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Taxonomia de *Stenochironomus* Kieffer, 1919 (Diptera: Chironomidae) da Amazônia

Belém, 2025

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Dissertação apresentada ao Programa de Pós-Graduação em Zoologia, do convênio da Universidade Federal do Pará e Museu Paraense Emílio Goeldi, como requisito parcial para obtenção do título de Mestre em Zoologia.
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“Na minha juventude, passei meu tempo investigando insetos”

Maria Sibylla Merian

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SUMÁRIO

RESUMO

Stenochironomus Kieffer, (Diptera: Chironomidae) é um grupo diverso e cosmopolita, cuja taxonomia é baseada principalmente na morfologia da genitália dos machos adultos. O gênero foi revisado por Borkent que elaborou chaves de identificação para larvas, pupas e adultos para as regiões Neártica, Neotropical e Paleártica. Além disso, o autor propôs a subdivisão do gênero em dois subgêneros com base na morfologia e no habitat dos estágios imaturos: *Stenochironomus* (*Petalopholeus*) Borkent, para espécies minadoras de folhas, e *Stenochironomus s. str.* Kieffer, para larvas minadoras de troncos. Existem cerca de 112 espécies de *Stenochironomus* distribuídas pelo mundo (exceto na Antártida), das quais 39 ocorrem na região Neotropical e 30 no Brasil, sendo 27 registradas na região Amazônica. Contudo, alguns estágios imaturos de *Stenochironomus* neotropicais ainda são desconhecidos: das 39 espécies descritas para a região, apenas 24 possuem pupas descritas e 18 possuem larvas descritas. Baseando-se nessa lacuna, o presente trabalho teve como objetivo geral realizar um estudo taxonômico sobre *Stenochironomus* na Amazônia. Para tanto, foi analisado material oriundo de coletas realizadas anteriormente pelo Laboratório de Citotaxonomia e Insetos Aquáticos (INPA) na Amazônia brasileira. A associação com os estágios imaturos foi possível a partir da coleta de folhas submersas colonizadas por larvas de *Stenochironomus*, que foram transportadas para criação em laboratório até a emergência dos adultos. Também foi analisado material proveniente de armadilhas Malaise e Pennsylvania. Como resultado foram descritas oito espécies novas para o gênero, das quais cinco foram descritas com base no macho, pupa e larva, uma descrita com base no macho e pupa, e duas com base apenas no macho. Além disso, a distribuição de *Stenochironomus figueiredoensis* Dantas, Hamada & Mendes, *Stenochironomus liviae* Dantas, Hamada & Mendes e *Stenochironomus roquei* Dantas, Hamada & Mendes foi ampliada para o estado do Acre. Assim, este trabalho contribui para o conhecimento taxonômico de *Stenochironomus* no Brasil, principalmente na Amazônia, aumentando o número de espécies conhecidas na região.

Palavras-chave: Biodiversidade; Insetos aquáticos; Chironominae; imaturos; Região Neotropical.

ABSTRACT

Stenochironomus Kieffer (Diptera: Chironomidae) is a diverse and cosmopolitan group whose taxonomy is mainly based on the morphology of adult male genitalia. This genus was revised by Borkent (1984), who developed identification keys for larvae, pupae, and adults from the Nearctic, Neotropical, and Palearctic regions. Additionally, the author proposed the subdivision of the genus into two subgenera based on the morphology and habitat of immatures and larvae: *Stenochironomus* (*Petalopholeus*) Borkent for leaf-mining species, and *Stenochironomus* s. str. Kieffer for trunk-mining larvae. There are approximately 112 species of *Stenochironomus* distributed worldwide (except in Antarctica), of which 39 occur in the Neotropical region and 30 in Brazil, with 27 recorded in the Amazon region. However, some immature stages of Neotropical *Stenochironomus* are still unknown: among the 39 species described for the region, 24 have described pupae, and 18 have described larvae. Based on this, the present work aims to conduct a taxonomic study of *Stenochironomus* from the Amazon. To this goal, material from previous collections conducted by the Laboratory of Aquatic Insect Cytotaxonomy (INPA) in the Brazilian Amazon was analyzed. The association with immature stages was made possible through the collection of submerged leaves colonized by *Stenochironomus* larvae, which were transported to the laboratory for rearing until the emergence of adults. Material collected using Malaise and Pennsylvania traps was also analyzed. As result, eight new species were identified for the genus, of which five were described by associating their developmental stages with males, one was described based on males and pupae, and two were described based solely on males. Furthermore, the distribution of *Stenochironomus figueiredoensis* Danta, Hamada & Mendes, *Stenochironomus liviae* Danta, Hamada & Mendes, and *Stenochironomus roquei* Dantas, Hamada & Mendes was expanded to the state of Acre. Thus, this study contributes to the taxonomic knowledge of *Stenochironomus* in Brazil, particularly in the Amazon rainforest, by expanding the number of known species in the region.

Keywords: Biodiversity; Aquatic insects; Chironominae; immatures; Neotropical Region.

INTRODUÇÃO GERAL

Amazônia

A Amazônia corresponde a uma área de cerca de $7x10^6$ km² localizada na América do Sul, compreendendo os seguintes países: Bolívia, Brasil, Colômbia, Equador, Guiana Francesa, Peru, Suriname, Venezuela. A maior parte está em território brasileiro, e é conhecida como Amazônia Legal (Coutinho, 2016), a qual, segundo o IBGE (2020), tem uma área equivalente a 5.015.067,749 km², compreendendo os estados do Acre, Amapá, Amazonas, Mato Grosso, Maranhão Roraima, Rondônia e Tocantins. A região amazônica é composta por florestas heterogêneas que abrigam uma rica diversidade de espécies, além de fornecer serviços ecossistêmicos que regulam o clima do planeta (Coutinho, 2016; Garrett *et al*., 2021). Apesar de sua importância, esse bioma está ameaçado por ações antrópicas, como o desmatamento impulsionado pela pecuária, ocasionando a perda de um patrimônio natural ainda pouco conhecido (Margulis, 2003; Friedrich, 2021).

O avanço do desmatamento na Amazônia é uma realidade (Silva *et al*., 2005; Copertino *et al*., 2019), assim, estudos taxonômicos na região são importantes para enriquecer o conhecimento sobre a biodiversidade. Do ponto de vista ambiental, o conhecimento faunístico de uma determinada área é fundamental para qualquer plano de conservação do ambiente aquático, fornecendo subsídios para a proposta de criação de áreas prioritárias para a conservação (Balian *et al*., 2008). Também, é importante para a compreensão da dinâmica das comunidades de invertebrados e vertebrados associados, além de ajudar na compreensão das respostas destes organismos às condições climáticas e edáficas e perturbações antropogênicas (Zequi *et al*., 2019).

Diptera

Comunidades biológicas de ecossistemas aquáticos dulcícolas, como rios, lagos e riachos, são compostas principalmente por invertebrados, sendo os insetos aquáticos os mais numerosos e representativos em termos de biomassa, correspondendo a 60% das espécies de invertebrados nestes ambientes (Gullan & Craston, 2012). São considerados aquáticos aqueles insetos que passam um ou mais estágios do seu ciclo de vida dentro da água, geralmente na forma de ovo e larva ou ninfa, ocupando o ambiente terrestre apenas na fase adulta, mas, em alguns casos, podem permanecer toda sua vida no ambiente aquático (Dijkstra *et al*., 2014; Koroiva & Pepinelli, 2019).

Dentre as ordens de insetos aquáticos, Diptera é a mais numerosa, representando metade da diversidade dos insetos aquáticos presentes nesses ambientes (Dijkstra, 2014; Adler & Courtnney, 2019). A ordem contém cerca de 180 famílias (Brown, 2009), das quais 41 possuem algum membro aquático, correspondendo a 46.000 espécies aquáticas distribuídas ao redor do mundo (Adler & Courtnney, 2019).

A grande diversidade observada entre os Diptera aquáticos deve-se a capacidade adaptativa desses insetos, que os permitem ocupar qualquer ambiente de água doce; além disso, algumas espécies também são capazes de habitar ambientes de água salgada costeiros (Springer, 2009; Koroiva & Pepinelli, 2019). Embora haja uma grande abundância de larvas de Diptera em ambientes aquáticos, o conhecimento sobre sua ecologia, morfologia e diversidade ainda é limitado, visto que a maior parte das espécies são descritas apenas com base na fase adulta (Wagner *et al*., 2008; Adler & Courtnney, 2019).

A região Neotropical possui mais de 30.000 espécies de Diptera distribuídas em 118 famílias (Amorim, 2009). No Brasil a ordem conta com cerca de 12229 espécies (Rafael *et al*., 2025), entretanto, são estimadas mais de 60.000 espécies para o país, pois muitas regiões brasileiras ainda são pouco exploradas (Carvalho *et al*., 2012).

Classicamente a maior parte dos estudos sobre Diptera aquáticos na região Norte do Brasil é dedicada aos mosquitos devido a sua importância médica e veterinária (Vinogradova, 2007). Assim, desde o século XX, os estudos sobre esses insetos na Amazônia têm sido em sua maior parte focados em grupos vetores de doenças, principalmente devido ao crescimento populacional da região que foi acompanhado do aumento na incidência de mortes por doenças transmitidas por representantes desse grupo (Nessimian *et al*., 2019). Isso resultou na predominância da ordem Diptera na produção literária dessa região, especialmente os trabalhos voltados para as famílias Culicidae, Psychodidae e Simuliidae (Nessimian *et al*., 2019).

Atualmente outras famílias de Diptera, como Chironomidae, são objetos de estudos importantes para avaliação de ambientes aquáticos, uma vez que suas larvas compõem uma parte significativa da densidade faunística desses ambientes, geralmente ocorrendo em grande abundância (Trivinho-Strixino, 2019). No entanto, o conhecimento sobre a sistemática de muitos grupos nessa família permanece relativamente limitado em decorrência da vasta extensão geográfica, das dificuldades de acesso à muitas áreas e pelo número limitado de taxonomistas trabalhando com alguns grupos.

Chironomidae

Chironomidae é uma família de Diptera amplamente distribuída, e atualmente encontra-se dividida em 11 subfamílias: Orthocladiinae, Tanypodinae e Chironominae — as quais possuem maior número de espécies descritas e são bem distribuídas ao redor do mundo (Ferrington, 2008; Spies *et al*., 2009); já Aphroteniinae, Buchonomyiinae, Chilenomyiinae, Diamesinae, Prodiamesinae, Podonominae, Telmatogetoninae e Usambaromyiinae são menos diversificadas, com ocorrência mais restrita a determinadas condições ambientais (Karima, 2021). Atualmente existem cerca de 400 gêneros e 6.200 espécies de quironomídeos conhecidas, número que está em constante atualização à medida que novas espécies são descobertas e novas revisões são realizadas (Silva *et al*., 2018; Karima, 2021).

Todas as subfamílias de Chironomidae são encontradas na região Neotropical, sendo a subfamília Chironominae a dominante, com o maior número de espécies descritas, seguida de Orthocladiinae e Tanypodinae; essas três representam cerca de 80% das 900 espécies válidas para região (Spies *et al*., 2009; Silva *et al*., 2018). O restante das espécies está distribuído nas subfamílias Aphroteniinae, Buchonomyiinae, Chilenomyiinae, Diamesinae, Podonominae e Prodiamesinae que ocorrem em ambientes frios, e Telmatogetoninae, representada por espécies de ambiente marinho (Silva *et al*., 2018). No Neotrópico, a fauna de Chironomidae conhecida ainda representa uma pequena porção da verdadeira riqueza de espécies desse táxon; além disso, é possível observar lacunas de conhecimento a respeito do ciclo de vida completo de muitas espécies no grupo, somado ao baixo número de chaves taxonômicas (Silva & Farrell, 2017).

No Brasil são listadas cerca de 680 espécies distribuídas em 100 gêneros para Chironomidae (Pinho *et al*., 2025), mas, segundo as estimativas, essa diversidade pode chegar a 1.500 espécies (Trivinho-Strixino, 2011). No país são registradas cinco subfamílias: Chironominae, Tanypodinae e Orthocladiinae são as mais comuns (Vieira *et al*., 2012), enquanto Telmatogetoninae e Podonominae tem distribuição mais restrita (Roque & Trivinho-Strixino, 2004).

As larvas de Chironomidae desempenham um papel fundamental como decompositoras de matéria orgânica submersa, uma vez que elas se alimentam de folhas e madeira em decomposição (Epler, 2001). Essas larvas possuem dieta alimentar a base de tecido vegetal, sendo capazes de consumir detritos rígidos com alta concentração de lignina, e ocorrem em grande quantidade associadas a detritos foliares, assim, são consideradas como coparticipantes da decomposição em sistemas aquáticos (Rossi, 2016).

De acordo com Trivinho-Strixino (2011), a maioria das pesquisas sobre Chironomidae é voltada para a ecologia de suas larvas, havendo carência de estudos taxonômicos que relacionem, por exemplo, as formas imaturas e adultas para uma melhor identificação taxonômica. Isso acarreta numa lacuna de conhecimento sobre as espécies dessa família e, consequentemente, na sua conservação e utilização em estudos mais aplicados.

Historicamente, as chaves e descrições de espécies de Chironomidae foram baseadas especialmente em machos adultos, sendo os estágios imaturos negligenciados devido ao tamanho diminuto de algumas espécies, pelas dificuldades de coleta e processamento e pela ausência de características morfológicas distintivas entre os diferentes táxons (Oliver & Roussel, 1983). As pesquisas brasileiras sobre Chironomidae se intensificaram nas décadas de 60 e 70, sendo os estudos taxonômicos focados sobre machos adultos; essa tendência continuou ao longo dos anos, o que gerou uma lacuna de conhecimento a respeito das formas imaturas (Trivinho-Strixino, 2019). Como destacado por Pinho *et al*. (2024), embora o número de espécies descritas tenha crescido substancialmente, a diversidade real de Chironomidae no Brasil permanece subestimada, com disparidades regionais evidentes e com notória predominância de descrições baseadas apenas em machos adultos.

Na Amazônia, os primeiros estudos taxonômicos sobre Chironomidae tiveram início com a descrição de *Chironomus calligraphus* Goeldi, 1905 e Goeldichironomus holoprasinus Goeldi, 1905, originalmente descritos no gênero *Chironomus,* e somente 50 anos depois houve novos avanços no conhecimento sobre esse grupo na região, com a descrição de 14 novos gêneros pelos trabalhos de Roback na década de 60 (Fittkau, 2001). Além disso, o trabalho de Fittkau (1971) reconheceu 58 gêneros e 437 morfoespécies dessa família para Amazônia, o autor também estimou mais de 1000 espécies de Chironomidae para região. Atualmente, são formalmente descritas 306 espécies para a Amazônia, das quais 206 são endêmicas (Pinho *et al*. 2024).

Na última década, projetos como o "Insetos aquáticos: biodiversidade, ferramentas ambientais e a popularização da ciência para melhoria da qualidade de vida humana no Estado do Amazonas", financiado pelo Programa de Apoio a Núcleos de Excelência em Ciência e Tecnologia (Pronex), estimularam o desenvolvimento de novas pesquisas taxonômicas sobre os Chironomidae na Amazônia (Silva *et al*., 2019). Assim, diversos trabalhos resultantes desse projeto forneceram a descrição de novas espécies para a região, bem como descrições de estágios imaturos de espécies anteriormente descritas apenas com base em adultos (e.g., Amora *et al*., 2015; Silva *et al*., 2019; Dantas & Gilka, 2017; Dantas *et al*., 2018; Dantas *et al*., 2023).

Outros trabalhos desenvolvidos na Amazônia brasileira envolvendo o grupo são de cunho ecológico, como os de biomonitoramento de áreas que sofreram ações antrópicas. Entretanto, devido à dificuldade na identificação de alguns táxons, a maioria das identificações fornecidas estão apenas a nível de família (Fidelis & Hamada, 2008; Couceiro, *et al*., 2009) e, às vezes, até gênero (Gomes, 2012; Sonoda *et al*., 2018). O uso potencial dos Chironomidae como bioindicadores depende da identificação das larvas, entretanto, muitas espécies ainda permanecem com a descrição de todos os seus estágios incompleta (Epler, 2001), por isso, a continuidade das pesquisas taxonômicas sobre o grupo na Amazônia é necessária para suprir essas lacunas.

***Stenochironomus* Kieffer, 1919**

Stenochironomus Kieffer, 1919 é um gênero cosmopolita, ocorrendo em todas as regiões biogeográficas exceto Antártica, e assim como outros membros da família, sua taxonomia é baseada principalmente na morfologia da genitália dos adultos (Borkent, 1984). Esse gênero foi originalmente estabelecido por Kieffer em 1919, e a sua espécie-tipo, *Chironomus pulchripennis* Coquillett, 1902, foi designada somente alguns anos depois por Townes (1945) (Spies & Sæther, 2004).

Stenochironomus foi revisado por Borkent (1984), que elaborou chaves de identificação para larvas, pupas e adultos para as regiões Neártica, Neotropical e Paleártica. Contudo, as chaves para larvas e pupas apresentam limitações de precisão, uma vez que a maioria das espécies descritas não possui informações sobre seus estágios imaturos. Esse mesmo autor também apontou que as adaptações das larvas minadoras e características da genitália dos adultos sugerem que *Stenochironomus* seja um grupo monofilético.

As larvas de *Stenochironomus* podem ser reconhecidas pelas seguintes características: cabeça achatada dorsoventralmente; primeiros segmentos do corpo achatados e mais largos que os demais segmentos; pseudópodes posteriores curtos e providos de garras fortes; túbulos anais longos; mento côncavo, com 10 dentes fortemente esclerosados e placas ventromentais com estriação pouco nítida e mandíbula com dentes fortes (sendo os internos mais longos que apical) (Trivinho-strixino, 2019). As pupas podem ser caracterizadas conforme a seguir: órgão respiratório com muitas ramificações e um corno torácico não bifurcado; espículas nos tergitos abdominais VII e VIII presentes ou ausentes, caso essas estruturas estejam presentes, o esporão do segmento VIII é castanho claro. Já os adultos são caracterizados conforme a seguir: antepronoto reduzido; escuto se projetando anteriormente; nos machos, as volselas inferiores são longas, com setas arranjadas ao longo da margem dorsal (Borkent, 1984).

Existem cerca de 112 espécies de *Stenochironomus* distribuídas ao redor do mundo (exceto na Antártida), das quais 39 ocorrem na região Neotropical e 30 no Brasil, com 27 delas ocorrendo na região Amazônica (Tabela 1) (Borkent 1984; Pinho *et al*., 2005; Andersen *et al*., 2007; Dantas *et al*., 2010; Reis *et al*., 2013; Dantas *et al*., 2016; Parise & Pinho 2016; Amora *et al*., 2018; Moubayed, 2024). Doze espécies novas foram descritas para a Amazônia nas últimas décadas desde as descrições de Borkent (1984), onde também foi perceptível o empenho desses trabalhos em associar os diferentes estágios de vida. Dentre as mais recentes, *Stenochironomus munteanpurin* Amora, Hamada & Pinho, 2018 ocorre na porção ocidental da Amazônia e no sudeste brasileiro, já *S. hallei* ocorre somente na Guiana Francesa. As demais espécies descritas para o Brasil ocorrem as regiões sudeste e sul:

Stenochironomus atlanticus Pinho & Mendes, 2005; *Stenochironomus maikeae* Andersen, Mendes & Pinho, 2007; *Stenochironomus sebastiao* Andersen, Mendes & Pinho, 2007 e *Stenochironomus falcifer* Parise & Pinho, 2016.

Como apontado por Dantas *et al*. (2016), para que haja melhor compreensão da história de vida desse gênero é necessário haver associação entre os diferentes estágios de vida. Porém, alguns imaturos de *Stenochironomus* neotropicais ainda são desconhecidos: das 39 espécies descritas para a região, 24 possuem as pupas descritas e 18 possuem as larvas descritas (Dantas *et al*., 2016; Parise & Pinho, 2016; Amora *et al*., 2018; Moubayed, 2024).

Tabela 1. Espécies do gênero *Stenochironomus* Kieffer, 1919 registradas na Amazônia, estágios em que foram descritos, instituição onde os holótipos estão depositados e distribuição geográfica/localidade. M = macho, F = fêmea, P = pupa, L= larva, INPA = Instituto Nacional de Pesquisas na Amazônia, CNC = Canadian Natural Collection (Canadá) AM= Amazonas, PA= Pará, RR= Roraima.

Espécie	**Estágios Descritos**	**Holótipo**	**Localidade**
S. aculeatus Borkent, 1984	M	INPA	Brasil (RR)
S. albidorsales Borkent, 1984	M, P	INPA	Brasil (AM)
S. bacrionis Borkent, 1984	M, P, L	INPA	Brasil (PA), Equador
S. fittkaui Borkent, 1984	M	INPA	Brasil (PA), Panamá
S. impendens Borkent, 1984	M	INPA	Brasil (PA)
S. jubatus Borkent, 1984	M, F	INPA	Brasil (AM)
S. licinus Borkent, 1984	M	INPA	Brasil (PA)
S. nudipupa Borkent, 1984	M, F, P, L	CNC	Brasil (AM, RR) Costa Rica, Equador e Venezuela
S. palliaculeatus Borkent, 1984	M	INPA	Brasil (AM, PA), Colômbia
S. pectinatus Borkent, 1984	M F	INPA	Brasil (AM, PA)
S. prolatus Borkent, 1984	M	INPA	Brasil (AM)
S. reissi Borkent, 1984	M	INPA	Brasil (AM, PA)

S. triannulatus Borkent, 1984	M F	INPA	Brasil (AM, PA)
S. vatius Borkent, 1984	M P	INPA	Brasil (AM)
S. zonarius Borkent, 1984	M	INPA	Brasil (PA)
S. roquei Dantas, Hamada & Mendes, 2010	M P L	INPA	Brasil (AM)
S. messias Reis, Serpa-Filho & Ferreira-Keppler, 2013	M P L	INPA	Brasil (AM)
S. oliveirai Reis, Serpa-Filho & Ferreira-Keppler, 2013	M P L	INPA	Brasil (AM)
S. manaura Dantas, Hamada & Mendes, 2016	M P L	INPA	Brasil (AM)
S. gracilis Dantas, Hamada & Mendes, 2016	M P	INPA	Brasil (AM)
S. bare Dantas, Hamada & Mendes, 2016	M P	INPA	Brasil (AM)
S. amazonicus Dantas, Hamada & Mendes, 2016	M F P L	INPA	Brasil (AM)
S. figueiredoensis Dantas, Hamada & Mendes, 2016	M P	INPA	Brasil (AM)
S. liviae Dantas, Hamada & Mendes, 2016	M P L	INPA	Brasil (AM, BH, SC)
S. suzanae Dantas, Hamada & Mendes, 2016	M	INPA	Brasil (AM)
S. munteanpurin Amora, Hamada & Pinho, 2018	M P L	INPA	Brasil (AC, BH, RJ, SC)
S. hallei Moubayed, 2024	M	MZL	Guiana Francesa

As larvas de *Stenochironomus* são relativamente grandes e possuem uma coloração vermelha distintiva. Dentre as espécies deste gênero, apenas uma, *Stenochironomus nelumbus* (Tokunaga & Kuroda, 1935) foi registrada minando tecido vegetal vivo (Deepu & Habeeburrahman, 2008). As demais espécies do gênero são minadoras de troncos ou folhas submersas, seja em ambientes lênticos ou lóticos (Borkent 1984). Borkent (1984) propôs a divisão de *Stenochironomus* em dois subgêneros: *Stenochironomus* (*Petalopholeus*) Borkent, constituído de espécies com larvas minadoras de folhas, e *Stenochironomus s. str*. Kieffer, constituído pelas espécies minadoras de troncos. Essa proposta de divisão em subgêneros não foi adotada em trabalhos taxonômicos posteriores, pois, como enfatizado por Pinho *et al*. (2005), apenas algumas espécies possuem seus estágios imaturos descritos, por isso, propostas de divisões em subgêneros baseadas nos hábitos dos imaturos precisam ser adotadas com cautela. No entanto, essa hipótese ainda não foi devidamente testada com novos dados, e os subgêneros permanecem válidos.

A criação de imaturos de *Stenochironomus* em laboratório é relativamente fácil, pois poucas espécies necessitam de temperatura e outras condições controladas (Oliveira & Pes, 2019), o que possibilita a associação dos diferentes estágios do seu ciclo de vida (Wantzen, 2006; Dantas *et al*., 2016). Entretanto, vale ressaltar que as larvas possuem taxonomia difícil devido à grande semelhança morfológica entre as espécies, o que exige um maior esforço do taxonomista (Dantas *et al*., 2016).

