: Trichoptera), con algunos registros del Norte, Centro y Sudamérica. *Anales del Instituto de Biología, Universidad Nacional Autónoma de México, Series de Zoología*, 49, 189–218.

- Calor, A.R., Holzenthal, R.W. & Amorim, D.S. (2006) Phylogenetic analysis of *Notalina* (*Neonotalina*) Holzenthal (Trichoptera: Leptoceridae), with the description of two new species from southeastern Brazil. *Zootaxa*, 1131, 33–48.
- Calor, A.R. & Mariano, R.L.S. (*in press*) The use of UV light traps for collecting aquatic insects. *Biota Neotropica*.
- Chen, Y.E. (1993) Revision of the *Oecetis* (Trichoptera: Leptoceridae) of the World. Unpublished PhD Thesis, Clemson University, South Carolina, USA. 1408 pp.
- Curtis, J. (1825) *British Entomology - being illustrations and descriptions of the genera of insects found in Great Britain and Ireland; containing coloured figures from nature of the most rare and beautiful species, and in many instances of the plants upon which they are found*. Richard Taylor, London. vol. 2. Pl. 57 pp.+ text.
- Dallwitz, M.J., Paine, T.A. & Zurcher, E.J. (1993) User's Guide to the DELTA System: a General System for Processing Taxonomic Descriptions. 4th edition. CSIRO Division of Entomology, GPO Box 1700, Canberra ACT 2601, Australia, 136 pp.
- Dallwitz, M.J., Paine, T.A. & Zurcher, E.J. (1995) User's Guide to Intkey: A Program for Interactive Identification and Information Retrieval. 1st edition. CSIRO Division of Entomology, GPO Box 1700, Canberra ACT 2601, Australia, 24 pp.
- Dallwitz, M.J., Paine, T.A. & Zurcher, E.J. (1999) User's Guide to the DELTA Editor. 1st edition. CSIRO Division of Entomology, GPO Box 1700, Canberra ACT 2601, Australia, 34 pp.
- Denning, D.G. & Sykora, J. (1966) New North American Trichoptera. *The Canadian Entomologist*, 98, 1219–1226.
- Dumas, L.L., Santos, A.P.M., Jardim, G.A., Ferreira Jr., N. & Nessimian, J.L. (2010) Insecta, Trichoptera: New records from Brazil and other distributional notes. *Check List*, 6, 7–9.
- Fischer, F.C.J. (1966) Leptoceridae Pars 2. Trichopterorum Catalogus 7. Amsterdam, Nederlandsche Entomologische Vereeniging. 163 pp.
- Flint, O.S. Jr. (1964) The caddisflies (Trichoptera) of Puerto Rico. *University of Puerto Rico, Agricultural Experiment Station, Technical Paper*, 40, 1–80.
- Flint, O.S., Jr. (1967a) Studies of Neotropical caddis flies, V: types of the species described by Banks and Hagen. *Proceedings of the United States National Museum*, 123, 1–37, plate 1.

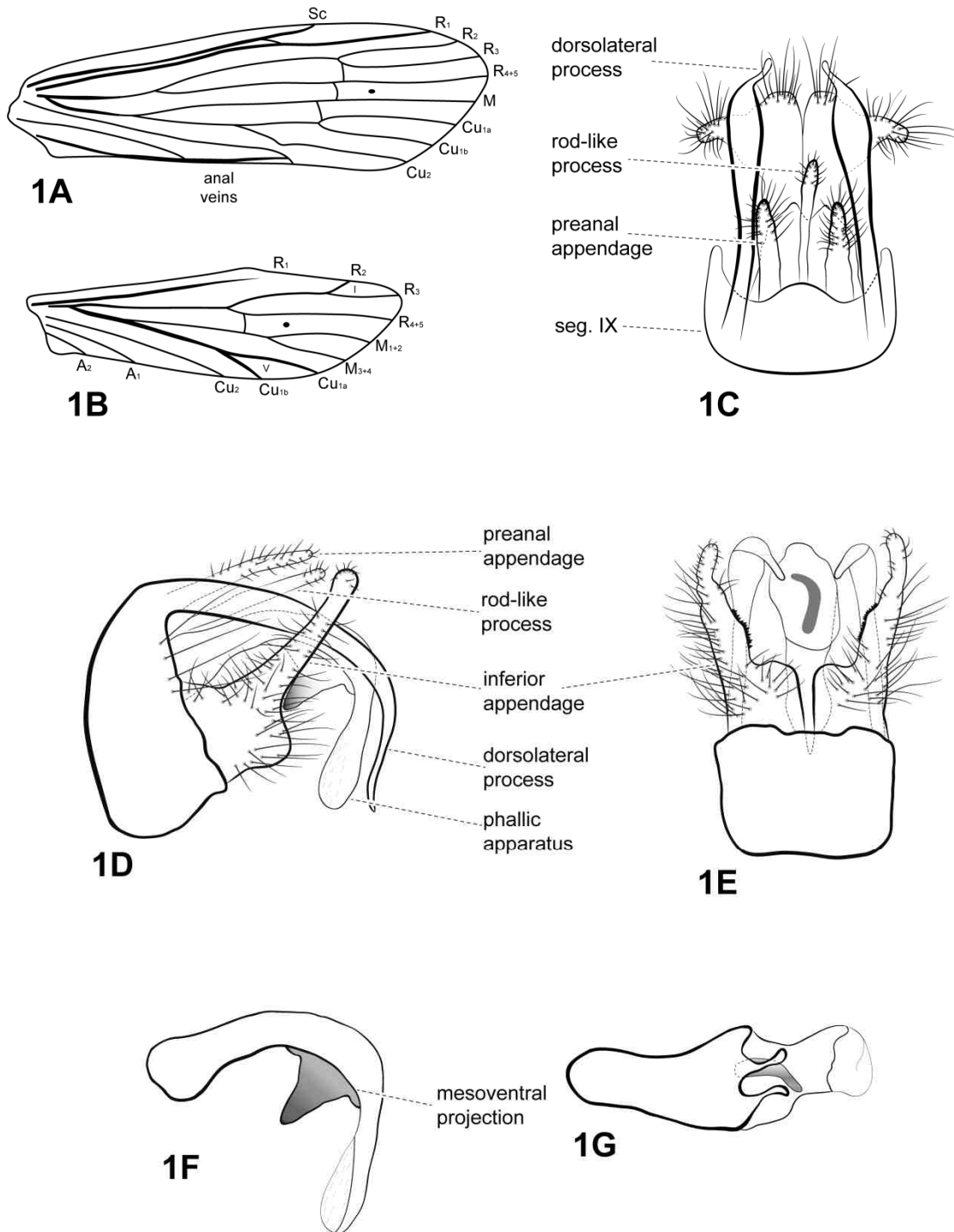
- Flint, O.S., Jr. (1967b) Studies of Neotropical caddis flies, VI: On a collection from northwestern Mexico. *Proceedings of the Entomological Society of Washington*, 69, 162–176.
- Flint, O.S., Jr. (1972) Studies of Neotropical caddisflies, XIV: on a collection from northern Argentina. *Proceedings of the Biological Society of Washington*, 85, 223–248.
- Flint, O.S., Jr. (1974) Studies of Neotropical caddisflies, XV: The Trichoptera of Surinam. *Studies on the Fauna of Suriname and other Guianas*, 14, 1–151.
- Flint, O.S. Jr. (1981) Studies of Neotropical caddisflies, XXVIII: The Trichoptera of the Río Limón Basin, Venezuela. *Smithsonian Contributions to Zoology*, 330, 1–60.
- Flint, O.S. Jr. (1982a) Studies of Neotropical caddisflies, XXXI: Five new species from Argentina (Trichoptera). *Entomological News*, 93, 43–97.
- Flint, O.S., Jr. (1982b) Trichoptera of the area Platense. *Biologia Acuatica*, 2, 1–70.
- Flint, O.S. Jr. (1983) Studies of Neotropical caddisflies, XXXIII: New species from austral South America (Trichoptera). *Smithsonian Contributions to Zoology*, 377, 1–100.
- Flint, O.S., Jr. (1991a) Studies of Neotropical caddisflies, XLV: The taxonomy, phenology, and faunistics of the Trichoptera of Antioquia, Colombia. *Smithsonian Contributions to Zoology*, 520, 1–113.
- Flint, O.S., Jr. (1991b) Studies of Neotropical caddisflies, XLIV: On a collection from Ilha de Maraca, Brazil. *Acta Amazonica*, 21, 63–83.
- Flint, O.S. Jr. (1996) Trichoptera collected on the expeditions to Parque Manu, Madre de Dios, Peru. In: Wilson D.E. & Sandoval, A.(Eds), *Manu: The biodiversity of southeastern Peru*. Smithsonian Institution Press. Washington, DC. pp 369–430.
- Flint, O.S., Jr., Holzenthal, R.W. & Harris, S.C. (1999) *Catalog of the Neotropical Caddisflies (Insecta: Trichoptera)*. Ohio Biological Survey, Columbus, Ohio, 239 pp.
- Hagen, H. (1861) Synopsis of the Neuroptera of North America. *Smithsonian Miscellaneous Collections*, 4(1), xx + 347 pp.
- Holzenthal, R.W. & Andersen, T. (2004) The caddisfly genus *Triaenodes* in the Neotropics (Trichoptera: Leptoceridae). *Zootaxa*, 511, 1–80.
- Holzenthal, R.W., Blahnik, R.J., Prather, A.L. & Kjer, K.M. (2007) Order Trichoptera Kirby, 1813 (Insecta), Caddisflies. In: Zhang, Z.Q. & Shear, W.A. (Eds.), *Linnaeus Tercentenary: Progress in Invertebrate Taxonomy*. *Zootaxa*, 1668, 639–698.
- Malm, T. & Johanson, K.A. (2011) A new classification of the long-horned caddisflies (Trichoptera: Leptoceridae) based on molecular data. *BMC Evolutionary Biology*, 11: 10, 17 pp.