Conforme o exposto anteriormente, ainda há muitas espécies de Chironomidae a serem descoberta e estudadas na Amazônia (Fittkau, 2001). Esse bioma está sob constante ameaça antrópica (Margulis, 2003; Vieira *et al*.,2005, Friedrich, 2021), o que pode comprometer o conhecimento sobre faunas ainda não estudada. Além disso, as diversas lacunas existentes no estudo sistemáticos sobre *Stenochironomus* e outros gêneros em Chironomidae só serão resolvidas a partir de novos estudos taxonômicos, com a descrição de espécies novas, de estágios desconhecidos e redescrições de espécies com poucas informações taxonômicas. Dessa forma, este trabalho agregará conhecimento às pesquisas que vêm sendo desenvolvidas sobre a família, possibilitando e facilitando, assim, o seu uso em estudos mais aplicados, como, por exemplo, sua utilização mais acurada como bioindicadores ambientais. Por fim, a possibilidade de formar novos recursos humanos trabalhando na área irá garantir a manutenção das pesquisas com esse grupo, uma vez que atualmente existem poucos taxonomistas no Brasil dedicados ao estudo dessa família.

OBJETIVOS

Objetivo geral

Realizar um estudo taxonômico sobre *Stenochironomus* da Amazônia.

Objetivos específicos

- Inventariar as espécies de *Stenochironomus* da Amazônia.
- Associar estágios imaturos e adultos de *Stenochironomus*.
- Descrever espécies novas do gênero para a Amazônia.

ORGANIZAÇÃO DA DISSERTAÇÃO

Essa dissertação está dividida em dois capítulos. O primeiro capítulo já está publicado e contém a descrição de duas espécies novas de *Stenochironomus*. O segundo capítulo contém a descrição de seis novas espécies, bem como novos registros de *Stenochironomus* para a Amazônia. Todos os nomes das espécies novas foram omitidos (inclusive do capítulo já publicado) para evitar futuros problemas taxonômicos, uma vez que uma dissertação não é um tipo de publicação que garanta a validade dos nomes propostos, de acordo com normas da ICZN.

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Capítulo 1

Stenochironomus (*Petalopholeus*) sp. 1 and *S.* (*P.*) sp. 2 (Diptera: Chironomidae), two new leaf-mining species from Brazil

O Capítulo I desta Dissertação foi elaborado e formatado conforme as normas da publicação científica *Annales Zoologici Fennici* as quais se encontram no Anexo I.

Stenochironomus (*Petalopholeus*) sp. 1 and *S.* (*P.*) sp. 2 (Diptera, Chironomidae), two new leaf-mining species from Brazil.

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Abstract

Two new species of *Stenochironomus* (*Petalopholeus*) from Brazil are described and illustrated based on adult, pupal, and larval stages. These species can be distinguished from their congeners primarily by characteristics of the male hypopygium. The larvae were collected mining leaves in lotic environments. Both species were found in the Amazon region, with one also recorded in the Cerrado biome.

1. Introduction

Stenochironomus Kieffer, 1919, is a cosmopolitan and species-rich genus easily recognized by its aquatic larvae, which are highly specialized for a leaf- or wood-mining lifestyle. Borkent (1984) conducted a comprehensive review of the genus, describing 32 new species and performing a cladistic analysis that corroborated its monophyly. Additionally, Borkent (1984) proposed the subdivision of the genus into two subgenera, based on the morphology of immatures and larval habitats: *Stenochironomus* (*Petalopholeus*) for leaf-mining species and *Stenochironomus s. str.* for those with woody-mining larvae. Pinho *et al*. (2005) questioned the validity of this classification, arguing that *S. atlanticus* Pinho & Mendes, 2005 does not fit easily into any of the subgenera proposed by Borkent (1984) and that the immature stages of many species remain unknown. However, this hypothesis has not yet been properly tested

with new data, and the subgenera remain valid. Currently, more than 100 species of *Stenochironomus* are recognized worldwide, with 39 occurring in the Neotropical region and 30 in Brazil (Borkent 1984, Pinho *et al*. 2005, Andersen *et al*. 2007, Dantas *et al*. 2010, Reis *et al*. 2013, Dantas *et al*. 2016, Parise & Pinho 2016, Amora *et al.* 2018, Moubayed 2024). In the present study, we describe and illustrate the adult and immature stages of two new leaf-mining species of *Stenochironomus* from Brazil.

Material and methods

The collection and rearing of immature stages were conducted following the methodology outlined by Amora (2018). Emerged adults, along with corresponding immature exuviae, were preserved in 80% ethanol. Specimens of *Stenochironomus* were collected in submerged leaves in streams and rivers from Amazonas, Goiás, Pará, Rondônia, and Roraima States. Except for one adult male from Pará State collected with Malaise trap.

The examined specimens were slide-mounted in Hoyer 's medium (Andersen *et al.* 2013) or in Euparal® (Pinder 1983, 1986, 1989). Morphological measurements follow Epler (1988), and the general terminology follows Sæther (1980). Measurements of the adult male, pupa, and larva are given as ranges, with the holotype measurement in square brackets. Adult female measurements are given as ranges.

Measurements were performed using an Olympus BX51 optical microscope with the Cell-D® (Olympus) software. Photographs of morphological features were taken with a Leica DFC295 digital camera attached to a Leica DM5500 B compound microscope. The habitus were photographed using a Leica M165C stereomicroscope with an attached Leica DFC72 camera. The drawings were made by hand using camera lucida attached to a Leica DM750 optic microscope, then scanned for editing.

The holotypes and some paratypes are housed in the Invertebrate Collection of the Instituto Nacional de Pesquisas da Amazonia (INPA), Manaus, Amazonas, Brazil. Some paratypes are housed in the Museu de Zoologia da Universidade de São Paulo (MZUSP), São Paulo, Brazil.

3. Taxonomy

Chironomidae Newman, 1834

Chironominae Newman, 1834

Stenochironomus Kieffer, 1919

***Stenochironomus* (*Petalopholeus*)** Borkent, 1984

***Stenochironomus* (*Petalopholeus*) sp. 1**

(Figs. 2−11)

Type material. Holotype, male with pupal and larval exuviae, BRAZIL, Roraima, Rorainópolis, Vicinal 12, Recanto da Cachoeira, 00°46'35.1" N, 060°19'58.7" W, 10.i.2018, in submerged leaf, leg. G. Amora, slide-mounted in Hoyer (INPA). Paratypes: 4 males with pupal and larval exuviae, same data as holotype; 3 males with pupal and larval exuviae, same data as holotype except slide-mounted in Euparal® (MZUSP); 2 males with pupal and larval exuviae, BRAZIL, Rondônia, Rio Urupá, 11°02'11.2" S, 62°08'40.4" W, 12.ix.2018, leg. N. Hamada; J. M. C. Nascimento; J. S. Oliveira; G. Amora, slide-mounted in Hoyer (INPA); 1 male with pupal and larval exuviae, BRAZIL, Amazonas, Presidente Figueiredo, Cachoeira da Maroca, 02º00'58.0" S, 59º51'33.9" W, 18.x.2014, 123 m, leg. J. O. da Silva. & G. G. Amora, slide-mounted in Hoyer (INPA); 1 male with pupal and larval exuviae, BRAZIL Amazonas, Presidente Figueiredo, Igarapé do Mutum, Cachoeira da Porteira; 2°02'21.1" S, 59°55'12.7" W, 06.x.2016, 89 m, leg. J. O. da Silva. & G. Amora slide-mounted in Hoyer (MZUSP); 1 male with pupal and larval exuviae, BRAZIL, Amazonas, Humaitá; 07°55'23.5" S, 63°00'55.6" W, 13.ix.2018, leg. Hamada, N.; Nascimento, J.M.C.; Oliveira, J.S.; Amora, G., slide-mounted in Hoyer (INPA); 2 males with pupal and larval exuviae, BRAZIL, Goiás, Alto Paraíso de Goiás, Fazenda Aves Grandes, Rio Piçarrão; 14°17'40.8" S, 47°37'22.3" W, 22.xi.2017, leg. N. Hamada; G. Amora , slide-mounted in Hoyer (INPA); 1 male with pupal and larval exuviae, BRAZIL, Pará, Santarém; Igarapé do Xibé; 03°07'04.3" S 55°03'49.5" W, 21.vi.2016, 90 m, leg. C. V. Dutra, D. Godinho, M. D. Santana, slide-mounted in Hoyer (INPA); 1 female with pupal and larval exuviae, BRAZIL, Pará, Santarém; Igarapé do Xibé; 03°07'04.3" S 55°03'49.5" W, 21.vi.2016, 90 m, leg. C. V. Dutra, D. Godinho, M. D. Santana , slide-mounted in Hoyer (INPA); 1 female with pupal and larval exuviae, same data as holotype (MZUSP); 1 female with pupal and larval exuviae, same data as holotype except slide-mounted in Euparal® (INPA).

Diagnostic characters. Male: lateral view of thorax with brown patches on preepisternum, anespiternum, posterior anepisternum, epimeron and near espiraculum; anal point broad in fusiform format in dorsal view; superior volsella short, tapering at the apex; inferior volsella with apical setae as long as the subapical setae. **Female:** lateral view of thorax with brown patches on preepisternum, anespiternum, posterior anepisternum, epimeron and near espiraculum; post-genital plate triangular, with round apex. **Pupa:** frontal apotome elongated; T II with posterior row of hooklets not extending to lateral margin of tergite; T VII without shagreens or with small fields of weak shagreens on posterolateral margin; conjunctive III/IV and IV/V with shagreen, spur on S VIII with two to six variable size yellowish brown teeth. **Larva:** spicules of the pecten epipharyngis simple, arranged in a row; labral lamella arranged in one group of irregular spicules with a cleft in the middle; labiohypopharynx with rounded lobes and a cleft between them.

Etymology. The specific epithet is in honor to Instituto Nacional de Pesquisas na Amazônia (INPA), where all phases of this study were carried out.

Male (n =16, except when otherwise stated).
Total length 4.28–5.55 [4.95] mm. Wing length 2.12–2.58 [2.17] mm. Total length/ wing length 2,15–2.35 [2.27]. Wing length/ length of profemur 3.13–3.66 [3.34].

General coloration yellowish. Head: eyes metallic green when in alcohol, flagellum yellowish (Fig. 2A–B). Thorax: with light-brown patch on the anterior portion of the lateral vitta; preepisternum with a transverse light-brown band; brown patches on median anespiternum, posterior anepisternum, epimeron and near espiraculum; scutellum without pigmentation; anterior margin of the postnotum with a light-brown patch (Figs. 2B; 3D). Legs: forefemur with a brown patch at the apex; fore tibia with a brown patch near the base and at the apex; all fore tarsus with brown patch in the apex. Mid femur and hind femur with a brown patch at the apex (Figs. 2A–B; 3B). Wings: membrane with a light-brownish medial band (Figs. 2A–B; 3E). Abdomen: posterior margin of T II–IV with brown pigmentation; hypopygium yellowish, with a brown anal point (Figs. 2A–B; 3C).

Head (Fig. 3A). AR 2.05–2.33 [2.16]. Thirteenth flagellomerum 849–1120 [921] µm long. Temporal setae 13–23 [16]. Clypeus with 27–43 [43] setae. Tentorium 154–200 [154] µm long; 45–62 [52] µm wide at the sieve pore; 17–25 [18] µm wide at the posterior tentorial pit. Stipes 156–179 (n = 3) µm long; 4–6 (n = 3) µm wide; cibarial pump 260–352 [269] µm long. Palpus with 50–64 [50] setae. Palpomere lengths (1–5 in µm): 37–55 [43]; 26–70 [45]; 168–200 [178]; 150–178 [151]; 232– 299 [232].

Thorax (Fig. 3D). Acrostichals 18–25 [18]; dorsocentrals 38–45 [38] in two rows; prealars 9–15 [11] in one, two, or three rows. Scutellum with 22–42 [22] setae in two rows. Scutum markedly projected anteriorly; anterior edge of the scutum angled in lateral aspect.

Wing (Fig. 3E). VR 2.15–2.53 [2.17]. Brachiolum 4–5 [4] setae. With 19–25 [21] sensilla campaniformia. R with 34–48 [41] setae. R_1 with 35–43 [39] setae. R_{4+5} with 34–50 [44] setae. RM with 0–2 [1] setae. Remaining veins bare. Squama with 8–13 (n = 14) setae.

Legs (Fig. 3B). Scale of front tibia 37–53 [37] µm long, with a small apical spine 2–3 [2] µm long; spurs of the mid tibia 33–43 [33] µm and 25–37 [34] µm long; spurs of the hind tibia 33–49 [40] µm and 36–40 [39] µm long. Apex of the fore tibia 66–84 [73] µm wide, the mid tibia 57–68 [57] µm wide, and the hind tibia 66–74 [68] µm wide. Lengths (in µm) and proportions of legs as in Table 1.

Hypopygium (Figs. 4A–C). Anal point broad, fusiform in dorsal view, originating subapically on T IX, 139–152 [144] µm long, 20–38 [38] µm wide at the base, 29–37 [35] µm at the midpoint, 14–17 [17] µm at the apex. Tergite IX with 38–47 [38] strong setae, caudal apex with pre-apical constriction in dorsal aspect. Laterosternite IX with 4–7 [7] setae. Phallapodeme 90–124 [90] µm long; transverse sternapodeme 33–51 [33] µm long. Gonocoxite 191–244 [220] µm long. Gonostylus 247–274 [249] µm long, swollen subapically, with the apex slightly tapering. Superior volsella short, 57–70 [61] µm long, tapering at the apex, with 4–7 [5] setae. Inferior volsella 254–333 [286] µm long, with 5–7 [5] setae; apical setae as long as the subapical one. HR 0.72–0.93 [0.88]; HV 1.56–2.17 [1.99].

Female (n = 1–3).

Total length 2.91–4.27 mm. Wing length 2.42–2.77 mm. Total length/wing length 1.21–1.50. Wing length/length of profemur 1.25–1.41.

General coloration yellow and dark brown. Head: eyes metallic green; antennal flagellomere yellowish, dark-brown at the apex. Thorax: with a light-brown patch on the anterior portion of

lateral vitta; preepisternum with a transversal light-brown band; brown patches on median anespiternum, posterior anepisternum, epimeron and near espiraculum; scutellum without pigmentation; anterior margin of the postnotum with a light-brown patch. Legs: forefemur with a brown patch at the apex; fore tibia with brown patches near the base and at the apex; all fore tarsus with brown patch at the apex. Mid femur and hind femur with a light-brown patch at the apex. Wings: membrane with a light-brownish band. Abdomen: dark brown, with marked dark-brown pigmentation at the posterior margins of T II and T III (Fig. 6A–B).

Head. Flagellomere length (in µm): 73–85; 110–122; 138–157; 139–159; 143–152; 190–226. AR 0.30–0.34. Clypeus with 36–42 setae. Tentorium 157–224 µm long; 28–51 µm wide at the sieve pore; 13–15 µm wide at the apex. Stipes 94 µm long. Palpomere length (in µm): 44–67; 66–73; 201–218; 158–187; 307–373.

Thorax. Acrostichals 29–32; dorsocentrals 37–58 in two or three rows; prealars 15–17. Scutellum with 21–43 setae in two, or three rows.

Wing. VR 1.12–1.15. Brachiolum with 6–8 setae. R with 52–62 setae; R_1 with 47–64 setae; R_{4+5} with 77–193 setae; RM with 1–2 setae; M with 9–10 setae; remaining veins bare. Squama with 12–15 setae.

Legs. Scale of front tibia 48–55 µm long, with a small spine 3 µm long at apex; spurs of mid tibia 36–42; spurs of hind tibia 39–45 µm long. Apex of fore tibia 77–86 µm wide, of mid tibia 64–87 µm wide, of hind tibia 78–95 µm wide. Lengths (in µm) and proportions of legs as in Table 2.

Genitalia (Fig. 7A–B). Tergite IX with 52–68 setae; gonocoxite IX with 2–5 setae. Post-genital plate rounded at apex. Cercus 137–187 µm long. Gonocoxapodeme IX 157–213 µm long. Notum 178–243 µm long.

Pupa (n = 8–11). Total length 6.32–6.76 [6.32 mm]. General coloration brown (Fig. 8 A). Cephalotorax 1323–1538 [1323] µm long, with an elongated frontal apotome (Fig. 9A–B); frontal warts absent (Fig. 9A) or present in a few specimens (Fig. 9B). Distance between Dc_1 and Dc_2 2–6 [3] µm; between Dc_2 and Dc_3 321–558 [373] µm; between Dc_3 and Dc_4 4–8 [8] µm. Median suture granulose.

Abdomen 4875–5765 [4998] µm long (Fig. 9C–E). T I bare; T II–IV with large field of shagreen, not extending to the lateral margin, and with approximately four circular bare areas near the posterior margin; T II with a posterior single row of hooklets 276–422 [277] µm long

(Fig. 9C), not extending to the lateral margin of the tergite; *pedes spurii* B absent. T IV with a field of shagreen on the posterior laterosternite reaching the middle region; T V with a field shagreen more restricted to the median region than the anterior tergites; T VI with two fields of shagreen separated or connected by a thin central band of shagreen, one anterior field somewhat triangular with thinner shagreen, and a posterior field of thicker shagreen; T VII without shagreens or with a very small shagreen restricted near the anterolateral margin; T VIII and Anal lobe with shagreen restricted near the anterolateral margin. Conjunctive III/IV and IV/V with shagreen. Abdominal setation: S I without L setae; S II–IV with 3–4 L setae; S V–VII with 4 LS setae; S VIII with 5 LS setae. Spur on S VIII (Fig. 8C–H) with 2–6 [3] variable size yellowish-brown teeth. Genital sac 480–565 [480] µm long, overreaching the posterior margin of the anal lobe by 33–57 [44] µm long; anal lobe 390–527 [390] µm long, with fringe of 54 filaments.

4th instar larva (n = 10–11).

Head. Head capsule 277–325 [317] µm long. Antenna (Fig. 10C); lengths of antennal segments (in µm): 71–76 [72]; 18–25 [13]; 9–15 [6]; 7–9 [5]; 2–6 [3]. Labrum (Fig. 10A). Spicules of the pecten epipharyngis simple, arranged in a row (Fig. 10A). Labral lamella arranged in a group of irregular spicules with a cleft in the middle (Fig. 10A). S1 simple, S2 pinnate, S3 bifurcated (Fig. 10A). Premandible not measurable. Mandible (Fig. 10A) 138–201 [175] µm long. Mentum 129–148 [141] µm wide, with 10 blackish teeth (Fig. 10B); ventromental plate 70–109 [90] µm wide (Fig. 10B). Base of the dorsolateral strip originating near the base of the dorsomedian strip. Labiohypopharynx (Fig. 10A, D–F) with rounded ligular lobes, with a parallel-sided cleft between them. Labiohypopharynx and mentum were found damaged in some specimens.

Taxonomic remarks. In the male identification key of the Neotropical *Stenochironomus* proposed by Dantas *et al*. (2016), *Stenochironomus* sp. 1 falls in couplet 20, which distinguishes *Stenochironomus fittkaui* Borkent, 1984 and *Stenochironomus bare* Dantas, Hamada & Mendes, 2016, both from Brazil. However, the broad anal point in fusiform format of *S.* sp. 1. differs from those two species, while the anal point in *S. fittkaui* and *S. bare* is swollen subapically. Additionally, the new species can be easily distinguished by the inferior volsella, which has a long apical seta, whereas in *S. fittkaui* and *S. bare*, the seta is short and thicker. The pupa of *S.* sp. 1 presents a single row of hooklets in T II (Fig. 9C) that differs from

S. bare in which the hooklets are divided in two groups. The spur on S VIII in *S. bare* presents one extremely elongate lateral tooth, an elongate penultimate tooth and four smaller medial teeth; in *S.* sp. 1 the spur has a variation between two and six irregular size teeth (Fig. 8C–H). In addition, *S.* sp. 1 has the anal lobe with spicules absent, while in *S. bare* these spicules are present.

The male of *S.* sp. 1 has an anal point broad and an inferior volsella with a long, thin apical seta — characteristics shared only with *Stenochironomus messias* Reis, Serpa-Filho & Ferreira-Keppler, 2013, *Stenochironomus oliverai* Reis, Serpa-Filho & Ferreira- Keppler, 2013 and *Stenochironomus crusanticus* Borkent, 1984. These first two species described by Reis *et al.* (2013) exhibit distinct lateral lobes in T IX, setting them apart from all other known species of the genus, including the new species described here. Additionally, the dark-brown pigmentation on all thorax dorsal to level of anapleural suture of *S. crusanticus* differs from the thorax with a sequency of brown patches on preepisternum, anespiternum, posterior anepisternum, epimeron and near espiraculum in *S.* sp. 1. Furthermore, the anal point in *S. messias*, *S. oliverai* and *S. crusanticus* is wider at the base, while in *S.* sp. 1 the anal point is slightly narrow at the base.

The pupa of *S.* sp. 1 has rounded warts present on the cephalotorax, similar to those described in the pupae of *S. oliverai*, but *S. messias* has two small lateral warts. The frontal apotome in *S. crusanticus* is short, while in the new species it is elongated. Shagreens on T VIII are absent in *S. crusanticus, S. messias* and *S. oliverai*, whereas *S.* sp. 1 exhibits shagreen restricted to the anterolateral margin on T VIII. Furthermore, *S. messias* has a large field of shagreens on T I, and *S. crusanticus* features two rows of hooklets on T II, differing from *S.* sp. 1, which has T I bare and only one row of hooklets**.**

The larva of *S.* sp. 1 has the mandible with two inner teeth, while the larva of *S. messias* has four inner teeth, and *S. oliverai* has three inner teeth. Comparing the labrum, the S1, S2, and S3 setae of *S. crusanticus* are all pinnate, while in *S.* sp. 1 they are as follows: S1 simple, S2 pinnate and S3 bifurcate (Fig. 10A).

A variation in T IX occurred during slide mounting using Euparal®, where the lateral portion of T IX bent (Fig. 5B), making it impossible to observe the pre-apical constriction on T IX (Fig. 5A). Additionally, the pre-apical constriction may not be as visible in improperly preserved material or if T IX is crushed during slide mounting. Damage was observed in the labiohypopharynx (Fig. 10D–F) and other larval structures, such as the mentum and mandible (Fig. 11B).

The pupa and larva of the new species present features consistent with the *Stenochironomus* (*Petalopholeus*), as proposed by Borkent (1984). In leaf-mining species, the diagnosis includes T II of the pupal abdomen with a posterior row of hooklets restricted to the medial portion and the head capsule of the 4th instar larva with dorsolateral stripes originating near the base of the dorsomedian stripe. This species was partially described by E. D. A. Reis, unpubl. data.

Distribution and notes on biology. The species occurs in five Brazilian states: Amazonas, Pará, Rondônia, and Roraima, all of which are part of the Amazon biome, as well as Goiás, which is situated in the Cerrado biome (Fig. 1). The larvae were found mining leaves in small aquatic habitats of black-water streams, some located near waterfalls, as well as in larger habitats, such as rivers backwaters.

***Stenochironomus* (*Petalopholeus*) sp. 2**

(Figs. 12−16)

Type material. Holotype, male with pupal and larval exuviae, BRAZIL, Amazonas, Manaus, Igarapé Água Branca; 02°55'08.59" S 59°54'44.60" W, 15.xi.2015, leg. G. Amora, slide-mounted in Hoyer (INPA). Paratypes: 1 male with pupal and larval exuviae, Brazil, Amazonas, Manaus, AM 010/Km 26, 02°58'07" S 60°00'20" W. 08-09.x.2011, leg H. F. Mendes, slide-mounted in Euparal® (MZUSP); 1 male, Brazil, Pará, Parauapebas, FLONA de Carajás, Igarapé do Cascalho, 5°57'31" S 50°23'49" W, 214 m. 15-20.ix.2023, leg. G. R. Desidério, L. Moreno. Malaise, slide-mounted in Hoyer (INPA).

Diagnostic characters. Male: anal point narrow, slightly bulbous at the apex; superior volsella markedly elongated extend beyond the apex of gonocoxite, slightly curved, and tapering at the apex, with five or six setae distributed in basal portion, and two additional setae in the apical portion; inferior volsella with apical setae thicker than the subapical one. **Pupa:** frontal apotome elongated; frontal warts with small spines; T II with a posterior row of hooklets divided medially into two groups; T VII with a small field of shagreens restricted to the posteromedian region; spur on S VIII with eight yellowish teeth, four larger and four smaller, all sharp. **Larva:** spicules of the pecten epipharyngis simple, arranged in a row; labral lamella arranged in one group with a cleft in the middle of the spicules.

296

297 **Etymology**. The specific epithet is in honor of Emiliano Reis for his collaboration and
298 valuable contribution to the knowledge of *Stenochironomus* in the Amazon region.

299

300 **Male** (n = 1–3)
301 Total length 4.05–4.77 [4.76] mm. Wing length 1.78–2.23 [2.23] mm. Total length/ wing
302 length 2.13–2.35 [2.13]. Wing length/ length of profemur 1.36–1.44 [1.39].