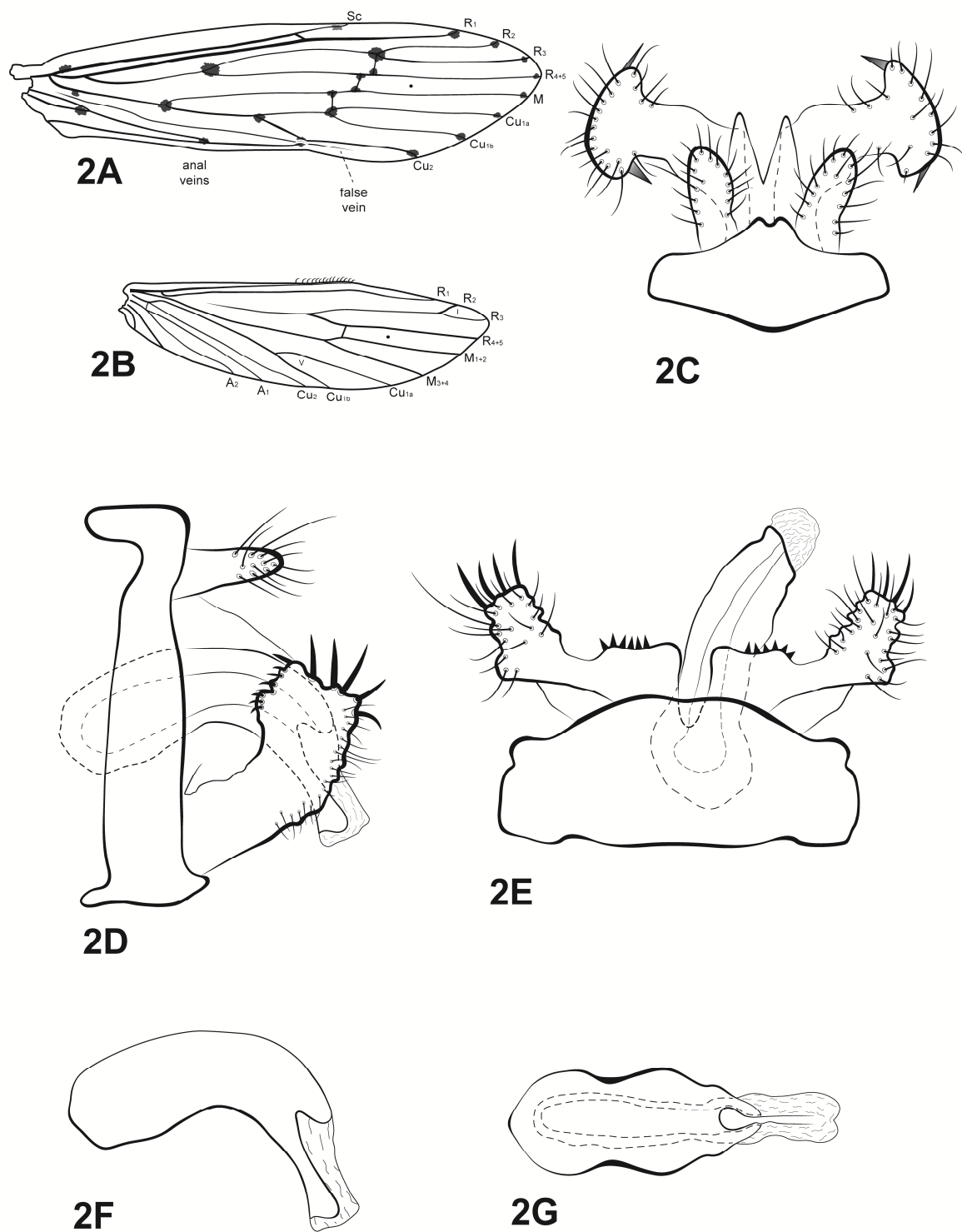
- Martín, P.R., Gibon, F.M. & Molina, C.I. (2011) The genus *Oecetis* McLachlan in Bolivia and northwestern Argentina (Trichoptera: Leptoceridae), with new species and identification key for males of *Oecetis* species from Mexico, Central and South America. *Zootaxa*, 2821, 19–38.
- McLachlan, R. (1877) *A monographic revision and synopsis of the Trichoptera of the European fauna* (1874–1880). John van Voorst, London, Part VII, pp. 349–428.
- Milne, L.J. (1934) *Studies in North American Trichoptera*. Part 1. Cambridge, Massachusetts, 19 pp.
- Morse, J.C. (1975) A phylogeny and revision of the caddisfly genus *Ceraclea* (Trichoptera, Leptoceridae). *Contributions of the American Entomological Institute*, 11, 1–97.
- Mosely, M.E. & Kimmins, D.E. (1953) *The Trichoptera of Australia and New Zealand*. London, British Museum (Natural History), 550 pp.
- Navás, L. (1918) Insecta nova, III, IV Series. *Memorie della Pontificia Accademia Romana dei Nuovi Lincei, Serie II*, 4, 1–23.
- Navás, L. (1920a) Algunos insectos de Santa Fe (República Argentina) recogidos por el P. Juan C. Muhn, S.J. *Estudios (Buenos Aires)*, 18, 131–135.
- Navás, L. (1920b) Insecta nova, V, VI, VII Series. *Memorie della Pontificia Accademia Romana dei Nuovi Lincei, Serie II*, 5, 1–29.
- Navás, L. (1931) Insectos de la Argentina, Séptima Serie (1). *Revista de la Sociedad Entomológica Argentina*, 3, 317–324.
- Paprocki, H., Holzenthal, R.W. & Blahnik, R.J. (2004) Checklist of the Trichoptera (Insecta) of Brazil I. *Biota Neotropica*, 4, 1–22.
- Ross, H.H. (1938) Lectotypes of North American caddis flies in the Museum of Comparative Zoology. *Psyche*, 45, 6–61.
- Ross, H.H. (1944) The caddisflies, or Trichoptera, of Illinois. *Illinois Natural History Survey Bulletin*, 23, 1–326.
- Schmid, F. (1949) Les Trichoptères de la collection Navás. *Eos*, 25, 305–426.
- Schmid, F. (1998) *The Insects and Arachnids of Canada. Part 7. Genera of the Trichoptera of Canada and Adjoining or Adjacent United States*. NRC Research Press, Ottawa, Ontario, Canada. 319 pp.
- Snodgrass, R.E. (1956) *Principles of insect morphology*. Cornell University Press, Ithaca, New York, 667 pp.

- Ulmer, G. (1905) Neue und wenig bekannte aussereuropäische Trichopteren, hauptsächlich aus dem Wiener Museum. *Annalen des Kaiserlich–Königlich naturhistorischen Hofmuseums*, 20, 59–98.
- Ulmer, G. (1907) Neue Trichopteren. *Notes from the Leyden Museum*, 29, 1–53.
- Walker, F. (1852) *Catalogue of the Specimens of Neuropterous Insects in the Collection of the British Museum, Part I: Phryganides–Perlides*. London: British Museum London, 192 pp.
- Wallengren, H.D.J. (1891) Skandinaviens Neuroptera. Andra afdelningen. *Svenska Akademien Handlingar* 24: 1–173.
- Wells, A. (2000) New Australian species of *Oecetis* allied to *O. complexa* Kimmins (Trichoptera: Leptoceridae). *Memoirs of Museum Victoria*, 58, 77–88.
- Wells, A. (2004) The long-horned caddisfly genus *Oecetis* (Trichoptera: Leptoceridae) in Australia: two new species groups and 17 new species. *Memoirs of Museum Victoria*, 61, 85–110.
- Wolcott, G.N. (1948) The insects of Puerto Rico. *Journal of Agriculture of University of Puerto Rico*, 32, 92–94.

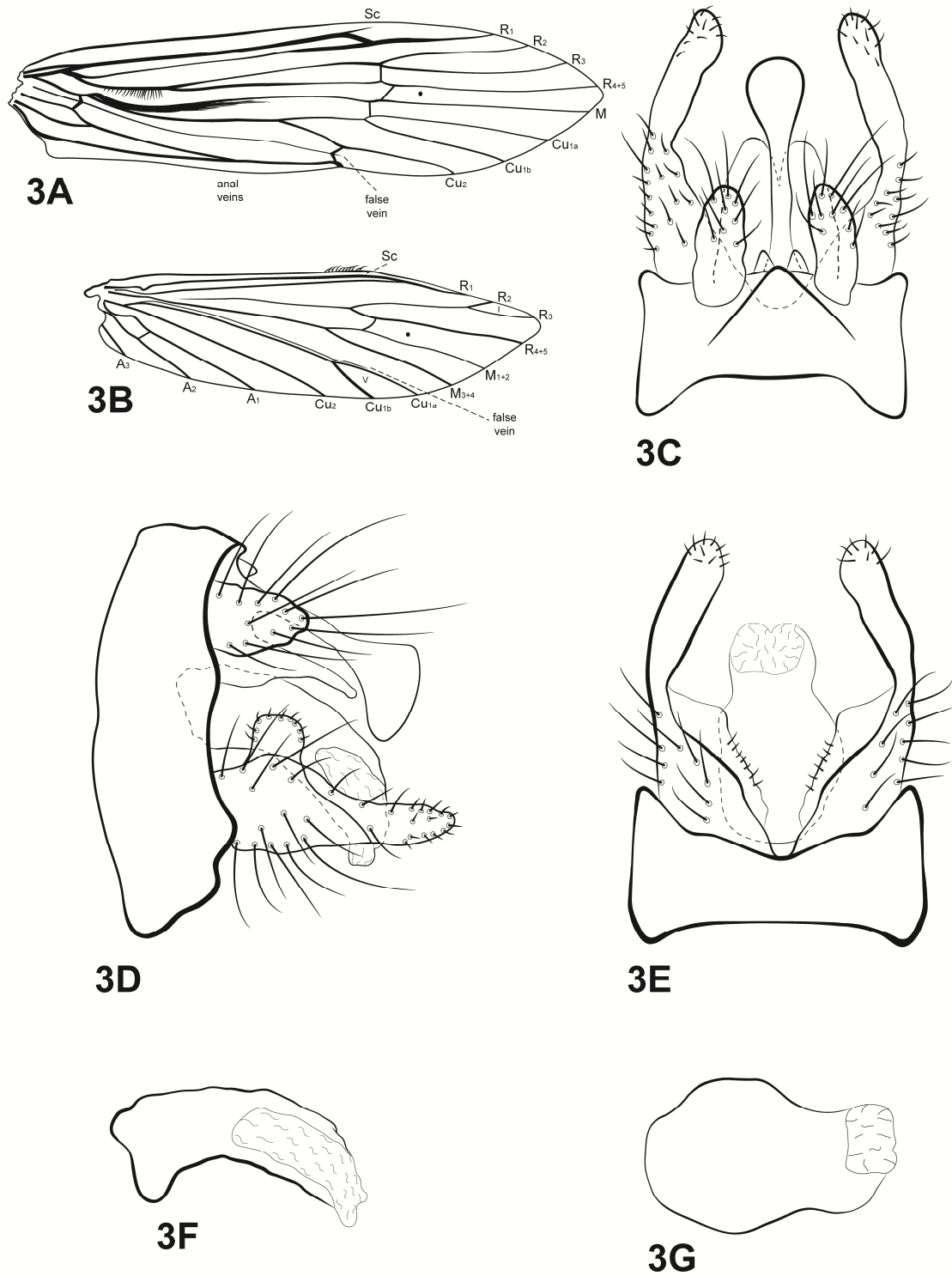
**FIGURES**



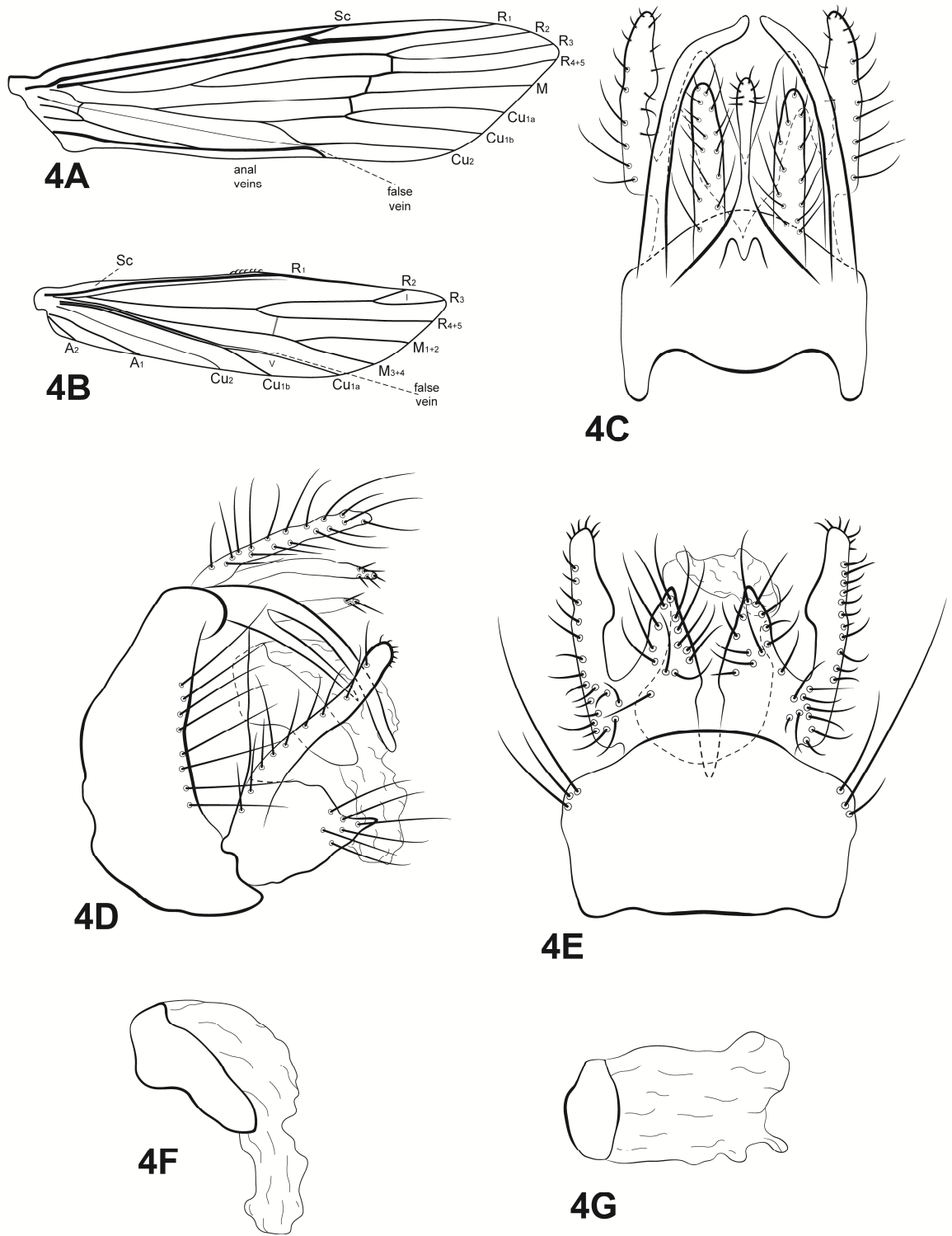
**FIGURE 1.** *Oecetis acanthostema*, new species. A—forewing. B—hind wing. C—male genitalia, dorsal view. D—male genitalia, lateral view. E—male genitalia, ventral view. F—phallic apparatus, lateral view. G—phallic apparatus, dorsal view.



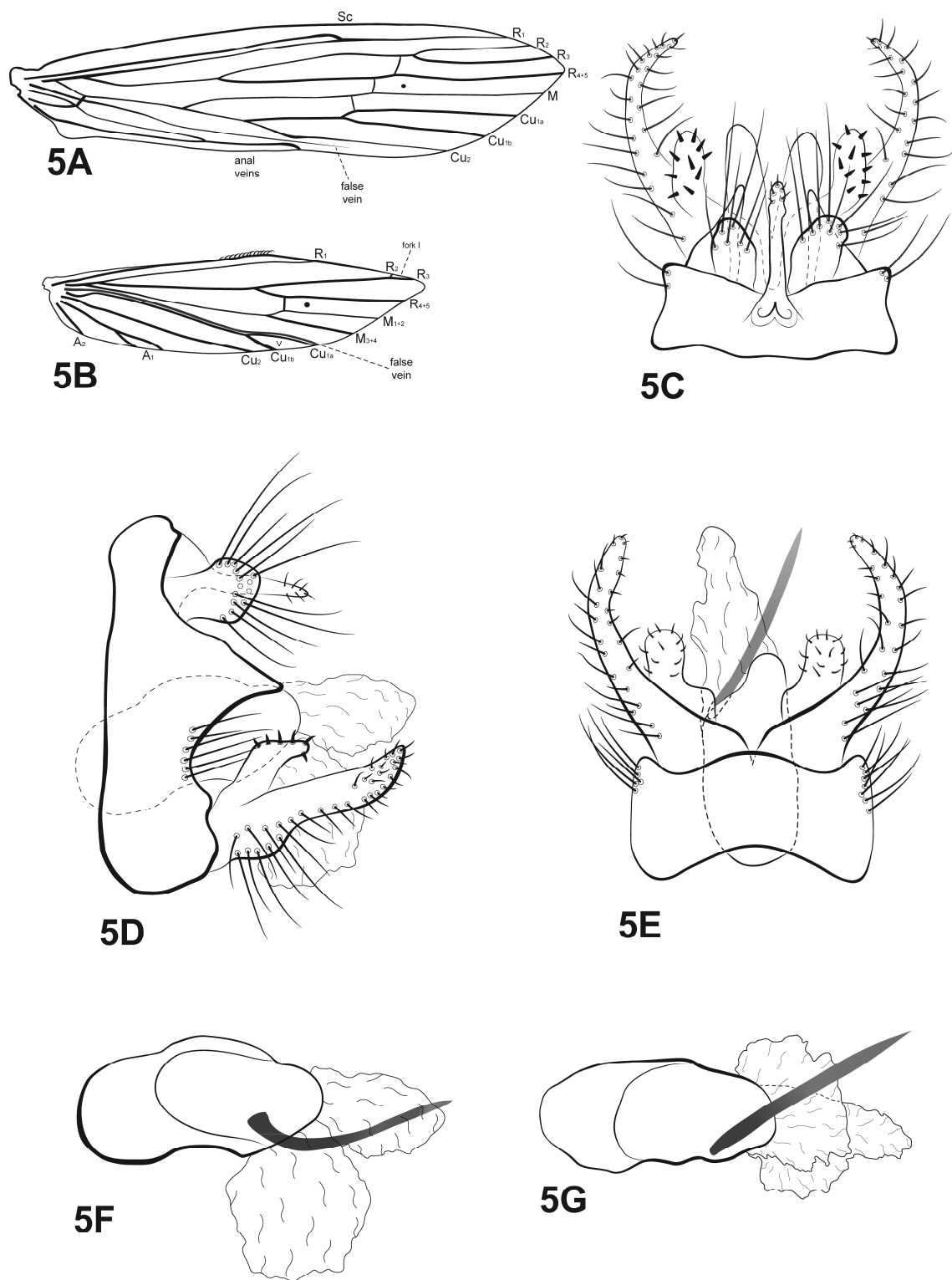
**FIGURE 2.** *Oecetis martinae*, new species. A—forewing. B—hind wing. C—male genitalia, dorsal view. D—male genitalia, lateral view. E—male genitalia, ventral view. F—phallic apparatus, lateral view. G—phallic apparatus, dorsal view.



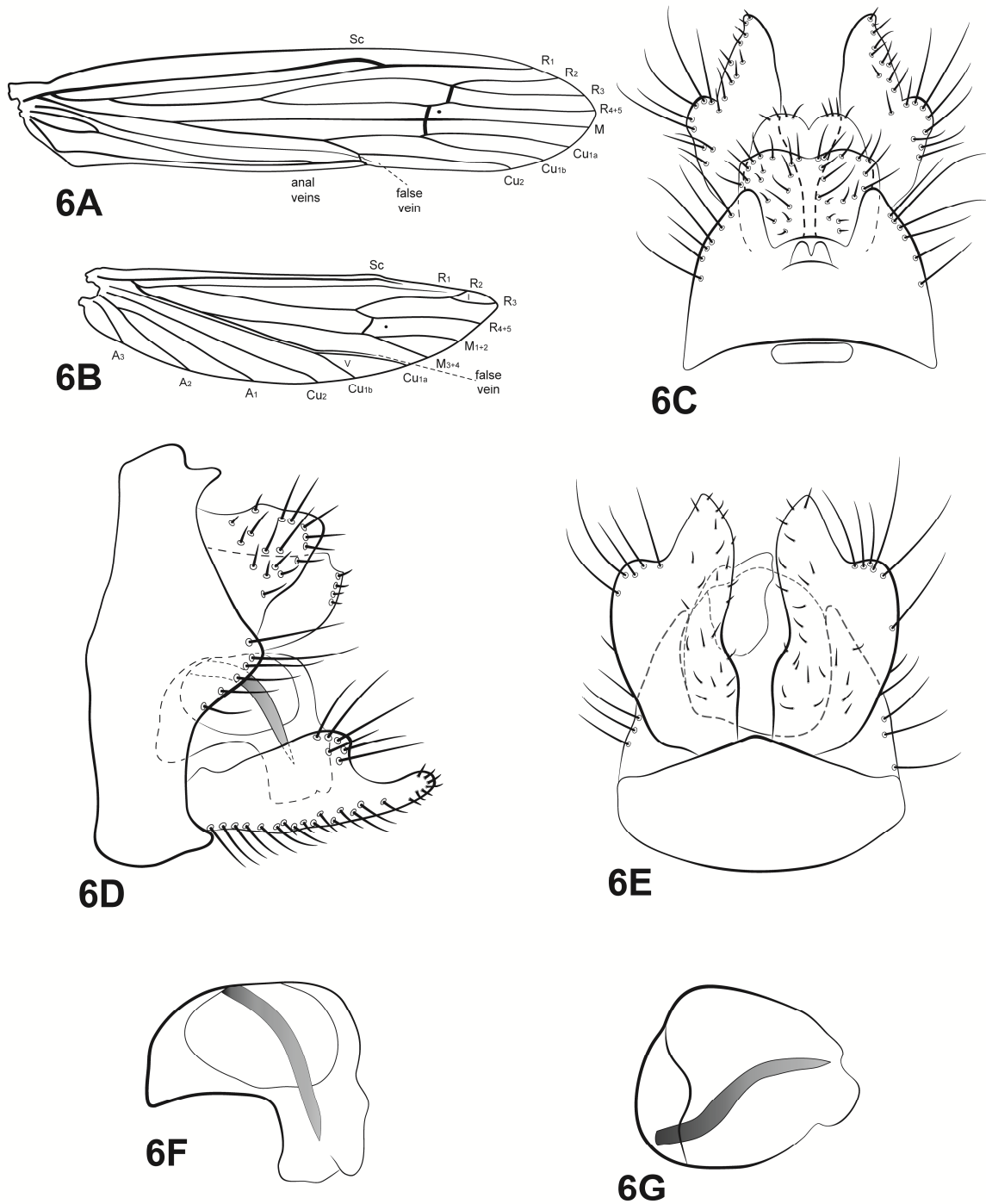
**FIGURE 3.** *Oecetis clavicornia*, new species. A—forewing. B—hind wing. C—male genitalia, dorsal view. D—male genitalia, lateral view. E—male genitalia, ventral view. F—phallic apparatus, lateral view. G—phallic apparatus, dorsal view.



**FIGURE 4.** *Oecetis furcata*, new species. A—forewing. B—hind wing. C—male genitalia, dorsal view. D—male genitalia, lateral view. E—male genitalia, ventral view. F—phallic apparatus, lateral view. G—phallic apparatus, dorsal view.