303

304 General coloration yellowish. Head: eyes metallic green when in alcohol, flagellum yellowish
305 (Fig. 12A–B). Thorax: with brown pigmentation on the margin of the lateral vitta;
306 preepisternum with a transverse brown band; brown pigmentation present on the
307 postpronotum, median anespiternum, posterior anepisternum and epimeron, with brown
308 patches; scutellum without pigmentation; anterior margin of the postnotum with a light-brown
309 patch (Figs. 12B; 13D). Legs: forefemur with a brown patch at the apex; fore tibia with a
310 brown patch at the posterior region. Mid femur and mid tibia with a brow patch it the anterior
311 region. Hind femur with a brown patch on the posterior region; hind tibia with a brown patch
312 on the anterior region (Figs. 12A–B; 13B). Wings membrane with a brownish band (Figs.
313 12A–B; 13E). Abdomen: posterior margin of T I–IV with brown pigmentation; hypopygium
314 yellowish, anal point and gonostylus brownish or yellowish (Figs. 12A–B; 13C).

315

316 Head (Fig. 13A). AR [2.03]. Thirteenth flagellomerum [1016] µm long. Temporal setae 12–14
317 [15]. Clypeus with 48–50 [55] setae. Tentorium 157–189 [189] µm long; 39–41, [41] µm wide
318 at the sieve pore; 11–14 [13] µm wide at the posterior tentorial pit. Stipes 121 µm long; 2 µm
319 wide. Cibarial pump 235–244 [238] µm long. Palpus with [46] setae. Palpomere lengths (n =
320 2) (1–5 in µm): 44 [47]; 40 [53]; 159 [186]; 130 [140]; 244 [293].
321 Thorax (Fig. 13D). Acrostichals 20–24 [21]; dorsocentrals 13–16 [16] in one row, prealars 6–
322 9 [9] in one row. Scutellum with 17–23 [18] setae in two rows. Scutum markedly projected
323 anteriorly; anterior edge of scutum angled in lateral aspect.
324 Wing (Fig. 13E). VR 0.90–0.93 [0.91] long. Brachiolum 5 [5] setae. With 20 [20] sensilla
325 campaniformia. R with 25–38 [38] setae. R_1 with 37–43 [42] setae. R_{4+5} with 65–70 [70]
326 setae. RM with 1–2 [1] setae. M with 2–4 [4] setae, remaining veins bare. Squama with 8–12
327 [8] setae.

Legs (Fig. 13B). Scale of front tibia 40–43 [43] µm long, without a spine at the apex; spurs of the mid tibia 42 [45] µm long; spurs of the hind tibia 39 [40] µm and 38 [39] µm long. Apex of the fore tibia 61–69 [69] µm wide, the mid tibia 57–68 [68] µm wide, and the hind tibia 65–70 [70] µm wide. Lengths (in µm) and proportions of legs as in Table 3.

Hypopygium (Fig. 14A–B). Anal point narrow, slightly bulbous at the apex, 93–119 [119] µm long, 16–22 [20] µm wide at the base, 6–9 [9] µm at the midpoint, 6–7 [7] µm at the apex. Tergite IX with 34–46 [46] setae, caudal apex with pre-apical constriction in dorsal aspect. Laterosternite IX with 3–4 [4] setae. Phallapodeme 77–90 [87] µm long; transverse sternapodeme 34–43 [43] µm long. Gonocoxite 161–182 [182] µm long. Gonostylus 191–230 [230] µm long, swollen subapically, with the apex slightly rounded. Superior volsella markedly elongate, extending beyond the apex of gonocoxite, 102–132 [132] µm long, slightly curved and tapering at the apex, with 7–8 [8] setae, five or six in the basal portion and two setae in the apical portion. Inferior volsella 240–285 [285] µm long, with 5–7 [5] setae; apical setae thicker than the subapical one. HR 0.72–0.86 [0.79]; HV 2.07–2.15 [2.07].

Pupa (n = 1) Total length [5.92 mm]. General coloration light brown.

Cephalotorax [1371] µm long, with and elongated frontal apotome, frontal warts with small spines (Fig. 15A). Distance between Dc_1 and Dc_2 [2] µm; between Dc_2 and Dc_3 [258] µm; between Dc_3 and Dc_4 [2] µm. Median suture granulose.

Abdomen [4552] µm long (Fig. 15C–E). T I with a small field of weak shagreens in the middle region; T II–TIII with a large field of shagreen not extending to the lateral margin; T II with a posterior row of hooklets divided medially into two groups by [30] µm, each row [166] and [154] µm long, not extending to the lateral margin of tergite; *pedes spurii* B absent. T IV with a large field of shagreens with a strong constriction in the anterior region and a slightly constriction on posterior region; T V with a field of shagreens restrict to the middle region, with the anterior and posterior portions somewhat triangular in shape; T VI with two separated fields of shagreen, one anterior field somewhat triangular, with thinner shagreens, and a posterior field with thicker shagreen; T VII with a small field of shagreens restricted to the posterior region; T VIII without shagreens; Anal lobe with shagreen restricted to the anterolateral margin. Conjunctive III/IV with shagreen. Abdominal setation: S I without L setae; S II–IV with 1–3 L setae; S V–VI with 4 LS setae; S VII with 3 or 4 LS setae S VIII with 5 LS setae. Spur on S VIII (Fig. 15B) with eight yellowish-brown teeth, four larger and

four smaller, all sharp. Genital sac [472] µm long, overreaching the posterior margin of the anal lobe by [60] µm long; anal lobe [341] µm long, with fringe of 46 filaments.

4th instar larva (n = 1).

Head. Head capsule [278] µm long. Antenna (Fig. 16B); lengths of antennal segments (in µm): [54]; [19]; [10]; [7]; [4]. Labrum (Fig. 16A). Spicules of the pecten epipharyngis simple, arranged in a row (Fig. 16A). Labral lamella arranged in one group with a cleft in the middle of the spicules (Fig. 16A). S1 pinnate, S2 bifurcated; S3 pinnate (Fig. 16A). Premandible not measurable. Mandible (Fig. 16A) [175] µm long. Mentum [142] µm wide, with 10 blackish teeth (Fig. 16C); ventromental plate [70] µm (Fig. 16C). Base of the dorsolateral strip originating near the base of the dorsomedian strip. Labiohypopharynx (Fig. 16A) with rounded ligular lobes, with a parallel-sided cleft between them.

Taxonomic remarks. In the male identification key of the Neotropical *Stenochironomus* (Dantas *et al*. 2016), *Stenochironomus* sp. 2 falls in couplet 35, leading to *Stenochironomus townesi* Borkent, 1984 and *Stenochironomus nudipupa* Borkent, 1984. However, the hypopygium of the new species is easily differentiated from those of the two species described by Borkent (1984) by the superior volsella, which extends beyond the apex of the gonocoxite (Fig. 14B); in *S. townesi* and *S. nudipupa* the superior volsella not extending beyond the apex of gonocoxite. The clearest difference between the pupae of *S.* sp. 2 and *S. nudipupa* are the elongate frontal apotome and the presence of small spines on the frontal warts of the new species (Fig. 15A). In contrast, in *S. nudipupa*, the frontal apotome is short, and the frontal warts appear more reduced and lack spines on surface. Other differences can be observed in the abdomen, where the hooklets on T II of *S.* sp. 2 are clearly divided in two rows (Fig. 15C), while those of *S. nudipupa* hooklest are arranged in a single row. The shagreens on T VII and T VIII of *S. nudipupa* are restricted to the anterolateral margins, whereas in *S.* sp. 2 there is a small field of shagreens restricted to the posteromedian region on T VII (Fig. 15D), and they are absent on T VIII. The larvae of *S.* sp. 2 and *S. nudipupa* can be easily differentiated by their mandibles: in the new species, there are two inner teeth (Fig. 16A), whereas in *S. nudipupa* there are three inner teeth.

The pupa and larva of the new species present features consistent with the *Stenochironomus* (*Petalopholeus*), as proposed by Borkent (1984). In leaf-mining species, the diagnosis includes T II of the pupal abdomen with a posterior row of hooklets restricted to the medial

393 portion and the head capsule of the 4th instar larva with dorsolateral stripes originating near
394 the base of the dorsomedian stripe. This species was partially described by E. D. A. Reis,
395 unpubl. data.
396
397 **Distribution and notes on biology**. The species occurs in two Brazilian states, Amazonas and
398 Pará, which are part of the Amazon biome (Fig. 1). The larvae were found mining leaves in
399 small black-water streams.
400
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415
416 **Disclosure Statement**
417
418 No potential conflict of interest was reported by the authors.
419
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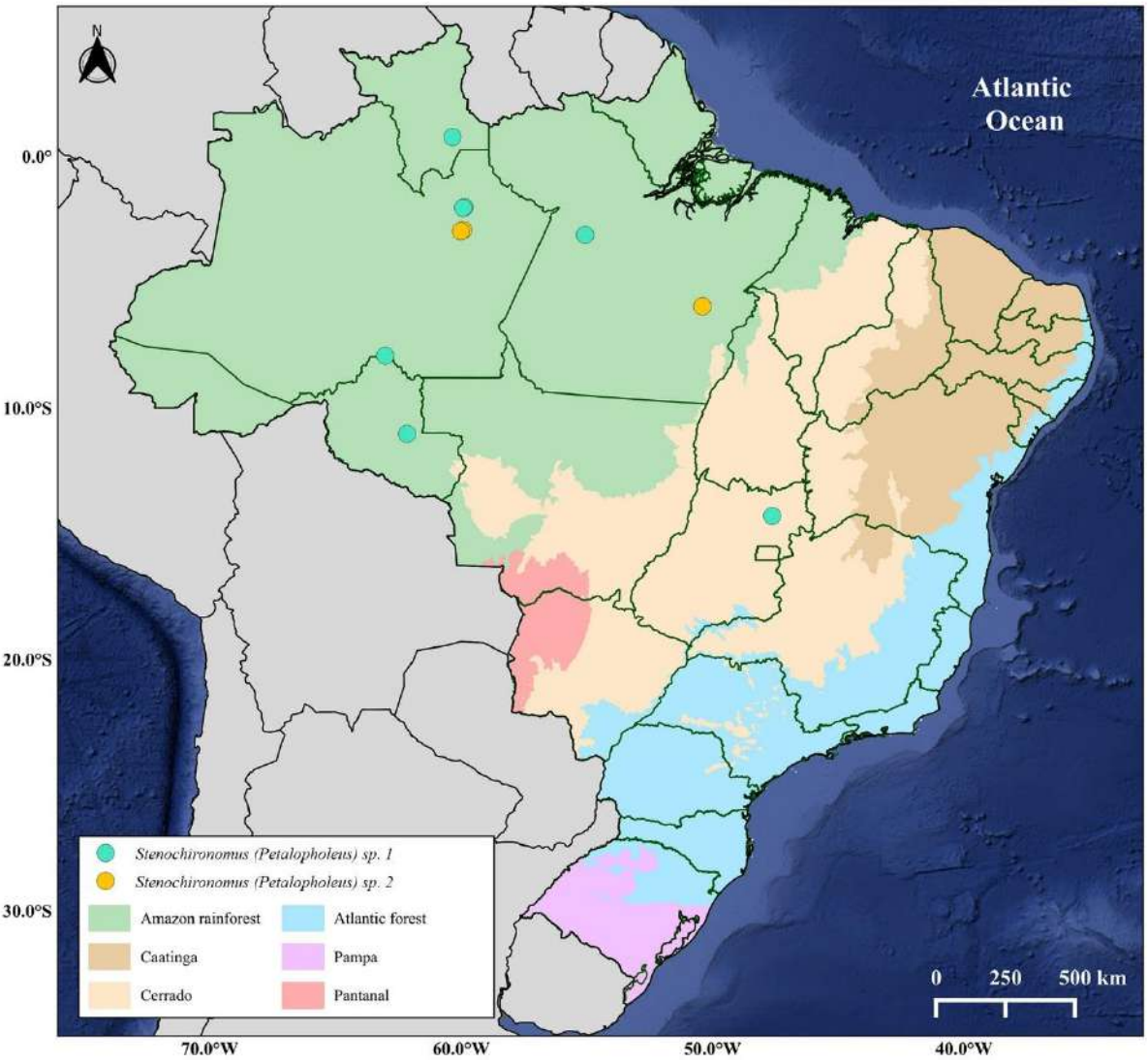


Fig. 1. Distribution of *Stenochironomus* (*Petalopholeus*) sp. 1 and *Stenochironomus* (*Petalopholeus*) sp. 2 (Diptera, Chironomidae) in Brazil.

476

477 **Fig. 2.** *Stenochironomus* (*Petalopholeus*) sp. 1 (Diptera, Chironomidae), male adult, habitus.
478 (**A**) Dorsal view. (**B**) Lateral view. Scale bars = 1 mm.

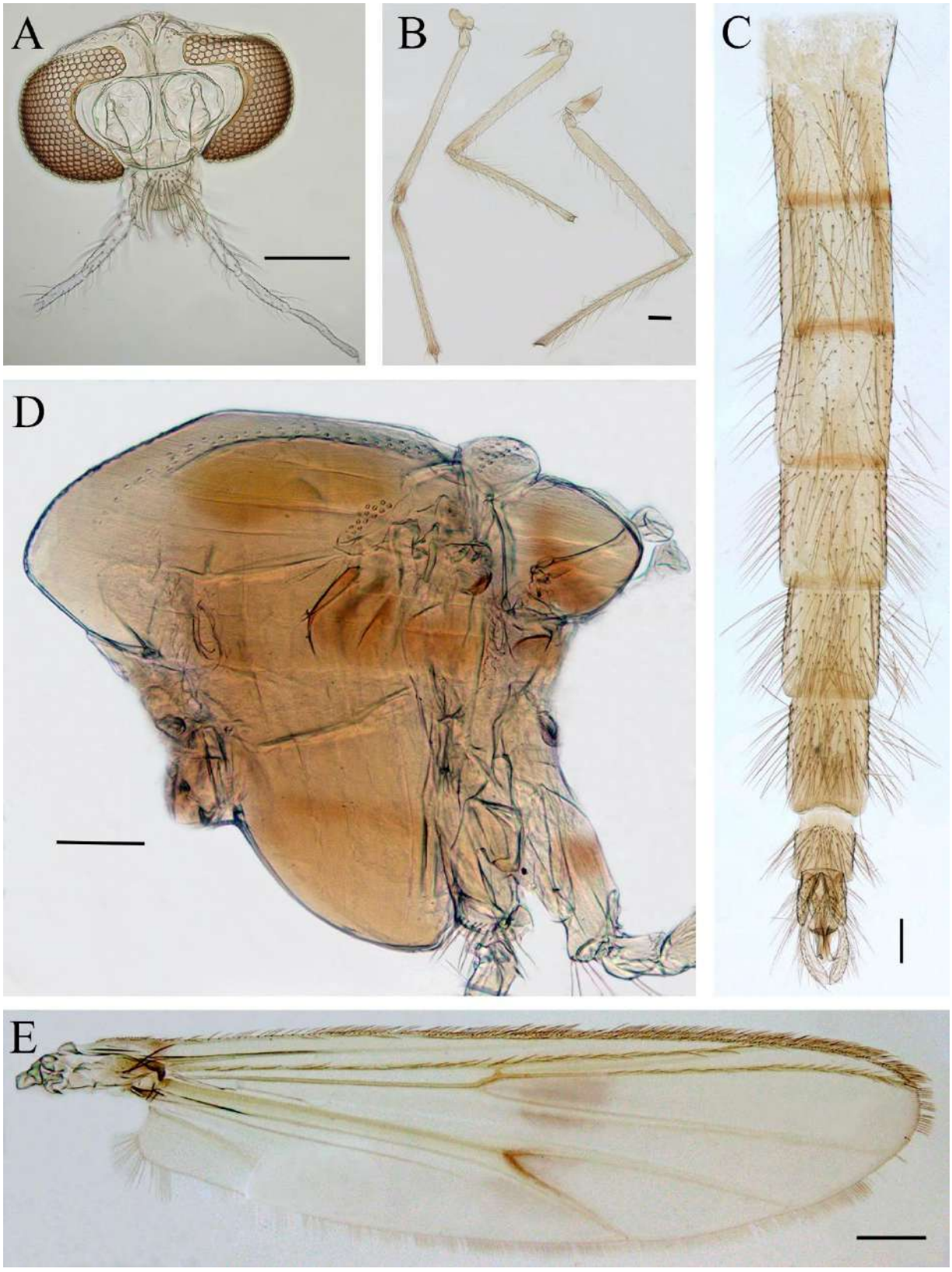


Fig. 3. *Stenochironomus* (*Petalopholeus*) sp. 1 (Diptera, Chironomidae), male adult. (**A**) Head, frontal view. (**B**) Legs (femur and tibia), from left to right, fore, mid, and hindleg. (**C**) Thorax, lateral view. (**D**) Abdomen, dorsal view. (**E**) Wing. Scale bars = 200 µm.

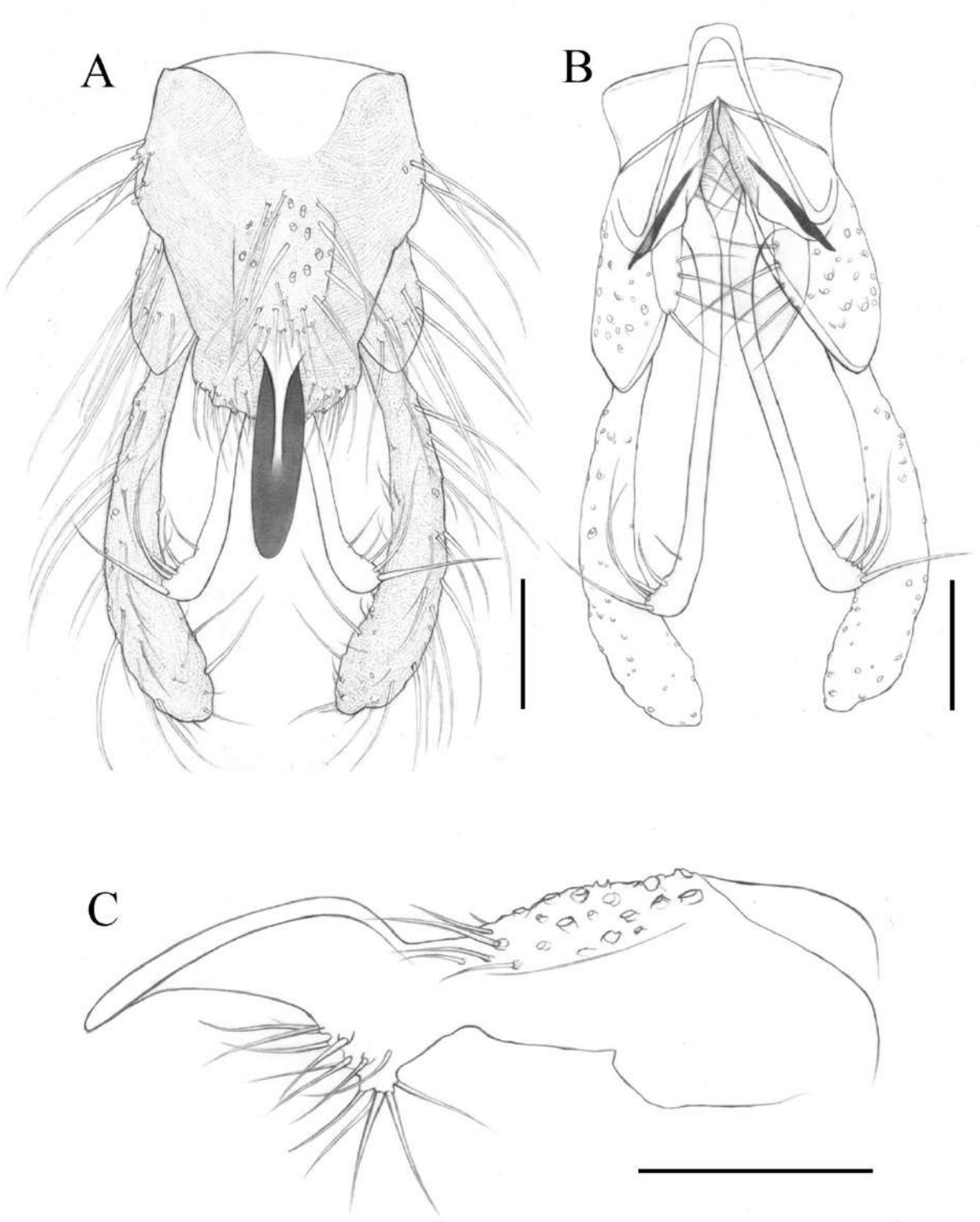


Fig. 4. *Stenochironomus* (*Petalopholeus*) sp. 1 (Diptera, Chironomidae), male adult. (**A**) Hypopygium, dorsal view. (**B**) Hypopygium, with tergite IX removed, dorsal view. (**C**) Anal point, lateral view. Scale bars = 100 µm.

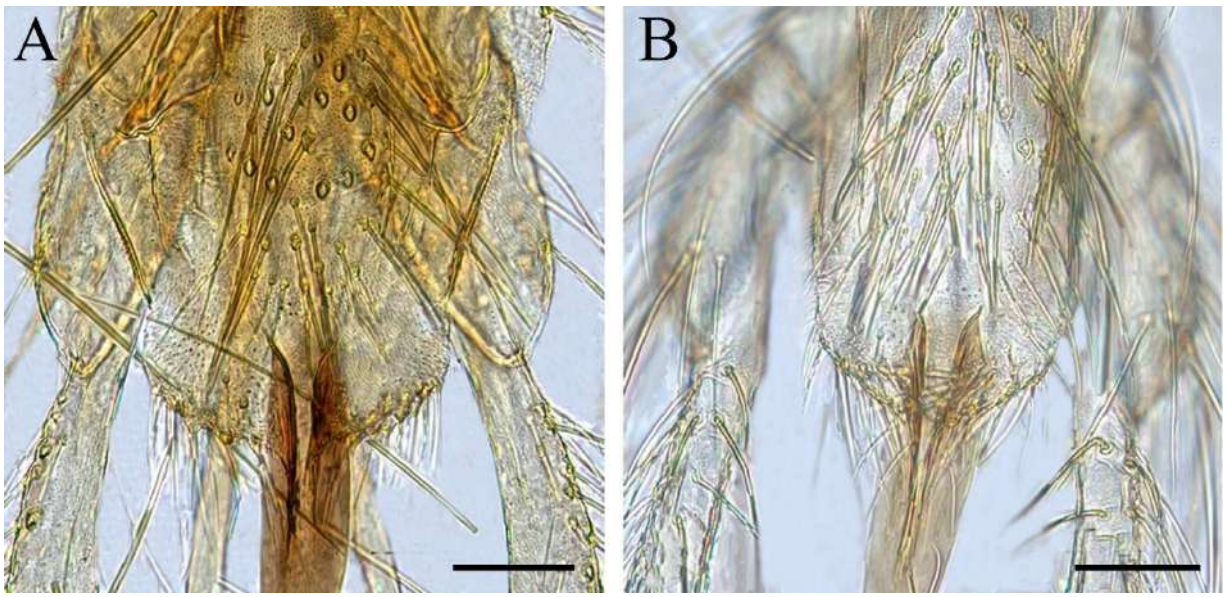
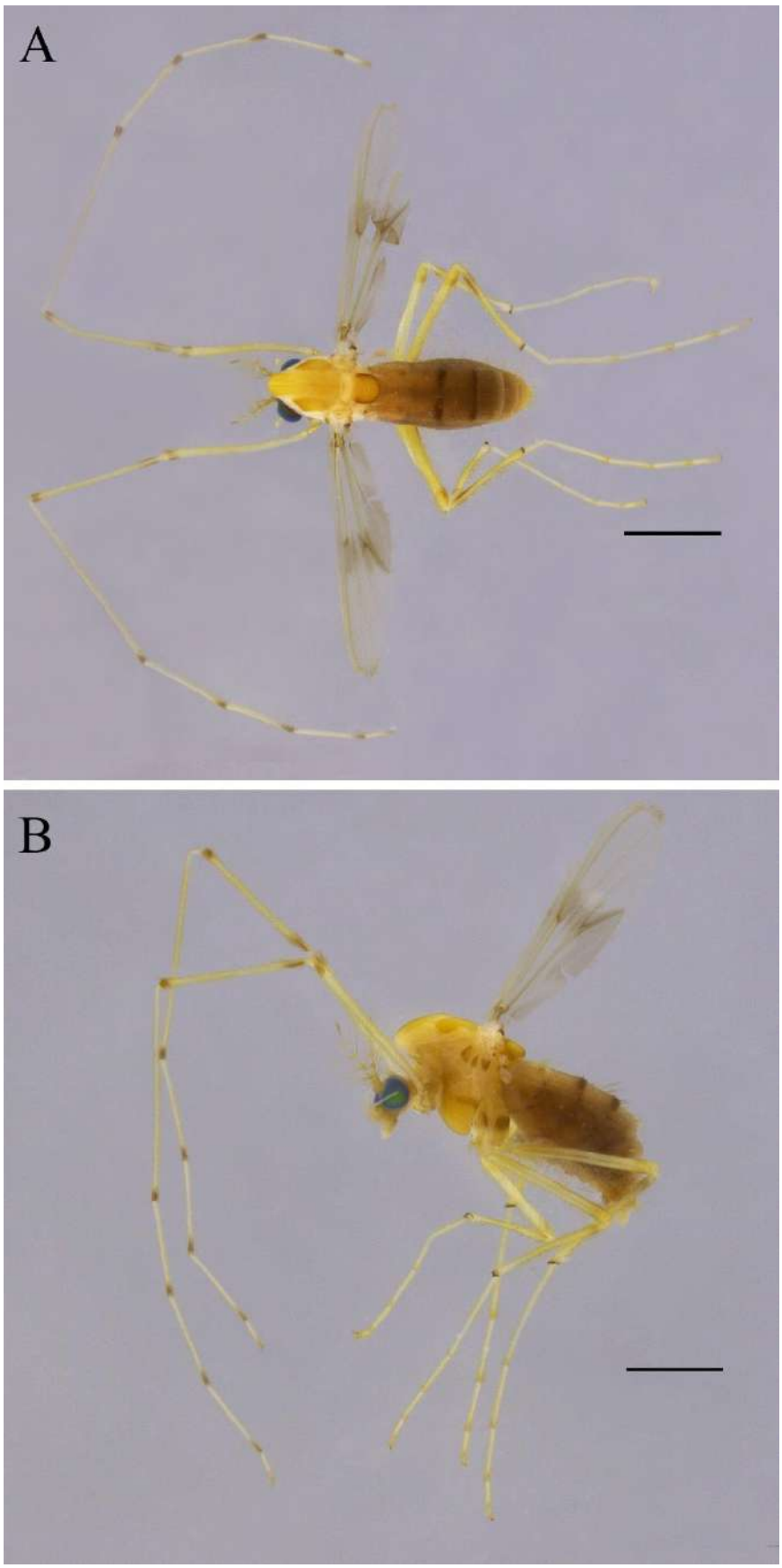