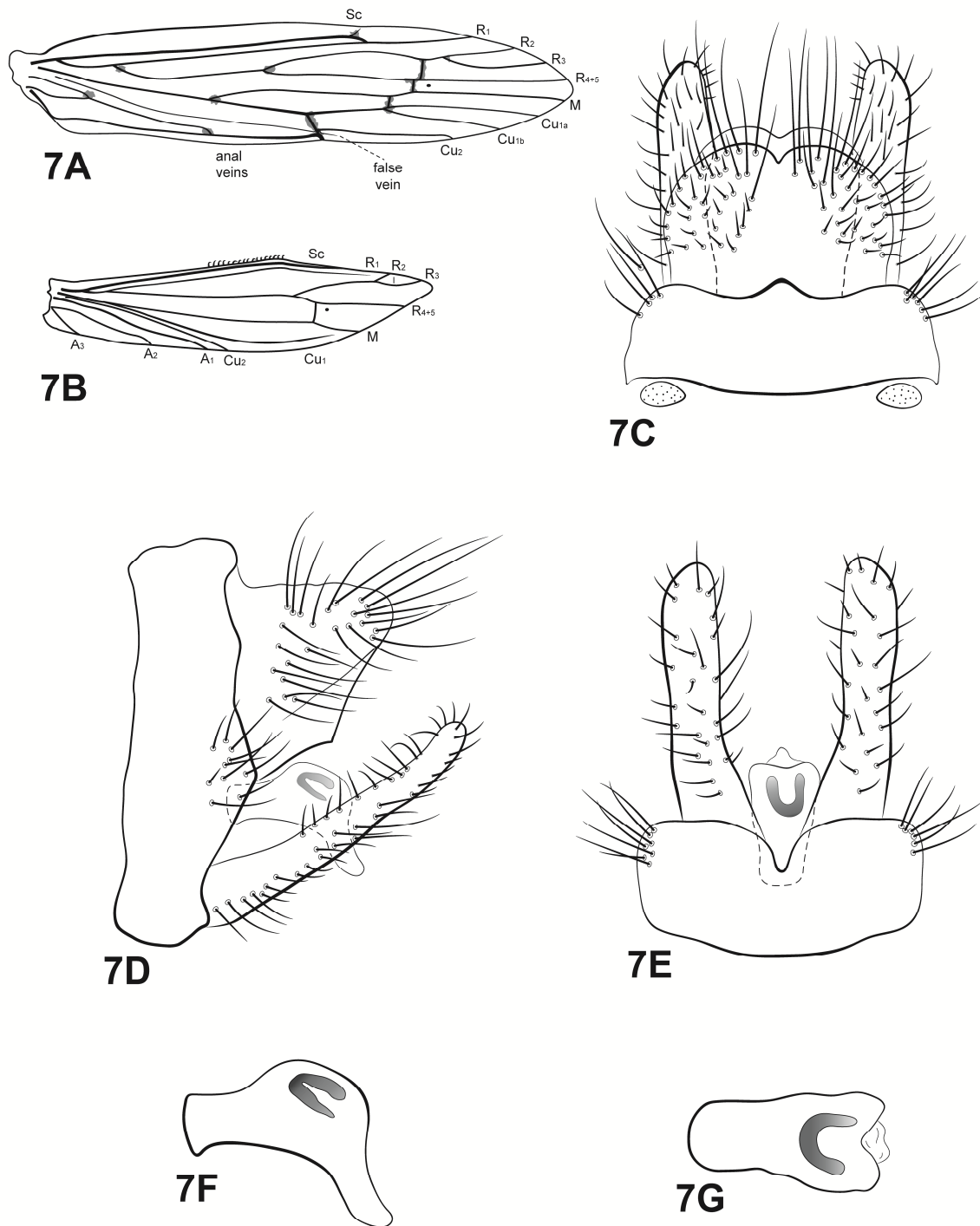


**FIGURE 5.** *Oecetis froehlichii*, new species. A–forewing. B–hind wing. C–male genitalia, dorsal view. D–male genitalia, lateral view. E–male genitalia, ventral view. F–phallic apparatus, lateral view. G–phallic apparatus, dorsal view.

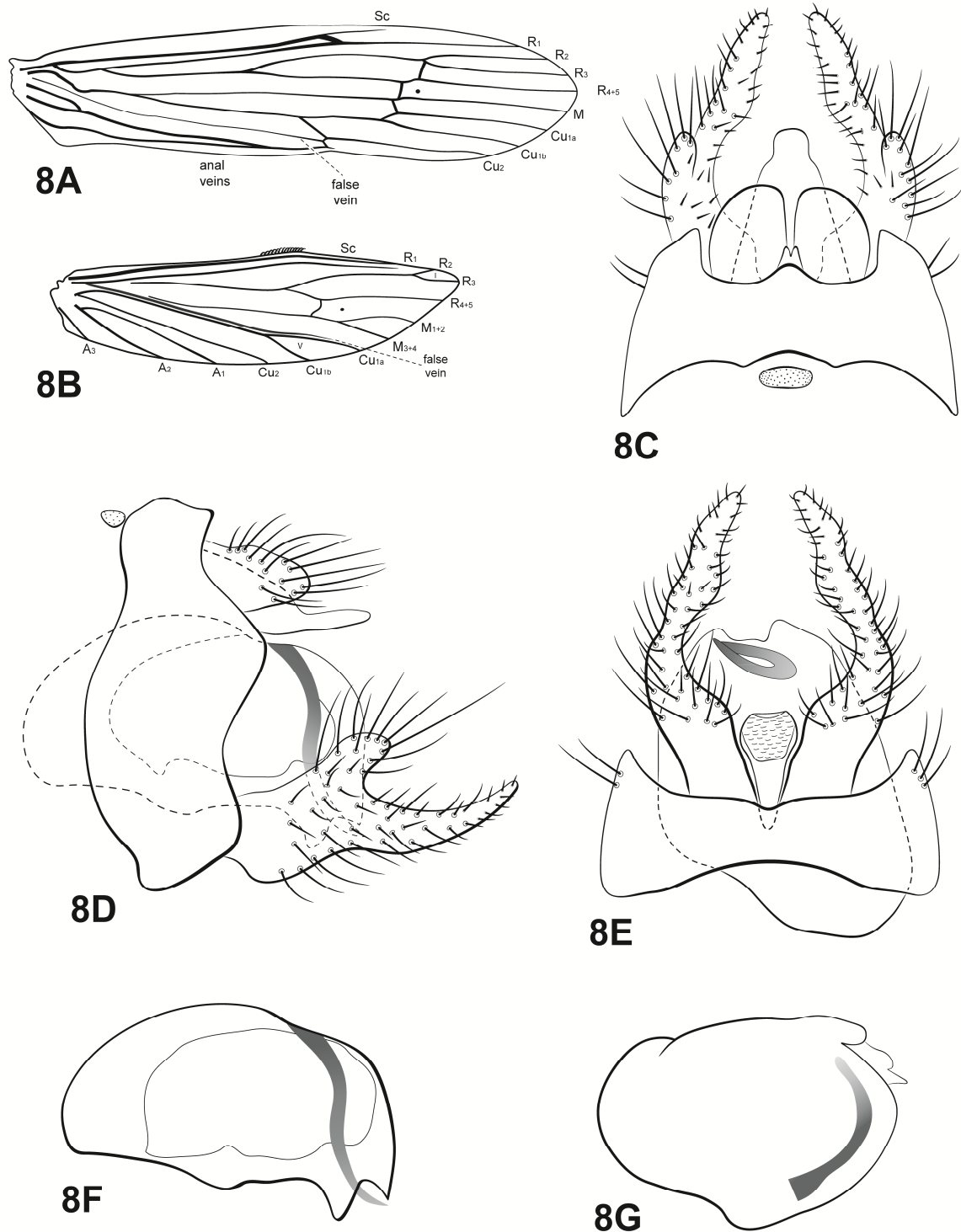


**FIGURE 6.** *Oecetis amazonica* Banks. A—anterior wing. B—posterior wing. C—male genitalia, dorsal view. D—male genitalia, lateral view. E—male genitalia, ventral view. F—phallic apparatus, lateral view. G—phallic apparatus, dorsal view.

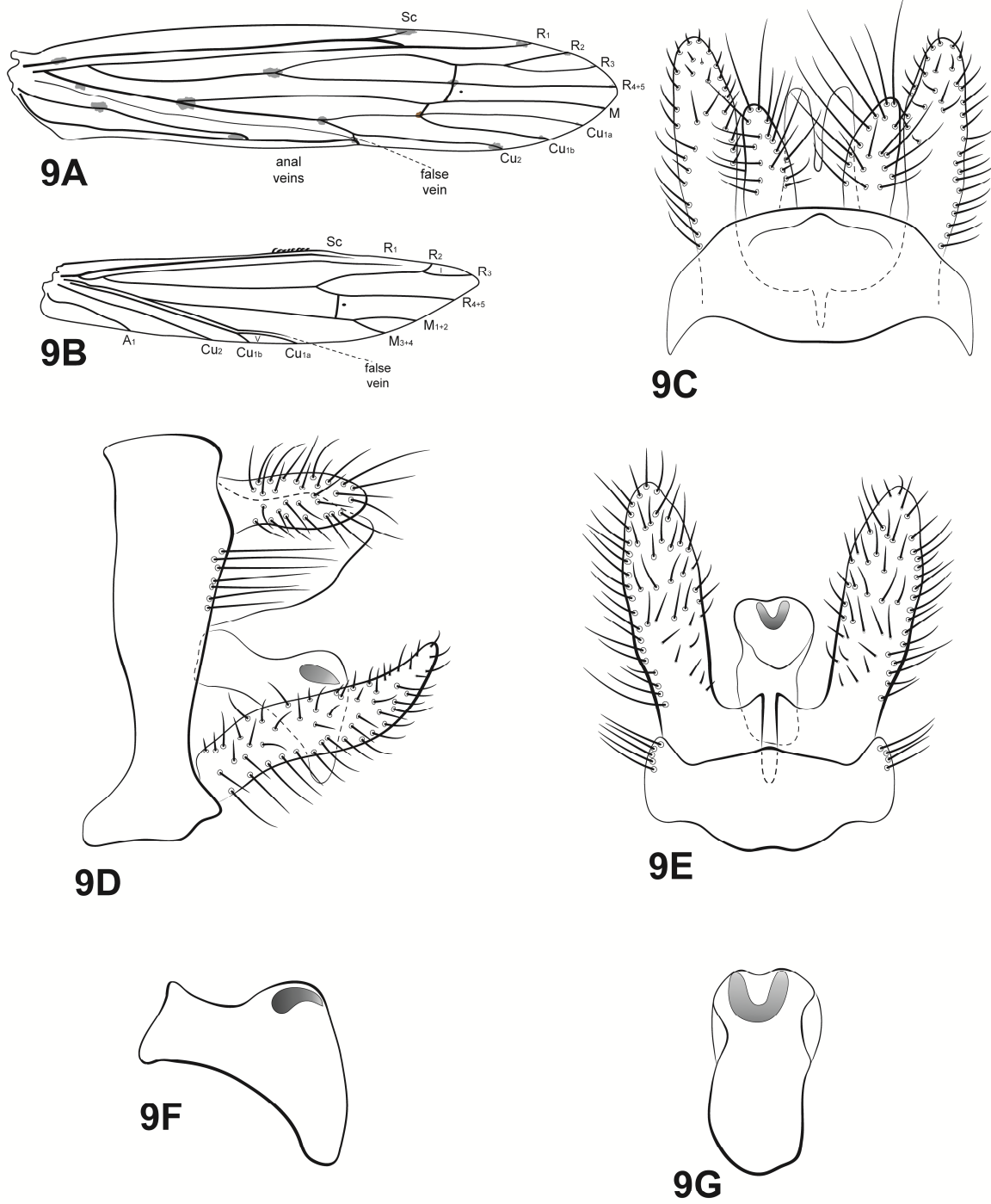




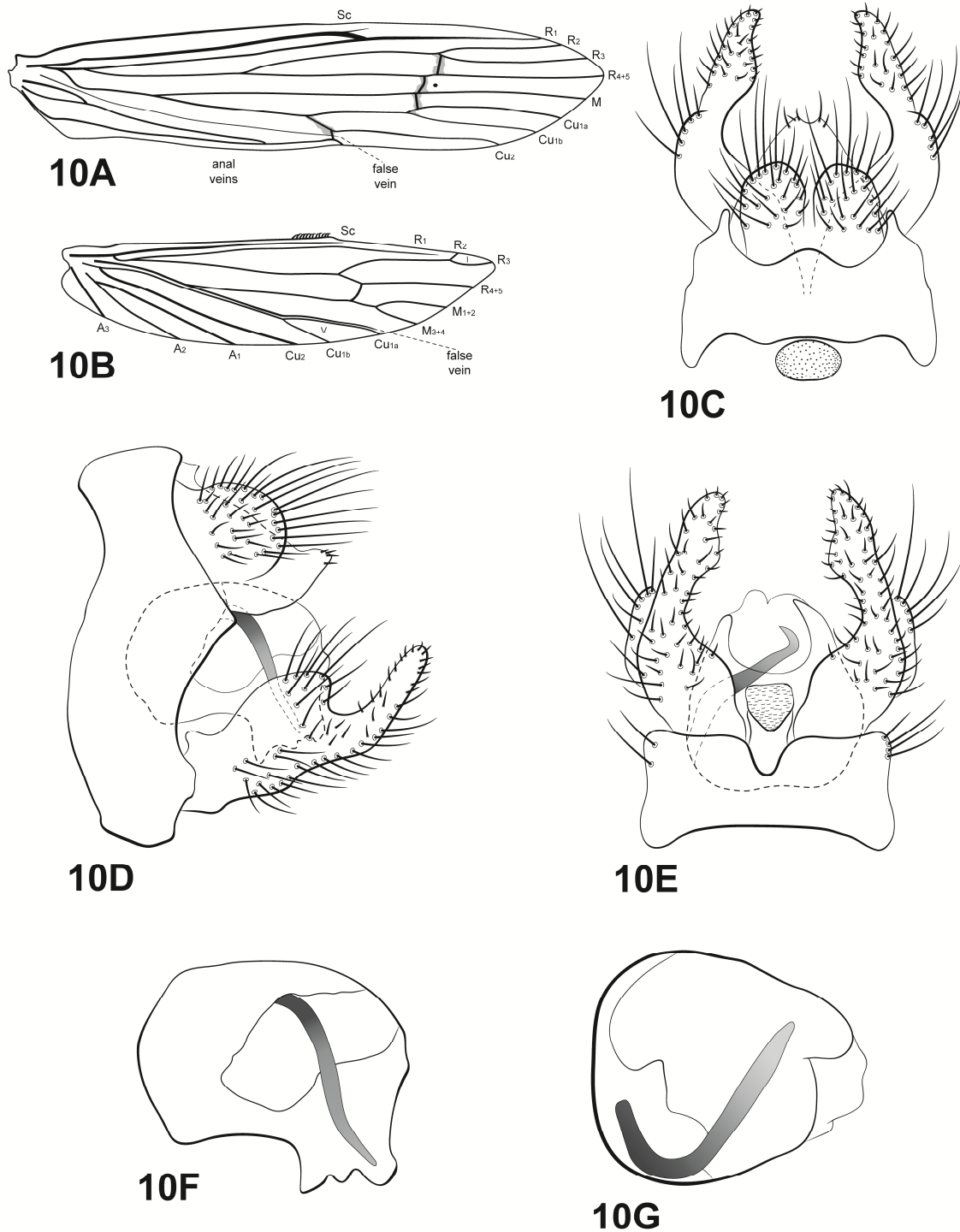
**FIGURE 7.** *Oecetis connata* Flint. A—forewing. B—hind wing. C—male genitalia, dorsal view. D—male genitalia, lateral view. E—male genitalia, ventral view. F—phallic apparatus, lateral view. G—phallic apparatus, dorsal view.



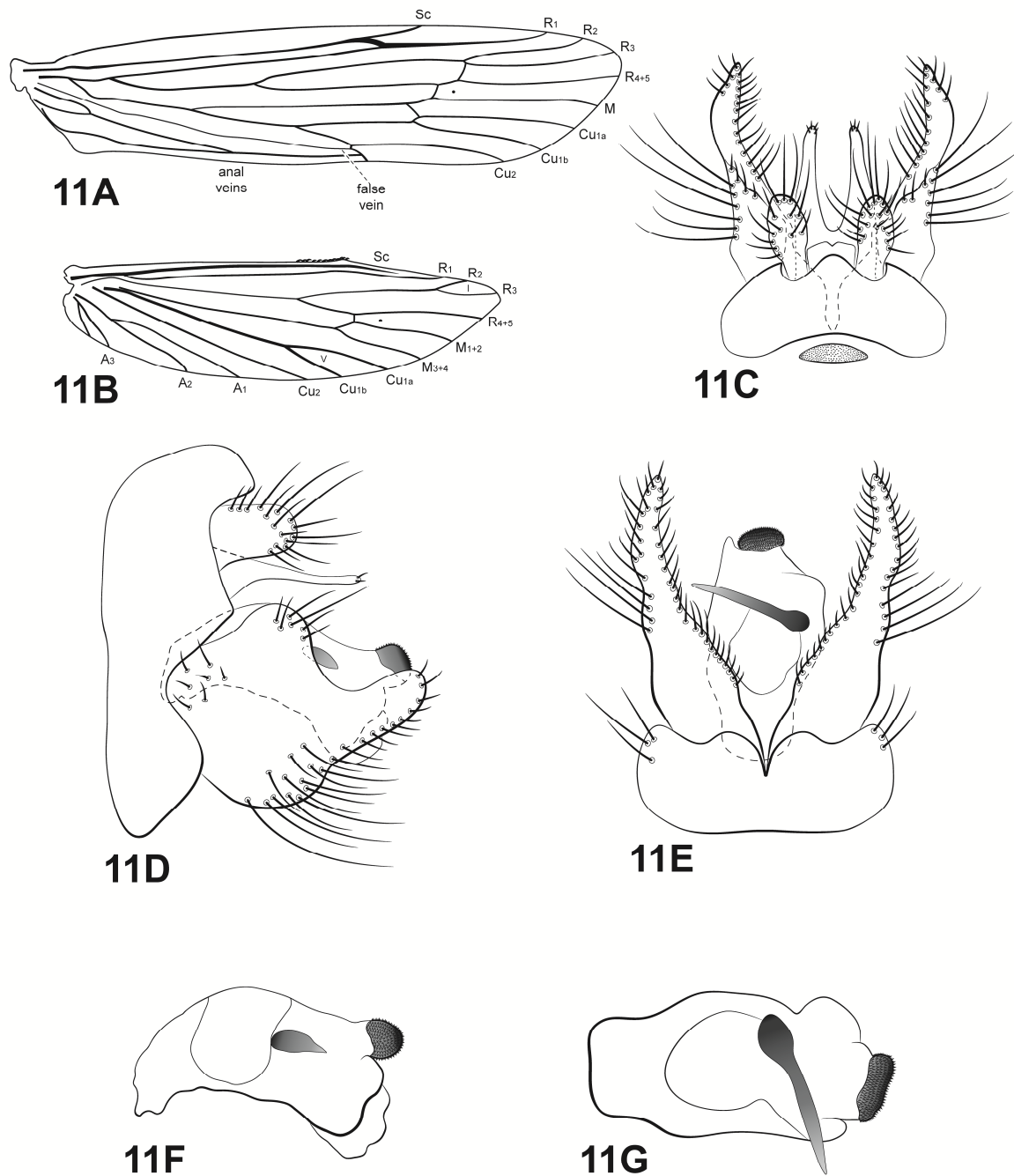
**FIGURE 8.** *Oecetis excisa* Ulmer. A—forewing. B—hind wing. C—male genitalia, dorsal view. D—male genitalia, lateral view. E—male genitalia, ventral view. F—phallic apparatus, lateral view. G—phallic apparatus, dorsal view.



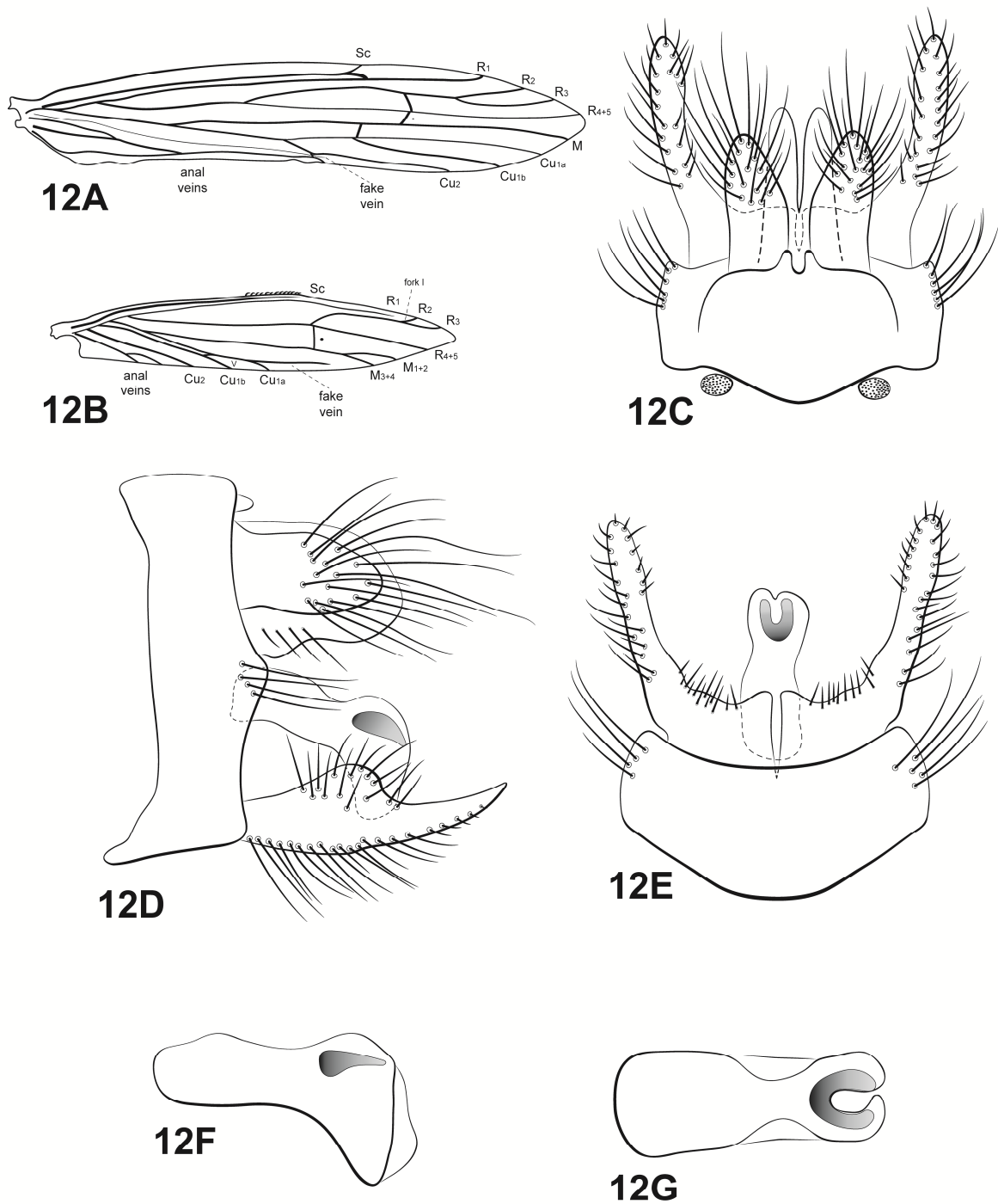
**FIGURE 9.** *Oecetis iguazu* Flint. A–forewing. B–hind wing. C–male genitalia, dorsal view. D–male genitalia, lateral view. E–male genitalia, ventral view. F–phallic apparatus, lateral view. G–phallic apparatus, dorsal view.