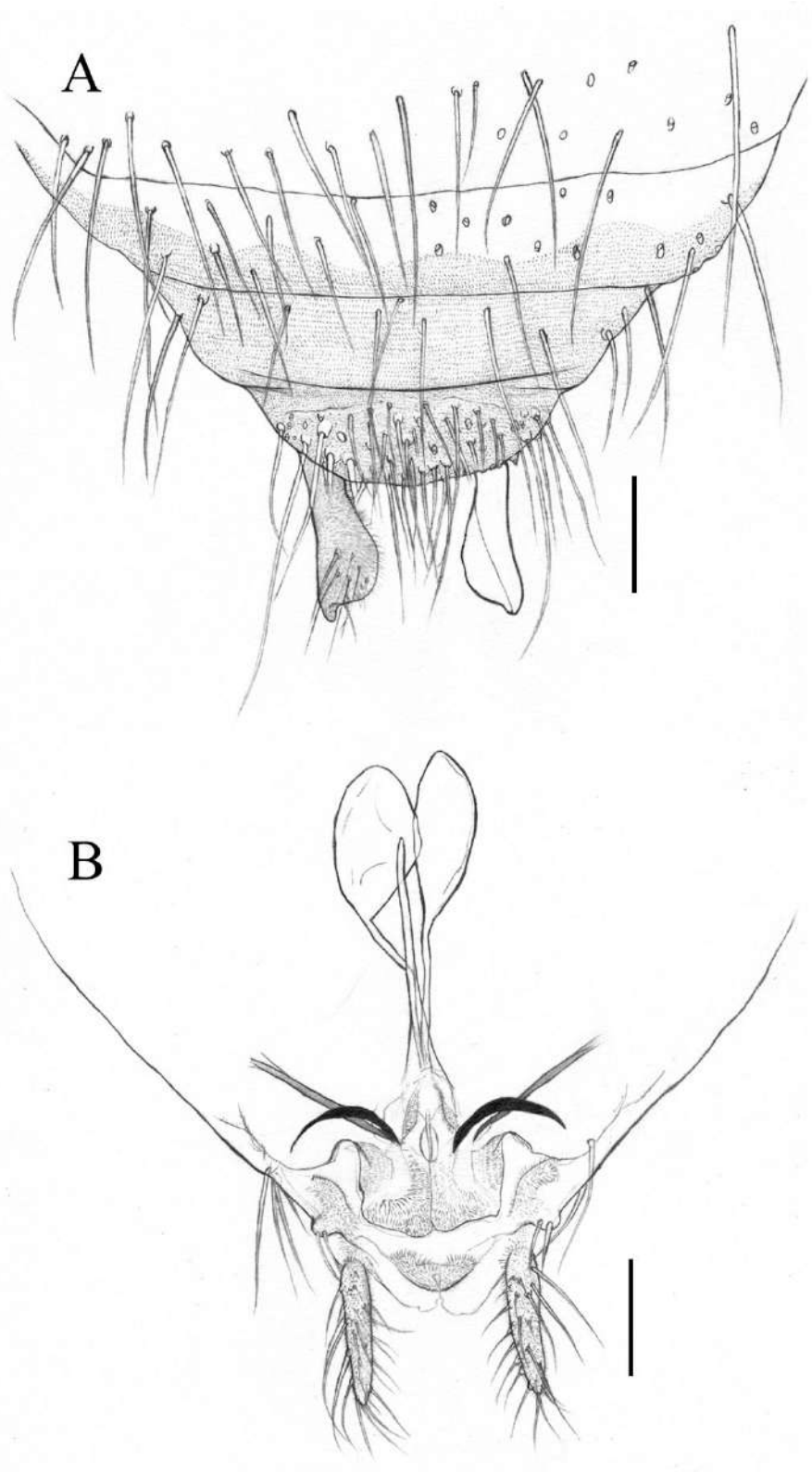
Fig. 5. *Stenochironomus* (*Petalopholeus*) sp. 1 (Diptera, Chironomidae), male adult. (**A**) T IX in Hoyer, dorsal view. (**B**) T IX in Euparal®, dorsal view. Scale bars = 50 µm.



490

491 **Fig. 6.** *Stenochironomus* (*Petalopholeus*) sp. 1 (Diptera, Chironomidae), adult female, habitus.

492 (**A**) Dorsal view. (**B**) Lateral view. Scale bars = 1 mm.



493

494 **Fig. 7.** *Stenochironomus* (*Petalopholeus*) sp. 1 (Diptera, Chironomidae), adult female. (**A**)

495 Genitalia, dorsal view. (**B**) Genitalia, ventral view. Scale bars = 100 µm.

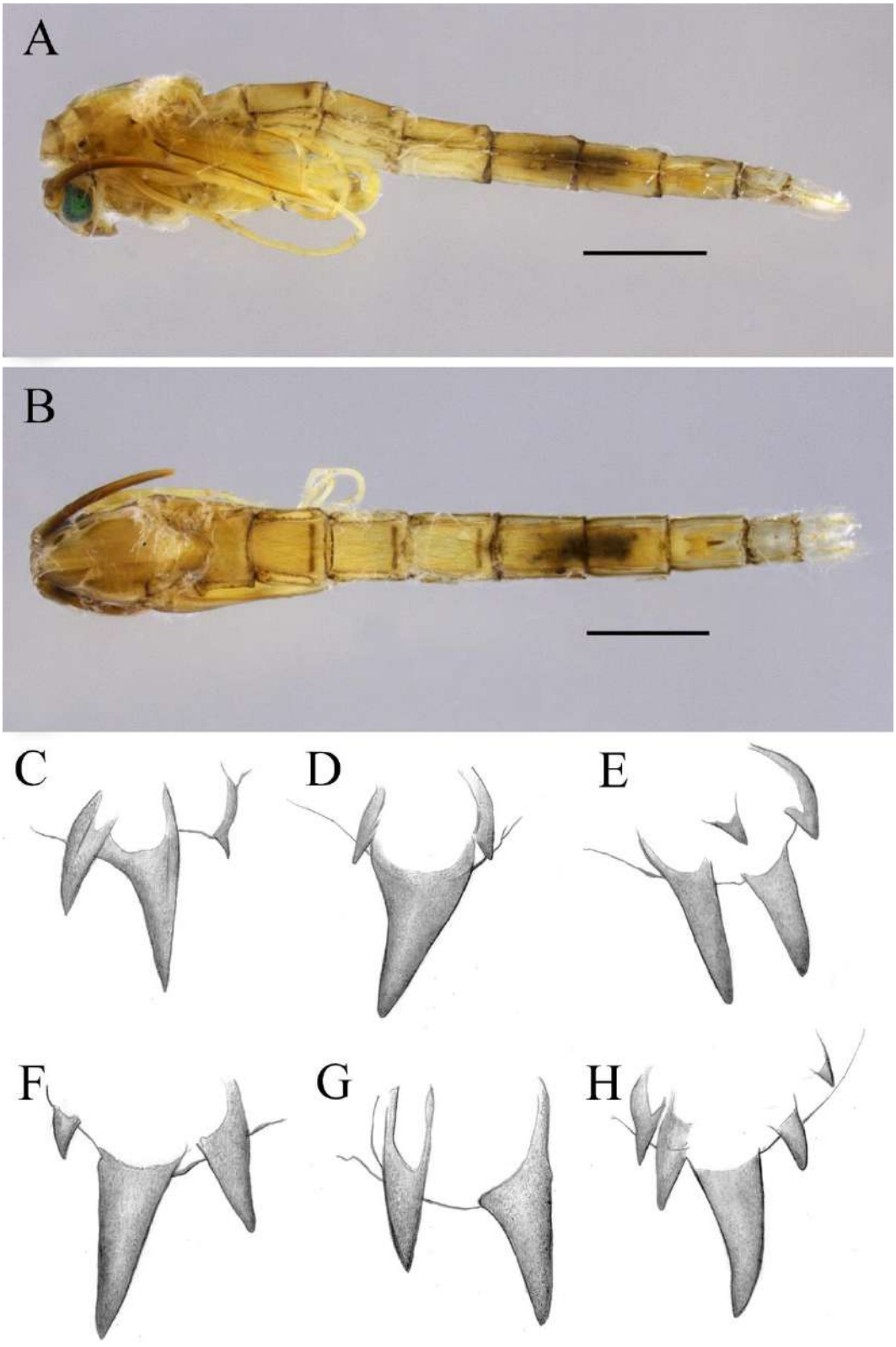


Fig. 8. *Stenochironomus* (*Petalopholeus*) sp. 1 (Diptera, Chironomidae), pupa. (**A**) Habitus, dorsal view. (**B**) Habitus, lateral view. (**C–H**). Variation of the spur on S VIII. Scale bars = 1 mm.

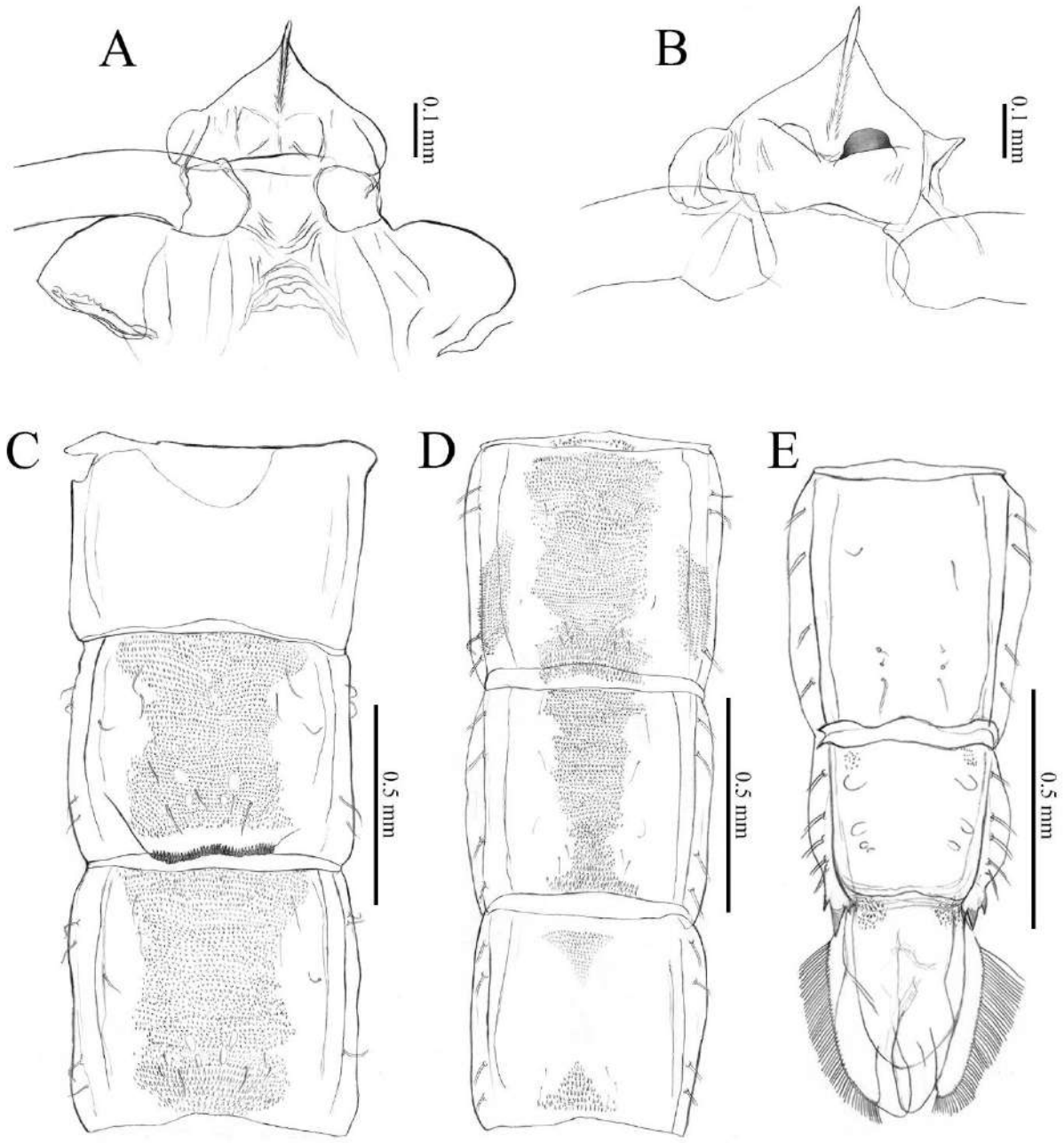
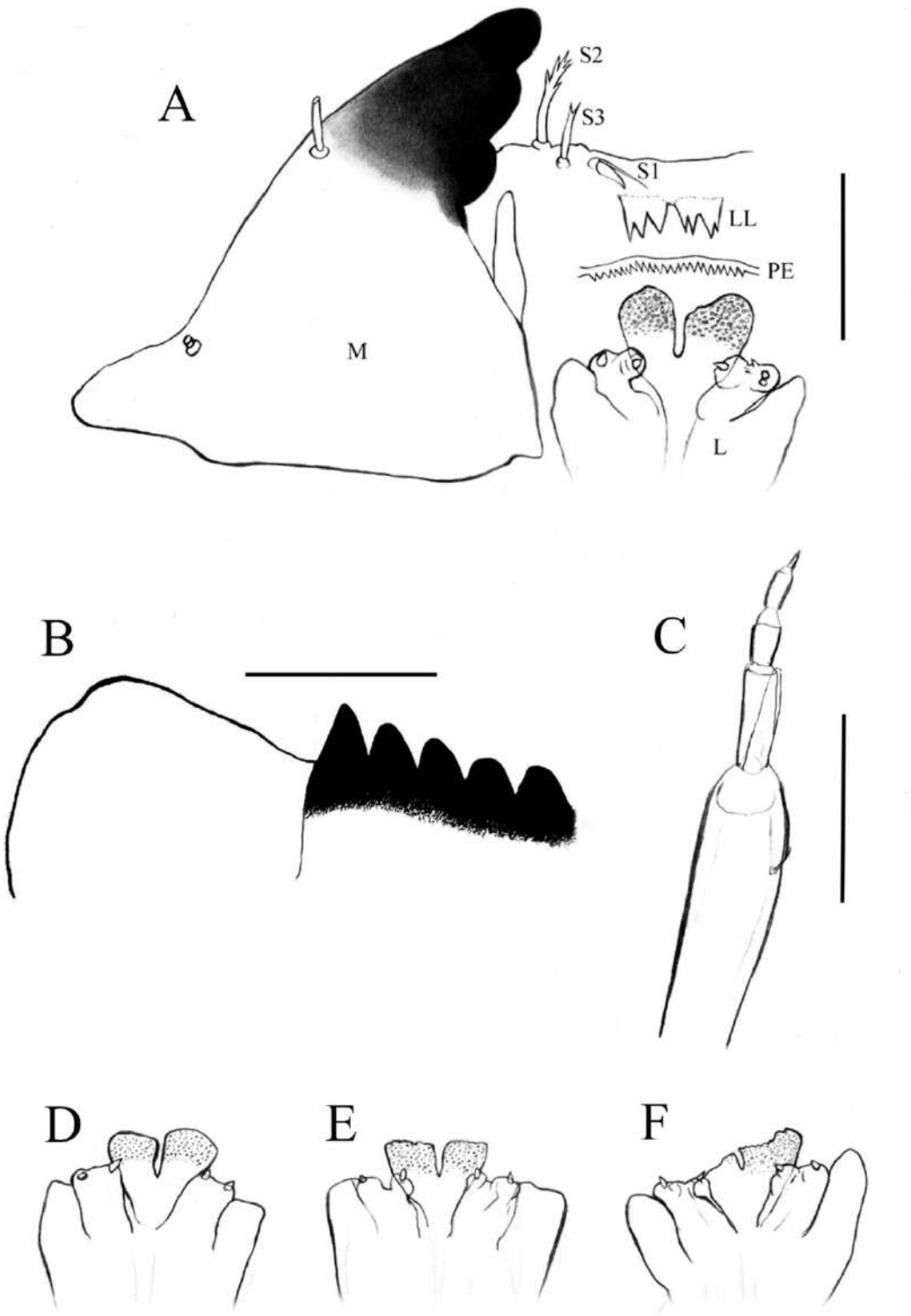


Fig. 9. *Stenochironomus* (*Petalopholeus*) sp. 1 (Diptera, Chironomidae), pupa. (**A**) Frontal apotome. (**B**) Frontal apotome with frontal warts. (**C–E**) Abdomen, in dorsal view. (**C**) Tergites I–III. (**D**) Tergites IV–VI. (**E**) Tergites VII–Anal lobe.



505

506 **Fig. 10.** *Stenochironomus* (*Petalopholeus*) sp. 1 (Diptera, Chironomidae), larva. (**A**) A. Labrum,
507 M, mandible; L, Labiohypopharynx; PE, Pecten epipharyngis; LL, Labral lamellae. (**B**)
508 Ventromental plate and mentum. (**C**) Antennae. (**D–E**) Examples of damaged
509 labiohypopharynx. Scale bars = 50 µm.

510

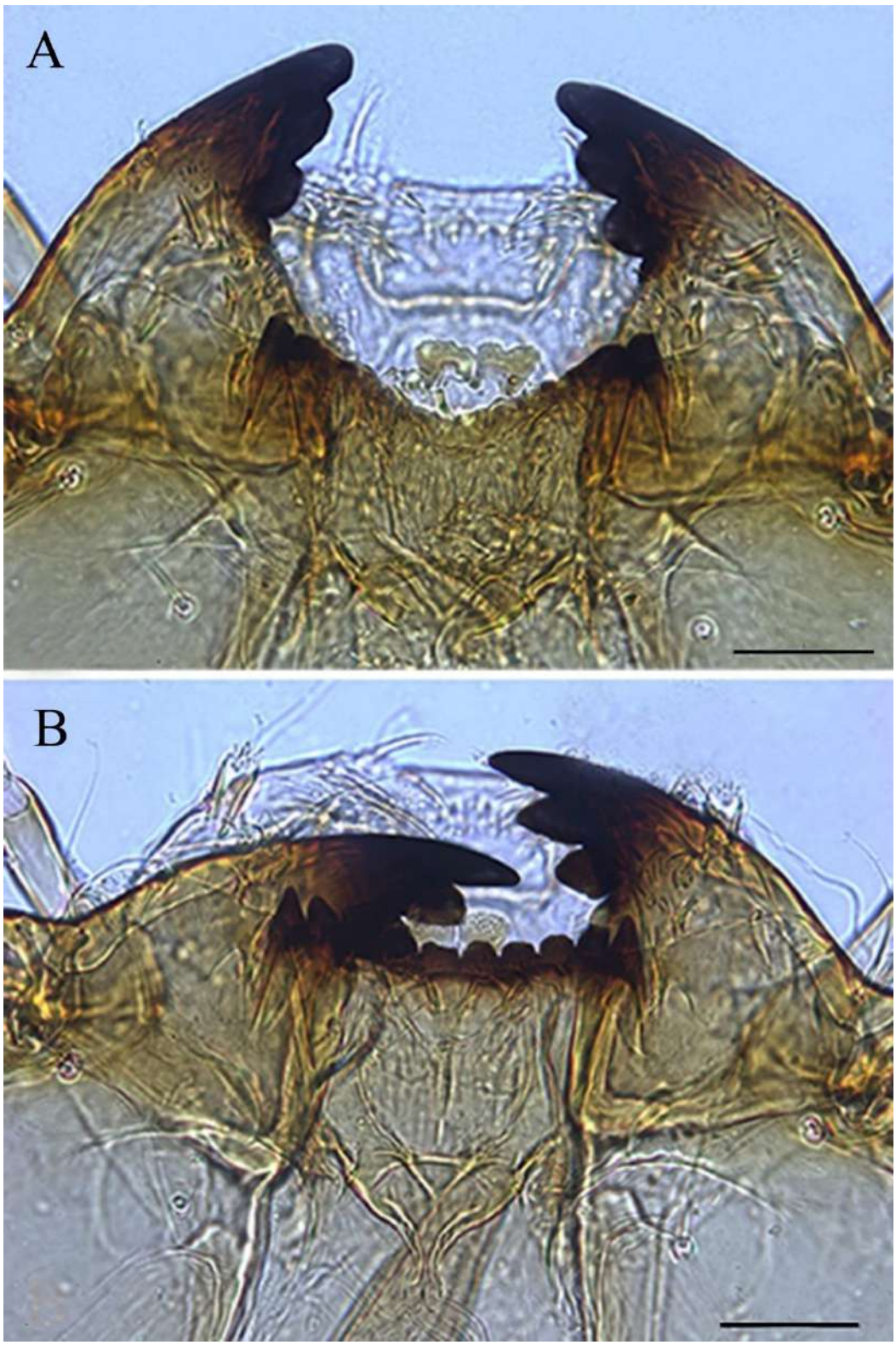


Fig. 11. *Stenochironomus* (*Petalopholeus*) sp. 1 (Diptera, Chironomidae), larva. (**A**) Mentum teeth and mandible damaged. (**B**) Mentum teeth and mandible non-damaged. Scale bars = 50 µm.