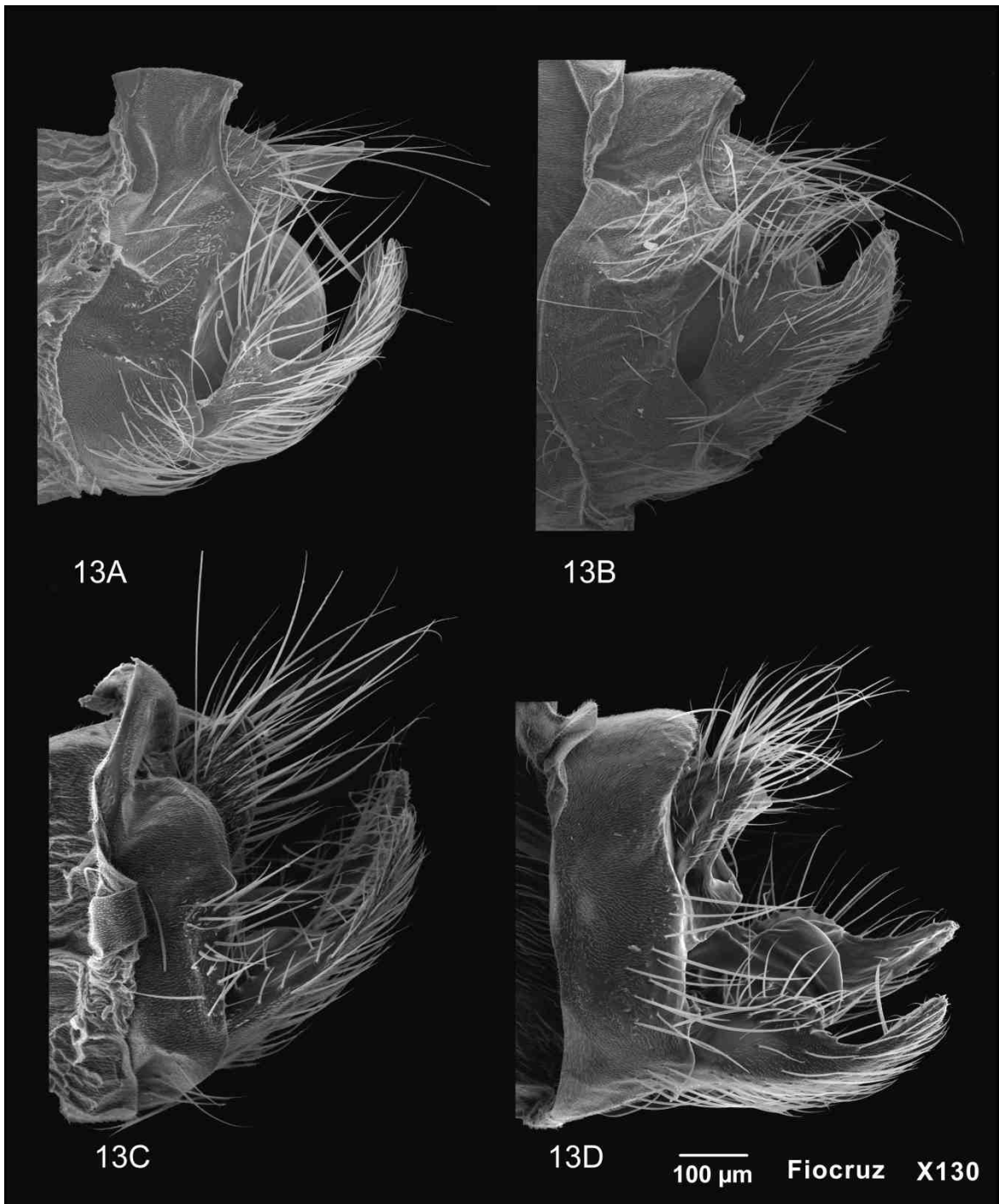
**FIGURE 10.** *Oecetis inconspicua* (Walker). A—forewing. B—hind wing. C—male genitalia, dorsal view. D—male genitalia, lateral view. E—male genitalia, ventral view. F—phallic apparatus, lateral view. G—phallic apparatus, dorsal view.



**FIGURE 11.** *Oecetis paranensis* Flint. A—forewing. B—hind wing. C—male genitalia, dorsal view. D—male genitalia, lateral view. E—male genitalia, ventral view. F—phallic apparatus, lateral view. G—phallic apparatus, dorsal view.



**FIGURE 12.** *Oecetis punctipennis* (Ulmer). A—forewing. B—hind wing. C—male genitalia, dorsal view. D—male genitalia, lateral view. E—male genitalia, ventral view. F—phallic apparatus, lateral view. G—phallic apparatus, dorsal view.



**FIGURE 13.** Sweeping Electron Microscope of four *Oecetis* species. A—*Oecetis excisa* Ulmer, male genitalia, lateral view. B—*Oecetis inconspicua* (Walker), male genitalia, lateral view. C—*Oecetis iguazu* Flint, male genitalia, lateral view. D—*Oecetis punctipennis* (Ulmer), male genitalia, lateral view.

## Capítulo 2

---

Este capítulo apresenta o manuscrito intitulado “A new species of *Oecetis* McLachlan, 1877 (Trichoptera: Leptoceridae) from Southeast Brazil” a ser submetido ao periódico científico *Zootaxa*.



**A new species of *Oecetis* McLachlan, 1877 (Trichoptera: Leptoceridae)  
from Southeast Brazil**

**FÁBIO B. QUINTEIRO<sup>1</sup> & ADOLFO R. CALOR<sup>1</sup>**

<sup>1</sup>*Universidade Federal da Bahia, Instituto de Biologia, Departamento de Zoologia, PPG  
Diversidade Animal, Laboratório de Entomologia Aquática (LEAq). Rua Barão de  
Jeremoabo, 147, campus Ondina, Ondina, CEP 40170-115, Salvador, Bahia, Brazil.  
E-mail: fabiobquinteiro@gmail.com; acalor@gmail.com*

**Abstract**

*Oecetis* McLachlan is the most specious genus within Leptoceridae Leach. It presents more than 400 species distributed over the world except Antarctica. The genus is easily recognized by its apparently unbranched M vein on fore wings, character that McLachlan used to establish this genus from *Setodes*. Milne divided the genus into four subgenera, being *Quaria* one of them. The males of this subgenus are recognized by their proeminent dorsolateral processes from seg. IX in lateral view. Chen, on his unpublished PhD thesis, recovered this subgenus and erected three others under a phylogenetic analysis. Herein we describe a new species collected in Southeast Brazil based on male specimens. This species was described by Chen but not published. The new species is recognized by its dorsolateral process on segment IX slender, curved ventrad with the same length of the phallic apparatus and its inferior appendages with distal lobe cylindrical.

**Keywords:** adults, caddisflies, ICZN, Neotropical, taxonomy.

## Introduction

*Oecetis* McLachlan, 1877 is the most specious genus within Leptoceridae Leach. It presents more than 400 species distributed over the world except Antarctica (Holzenthal *et al.*, 2007). These caddisflies are frequently found in lentic and lotic habitats (Wiggins, 1996) and even in arid lands in Australia (Wells, 2004). The larvae are characterized by its long and sharp mandibles, which identify them as predators, and also long maxillary palps (Wiggins, 1996).

The genus was first recognized by McLachlan, who separated it from *Setodes* using as differential diagnostic character the M vein on forewings apparently unbranched. But he did not established a type species, which Ross (1944) made, selecting *O. ochracea*.

Milne (1934) divided *Oecetis* in 4 subgenera: *Quaria*, *Friga*, *Yrulea* and *Oecetodes*, based on the shape and length of inferior appendages. He established *O. scala* as the type species for subgenus *Quaria*. From the four subgenera erected by Milne, Chen (1993) recovered only *Quaria* on his unpublished data based on two synapomorphies: dorsal internal part of female gonopod VIII fused with its spermathecal sclerite and a homologous dorsolateral projection of male segment IX prominent in lateral view. Also, he proposed other three subgenera: *Pseudosetodes*, *Oecetis* and *Pleurograpta*.

Among the seven species of *Oecetis* recorded by Flint *et al.* (1999) from the Neotropical region, only two of them (*O. paranensis* and *O. rafaeli*) belong to *Quaria* subgenus plus two new species in preparation for the same authors of this paper.

Herein we describe one new species recorded for Southeast Brazil, based on male specimens with notes on its distribution. This species was presented by Chen (1993) but not published. The species epithet is the same Chen named in order to avoid the

invalidation of the name (ICZN 1999, Recommendation 51E) and to recognize his work on *Oecetis*.

### **Material and methods**

Specimens were collected using light traps and Malaise traps and stored in 80% alcohol or pinned. Genitalia were cleared using a 85% lactic acid solution (Blahnik *et al.*, 2007) or KOH 10% solution, and stored in microvials containing glycerin, as discussed in Holzenthal & Andersen (2004) and Blahnik & Holzenthal (2004). Illustrations were made using a microscope with a drawing tube attached. Improvements on illustrations were made using the softwares Adobe® Photoshop® CS and Adobe® Illustrator® CS 5. Morphological terminology follows Schmid (1998) implemented by Holzenthal & Andersen (2004). Type material will be deposited at Museu de Zoologia da Universidade de São Paulo (MZUSP), Museu de Zoologia da Universidade Federal da Bahia (UFBA) and Insect Museum, University of Minnesota (UMSP).

### **Taxonomy**

#### ***Oecetis fibra* Chen & Morse, new species (Fig. 1)**

This species was presented by Chen (1993) based on one specimen only, but the PhD thesis of Chen was not published. Dr. Morse, advisor of Chen, was contacted and he authorized us to formally describe the species based on more than one specimen, but we consider the original authors as Chen & Morse following the ICZN (1999, Recommendation 51E).

**Diagnosis:** the new species can be distinguished from the others of *Quaria* Milne, 1934, by the presence of a pair of sclerotized, cylindrical dorsolateral processes, bent ventrad on posterior half almost the same length as the phallic apparatus. Additional character is a long phallus with no projections and a long endotheca.

**Male:** body length 5.5 mm (n=6). Forewing length 6.7 mm (n=6).

Head: color pale yellow (alcohol). Antennae very long, about 3 times the length of the forewings; scape stout; pedicel cylindrical. Maxillary palps pale yellow, densely covered by setae, 5-segmented, all segments sub equal in length and width. Labial palps pale yellow, 4-segmented.

Thorax: pale yellow. Forewings flat, without spots or bands (Fig. 1A). Hind wings with forks I, III and V (Fig. 1B); row of long setae along the base of posterior margin present. Legs pale yellow. Mid leg with a longitudinal row of spines over the inner distal half of the femur, all along the tibia and the tarsal segments. Tibial spurs formula 0,2,2.

Abdomen: membranous. No modifications on segments I–VIII. Segment IX annular and narrow bearing a pair of dorsolateral processes cylindrical, bent ventrad on mid portion, tapering posteriorly, the same length of the phallic apparatus in lateral view (Fig. 1D).

Preanal appendage cylindrical, apex digitate, barely exceeding the length of tergum X, setose; rod-like process above tergum X, between preanal appendages, slightly longer than the preanal appendages, apex with small setae in dorsal view (Fig. 1C). Tergum X membranous, divided medially by v-shaped incision, forming two processes apically, broad basally and acute apically in dorsal view (Fig. 1C). Inferior appendage 1-segmented, long, broad basally and posterior portion digitate, setose; presence of a small rounded hump on basis, dorsally, in lateral view (Fig. 3D); ventral lobe quadrat, smooth, in lateral

view (Fig. 3D). Phallic long, slightly asymmetrical (Fig. 1G), almost the same length of dorsolateral processes of tergum IX, bent ventrad (Fig. 1F).

Larvae and pupae unknown.

**Material examined. Holotype: Brazil: São Paulo:** Salesópolis, Estação Biológica Boracéia, Córrego Venerando, 09.xii.2005, light trap U.V./white lights, Froehlich, C.G. *et al.* – 1 male (alcohol; MZUSP). **Paratypes:** same data as holotype except Pedregulho, Furnas São Pedro, 22.vi.2010, Mateus, S, Lecci, L.S.– 1 male (alcohol; MZUSP); same as except Bertioiga, waterfall at the end of Torre 47 path, 17.ix.2006, light trap U.V./white lights, Calor, A., Roque, F., Siqueira, T.– 4 males (alcohol; UFBA, UMSP).

Chen (1993) presented this species based on only one specimen labeled with this data “*Casa Grande, SP., pedreira, a luz, 15-xi-1974, C.G. Froehlich (USNM/NMNH).*” As cited in the PhD thesis. It is the same locality from the holotype we propose here.

Distribution: Brazil (São Paulo State).

**Etymology:** name is given by Chen (1993) from Latin means “thread, filament, sinew” referring to the shape of the dorsolateral process of tergum IX narrow and thread-like.