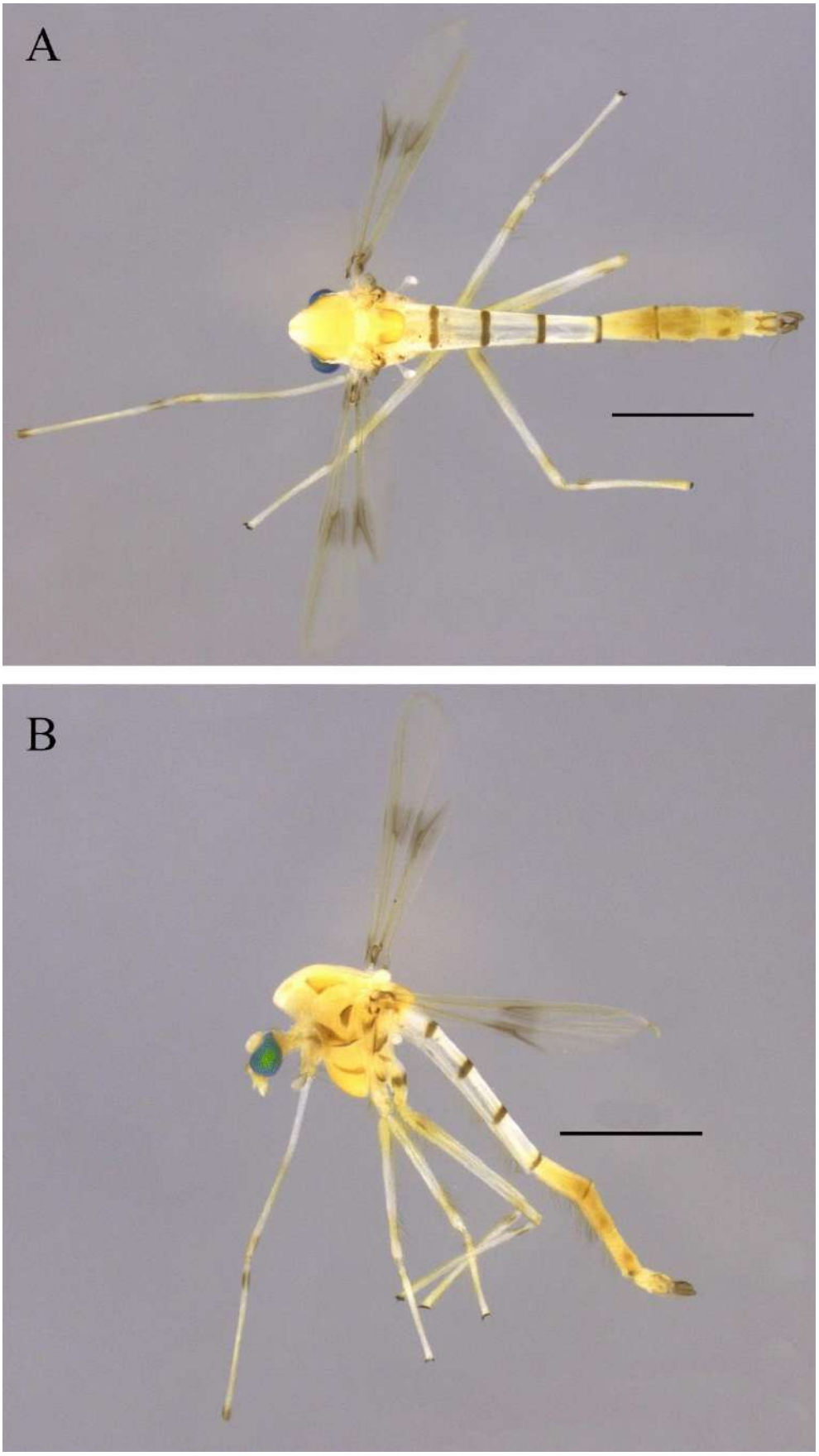
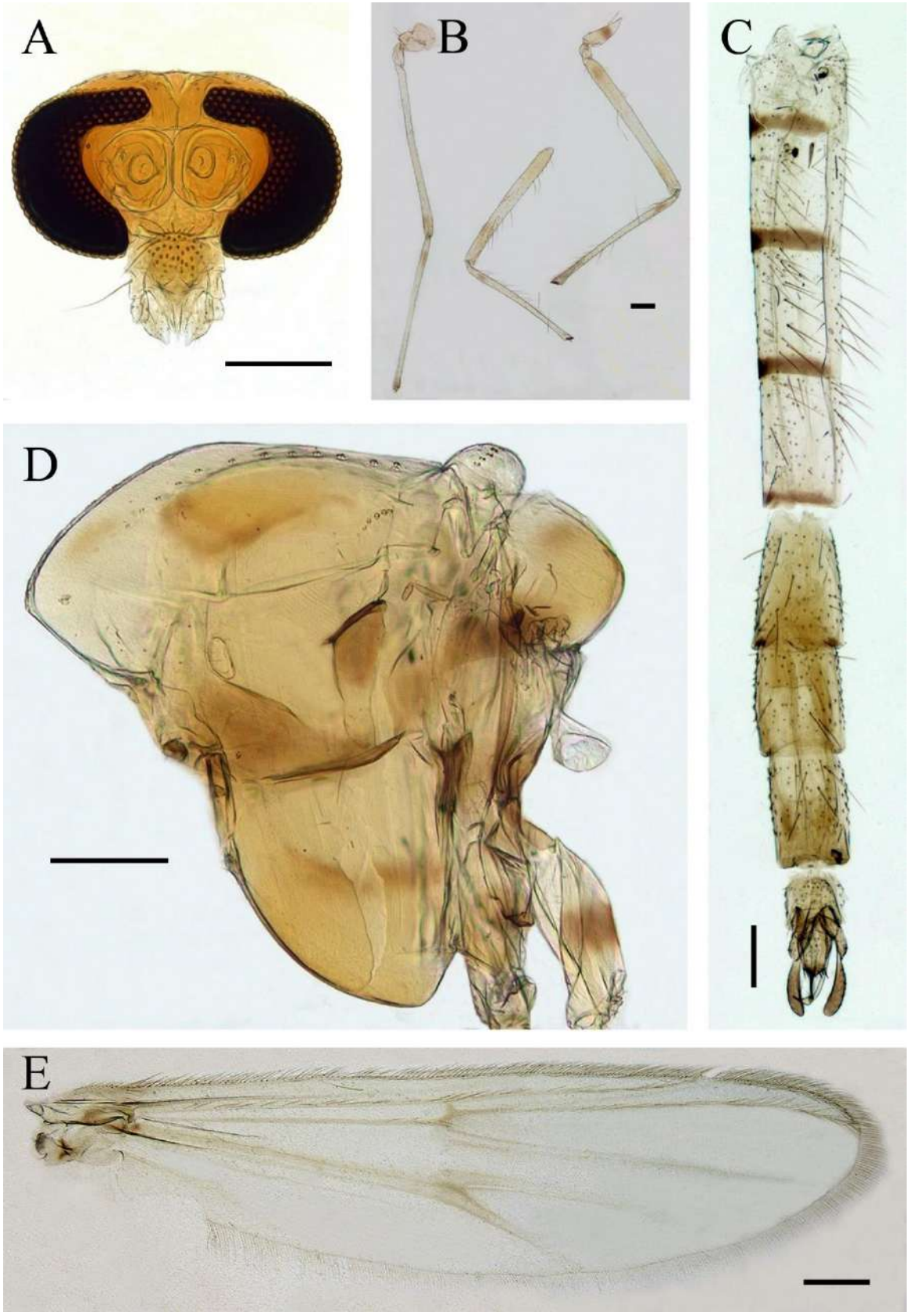


Fig. 12. *Stenochironomus* (*Petalopholeus*) sp. 2 (Diptera, Chironomidae), adult male, habitus. (**A**) Dorsal view. (**B**) Lateral view. Scale bars = 1 mm.



518

519 **Fig. 13**. *Stenochironomus* (*Petalopholeus*) sp. 2 (Diptera, Chironomidae), adult male. (**A**)
520 Head, frontal view. (**B**) Legs (femur and tibia), from left to right, fore, mid, and hindleg. (**C**)
521 Thorax, lateral view. (**D**) Abdomen, dorsal view. (**E**) Wing. Scale bars = 200 µm.

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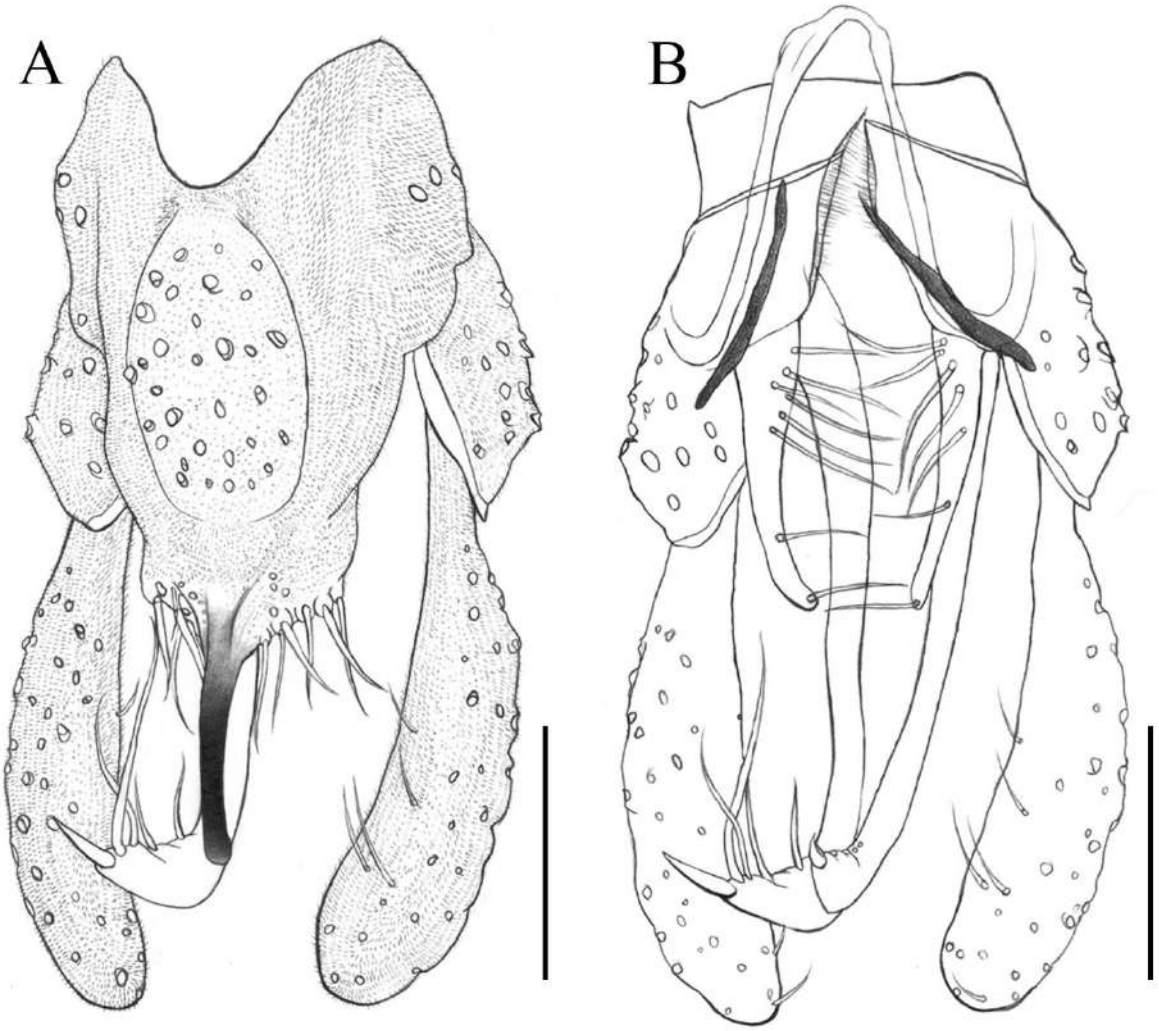

523

524 **Fig. 14**. *Stenochironomus* (*Petalopholeus*) sp. 2 (Diptera, Chironomidae), adult male. (**A**)
525 Hypopygium, dorsal view. (**B**) Hypopygium with tergite IX removed, dorsal view. Scale bars
526 = 100 µm.

527

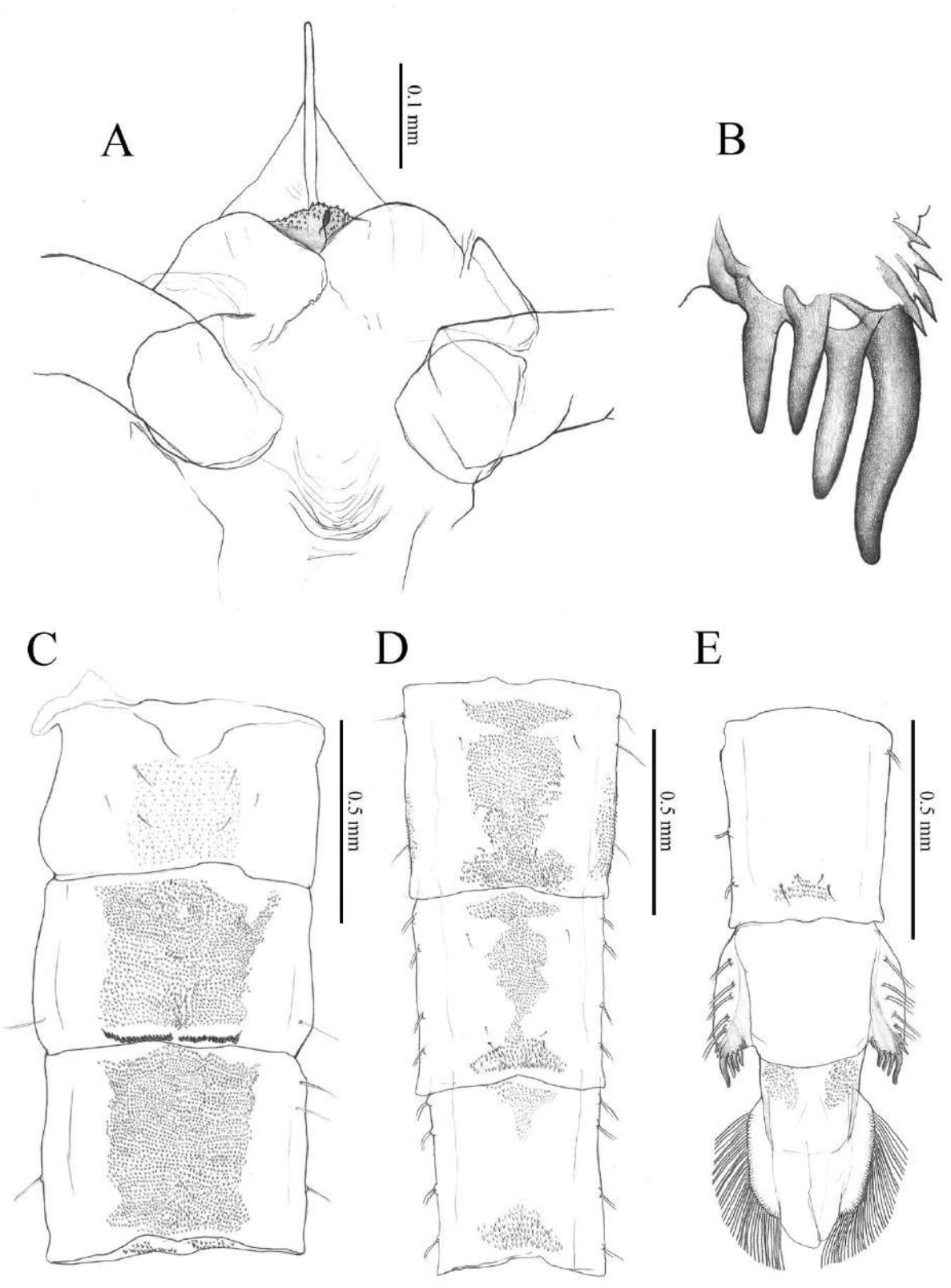

Fig. 15. *Stenochironomus* (*Petalopholeus*) sp. 2 (Diptera, Chironomidae), pupa. (**A**) Frontal apotome. (**B**) Spur on S VIII. (**C–E**) Abdomen, in dorsal view. (**C**) Tergites I–III. (**D**) Tergites IV–VI. (**E**) Tergites VII–Anal lobe.

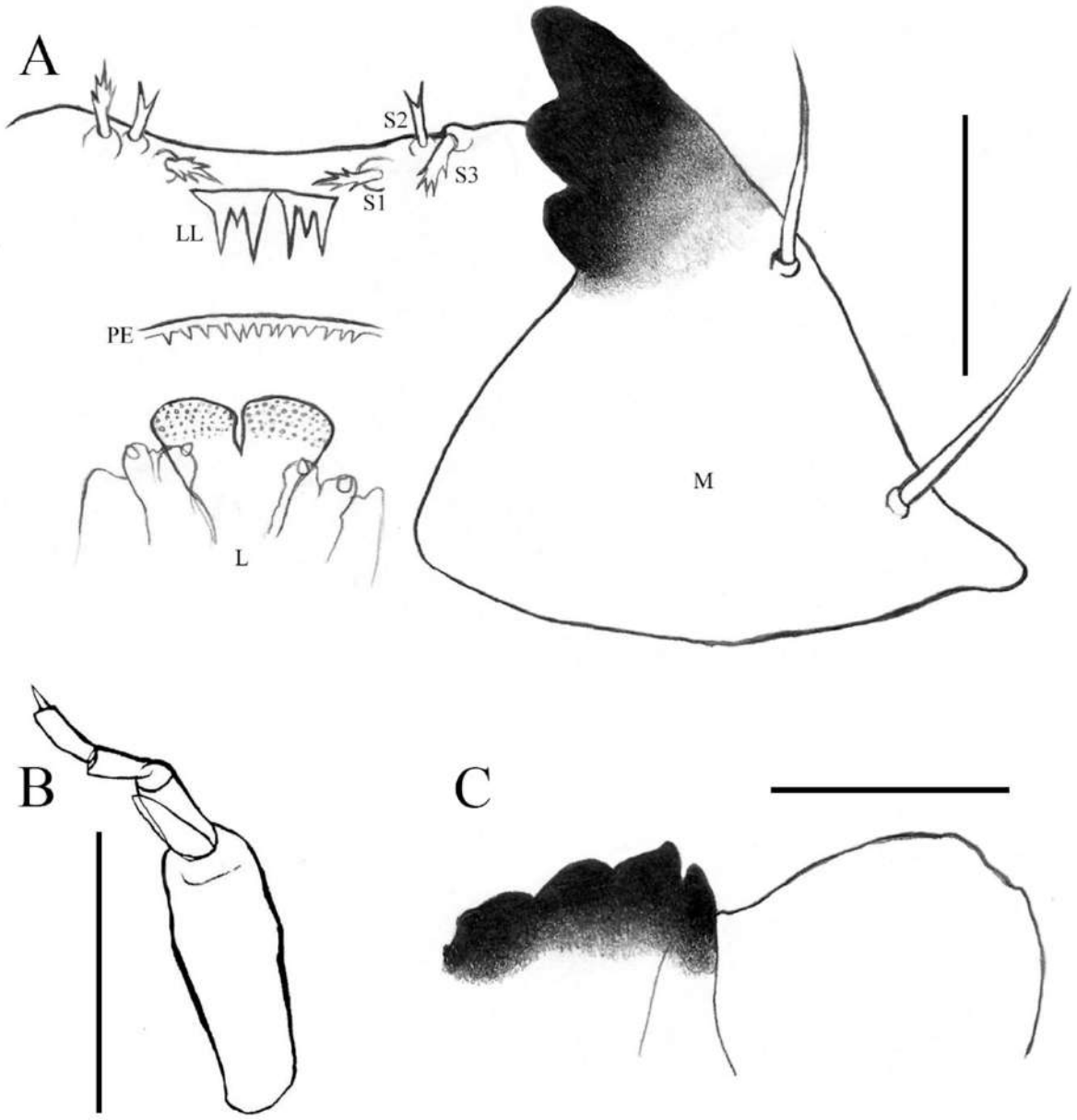

Fig. 16. *Stenochironomus* (*Petalopholeus*) sp. 2 (Diptera, Chironomidae), larva. (**A**) A. Labrum, M, mandible; L, Labiohypopharynx; PE, Pecten epipharyngis; LL, Labral lamellae. (**B**) Antennae. (**C**) Ventromental plate and mentum. Scale bars = 50 µm.

TABLE 1. Lengths (in µm) and proportions of legs of *Stenochironomus* (*Petalopholeus*) sp. 1 (Diptera, Chironomidae), adult male.

	Fe	ti	ta1	ta2	ta3
P1	1433–1690 [1444]	1269–1719 [1335]	1797–2013 [1750]	753–940 [825]	709–914 [770]
P2	1191–1462 [1227]	1042–1254 [1083]	786–943 [809]	358–423 [388]	295–368 [312]
P3	1370–1690 [1401]	1310–1532 [1352]	955–1200 [1045]	532–629 [545]	430–523 [436]
	ta4	**ta5**	**LR**	**BV**	**SV**
P1	630–809 [675]	263–328 [282]	1.18–1.41 [1.31]	1.62–1.91 [1.77]	1.50–1.76 [1.58]
P2	162–220 [167]	87–126 [91]	0.68–0.81 [0.74]	3.20–3.40 [3.25]	2.72–3.09 [2.85]
P3	226–282 [231]	97–140 [112]	0.72–0.78 [0.77]	2.72–293 [2.86]	2.61–2.90 [2.63]

TABLE 2. Lengths (in µm) and proportions of legs of *Stenochironomus* (*Petalopholeus*) sp. 1 (Diptera, Chironomidae), adult female.

	Fe	ti	ta1	ta2	ta3
P1	1703–1899	1447–1600	2128–2480	974–1115	957–1142
P2	1388–1661	1214–1491	906–1058	417–498	330–402
P3	1570–1878	1464–1797	1117–1335	630–711	527–589
	ta4	**ta5**	**LR**	**BV**	**SV**
P1	858–1005	326–403	1.21–1.55	1.63–1.88	1.41–1.71
P2	204–228	112–147	0.70–0.78	3.22–3.38	2.82–2.97
P3	218–274	118–141	0.74–0.77	2.67–2.87	2.71–2.75

TABLE 3. Lengths (in µm) and proportions of legs of *Stenochironomus* (*Petalopholeus*) sp. 2 (Diptera, Chironomidae), adult male.

	Fe	**ti**	**ta1**	**ta2**	**ta3**
P1	1320–1604 [1604]	1144–1453 [1453]	[1798]	[953]	[816]
P2	1069–1280 [1280]	946–1137 [1137]	677 [741]	315 [349]	268 [296]
P3	1200–1501 [1501]	1120–1395 [1395]	949 [1039]	518 [562]	426 [465]
	ta4	**ta5**	**LR**	**BV**	**SV**
P1	[665]	[288]	[1.23]	[1.78]	[1.70]
P2	177 [183]	87 [107]	0.65 [0.65]	3.38 [3.37]	3.23 [3.26]
P3	213 [269]	111 [124]	0.74 [0.74]	2.82 [2.77]	2.77 [2.78]

Capítulo 2

Six new species and new records of *Stenochironomus* Kieffer, 1919 (Diptera: Chironomidae) from the Brazilian Amazon

O Capítulo 2 desta Dissertação foi elaborado e formatado conforme as normas da publicação científica *Austral Entomology*, as quais se encontram no Anexo II.

Austral Entomology

Six new species and new records of *Stenochironomus* Kieffer, 1919 (Diptera: Chironomidae) from the Brazilian Amazon

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Six new species of *Stenochironomus* from Brazil

Abstract

Currently, thirty species of *Stenochironomus* are known from Brazil, twenty-five of which occur in the Amazon region. In this study, six new species of *Stenochironomus* from the Brazilian Amazon are described and illustrated. Three of these species are associated with their respective immature stages, one is associated with the pupal stage, and two are based solely on the adult male. Additionally, new records of *S. figueiredoensis* Dantas, Hamada & Mendes, *S. liviae* Dantas, Hamada & Mendes and *S. roquei* Dantas, Hamada & Mendes are provided.

Key words

Taxonomy, biodiversity, Chironominae, Chironomini, aquatic insects, Neotropical region

INTRODUCTION

Stenochironomus Kieffer, 1919 is a species-rich genus found in all biogeographic regions except Antarctica. The taxonomic revision conducted by Borkent (1984) recognized two subgenera based on morphology and habitat of immature stages. *Stenochironomus* (*Petalopholeus*) includes leaf-mining species, diagnosed by the presence of a posterior row of hooklets on T II of the pupal abdomen, restricted to the medial portion, and by the head capsule of the 4th instar larva, which has dorsolateral stripes originating near the base of the dorsomedian stripe. In contrast, *Stenochironomus* (*Stenochironomus*) comprises wood-mining larvae, diagnosed by a posterior row of hooklets on T II of the pupal abdomen that extends to the lateral margin and by the head capsule of the 4th instar larva, where dorsolateral stripes originate in the anterior 2/3 of the dorsomedian stripe.

Currently, the genus includes more than 100 species recognized worldwide, 39 of which occur in the Neotropical region and 30 in Brazil. Most Brazilian species (n = 26) are found in the Amazon region (Borkent 1984, Pinho *et al*. 2005, Andersen *et al.* 2007, Dantas *et al*. 2010, Reis *et al*. 2013, Dantas *et al*. 2016, Parise & Pinho 2016, Amora *et al*. 2018, Moubayed, 2024).

In the present study, we describe and illustrate six new species of *Stenochironomus* from the Brazilian Amazon, three of which are associated with their respective immature stages, one with the pupal stage and two based solely on the adult male. Additionally, we provide new distributional records for *Stenochironomus figueiredoensis* Dantas, Hamada & Mendes, 2016, *Stenochironomus liviae* Dantas, Hamada & Mendes, 2016, and *Stenochironomus roquei* Dantas, Hamada & Mendes, 2010 from the state of Acre.

MATERIALS AND METHODS

The collection and rearing of immature stages followed the methodology outlined by Amora (2018). Emerged adults, along with corresponding immature exuviae, were preserved in 80% ethanol. Specimens of *Stenochironomus* were collected in submerged leaves in streams and rivers in the states of Amazonas, Pará, and Roraima. Additional specimens were obtained using Malaise and light traps in Acre, Pará, and Roraima.