**Taxonomic remarks**

Based on the presence of the dorsolateral processes on segment IX, it is possible to say that this species belong to *Quaria* subgenus (*sensu* Chen, 1993). Other character that makes this evident is the developed phallic apparatus in opposition to *Oecetis avara* (Banks) or *Oecetis punctipennis* (Ulmer), for example. Although characters like the cylindrical preanal appendages and the rod-like process over the tergum X are usual for the subgenus, as seen in *Oecetis falicia* Denning and *Oecetis prolongata* Flint, the shape of the phallic apparatus, the inferior appendages and the dorsolateral process make this species different of any other species.

Comparing this species with *O. paranensis* and *O. rafaeli*, the species recorded in Brazil that belong to *Quaria* subgenus (*sensu* Chen, 1993), it is possible to observe several differences. *Oecetis paranensis* has a triangular process on segment IX, while *O. fibra* has a thread-like process on segment IX. Moreover, *O. paranensis* has a shorter inferior appendage and phallic apparatus when compared to *O. fibra* and presents a straight paramere spine, which is absent in *O. fibra*.

Comparing the new species with *Oecetis rafaeli*, it is possible to observe that the later species has a straight dorsolateral process on segment IX, while *O. fibra* has a curved ventrad one. Moreover, the preanal appendage of *O. rafaeli* is small and stout, while the new species has a cylindrical and digitate one. *Oecetis rafaeli* also has a individed tergum X and the presence of paramere spine in the phallic apparatus, while *Oecetis fibra* has a divided tergum X and paramere spine absent.

### **Acknowledgements**

The authors would like to thank Dr. John C. Morse (Clemson University) for encouraging us to validate *O. fibra*. We would also like to thank Dr. Ralph Holzenthal (University of Minnesota) and Dr. Humberto Mendes (Universidade Federal do ABC) for critical analysis

of the manuscript. We also thank Dr. Carla Menegola (Laboratório de Porifera, UFBA) for loan of optical equipment. This work was supported by a FAPESB (process 1668/2010) fellowships and CAPES-PROAP/PPGDA to FBQ, FAPESB grant (process nº 5716/2009), and CNPQ grants (process 473703/2010-6, process 552525/2010-3, PPBIO Semi-árido, process 558317/2009-0).

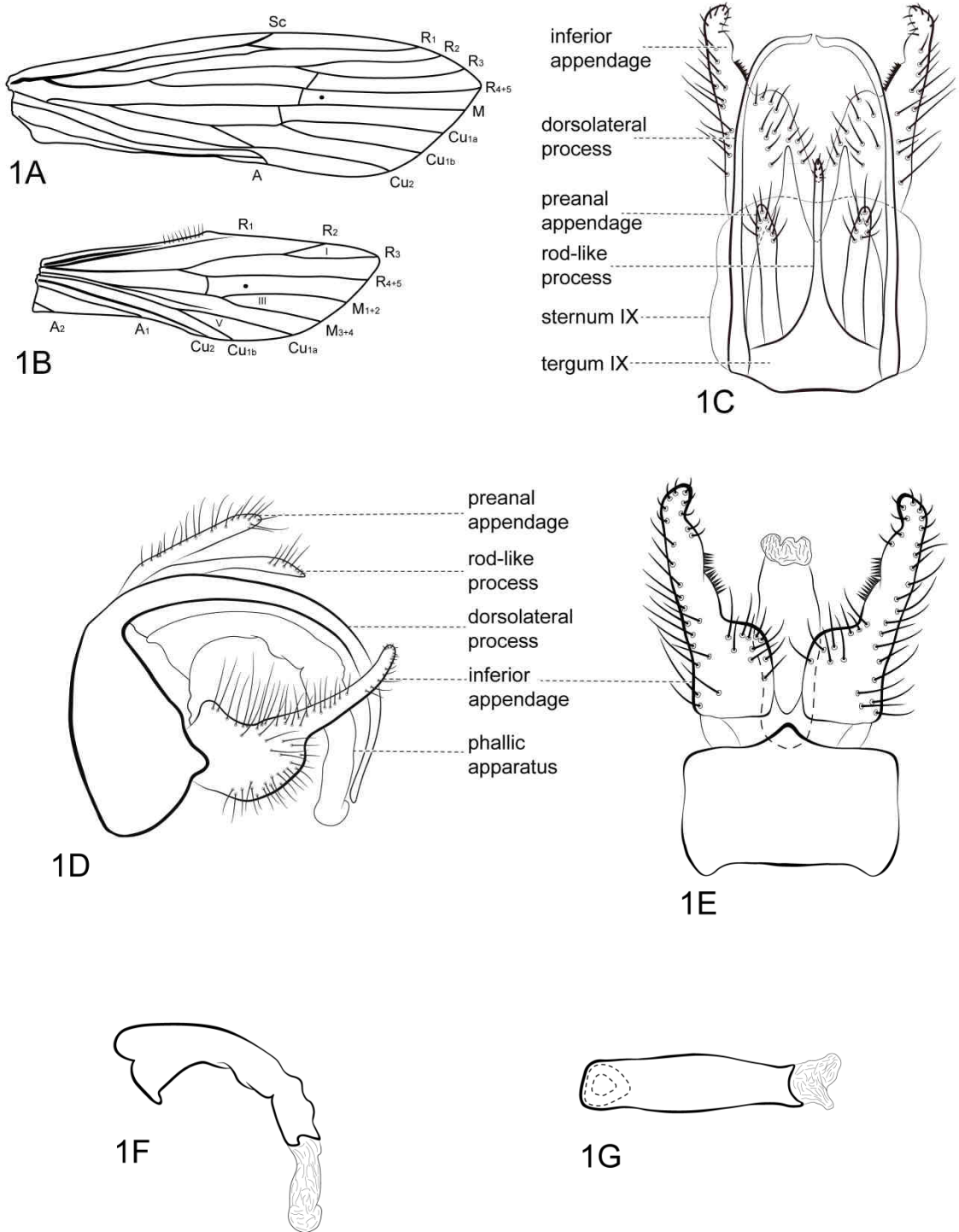
## References

- Blahnik, R.J. & Holzenthal, R.W. (2004) Collection and curation of Trichoptera, with an emphasis on pinned material. *Nectopsyche, the Neotropical Trichoptera Newsletter*, 1, 8–20. Available from <http://www.entomology.umn.edu/museum/links/news.html> (accessed Jan, 24<sup>th</sup>, 2012.)
- Blahnik, R.J., Holzenthal, R.W. & Prather, A.L. (2007) The lactic acid method for clearing Trichoptera genitalia. *In*: Bueno-Soria, J., Barba-Álvarez, R. & Armitage, B. (Eds.) *Proceedings of the 12th International Symposium on Trichoptera*. Columbus, Ohio, The Caddis Press, pp. 9–14.
- Chen, Y.E. (1993) Revision of the *Oecetis* (Trichoptera: Leptoceridae) of the World. Unpublished PhD Thesis, Clemson University, South Carolina, USA, 1408 pp.
- Flint, O.S. Jr., Holzenthal, R.W. & Harris, S.C. (1999) *Catalog of the Neotropical Caddisflies (Insecta: Trichoptera)*. Ohio Biological Survey, Columbus, Ohio, 239 pp.
- International Commission for Zoological Nomenclature (1999) International Code of Zoological Nomenclature. 4<sup>th</sup> edition. International Trust for Zoological Nomenclature 1999. Available from: <<http://www.nhm.ac.uk/hosted-sites/iczn/code/>> (Accessed April, 23<sup>th</sup>, 2012).
- Holzenthal, R.W. & Andersen, T. (2004) The caddisfly genus *Triaenodes* in the Neotropics (Trichoptera: Leptoceridae). *Zootaxa*, 511, 1–80.
- Holzenthal, R.W., Blahnik, R.J., Prather, A.L. & Kjer, K.M. (2007) Order Trichoptera Kirby, 1813 (Insecta), Caddisflies. *In*: Zhang, Z.Q. & Shear, W.A. (Eds.), *Linnaeus Tercentenary: Progress in Invertebrate Taxonomy*. *Zootaxa*, 1668, 639–698.

- McLachlan, R. (1877) *A monographic revision and synopsis of the Trichoptera of the European fauna* (1874–1880). John van Voorst, London, Part VII, pp. 349–428.
- Milne, L.J. (1934) *Studies in North American Trichoptera*. Part 1. Cambridge, Massachusetts, 1–19 pp.
- Ross, H.H. (1944) The caddis flies, or Trichoptera, of Illinois. *Illinois Natural History Survey Bulletin*, 23, 1–326.
- Schmid, F. (1998) *The Insects and Arachnids of Canada. Part 7. Genera of the Trichoptera of Canada and Adjoining or Adjacent United States*. NRC Research Press, Ottawa, Ontario, Canada, 319 pp.
- Wells, A. (2004) The long-horned caddisfly genus *Oecetis* (Trichoptera: Leptoceridae) in Australia: two new species groups and 17 new species. *Memoirs of Museum Victoria*, 61, 85–110.
- Wiggins, G.B. (1996) *Larvae of the North American Caddisflies Genera (Trichoptera)*. 2nd Edition. University of Toronto Press, Toronto & Buffalo, 457 pp.



**FIGURE**



**FIGURE 1.** *Oecetis fibra* Chen & Morse, 1993. A—forewing. B—hind wing. C—male genitalia, dorsal view. D—male genitalia, lateral view. E—male genitalia, ventral view. F—phallic apparatus, lateral view. G—phallic apparatus, dorsal view.

## Considerações Finais

---

A falta de conhecimento taxonômico acerca dos insetos aquáticos na Região Nordeste do Brasil pode ser evidenciada pela ampliação tanto de registros como de novas espécies. No caso do gênero *Oecetis*, onde havia apenas um registro (*O. punctipennis* no Estado da Bahia), agora temos registros de 12 espécies do gênero, sendo cinco novas. Apesar do maior número de estudos em outras regiões do país, também é esperado um aumento do número de espécies, visto os táxons apresentados por Chen (1993), incluindo *O. fibra*, aqui apresentada.

No tocante a distribuição das espécies do gênero *Oecetis*, pôde ser visto que com a ampliação dos estudos, diversas espécies descritas com distribuição restrita, na verdade, apresentam distribuição ampla. Assim, a ampliação do esforço amostral poderá contribuir para a compreensão dos reais limites distribucionais das espécies.

A padronização das descrições das espécies de *Oecetis* esbarrava-se nas diferentes interpretações da ramificação da veia M, entretanto, o possível consenso “Veia M não se ramifica ao longo da asa anterior de *Oecetis*”, caráter singular entre os Trichoptera, poderá, através de estudos filogenéticos, revelar mais uma sinapomorfia para o gênero.

Ainda pode ser afirmado que as micrografias, advindas de Microscopia Eletrônica de Varredura (SEM), revelaram-se boas fontes de informação para resolução de problemas taxonômicos, especialmente no caso de *Oecetis*, com espécies definidas por características diagnósticas com diferenças bastante sutis. Eventualmente, essa tecnologia, se usada com fêmeas e imaturos, poderia revelar detalhes que passavam despercebidos à microscopia óptica convencional, tornando possível a identificação em nível específico destes semaforontes.