The examined specimens were slide-mounted in Hoyer's medium (Andersen *et al*. 2013).

Morphological measurements follow Epler (1988), while general terminology follows Sæther (1980). Measurements of the adult males, pupae, and larvae are given as ranges, with holotype measurement in square brackets when applicable.

Measurements were taken using an Olympus BX51 optical microscope with Cell-D

® 53 (Olympus) software. Photographs of morphological features were captured using a Leica DFC295 digital camera attached to a Leica DM5500 B compound microscope. Habitus images were taken with a Leica M165C stereomicroscope equipped with a Leica DFC72 camera. Illustrations were drawn by hand using camera lucida attached to a Leica DM750 optical microscope and later scanned for digital editing. The holotypes and some paratypes are housed in the Invertebrate Collection of the Instituto Nacional de Pesquisas da Amazonia (INPA), Manaus, Amazonas, Brazil. Some paratypes are housed in the Museu de Zoologia da Universidade de São Paulo (MZUSP), São Paulo, Brazil

RESULTS

TAXONOMY

Chironomidae Newman, 1843
Chironominae Newman, 1834
***Stenochironomus* Kieffer, 1919**
***Stenochironomus* (*Petalopholeus*) Borkent, 1984**

***Stenochironomus* (*Petalopholeus*) sp. nov. 3.**
(Figs. 2–6)

Material Examined

Holotype
♂, with pupal and larval exuviae, BRAZIL: Amazonas, Manaus, Reserva Florestal Adolpho Ducke, Igarapé Bolivia, 2°55’08.6”S, 59°54’44.6”W, 10.iv.2015, in submerged leaf, leg. G. Amora, slide-mounted in Hoyer (INPA).

Paratypes
2 ♂ with pupal and larval exuviae, same data as holotype (INPA). 1 ♂, same data as holotype (MZUSP).

Diagnosis

Male: thorax yellowish; tergite IX with dorsal setae placed on a slightly posteriorly projecting lobe, posterior margin convex, with setae arising from small lobes. **Pupa:** Frontal apotome short; TII hooklets divided into two groups; T VI–VII with two central fields of shagreen, one anterior and one posterior field, TVIII with a small central filed of shagreen; anal lobe without shagreen. **Larva:** spicules of pecten epipharyngis elongate and simple, arranged in a row; labral lamella arranged in two groups of elongate spicules; S1 simple, S2 simple, S3 bifurcated.

Description

Male (n = 1–4)

Total length 3.31–3.43 [3.43] mm. Wing length 1.47–1.48 [1.47] mm. Total length/wing length 2.32– 2.33 [2.33]. Wing length/ length of profemur 1.49– 1.50 [1.50].

General coloration yellowish (Fig. 2a–b). Head: eyes not metallic green when in alcohol (Fig. 3a), flagellum yellowish. Thorax yellowish (Fig. 3d). Legs pale (Fig. 2a–b). Wings lacking dark pigmentation (Fig. 3e). Abdomen yellowish, lacking dark pigmentation (Fig. 3c).

Head (Fig. 3a). AR 1.23–1.35 [1.28]. Thirteenth flagellomerum 575–603 [592] μm long. Temporal setae 11–12 [11]. Clypeus with 11–12 [11] setae. Tentorium 126–146 [134] μm long; 25–30 [30] μm wide at sieve pore; 3–5 [3] μm wide at posterior tentorial pit. Stipes not measurable; cibarial pump 183–207 [183] μm long. Palpus with 40–46 [46] setae. Palpomere lengths (1–5 in μm): 34–36 [36]; 46–49 [46]; 132–138 [132]; 103–106 [103]; 167–177 [167].

Thorax (Fig. 3d). Acrostichals 10–11 [11]; dorsocentrals 9–10 [9] in a single row; prealars 4–5 [4]. Scutellum with 6 setae in a single row. Scutum projecting anteriorly, with anterior edge angled in lateral aspect.

Wing (Fig. 3e). VR 1.23–124 [1.23]. Brachiolum with 4–5 [4] setae and about 18 sensilla campaniformia. R with 29–33 [29] setae. R_1 with 35–43 [33] setae. R_{4+5} with 33–39 [33] setae. RM with 0–2 [2] setae. M with 5 setae, remaining veins bare. Squama with 4–6 [4].

Legs (Fig. 3b). Scale of front tibia 29–30 [30] μm long, without spine; spurs of mid tibia 34–37 [34] μm and 32–47 [32] μm long; spurs of hind tibia 33–41 [33] μm and 40–46 [40] μm long. Apex of fore tibia 46–48 [46] μm wide, of mid tibia 43–47 [43] μm wide, of hind tibia 46–47 [46] μm wide. Lengths (in μm) and proportions of legs as in Table 1.

Hypopygium (Figs. 4a–c). Anal point slender, tapering posteriorly, originating apically on Tergite IX, 70–80 [80] μm long, 20–21 [20] μm wide at base, 4–5 [4] μm wide at the midpoint, 2–3 [3] μm wide at apex. Tergite IX with 39–44 [39] dorsal setae, placed on a slightly posteriorly projecting lobe; posterior margin convex, with setae arising from small lobes. Laterosternite IX with 3–4 [3] setae. Phallapodeme 77–82 [77]

µm long; transverse sternapodeme 20–22 [22] µm long. Superior volsella subcylindrical and short, not extending beyond the apex of gonocoxite, 43–49 [49] long µm, with 2 apical setae. Inferior volsella 132–137 [136] µm long, with 4–5 [4] setae, apical seta as long as the subapical seta. Gonocoxite 126–142 [142] µm long. Gonostylus with width almost uniform, tapering at the apex, 137–159 [159] µm long. HR 0.89–0.91 [0.89]; HV 2.16–2.41 [2.16].

Pupa (n = 1–2)

Total length [3.82]. General coloration brownish.

Cephalothorax [0.90] mm long, with frontal apotome not elongated (Fig. 5a), frontal warts absent. Distance between Dc_1 and Dc_2 [2] µm; between Dc_2 and Dc_3 [187] µm; between Dc_3 and Dc_4 4–8 [2] µm. Median suture granulose.

Abdomen [2.91] mm long (Fig. 5c–e). T I bare; T II–T III with large field of shagreen not extending to the lateral margin, with 2 somewhat circular bare areas near posterior margin; T II with posterior row of hooklets not extending to the lateral margin of tergite, divided medially into two groups by 14 µm, each row 79–83 [83] µm long; *pedes spurii* B absent. T IV–V with central field of shagreens with a constriction near posterior portion; T VI–VII with two central fields of shagreen, one anterior field and a posterior field of thicker shagreen; T VIII with a small central filed of shagreen; anal lobe without shagreen. Abdominal setation: SI without L setae; SII–SIV with 3 L setae; SV with 4 LS setae; SVI with 3 LS setae; SVII with 4 LS setae; SVIII with 3 LS setae. Spur on S VIII (Fig. 5b) bearing 4 yellowish teeth of variable sizes. Genital sac 326–340 [340] µm long, overreaching the posterior margin of the anal lobe by 51–54 [54] µm long; anal lobe 148–200 [148] µm long, with fringe of about 28 filaments.

4th instar larva (n = 2).

Head. Antenna as in figure 6d; lengths of antennal segments (in µm): 49–52 [49]; 12 [12]; 6 [6]; 5 [5]; 2–3 [3]. Labrum as Figure 6a. Spicules of pecten epipharyngis simple and elongate, arranged in a row (Fig. 6a). Labral lamella arranged in two groups of elongate spicules (Fig. 6a). S1 and S2 simple, S3 bifurcated (Fig. 6a). Premandible not measurable. Mandible (Fig. 6b) 101–109 [101] µm long. Mentum 76–79 [76] µm wide, with 10 blackish teeth; ventromental plate 42–43 [42] µm wide, projecting anteriorly well beyond the mentum (Fig. 6e). Base of dorsolateral strip originating at the base of the dorsomedian strip. Labiohypopharynx (Fig. 6c) with ligular lobes rounded, with parallel-sided cleft between them.

Remarks

The adult males of *Stenochironomus impendens* Borkent, 1984 *Stenochironomus prolatus* Borkent, 1984 and *Stenochironomus* sp. 3 share a posteriorly projecting lobe on TIX. The new species also shares a pale

thorax with *S. prolatus*, whereas in *S. impendens*, the thorax exhibits a circular dark brown patch. Additionally, the *Stenochironomus* sp. 3 possesses small lateral lobes projecting posteriorly at the caudal apex of T IX, each bearing a seta – a feature not found in any other Neotropical species of the genus. The pupa of *S. impendens* and the new species share certain characteristics, such as a short frontal apotome and the absence of frontal warts on the cephalothorax. However, they can be distinguished by the distribution of shagreens in the last four abdominal segments. In *Stenochironomus* sp. 3, TVI–VII have two central fields of shagreen - one anterior and posterior - TVIII has a small central filed of shagreen, and TIX lacks shagreen. In contrast, *S. impendens* has three fields of shagreen on TVI, one anterior, one median, and one posterior, a small posterior field of shagreen on TVII, fine shagreen restricted to the anterolateral margin of TVIII, and an anterior pair of shagreen on TIX. The larva of *Stenochironomus* sp. 3 shares a unique combination of three morphological features with *Stenochironomus leptopus* Borkent, 1984: (1) a ventromental plate that projects anteriorly well beyond the apex of the mentum teeth; (2) pecten epipharyngis spicules that are simple and arranged in a row of elongate spicules; and (3) labral lamella arranged in two groups of elongate spicules.

Distribution and notes on biology

The species is known only from its type locality in the Brazilian Amazon (Fig. 1). Immature stages were collected mining leaves in black-water streams.

***Stenochironomus* (*Petalopholeus*) sp. nov. 4**

(Figs. 7–11)

Material Examined

Holotype

♂, with pupal and larval exuviae, BRAZIL: Pará, Santarém, Igarapé da Onça; 03°33'48.2"S 54°52'30.90"W, 22.ix.2016, in submerged leaf, leg. C. V. Dutra, D. Godinho, M. D. Santana, slide-mounted in Hoyer (INPA).

Paratypes

♂, with pupal and larval exuviae, BRAZIL: Amazonas, Manaus, Reserva Florestal Adolpho Ducke, Igarapé Barro Branco, 02°58'07" S 60°00'20" W. 30.viii.2013, in submerged leaf, leg. G. Amora, slide-mounted in Hoyer (INPA).

Diagnosis

Male: Tergite IX markedly broad, with rounded and protruding posterolateral region in dorsal aspect, truncated at apex; anal point ovoid; superior volsella short, not extending beyond apex of gonocoxite, with two setae located basally and two apically; inferior volsella with apical seta shorter and thicker than subapical setae. **Pupa:** Frontal apotome elongated, with small warts; T II hooklets divided in two rows; T I, T VII, and T VIII without shagreens; spur on S VIII with 8 yellowish teeth of variable sizes. **Larva:** Spicules of pecten epipharyngis simple, arranged in a row; labral lamella arranged in two groups of spicules, with a cleft in the middle; S1 pinnate and S2 pinnate, S3 bifurcated.

Description

Male (n = 1–2).

Total length 3.35–3.73 [3.73] mm. Wing length 1.53–1.73 [1.73] mm. Total length/ wing length 2.25–2.19 [2.15]. Wing length/ length of profemur 1.52–1.57 [1.52].

General coloration yellowish (Fig. 7a–2b). Head: eyes metallic green when in alcohol, flagellum brownish (Fig. 7a–2b). Thorax: preepisternum with a transversal brown band; postnotum without pigmentation or with a posterior brown patch (Fig. 8d). Legs: forefemur with an apical light brown band, fore tibia with light brown band at apex; mid leg pale; hind femur with a basal light brown patch (Fig. 8b). Wings membrane with a brownish band (Fig. 8b). Abdomen: posterior margin of T II–IV with a brown band; hypopygium yellowish (Fig. 8c).

Head (Fig. 8a). AR 1.61–1.64 [1.64]. Thirteenth flagellomerum 703–742 [742] μm long. Temporal setae 10–14 [14]. Clypeus 12–16 [16] setae. Tentorium 140–141 [141] μm long; 25–32 [32] μm wide at sieve pore; 5–6 [6] μm wide at posterior tentorial pit. Stipes are not measurable. Cibarial pump 164–208 [208] μm long. Palpus with 38–40 [40] setae. Palpomere lengths (1–5 in μm): 38–42 [42]; 37–43 [43]; 138–157 [157]; 103–113 [113]; 197–227 [227].

Thorax (Fig. 8d). Acrostichals 14–15 [15]; dorsocentrals 16–19 [19], in a single row; prealars 5 [5], in a single row. Scutellum with 16–18 [18] setae in two rows. Scutum anteriorly projected; anterior edge of scutum angled in lateral aspect.

Wing (Fig. 8e). VR 1.13–1.16 [1.16] mm long. Brachiolum [5] with setae, with about 19–20 [20] sensilla campaniformia. R with 21–30 [30] setae; R_1 with 20–25 [25] setae; R_{4+5} with 29–31 [31] setae; RM with 0–1 [1] setae; M with 0–1 [0] seta, remaining veins bare. Squama damaged.

Legs (Fig. 8b). Scale of front tibia 35–36 [35] μm long, without spine; spurs of mid tibia 31–35[31] μm 47–48 [48] μm long; spurs of hind tibia 34–38 [34] μm and [30] μm long. Apex of fore tibia 41–52 [52]

μm wide, of mid tibia 47–48 [48] μm wide, of hind tibia 46–52 [52] μm wide. Lengths (in μm) and proportions of legs as in Table 1.

Hypopygium (Fig. 9a–b). Anal point broad and ovoid, originating subapically on TIX, 84–97 [97] μm long, 37–38 [37] μm wide at base, 31–36 [36] μm wide at the midpoint, 7–8 [7] μm wide at apex. Tergite IX with 28–33 [33] setae; markedly broad, with posterolateral margin protruding and rounded in dorsal aspect; truncated at apex. Laterosternite IX with 3–4 [3] setae. Phallapodeme 58–63 [63] μm long; transverse sternapodeme 24 [18] μm long. Superior volsella short, not extending beyond the apex of gonocoxite, 68–70 [70] μm long, tapering at the apex, with 4 setae, two located basally and two apically. Inferior volsella 163–168 [168] μm long, with 4–5 [5] setae, apical seta shorter and thicker than subapical setae. Gonocoxite 115 [142] μm long. Gonostylus 142–156 [156] μm long, nearly uniform width, but tapering at the apex. HR 0.80–0.91 [0.91]; HV 2.36–2.39 [2.39].

Pupa (n = 1).

Total length [4.96 mm]. General coloration yellowish.

Cephalotorax [1.16] mm long, with frontal apotome elongated (Fig. 10a); frontal warts absent. Distance between Dc_1 and Dc_2 2–6 [2] μm; between Dc_2 and Dc_3 321–558 [231] μm; between Dc_3 and Dc_4 4–8 [2] μm. Median suture granulose.

Abdomen [3.80] mm long (Fig. 10c–e). T I bare; T II–T III with large field of shagreen with two elliptical bare areas near posterior region, not extending to the lateral margin; T II with posterior row of hooklets not extending to lateral margin of tergite, divided medially into two groups by a distance of [12] μm, with about [130] μm each row; *pedes spurii* B absent. T IV–T V with central field of shagreen expanding posteriorly; T VI with two fields of shagreen, an anterior, somewhat triangular field of shagreen, and a posterior field composed of thicker shagreen; T VII–T VIII without shagreen; anal lobe with shagreen restricted to anterolateral margin. Conjunctive III/IV and IV/V with shagreen. Abdominal setation: SI without L setae; SII–SIV with 3–4 L setae; SV–SVII with 4 LS setae; SVIII with 5 LS setae. Spur on S VIII with 8 yellowish teeth of variable sizes (Fig. 10b). Genital sac [301] μm long, overreaching the posterior margin of the anal lobe by [37] μm long; anal lobe [209] μm long, with fringe of about 26 filaments.

4th instar larva (n = 1).

Head. Antenna as in figure 11d; lengths of antennal segments (in μm): [39], [16], [9], [9], [5]. Labrum as in figure 11a. Spicules of pecten epipharyngis simple, arranged in a row (Fig. 11a). Labral lamella arranged in two groups of spicules with a cleft in the middle (Fig. 11a). S1 and S2 pinnate, S3 bifurcated (Fig. 11a). Premandible not measurable. Mandible (Fig. 11b) [107] μm long. Mentum [87] μm wide, with 10 blackish

teeth; ventromental plate [46] µm wide (Fig. 11e). Base of dorsolateral strip originating at the base of the dorsomedian strip. Labiohypopharynx (Fig. 11c) with ligular lobes rounded, cleft between lobes widening posteriorly.

Remarks

The new species shares a markedly broadened tergite IX with round posterolateral margins with *Stenochironomus discus* Borkent, 1984. However, in *S. discus*, the rounded edge of T IX has a dense patch of setae, which is absent in the new species. Additionally, the anal point in *S. discus* is short and narrow, whereas in *Stenochironomus* sp. 4. it is broad. The pupa of the new species is similar to that of *Stenochironomus albidorsalis* Borkent, 1984. However, in *S. albidorsalis*, shagreens is present on the anterior portion of T VI and the anterolateral margin of T VIII – features that are absent in *Stenochironomus* sp. 4.

Distribution and notes on biology. The species occur in two Brazilian states, Amazonas and Pará (Fig. 1). The mining leaves collected in Pará were found in a small stream with a width of 1.74 m, a depth of 0.20 m, and a water flow of 0.18 m3/s. The stream is characterized by acidic black water (pH = 4.21), a low temperature (25.65°C), low electrical conductivity (17.80µS/cm), and a high concentration of dissolved oxygen (7.18 mg/L).

***Stenochironomus* (*Petalopholeus*) sp. nov. 5**

(Figs. 12–16)

Material Examined

Holotype

♂ with pupal and larval exuviae, Brazil: Amazonas, Iranduba, Vila do Paricatuba, 03°'08'16.22"S 60°23'49.79"W. 14.viii.2016, in submerged leaf, leg. G. Amora, D. Colpani, J. O. Silva, slide-mounted in Hoyer (INPA)

Paratypes

1 ♂, with pupal and larval exuviae, Brazil: Pará, Santarém, Igarapé Maguari, 02°47'23.0" S 55°01'14.9" W. 17.ix.2016, in submerged leaf, leg. C. V. Dutra, D. Godinho, M. D. Santana, slide-mounted in Hoyer (INPA). 1 ♂, with pupal and larval exuviae, same data as paratype (MZUSP)

Diagnosis

Male: Thorax yellowish, lacking dark pigmentation; T I–III with brown pigmentation; caudal apex of T IX with markedly pre-apical constriction in dorsal view; anal point fusiform; inferior volsella with apical setae as long as the subapical setae. **Pupa:** Frontal apotome elongated; T II hooklets divided in two rows; T V with three fields of shagreen; T VI with two fields of shagreen; T VII bare; spur on S VIII with 3 yellowish teeth. **Larva:** Spicules of pecten epipharyngis simple, arranged in a row; labral lamella arranged in two groups of spicules, with a cleft in the middle; S1 and S2 pinnate, S3 simple; ventromental plate with some crests near anterolateral margin.

Description

Male (n = 2–3).

Total length 4.63–5.03 [5.03] mm. Wing length 1.94–2.42 [2.42] mm. Total length/ wing length 2.08–2.26 [2.08]. Wing length/ length of profemur 1.32 – 1.39 [1.39].

General coloration yellowish (Fig. 12a–b). Head: eyes metallic green when in alcohol, flagellum brown (Fig. 12a–b). Thorax: yellowish, with lateral vittae and postnotum slightly darker (Fig. 13d). Legs: forefemur with a pre-apical brown band, fore tibia with basal band, fore tarsus with apical bands on ta_{1-3}; mid and hind legs yellowish (Fig. 13b). Wings membrane with a brownish band (Fig. 13e). Abdomen: posterior margin of T I–III with brown pigmentation, hypopygium pale, with a brownish anal point (Fig. 13c)

Head (Fig. 13a). AR 1.74–1.80 [1.80]. Thirteenth flagellomerum 842–1011 [1011] μm long. Temporal setae 12–14 [14]. Clypeus 15–20 [20] setae. Tentorium 165–194 [194] μm long; 42–55 [52] μm wide at sieve pore; 15–17 [15] μm wide at posterior tentorial pit. Stipes not measurable; cibarial pump 252–306 [306] μm long. Palpus with 59 [67] setae. Palpomere lengths (1–5 in μm): 45–64 [64]; 45–59 [59]; 220–246 [246]; 140–158 [158]; 206– 249 [249].

Thorax (Fig. 13d). Acrostichals 25–30 [30]; dorsocentrals 16–20 [20] in a single row; prealars 9–12 [12]. Scutellum with 18–28 [28] setae, in two rows. Scutum projecting anteriorly; anterior edge of scutum angled in lateral aspect.

Wing (Fig. 13e). VR 1.14–1.80 [1.80] mm long. Brachiolum with 6–7 [6] setae, with about 20–21 [21] sensilla campaniformia. R with 33–38 [35] setae. R_1 with 32–38 [38] setae. R_{4+5} with 50–56 [56] setae. RM with 1–2 [2] setae. Remaining veins bare. Squama with 8–10 [10] setae.

Legs (Fig. 13b). Scale of front tibia 45–52 [52] μm long, without spines; spurs of mid tibia 42–44 [44] μm long; spurs of hind tibia 40–45 [45] μm and 43–46 [46] μm long. Apex of fore tibia 63–81 [76] μm wide,

of mid tibia 64–70 [70] μm wide, of hind tibia 68–78 [78] μm wide. Lengths (in μm) and proportions of legs as in Table 1.

Hypopygium (Figs. 14a–b). Anal point broad, fusiform in dorsal view, originating subapically on TIX, 126–156 [156] μm long, 29–35 [35] μm wide at base, 43–47 [47] μm wide at the midpoint, 13–16 [14] μm wide at apex. Tergite IX with 27–37 [34] strong dorsal setae, caudal apex with strong pre–apical constriction in dorsal aspect. Laterosternite IX with 1–3 [3] setae. Phallapodeme 84–122 [122] μm long; transverse sternapodeme 32–42 [32] μm long. Gonocoxite 180–219 [219] μm long. Gonostylus enlarging posteriorly, tapering at apex, 223–262 [262] μm long. Superior volsella short, not extending beyond the apex of gonocoxite, 59–81 [75] μm long, tapering to the apex, with 4–6 [5] setae. Inferior volsella 218–270 [270] μm long, with 6–7 [7] setae, apical seta as long as the subapical seta. HR 0.83–0.89 [0.83]; HV 1.92–2.07 [1.92].

Pupa (n = 2–3).

Total length 5.60–7.08 [7.08] mm. General coloration brown.

Cephalotorax 1.15–1.35 [1.35] mm long, with frontal apotome elongated. Frontal warts present (Fig. 15a). Distance between Dc_1 and Dc_2 3–8 [4] μm; between Dc_2 and Dc_3 455–621 [621] μm; between Dc_3 and Dc_4 4–8 [3] μm. Median suture granulose.

Abdomen 4.44–5.72 [5.72] μm long (Fig. 15c–e). T I bare; T II–T III with large field of shagreen, with two elliptical bare areas near posterior region not extending to the lateral margin; T II with posterior row of hooklets not extending to lateral margin of tergite, divided medially into two groups by 61–66 [66] μm, each row about 171–222 [222] μm long; *pedes spurii* B absent. TIV with central field of shagreen expanding anteriorly and posteriorly, with some bare circular areas in middle region, it connects posteriorly to shagreen fields on paratergite; T V with three fields of shagreen, one anterior somewhat triangular field connecting with a weak field of thinner shagreens in middle region, and a posterior field of shagreen; T VI with two small fields of shagreen, one anterior somewhat triangular field of thinner shagreens and a posterior field of thicker shagreen; T VII bare; T VIII–anal lobe with small filed of shagreen restricted near anterolateral margin. Conjunctive III/IV and IV/V with shagreen. Abdominal setation: SI without L setae; SII–SIV with 3 L setae; SV–SVII with 4 LS setae; SVIII with 5 LS setae. Spur on S VIII (Fig. 15b) with 3 yellowish teeth. Genital sac 450–520 [520] μm long, overreaching the posterior margin of the anal lobe by 79–85 [84] μm; anal lobe 226–296 [296] μm long, with fringe of about 48 filaments.

4th instar larva (n = 2–3).

Head. Antenna as in figure 16d; lengths of antennal segments (in μm): 69– 78 [78]; 22–27 [27]; 11–14 [14]; 10–12 [10]; 5–6 [5]. Labrum as in Figure 16a. Spicules of pecten epipharyngis simple, arranged in a

row (Fig. 16a). Labral lamella arranged in two groups of spicules with a cleft in the middle (Fig. 16a). S1 and S2 pinnate, S3 simple (Fig. 16a). Premandible not measurable. Mandible (Fig. 16b) 170–178 [174] μm long. Mentum 127–136 [136] μm wide, with 10 blackish teeth; ventromental plate 81–94 [94] μm wide (Fig. 16e). Base of dorsolateral strip originating at the base of the dorsomedian strip. Labiohypopharynx (Fig. 16c) with ligular lobes rounded, cleft between lobes widening posteriorly.

Remarks

In the male identification key for Neotropical *Stenochironomus* proposed by Dantas *et al.* (2016), the lack of thoracic pigmentation and the broad anal point place *Stenochironomus* sp. 5 in couplet 3, which leads to *Stenochironomus prolatus* Borkent, 1984, and *Stenochironomus vatius* Borkent, 1984. However, the fusiform anal point of *Stenochironomus* sp. 5 differs from the bulbous anal point of *S. prolatus* and the broader based anal point of *S. vatius.* Additionally, the new species exhibits a pronounced pre-apical constriction on TIX, a feature absent both species described by Borkent (1984). The pupa of *S. vatius* has a single field of shagreens on TV–VI, posterolateral fields of shagreens on TVII, and spur on SVIII with two teeth. In contrast, *Stenochironomus* sp. 5 has three fields of shagreen on fields of shagreen, two on TVI, a bare TVII, and a spur on SVIII with three teeth. The larval labrum of *Stenochironomus* sp. 5 closely resembles that of *Stenochironomus* sp. 4. Both species share the following characteristics: simple spicules of pecten epipharyngis arranged in a row and labral lamella arranged in two groups of spicules with a cleft in the middle. They also have pinnate S1 and S2 setae; however, S3 is bifurcated in *Stenochironomus* sp. 4 but simple in *Stenochironomus* sp. 5. Additionally, the mandible mola in *Stenochironomus* sp. 4 is rounder and more swollen compared to that of *Stenochironomus* sp. 5.

Distribution and notes on biology

The species occurs in the Brazilian states of Amazonas and Pará (Fig. 1). The larvae collected in Pará were found mining leaves in a small stream with a width of 1.73 m, a depth of 0.14 m, and a water flow of 0.11 m3/s. The stream is characterized by acidic black-water (pH = 3.82), a low temperature (26.325°C), low electrical conductivity (19.36μS/cm), and a high concentration of dissolved oxygen (7.66 mg/L).

***Stenochironomus* (*Petalopholeus*) sp. nov. 6.**

(Figs. 17–20)

Material Examined

Holotype

♂, BRAZIL: Roraima, Amajari, Tepequém, Igarapé do Paiva, 03°47'08.8" N 61°42'02.9" W, 17.i.2024, in submerged leaf, leg. G. Jorge, slide-mounted in Hoyer (INPA).

Paratypes

♂ with pupal exuviae, same data as holotype (INPA).

Diagnosis

Male: Thorax pale or with a light brow patch on postnotum; anal point with bulbous apical half; superior volsella subcylindrical and short, not extending beyond apex of gonocoxite; inferior volsella with apical seta shorter and thicker than subapical seta. **Pupa:** TIV with central field of shagreen expanding posteriorly; T VII–anal lobe bare. Spur on S VIII with one elongated tooth and four smaller yellowish teeth.

Description

Male (n = 1–2)

Total length 2.76–3.91 [3.91] mm. Wing length 1.59–1.65 [1.65] mm. Total length/ wing length 2.21–2.38 [2.38]. Wing length/ length of profemur 1.50–1.53 [1.53].

General coloration yellowish (Fig. 17a–b). Antenna: brown. Head: eyes metallic green (Fig. 17b), antenna yellowish. Thorax: pale or with a light brow patch on postnotum (Fig. 18d). Legs: forefemur with a pre-apical brown band, fore tibia with basal band, fore tarsus with apical bands on ta_{1-3}; mid leg yellowish; hind femur with an anterior patch brow (Fig. 18b). Wing: medial light-brownish band, apex slightly pigmented (Fig. 18e). Abdomen: T II–TIV with posterior dark brown bands (Fig. 18c).

Head (Fig. 18a). AR 1.59–1.62 [1.59]. Thirteenth flagellomere 710–733 [733] μm long. Temporal setae 12. Clypeus with 13 setae. Tentorium 130–151 [130] μm long, 34–36 [34] μm wide at sieve pore, 11 μm wide at posterior tentorial pit; cibarial pump 195–196 [196] μm long. Stipes 141 μm long, 7 μm wide. Palpomere lengths (1–5 in μm): 33–39 [33], 42–44 [42], 150–151 [151], 109–110 [110], 191–205 [191].

Thorax (Fig. 18d). Acrostichals 10; dorsocentrals 11, in irregular row; prealars 4. Scutellum with 14 setae, biserial. Scutum projected anteriorly; anterior edge of scutum angled in lateral aspect.

Wing (Fig. 18e). VR 1.11–1.18 [1.11]. Brachiolum with 5 setae, with about 21 sensilla campaniformia. R with 38 setae; R_1 with 36 setae; R_{4+5} with 53 setae; M with 2 setae; remaining veins bare. Squama with 7 setae.

Legs (Fig. 18b). Scale of front tibia 34–41 [34] μm long, without spine; spurs of mid tibia 45 μm and 51 μm long; spurs of hind tibia 30 μm and 41 μm long. Apex of fore tibia 52–54 [52] μm wide, of mid tibia

51–68 [51] μm wide, of hind tibia 54–55 [55] μm wide. Lengths (in μm) and proportions of legs as in Table 4.

Hypopygium (Fig. 19a–c). Anal point 89–102 [102] μm long, with markedly bulbous apical half, in clavate format, originating subapically on T IX, with dorsal crests converging posteriorly; 27–38 [38] μm wide at base, 12–14 [14] μm wide at the midpoint, 25 μm wide at posterior bulbous region; in lateral aspect 2/3 of dorsal edge of anal point up straight, apex bent ventrally. Tergite IX with 48 dorsal setae, apex truncated in dorsal aspect. Laterosternite IX with 3 setae. Phallapodeme 82–97 [82] μm long; transverse sternapodeme 13–17 [13] μm long. Superior volsella 40 μm long, subcylindrical and short, not extending beyond the apex of gonocoxite, with 5 setae. Inferior volsella 160 μm long, with 4 setae, apical setae shorter and thicker than subapical setae. Gonocoxite 136–140 [140] μm long. Gonostylus short, tapering towards apex; 120–124 [124] μm long. HR 1.12–1.13 [1.12]; HV 2.93–3.16 [3.16].

Pupa (n = 1).

Total length 4.72 mm. General coloration brown.

Cephalotorax 1.04 mm long; with frontal apotome elongated, with round shaped warts (Fig. 20a). Distance between Dc_1 and Dc_2 5 μm; between Dc_2 and Dc_3 214 μm; between Dc_3 and Dc_4 2 μm. Median suture granulose.

Abdomen 3.67 mm long (Fig. 20c–e). T I bare; T II–T III with large field of shagreen with four elliptical bare areas near posterior region, not extending to the lateral margin; T II with posterior row of hooklets not extending to lateral margin of tergite, divided medially into two groups by 20 μm with about 118 μm each row; *pedes spurii* B absent. TIV with central field of shagreen expanding posteriorly; T V with central field of shagreen expanding anteriorly and posteriorly; T VI with two central field of fine shagreens, connecting by a thin central band of shagreens; T VII–anal lobe bare. Conjunctive III/IV and IV/V with shagreen. Abdominal setation: SI without L setae; SII–SIII and SV–SVI with 3 L setae; SIV and SVIII without L setae; SVII with 4 LS setae. Spur on S VIII (Fig. 20b) with one elongated tooth and four smaller yellowish teeth. Genital sac 311 μm long, overreaching the posterior margin of the anal lobe by 20 μm long; anal lobe 228 μm long, with fringe of about 48 filaments.

Female and larva. Unknown**.**

Remarks

In the male identification key of the Neotropical *Stenochironomus* proposed by Dantas *et al*. (2016), the lack of thoracic pigmentation and broad anal point place *Stenochironomus* (*Petalopholeus*) sp. 6 in couplet 3, which includes *Stenochironomus prolatus* Borkent, 1984, and *Stenochironomus vatius* Borkent, 1984.

However, the new species is easily distinguished from *S. vatius* by its bulbous apical anal point. Additionally, *S. prolatus* has a posteriorly projecting lobe on T IX and a markedly elongate thorax, features absent in the new species. The pupa of the *S. vatius* presents pedes spurii A on T IV and shagreen on T VII-VIII, features absent in the pupa of the new species.

Distribution and notes on biology

The species is known only from its type locality, in the far north of the Brazilian Amazon (Fig. 1). The immatures were collected while mining leaves in black-water streams.

***Stenochironomus* sp. nov. 7.**

(Figs. 21–24)

Material Examined

Holotype

♂, BRAZIL: Pará, Parauapebas, Parque Nacional dos Campos Ferruginosos, Igarapé da Cachoeira, Trilha Timborama, 6°10'08.9" S 50°21'02.9" W, 397 m. 18-21.ix.2023, Malaise, leg. G.R. Desidério, L. Moreno, slide-mounted in Hoyer (INPA).

Diagnosis

Male: Thorax with dark-brown pigmentation on parapsidal suture, posterior anepisternum and posterior margin of epimeron, light-brown band on prepisternum; forefemur with apical bicolor brown band; mid and hind femur with a sub-basal and a pre-apical brown band; mid tibia with 3 spurs; anal point broad, tapering apically in dorsal aspect; dorsal crests not converging; inferior volsella with apical setae shorter and thicker than subapical setae.

Description

Male (n = 1)

Total length 5.64 mm. Wing length 2.58 mm. Total length/ wing length 2.18. Wing length/length of profemur 1.29.

General coloration yellowish (Fig. 21a–c). Head: eyes metallic green; pedicel with one rounded brown patch (Fig. 22a). Thorax: dark-brown pigmentation on parapsidal suture, posterior anepisternum and posterior margin of epimeron, light-brown band on prepisternum, postonotum with two anterolateral patches and a posterior patch at apex (Fig. 22d). Legs: forefemur with apical bicolor brown band, anterior

tibia with a yellowish apical band; mid and hind femur with a subbasal and a pre-apical brown band, mid tibia with brown pigmentation in the middle area, hind tibia pale (Fig. 22b). Wings with medial and apical brownish bands (Fig. 22e). Abdomen: TI with small patches restricted to anterolateral margin, TII–IV with posterior brown band, anal point dark brown, inferior volsella with dark brown apex (Fig. 22e).

Head (Fig. 22a). Antenna missing. Temporal 22 setae. Clypeus with 46 setae. Tentorium 183 μm long, 52 μm wide at sieve pore, 15 μm wide at posterior tentorial pit. Cibarial pump 304 μm. Stipes not measurable. Palpomere lengths (1–5 in μm): 62, 64, 168, 204, 317.

Thorax (Fig. 22d). Acrostichals 43; dorsocentrals 75, tiserial; prealars 14, biserial. Scutellum with 43 setae, triserial. Scutum projected anteriorly; anterior edge of scutum angled in lateral aspect.

Wing (Fig. 21e). VR 1.03. Brachiolum with 9 setae, with about 20 sensilla campaniform, R with 50 setae; R_1 with 51 setae; R_{4+5} with 83 setae; M with 1 seta; RM with 2 setae; remaining veins bare. Squama with 14 setae.

Legs (Fig. 22b). Scale of front tibia 56 μm long, without apical spine; spurs of mid tibia 39 μm, 40 μm and 41 μm long (Fig. 23a–b); spurs of hind tibia 39 μm and 40 μm long. Apex of fore tibia 92 μm wide, of mid tibia 68 μm wide, of hind tibia 95 μm wide. Lengths (in μm) and proportions of legs as in Table 5.

Hypopygium (Fig. 24a–b). Anal point broad, tapering apically in dorsal view; dorsal crests not converging; 158 μm long, 50 μm wide at base, 48 μm wide at the midpoint, 16 μm wide at apex. Tergite IX with 60 dorsal setae, caudal apex wedge-shaped with pre-apical constriction. Laterosternite IX with 4 setae. Phallapodeme 132 μm long; transverse sternapodeme 47 μm long. Superior volsella short, not extending beyond the apex of gonocoxite, tapering to the apex, 70 μm long, with 4-5 setae. Inferior volsella 320 μm long, with 5 setae, subapical setae elongated, and apical setae short and thick. Gonocoxite 207 μm long. Gonostylus 248 μm long, slightly curved; HR 0.83; HV 2.27.

Female, pupa, and larva. Unknown**.**

Remarks

The hypopygium of *Stenochironomus* sp. 7 exhibits features similar to those of *Stenochironomus vatius* Borkent, 1984, and *Stenochironomus gracilis* Dantas, Hamada & Mendes, 2016, such as a broad anal point tapering apically. However, in the new species, the dorsal crest does not converge, as observed in the other two species. The caudal apex of *Stenochironomus* sp. 7 is wedge-shaped with a pre-apical constriction, whereas in *S. vatius*, it is rounded or truncated, and in *S. gracilis*, there is no pre-apical constriction. Additionally, the thorax of *Stenochironomus* sp. 7 displays a distintic color pattern, with dark-brown pigmentation on the parapsidal suture, posterior anepisternum, and posterior margin of the epimeron, along with a light brown band on the preepisternum. In contrast, the thorax of *S. vatius* and *S. gracilis* lacks

pigmentation. *Stenochironomus* sp. 7 is the only species in the genus that possesses three spurs on the mid tibia (Fig. 23a–b).

Distribution.

The species is known only from the type locality, in the eastern of the Brazilian Amazon (Fig. 1).

***Stenochironomus* sp. nov. 8**

(Figs. 25–27)

Material Examined

Holotype

♂, BRAZIL: Pará, Parauapebas, FLONA de Carajás, Igarapé do Carangueijo, 6°10' 17.9"S 50°20'34.3"W, 410 m. 15-20.ix.2023, Malaise, leg. G. R. Desidério, L. Moreno, slide-mounted in Hoyer (INPA).

Diagnosis

Male: Thorax with dark brown pigmentation along the lateral margin of the lateral vittae, extending anteriorly to meet above the anterior point of the scutum; pigmentation present on the median anepisternum and epimerum; with vertical dark-brown band on prepisternum; postnotum all pigmented; dark brown pigmentation on lateral margins of T I–III with circular pale patches around the setae; caudal apex of T IX wedge-shaped; T IX with a posteriorly projecting lobe.

Description

Male (n = 1)

Total length 2.47 mm. Wing length 1.17 mm. Total length/ wing length 2.11. Wing length/ length of profemur 1.47.

General coloration yellowish and dark brown (Fig. 25a–b). Head: eyes not metallic. Thorax: dark brown pigmentation along the lateral margin of the lateral vittae extending anteriorly to meet above anterior point of scutum; pigmentation present on the mediam anepisternum and epimerum; with vertical dark-brown band on prepisternum; postnotum all pigmented. (Fig. 25a; 26d). Legs: pale. Wing: lack of pigmentation (Fig. 26e). Abdomen: with dark brown pigmentation on lateral margins of T I–III; with circular pale patches around the setae; T IV–V with pigmentation divided into two areas on anterior and posterior margins; T VI–VII with pigmentation on anterior margin; T VIII with pigmentation divided into two areas on anterior margin, T IX brownish (Fig. 26c).

Head (Fig. 26a). Antenna missing. Temporal setae 12. Clypeus with 12 setae. Tentorium 183 μm long, 52 μm wide at sieve pore, 15 μm wide at posterior tentorial pit; cibarial pump 304 μm. Stipes not measurable. Palpomere lengths (1–5 in μm): 62, 64, 168, 204, 317.

Thorax (Fig. 26d). Acrostichals 12; dorsocentrals 8, uniserial; prealars 4. Scutellum with 8 setae, uniserial. Scutum projected anteriorly; anterior edge of scutum slightly rounded in lateral aspect.

Wing (Fig. 26e). VR 1.12. Brachiolum with 5 setae, with 16 sensilla campaniform. R with 31 setae; R_1 with 19 setae; R_{4+5} with 44 setae; M with 2 setae; RM with 3 setae; remaining veins bare. Squama with 2 setae.

Legs (Fig. 26b). Scale of front tibia 28 μm long, without apical spine; spurs of mid tibia 22 and 24 μm long; spurs of hind tibia 22 and 23 μm long. Apex of fore tibia 42 μm wide, of mid tibia 38 μm wide, of hind tibia 42 μm wide. Lengths (in μm) and proportions of legs as in Table 6.

Hypopygium (Fig. 27a–b). Anal point narrow in dorsal view, 45 μm long, 5 μm wide at base, 5 μm wide at the midpoint, 2 μm wide at apex. Tergite IX with 48 dorsal setae, distributed on posteriorly projected lobe; caudal apex wedge-shaped in dorsal aspect. Laterosternite IX with 2 setae. Phallapodeme 73 μm long; transverse sternapodeme 19 μm long. Superior volsella 38 μm long, subcylindrical and short, not extending beyond the apex of the gonocoxite, with 3 setae. Inferior volsella 126 μm long, with 3 setae, subapical setae shorter than apical setae, and both thin. Gonocoxite 124 μm long. Gonostylus enlarging slightly to the posterior region and narrow at extremities; 127 μm long. HR 0.97; HV 1.94

Female, pupa and larva. Unknown**.**

Remarks

A posteriorly projecting lobe on TIX is a characteristic found only in *Stenochironomus impendens* Borkent, 1984, *Stenochironomus prolatus* Borkent, 1984, and *Stenochironomus* (***Petalopholeus***) sp. 3, described above. However, these species differ significantly in ways that allow for clear distinctions.

Stenochironomus sp. 8 can be distinguished from *S. impendens* by the thoracic pigmentation: *Stenochironomus* sp. 8 displays dark brown pigmentation along the lateral margins of the lateral vittae, extending anteriorly to meet above the anterior point of the scutum, whereas *S. impendens* has a dark brown circular patch on the lateral vittae. The differences in coloration patterns between *Stenochironomus* sp. 8 and *S. impendens* extends to the abdomen. In *Stenochironomus* sp. 8, dark brown pigmentation is present along the lateral margins of T I–III, with circular pale patches around the setae, a feature absent in *S. impendens*. Moreover, the apex of T IX in *S. impendens* is truncated in dorsal aspect, whereas in the new species, the apex of T IX is wedge-shaped. The thorax coloration of the other two closely related species, *S. prolatus* and *Stenochironomus (**Petalopholeus**)*sp. 3, lacks pigmentation, which clearly differentiates

them from *Stenochironomus* sp. 8. Additionally, the anal point of *S. prolatus* is broad and bulbous apically, differing markedly from the narrow anal point of the new species.

Distribution

The species is known only from the type locality, in the eastern of the Brazilian Amazon (Fig. 1).

Stenochironomus figueiredoensis Dantas, Hamada & Mendes, 2016

Stenochironomus figueiredoensis Dantas, Hamada & Mendes, 2016: 12–16 (Type locality: BRAZIL: Amazonas, Presidente Figueiredo, AM 240, KM 61, 01º59'32.7"S, 59º31'20.1"W, 22.ii.2009, in decayed leaves, leg. G.P.S. Dantas (INPA); ♂)

Material examined

BRAZIL: Acre, Mâncio Lima, Parque Nacional da Serra do Divisor, Igarapé Pirapora Grande, afluente à direita do Rio Moa, 7°28'18.3" S 73°42'06.5" W. 08-09.vii.2023, 243 m, Malaise, leg. G.C. Mendes, G. R. Desidério, J. O. da Silva, M. A. R. Pires, R. B. Pinedo-Garcia, slide-mounted in Hoyer (INPA).

Distribution

New record for Acre, Brazil (Fig. 1), expanding the previously known range from the Brazilian state of Amazonas.

Stenochironomus liviae Dantas, Hamada & Mendes, 2016

Stenochironomus liviae Dantas, Hamada & Mendes, 2016: 28–32 (Type locality: BRAZIL: Amazonas, Itacoatiara, Madeireira Mil, 02º 46’37.7’’ S, 58º 50’38.3’’ W, 5.v.2009, in decayed wood, leg. G.P.S. Dantas, S.C. Escarpinati (INPA); ♂, with pupal exuviae.

Material examined

♂, BRAZIL: Acre, Mâncio Lima, Parque Nacional da Serra do Divisor, Igarapé Pirapora Grande, afluente à direita do Rio Moa, 7°28'18.3" S 73°42'06.5" W. 08-09.vii.2023, 243 m, Malaise, leg. G.C. Mendes, G. R. Desidério, J. O. da Silva, M. A. R. Pires, R. B. Pinedo-Garcia, slide-mounted in Hoyer (INPA). ♂,

Distribution

New record for Acre, Brazil (Fig. 1), expanding the previously known range from the Brazilian states of Amazonas, Bahia, and Santa Catarina.

Stenochironomus roquei Dantas, Hamada & Mendes, 2010

Stenochironomus roquei Dantas, Hamada & Mendes, 2010: 48–53 (Type locality: BRAZIL: Amazonas, Itacoatiara, Madeireira Mil, 02°46’43.1’’S, 58°38’54.0’’W, 14.IV.09, 5.iv.2009, in submerged wood, leg. G.P.S. Dantas, S.C. Escarpinati, slide-mounted in Euparal (INPA); ♂, with pupal and larval exuviae).

Material examined

♂, BRAZIL: Acre, Mâncio Lima, Parque Nacional da Serra do Divisor, Igarapé Pirapora Grande, afluente à direita do Rio Moa, 7°28'18.3" S 73°42'06.5" W. 08-09.vii.2023, 243 m, Malaise, leg. G.C. Mendes, G. R. Desidério, J. O. da Silva, M. A. R. Pires, R. B. Pinedo-Garcia, slide-mounted in Hoyer (INPA). ♂,

Distribution

New record for Acre, Brazil (Fig. 1), expanding the previously known range from the Brazilian state of Amazonas.

Remarks

This study describes and illustrates six new species of *Stenochironomus* from Amazonas, Pará, and Roraima, all of which belong to the Amazon biome. Consequently, the number of Neotropical species of *Stenochironomus* has increased from 39 to 45, from 30 to 36 in Brazil, and from 26 to 32 in the Brazilian Amazon. Three new leaf-mining species (*Stenochironomus* (*Petalopholeus*) sp.3, *Stenochironomus* (*Petalopholeus*) sp. 4 and *Stenochironomus* (*Petalopholeus*) sp. 5) were placed in the subgenera *Stenochironomus* (*Petalopholeus*) proposed by Borkent (1984), as their immature features align with the subgeneric diagnosis. This includes T II of the pupal abdomen having a posterior row of hooklets restricted to the medial portion and the head capsule of the 4^{h} instar larva exhibiting dorsolateral stripes originating near the base of the dorsomedian stripe. Although the larval stage of *Stenochironomus* (*Petalopholeus*) sp. 6 remains unknow, its pupal exuviae share the diagnostic features of subgenus, and it was found on submerged leaves. Therefore, for now, this species is also placed in *Stenochironomus* (*Petalopholeus*). The remaining species, *Stenochironomus* sp. 7 and *Stenochironomus* sp. 8 were, not assigned to any subgenus, as their immature stages and larval habits remain unknown. Finally, new records of *S. figueiredoensis*

Dantas *et al*. 2016, *S. liviae* and *S. roquei* Dantas *et al.* 2010 are provided for the state of Acre, expanding the know occurrence of these species to the western Amazon.

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Conflict of Interest Statement

No potential conflict of interest was reported by the authors.

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Tables

Table 1. Lengths (in μm) and proportions of legs of Stenochironomus (*Petalopholeus*) sp. 3 nov. (Diptera: Chironomidae), adult ♂.

	fe	**ti**	**ta_1**	**ta_2**	**ta_3**
P1	984–988 [984]	804–821 [804]	638	520	519
P2	825–847 [825]	742–725 [742]	528–523 [528]	282–287 [282]	203–205 [205]
P3	856–883 [883]	886–897 [897]	680–864 [864]	419–420 [419]	314–318 [314]
	ta_4	**ta_5**	**LR**	**BV**	**SV**
P1	453	180	0.77	1.46	2.83
P2	122–116 [116]	72–76 [76]	0.71–0.72 [71]	3.0–3.05 [3.0]	2.96–3.0 [2.96]
P3	180–186 [180]	83–85 [83]	0.76	2.40–2.47 [2.47]	2.56–2.60 [2.60]

P1, front leg; P2, mid leg; P3, hind leg; fe, femur length; ti, tibia length; ta_1–ta_5, tarsomere lengths 1–5; LR, leg ratio; BV, Beinverhältnisse; SV, Schenkel–Schiene–Verhältnisse.