## Referências bibliográficas (gerais)

---

- BUENO-SORIA, J. Estudios en insectos acuáticos de México I. Trichoptera (Leptoceridae). Cinco nuevas especies de *Oecetis* McLachlan. *Folia Entomologica Mexicana*, v. 49, p. 103–120, 1981.
- CALOR, A. R. Checklist dos Trichoptera (Insecta) do Estado de São Paulo, Brasil. *Biota Neotropica*, v. 11, n. 1a, p. 317–328, 2011. Disponível em: <<http://www.biotaneotropica.org.br/v11n1a/pt/abstract?inventory+bn0311101a2011>> Acesso em: 24 jan. 2012
- CALOR, A. R.; HOLZENTHAL, R. W. Phylogeny of Grumichellini Morse, 1981 (Trichoptera: Leptoceridae) with the description of a new genus from southeastern Peru. *Aquatic Insects*, n. 30, p. 245–259, 2008.
- CHEN, Y. E. Revision of the *Oecetis* (Trichoptera: Leptoceridae) of the World. South Carolina: Clemson University, Unpublished PhD Thesis, USA, 1993. 1408 p.
- DE MOOR, F. C.; IVANOV, V. D. Global diversity of caddisflies (Trichoptera: Insecta) in freshwater. *Hydrobiologia*, n. 595, p. 393–407, 2008.
- DUMAS, L. L.; SANTOS, A. P. M.; JARDIM, G. A.; FERREIRA Jr., N.; NESSIMIAN, J. L. Insecta, Trichoptera: New records from Brazil and other distributional notes. *Check List*, v. 6, n. 1, p. 7–9, 2010.
- ESKOV, K. Y.; SUKATCHEVA, I. D. Geographical distribution of the Paleozoic and Mesozoic caddisflies (Insecta: Trichoptera). In: *Proceedings of the 8th International Symposium on Trichoptera*. Columbus, Ohio, Ohio Biological Survey, 1997. p. 95–98.
- FLINT, O. S., Jr. Trichoptera of the area Platense. *Biologia Acuatica*, v. 2, p. 1–70, 1982.
- FLINT, O. S., Jr.; HOLZENTHAL, R. W.; HARRIS, S. C. *Catalog of the Neotropical Caddisflies (Trichoptera)*. Columbus, Ohio, Special Publication, Ohio Biological Survey, 1999. 239 p.
- FRANIA, H. E.; WIGGINS, G. B. Analysis of morphological and behavioural evidence for the phylogeny and higher classification of Trichoptera (Insecta). *Life Sciences Contributions*. Royal Ontario Museum. n. 160, p. 1–67, 1997.

- GRIMALDI, D.; ENGEL, M. S. *Evolution of the Insects*. New York, Cambridge University Press, 2005. 772 p.
- HOLZENTHAL, R. W. The Neotropical species of *Notalina*, a southern group of long-horned caddisflies (Trichoptera: Leptoceridae). *Systematic Entomology*, n. 11, p. 61–73, 1986.
- HOLZENTHAL, R. W.; BLAHNIK, R. J.; KJER, K. M.; PRATHER, A. P. An update on the phylogeny of caddisflies (Trichoptera). In: *Proceedings of the 12th International Symposium on Trichoptera*. Columbus, Ohio, The Caddis Press, 2007a. p. 143–153.
- HOLZENTHAL, R. W.; BLAHNIK, R. J.; PRATHER, A. L.; KJER, K. M. Order Trichoptera Kirby, 1813 (Insecta), Caddisflies. In: Zhang, Z. Q. & Shear, W. A. (Eds.), Linnaeus Tercentenary: Progress in Invertebrate Taxonomy. *Zootaxa*, n. 1668, p. 639–698, 2007b.
- IVANOV, V. D. Rhyacophiloidea: a paraphyletic taxon. In: *Proceedings of the 8th International Symposium on Trichoptera*. Columbus, Ohio, Ohio Biological Survey, 1997. p. 189–193.
- KIRBY, W. Strepsiptera, a new order of insects proposed; and the characters of the order, with those of its genera, laid down. *Transactions of the Linnean Society*, n. 11, p. 86–122, 1813.
- KJER, K. M.; BLAHNIK, R. J.; HOLZENTHAL, R. W. Phylogeny of Trichoptera (Caddisflies): Characterization of signal and noise within multiple datasets. *Systematic Biology*, n. 50, p. 781–816, 2001.
- KJER, K. M.; BLAHNIK, R. J.; HOLZENTHAL, R. W. Phylogeny of caddisflies (Insecta, Trichoptera). *Zoologica Scripta*, n. 31, p. 83–91, 2002.
- LEACH, W. E. Entomology. In: *Brewster's Edinburgh Encyclopedia*. v. 9, 1815. p. 52–172.
- MARTYNOV, A. V. Caddisflies (Trichoptera). In: *Practical Entomology*. v. 5, 1924. 384 p.
- MCLACHLAN, R. *A monographic revision and synopsis of the Trichoptera of the European fauna* (1874–1880). John van Voorst, London, Part vii, 1877. p. 349–428.

- MORSE, J. C. A phylogeny and revision of the caddisfly genus *Ceraclea* (Trichoptera, Leptoceridae). *Contributions of the American Entomological Institute*, v. 11, p. 1–97, 1975.
- MORSE, J. C. A phylogeny and classification of family-group taxa of Leptoceridae (Trichoptera). In *Proceedings of the 3rd International Symposium on Trichoptera*. W. Junk. Series Entomologia, n. 20, 1981. p. 257–264.
- MORSE, J. C. Phylogeny of Trichoptera. *Annual Review of Entomology*, n. 42, p. 427–50, 1997.
- MORSE, J. C. Insecta: Trichoptera. In: *Freshwater Invertebrates of the Malaysian Region. Academy of Sciences Malaysia*, 2004. p. 501–539.
- MORSE, J. C.; HOLZENTHAL, R. W. Higher classification of Triplectidinae (Trichoptera: Leptoceridae). In: *Proceedings of the 5th International Symposium on Trichoptera*. Dordrecht, The Netherlands, Dr. W. Junk, 1987. p. 139–144.
- MORSE, J. C. Trichoptera World Checklist.2012. Disponível em:<<http://entweb.clemson.edu/database/trichopt/index.htm>>. Acesso em: 24 jan. 2012.
- MUÑOZ-QUESADA, F.; HOLZENTHAL, R. W. A new species of *Xiphocentron* (*Antillotrichia*) from Costa Rica with semiterrestrial immature stages (Trichoptera: Xiphocentronidae). In: *Proceedings of the 8th International Symposium on Trichoptera*. Columbus, Ohio, Ohio Biological Survey, 1997. p. 355–363.
- PAPROCKI, H.; HOLZENTHAL, R. W.; BLAHNIK, R. J. Checklist of the Trichoptera (Insecta) of Brazil I. *Biota Neotropica*, v. 4, n. 1, p. 1–22, 2004.
- ROSS, H. H. The caddis flies, or Trichoptera, of Illinois. *Illinois Natural History Survey Bulletin*, v. 23, n. 1, p. 1–326, 1944.
- ROSS, H. H. The evolution and past dispersal of the Trichoptera. *Annual Review of Entomology*, n. 12, p. 169–206, 1967.
- TILLYARD, R. J. Upper Permian insects of New South Wales. Part i. Introduction and the Order Hemiptera. Part ii. The Orders Mecoptera, Paramecoptera, and Neuroptera. In: *Proceedings of the Linnean Society of New South Wales*, n. 51. p. 1–30. 1926.

- ULMER, G. Neuer Beitrag zur Kenntnis aussereuropäischer Trichopteren. *Notes from the Leyden Museum*, n. 28, p. 1–116, 1906.
- WEAVER, J. S., III. The evolution and classification of Trichoptera. Part I: the groundplan of Trichoptera. In: *Proceedings of the 4th International Symposium on Trichoptera*. The Hague, Dr. W. Junk, 1984. p. 413–419.
- WELLS, A. The long-horned caddisfly genus *Oecetis* (Trichoptera: Leptoceridae) in Australia: two new species groups and 17 new species. *Memoirs of Museum Victoria*, v. 61, p. 85–110, 2004.
- WIGGINS, G. B.; WICHARD, W. Phylogeny of pupation in Trichoptera, with proposals on the origin and higher classification of the order. *Journal of the North American Benthological Society*, n. 8, p. 260–276, 1989.

## Anexo I

---

Normas para publicação no periódico científico Zootaxa, disponíveis em  
<http://www.mapress.com/zootaxa/support/final-files.pdf>.

## Preparing final files for publication in Zootaxa

Please consult the **Information for Authors**: [www.mapress.com/zootaxa/author.html](http://www.mapress.com/zootaxa/author.html). If possible, use the common font **Times New Roman** for the main text and **use as little formatting as possible** (use only **bold** and *italics* where necessary; and indent the paragraphs from the second of each section). Special symbols (e.g. male or female sign) should be avoided because they are likely to be altered when files are converted. You are recommended to code males as m# and females as f#. We can replace them easily. Please provide the following information when submitting the final files to enable us to typeset and index your paper: a) name of corresponding author and email; b) family names of authors and preferred short running title (<60 alphabets); c) number of plates and cited references; and d) high taxon (as in Zootaxa sections) and number of new taxa described in the paper.

### Specific points to note:

- 1) Text of the manuscript.** Please save the file containing the text and tables as a ms word or RTF file. Do not double space or use footer/header. Captions of plates/figures should be inserted where you want your figures to be inserted, or listed at the end of the manuscript. Vector diagrams/charts generated in programs such as excel can be embedded in the text file as well.
- 2) Tables.** Please use the table function in your word processor to build tables so that the cells can be easily re-sized to fit the page by the typesetters. Never use the Tab key to type tables, nor use space bar to adjust space. If you did that, please correct them.
- 3) Figures.** Please note that the journal has a matter size of 25 cm x 17 cm (printable area of the main text and plates) and is printed on A4 paper. If the final size of your plates is greater than this, please crop extra white areas around plates or reduce it to this size; this will reduce file size. Plates containing only black&white lines/dots are line art works and must be scanned as such (i.e. 1 bit, monochrome line art) at 600 dpi (maximum 1200 dpi). They should be saved in tiff file and LZW compression is recommended to be used to reduce file size for easy sub-mission by e-mail. Plates containing greyscale drawings and photographs should be scanned at 300 dpi and saved in TIFF (use LZW compression) or jpeg at the highest quality. **Please do not modify photographs in the jpeg files; the print quality would be severely altered if you did that. You can modify files in the TIFF file and when completed, convert to high quality jpeg for submission.** If you have colour figures, it is best to group them together in plates, which will save cost.
- 4) Reference list.** This must be formatted using Zootaxa style (see below for examples of main types of papers): Please note that (1) **journal titles must be written in full (not abbreviated)**; (2) journal titles and volume numbers are followed by a “;”; (3) page ranges are connected by a “n dash”, not a hyphen “-”, which is used to connect two words. For websites, it is important to include the last date when you see that site, as it can be moved or deleted from that address in the future.
- 5) Submission of files.** Please send final files by e-mail (or ftp) to your subject editor who will then forward files of accepted versions to Zootaxa office. Plates (if many) may be sent directly to Zootaxa office if the subject editor agrees.

### Journal paper

Gusarov, V.I. (2002). A revision of Nearctic species of the genus *Geostiba* Thomson, 1858 (Coleoptera: Staphylinidae: Aleocharinae). *Zootaxa*, 81, 1–88.

### Book chapter

Newton, A.F., Thayer, M.K., Ashe, J.S. & Chandler, D.S. (2000) Staphylinidae Latreille, 1802. In: Arnett, R.H. & Thomas, M.C. (Eds.), *American Beetles. Vol.1. Archostemata, Myxophaga, Adepaga, Polyphaga: Staphyliniformia*. CRC Press, Boca Raton, pp. 272–418.

### Book

Baker, E.W. & Tuttle, D.M. (1994) *A Guide to Spider Mites (Tetranychidae) of the United States*. Indira Publishing House, West Bloomfield, Michigan, 347 pp.

### Internet resources

O'Connor, R.J., Dunn, E., Johnson, D.H., Jones, S.L., Petit, D., Pollock, K., Smith, C.R., Trapp, J.L. & Welling, E. (2000) A programmatic review of the North American Breeding Bird Survey: report of a peer review panel. U.S. Geological Survey Patuxent Wildlife Research Center, Laurel, Maryland. Available from <http://www.mp2-pwrc.usgs.gov/bbs/bbsreview/> (accessed 3 April 2003)

include the last date when you see that site, as it can be moved or deleted from that address in the future