Table 2. Lengths (in μm) and proportions of legs of *Stenochironomus* (*Petalopholeus*) sp. 4 (Diptera, Chironomidae), adult ♂.

	fe	**ti**	**ta1**	**ta2**	**ta3**
P1	979–1139 [1139]	855–990 [990]	1153–1275 [1275]	623–682 [682]	526–584 [584]
P2	847–954 [954]	763–821 [821]	494–549 [549]	260–279 [279]	216–242 [242]
P3	943–1096 [1096]	910–1014 [1014]	[733]	[413]	[334]
	ta4	**ta5**	**LR**	**BV**	**SV**

P1	–	–	1.28–1.34 [1.28]	–	1.59–1.66 [1.66]
P2	142–157 [157]	74–84 [84]	0.64–0.66 [0.66]	3.04 [3.04]	3.23–3.25 [3.23]
P3	[218]	[85]	[0.72]	[2.70]	[2.87]

P1, front leg; P2, mid leg; P3, hind leg; fe, femur length; ti, tibia length; ta_1–ta_5, tarsomere lengths 1–5; LR, leg ratio; BV, Beinverhältnisse; SV, Schenkel–Schiene–Verhältnisse.

Table 3. Lengths (in µm) and proportions of legs of *Stenochironomus* (*Petalopholeus*) sp. 5 (Diptera: Chironomidae), adult ♂.

	fe	**ti**	**ta1**	**ta2**	**ta3**
P1	1396–1749 [1749]	1248–1719 [1512]	1863–2308 [2308]	928–1190 [1190]	750–980 [980]
P2	1191–1227 [1227]	1042–1083 [1083]	786–809 [809]	358–388 [388]	295–312 [312]
P3	1435–1645 [1645]	1317–1576 [1576]	995–1159 [1159]	580–681 [681]	421–462
	ta4	**ta5**	**LR**	**BV**	**SV**
P1	660–855 [855]	229–288 [288]	1.50–1.52 [1.52]	1.68–1.77 [1.68]	1.41–1.43 [1.41]
P2	252–258	95–115	0.66–0.74 [0.74]	2.98–3.03	3.06–3.11
P3	252–282 [282]	95–140 [140]	0.69–0.73 [0.73]	2.67–271 [2.67]	2.77–2.87 [2.77]

P1, front leg; P2, mid leg; P3, hind leg; fe, femur length; ti, tibia length; ta_1–ta_5, tarsomere lengths 1–5; LR, leg ratio; BV, Beinverhältnisse; SV, Schenkel–Schiene–Verhältnisse.

Table 4. Lengths (in µm) and proportions of legs of *Stenochironomus* (*Petalopholeus*) sp. 6 (Diptera: Chironomidae), adult ♂.

	fe	**ti**	**ta1**	**ta2**	**ta3**
P1	1064–1078 [1.78]	860	–	–	–
P2	864–924 [924]	770–806 [806]	554–619 [619]	295–308 [308]	241–234 [234]

P3	992–1057 [1057]	945–1020 [1020]	731–759 [759]	406–408 [406]	344–358 [358]
	ta4	**ta5**	**LR**	**BV**	**SV**
P1	–	–	–	–	–
P2	142–143 [143]	65–70 [65]	0.71–0.76 [0.76]	2.92–3.14 [3.14]	2.81–2.94 [2.81]
P3	208–209 [208]	79–93 [93]	0.74–0.77 [0.74]	2.56–2.66 [2.66]	2.64–2.73 [2.73]

P1, front leg; P2, mid leg; P3, hind leg; fe, femur length; ti, tibia length; ta_1–ta_5, tarsomere lengths 1–5; LR, leg ratio; BV, Beinverhältnisse; SV, Schenkel–Schiene–Verhältnisse.

Table 5. Lengths (in µm) and proportions of legs of *Stenochironomus* sp. 7 (Diptera: Chironomidae), adult ♂.

	fe	**ti**	**ta1**	**ta2**	**ta3**
P1	2000	1672	–	–	–
P2	1520	1257	848	446	355
P3	1800	1620	–	–	–
	ta4	**ta5**	**LR**	**BV**	**SV**
P1	–	–	–	–	–
P2	224	112	0.67	3.18	3.27
P3	–	–	–	–	–

P1, front leg; P2, mid leg; P3, hind leg; fe, femur length; ti, tibia length; ta_1–ta_5, tarsomere lengths 1–5; LR, leg ratio; BV, Beinverhältnisse; SV, Schenkel–Schiene–Verhältnisse.

Table 6. Lengths (in µm) and proportions of legs of *Stenochironomus* sp. 8 (Diptera: Chironomidae), adult ♂.

	Fe	**ti**	**ta1**	**ta2**	**ta3**
P1	798	600	846	483	380
P2	664	546	366	196	139
P3	732	660	519	310	225
	ta4	**ta5**	**LR**	**BV**	**SV**
P1	302	131	1.41	1.73	1.65
P2	79	66	0.67	3.28	3.30

P3	128	67	0.78	2.61	2.68

P1, front leg; P2, mid leg; P3, hind leg; fe, femur length; ti, tibia length; ta_1–ta_5, tarsomere lengths 1–5; LR, leg ratio; BV, Beinverhältnisse; SV, Schenkel–Schiene–Verhältnisse.

Figures and legends

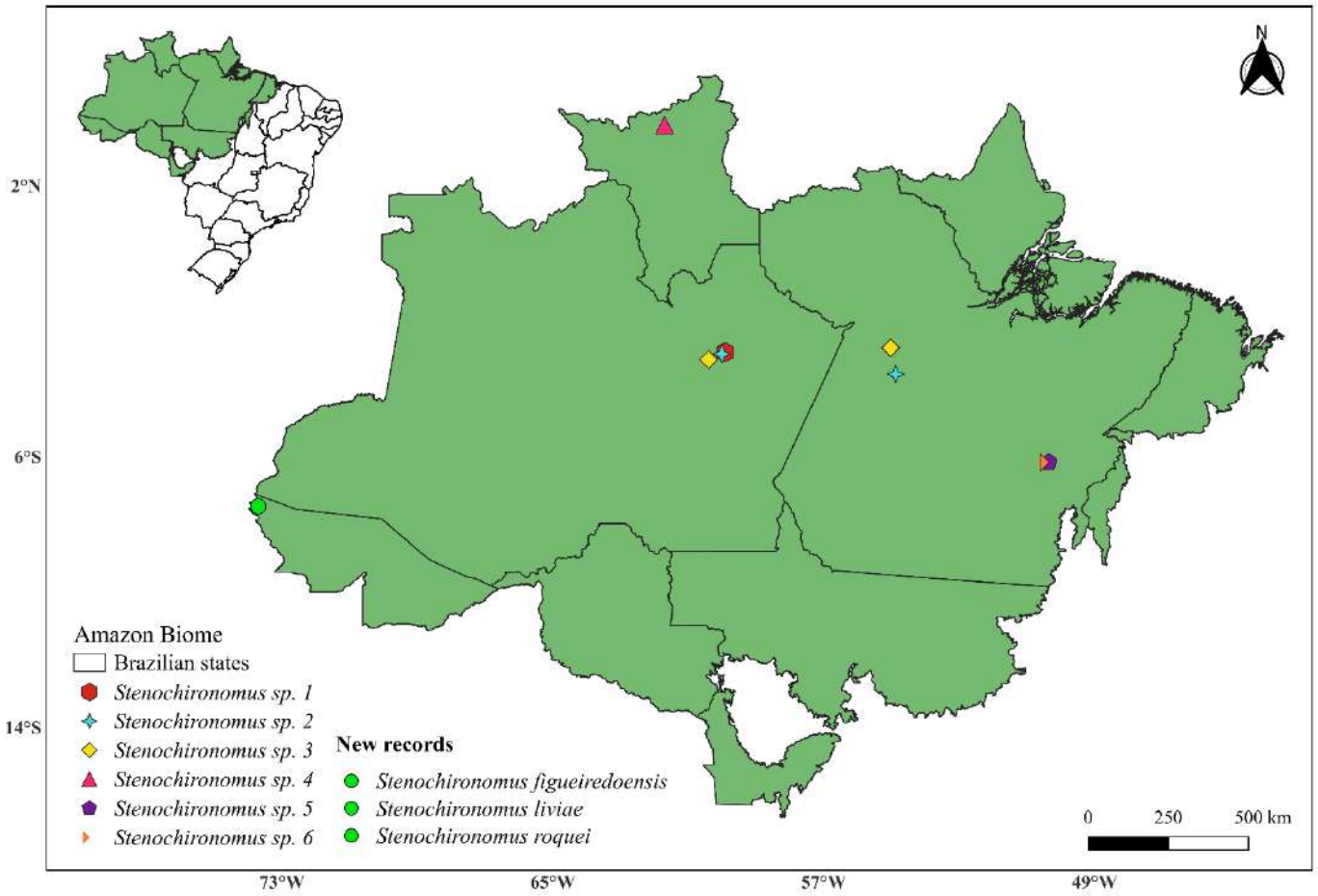

Fig. 1. Distribution map for the new species and new records of *Stenochironomus* species analyzed in this study.

Fig. 2. *Stenochironomus* (*Petalopholeus*) sp. 3 (Diptera: Chironomidae), male adult, habitus. (a) Dorsal view. (b) Lateral view. Scale bars = 1 mm.

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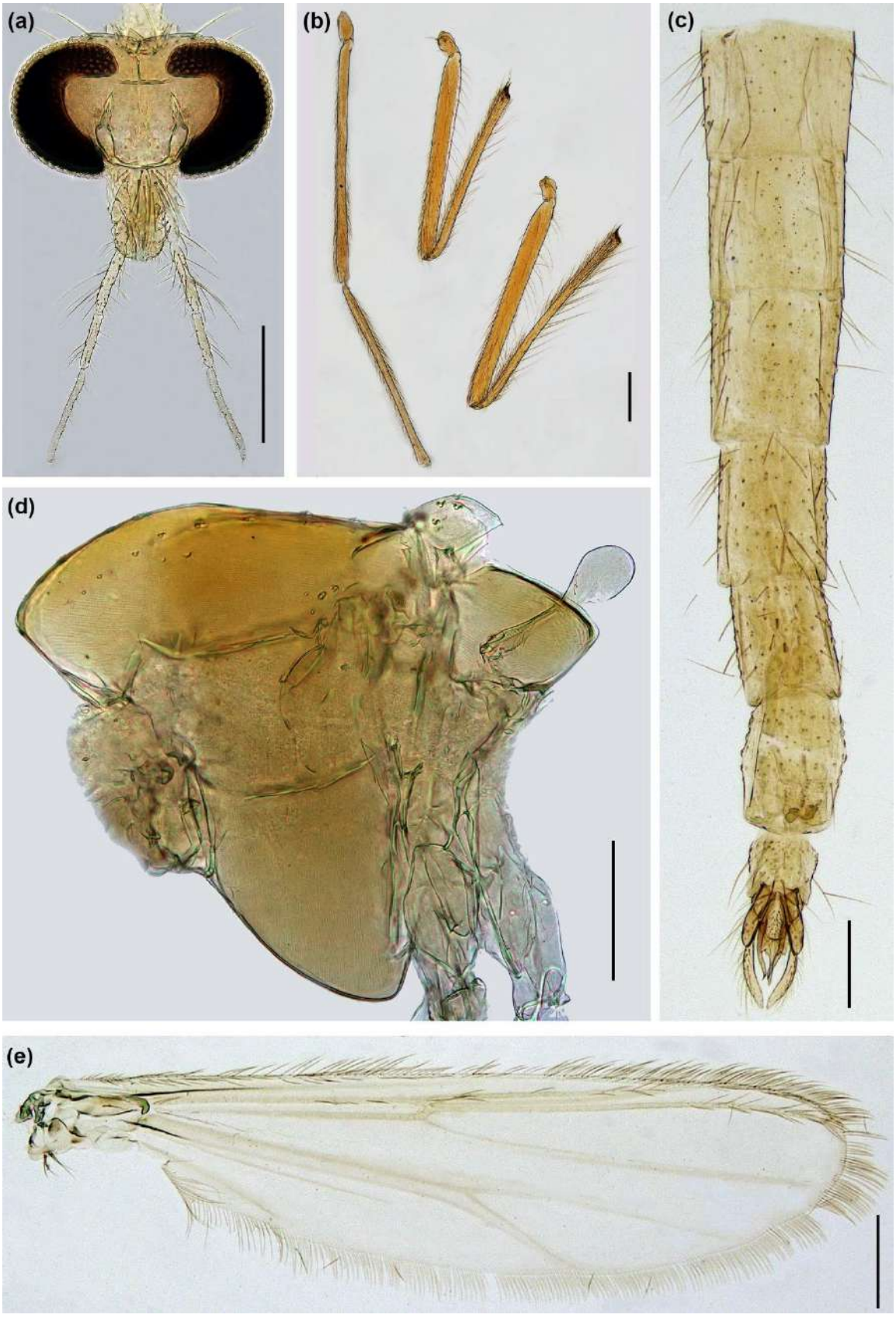
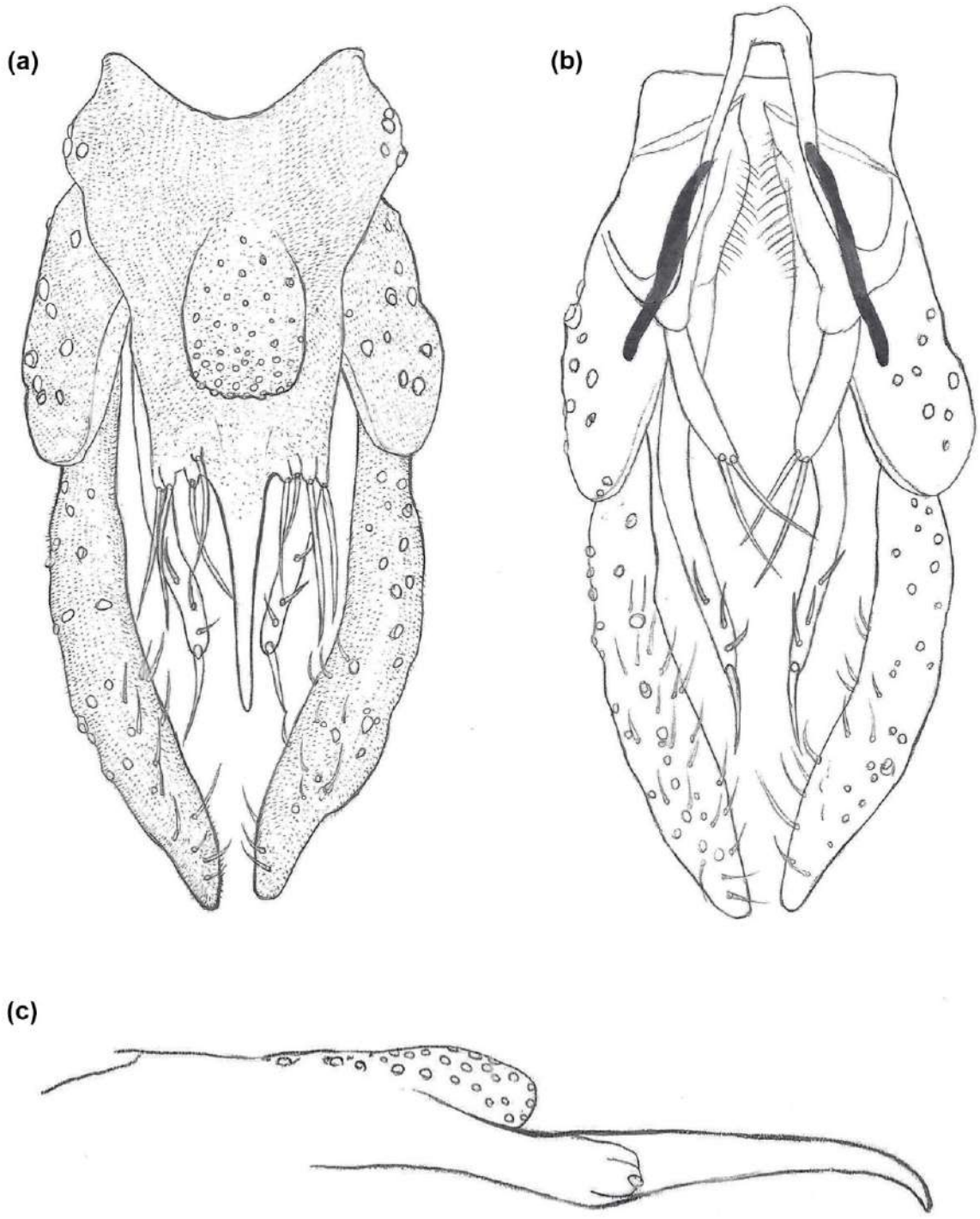


789

790 **Fig. 3**. *Stenochironomus* (*Petalopholeus*) sp. 3 (Diptera: Chironomidae), male adult. (a) Head, frontal
791 view. (b) Legs (femur and tibia), from left to right, fore, mid, and hindleg. (c) Thorax, lateral view. (d)
792 Abdomen, dorsal view. (e) Wing. Scale bars = 200 µm.



793

794 **Fig. 4.** *Stenochironomus* (*Petalopholeus*) sp. 3 (Diptera: Chironomidae), male adult. (a) Hypopygium,
795 dorsal view. (b) Hypopygium, with tergite IX removed, dorsal view. (c) Anal point, lateral view.

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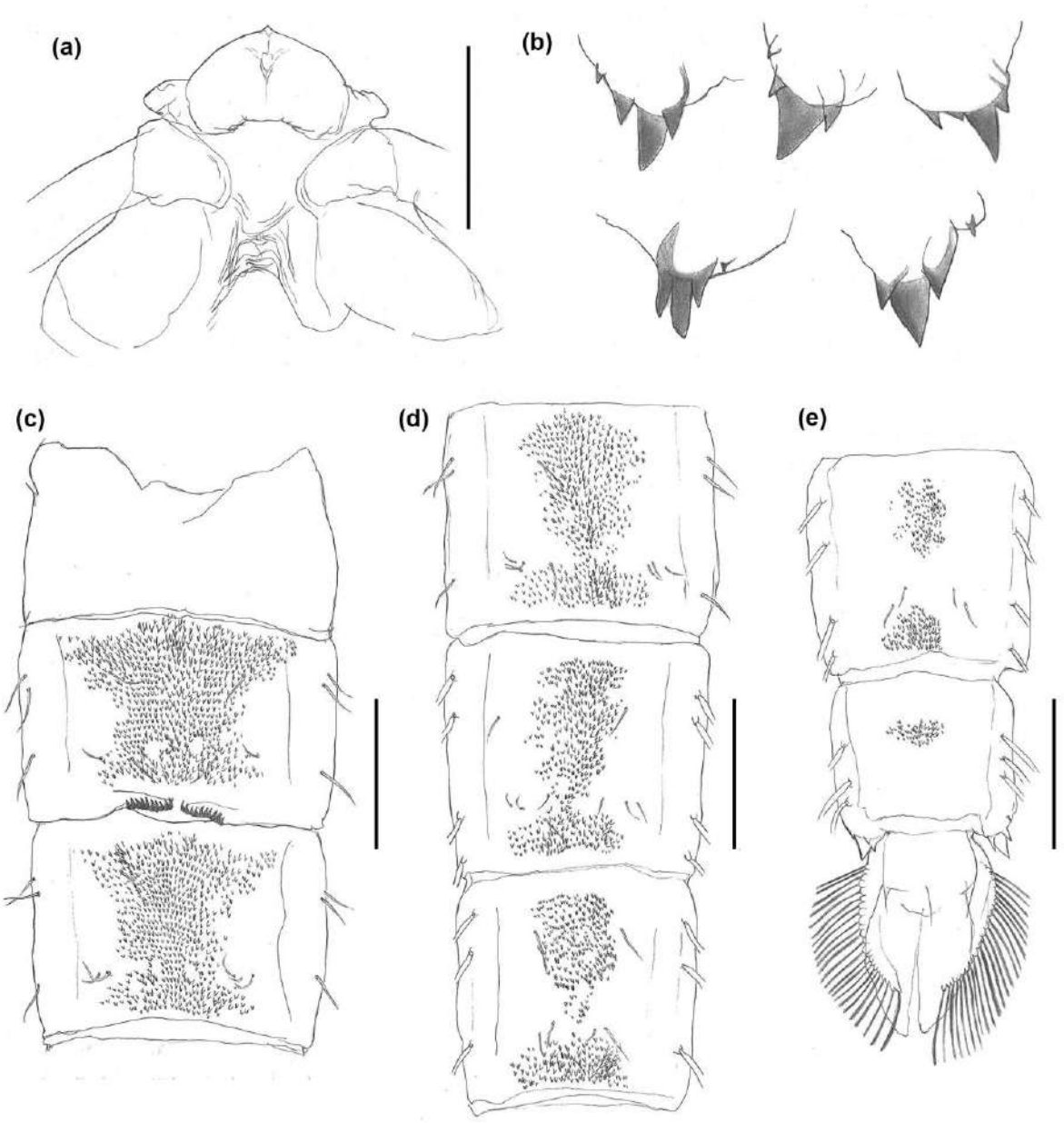
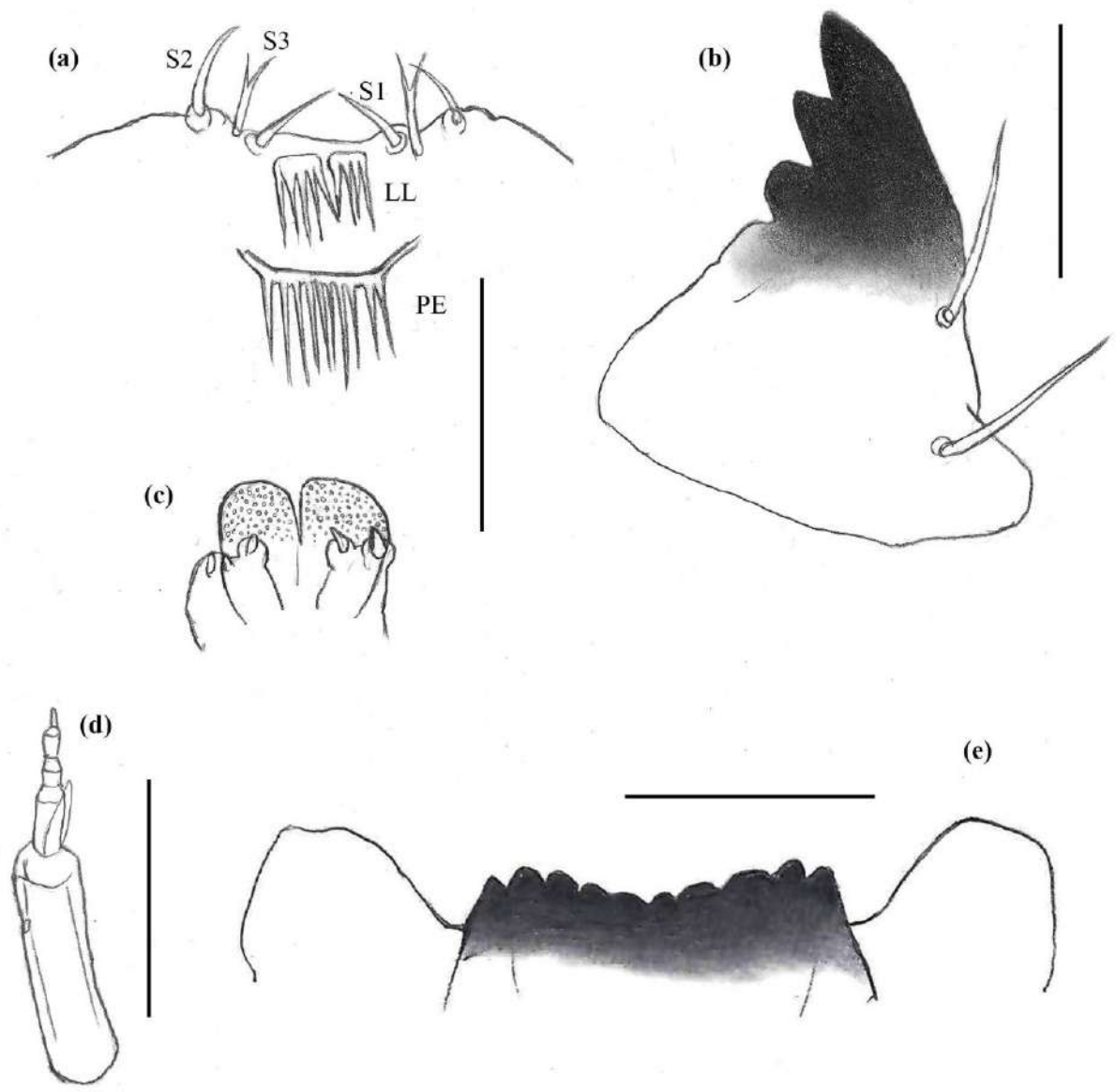


Fig. 5. *Stenochironomus* (*Petalopholeus*) sp. 3 (Diptera: Chironomidae), pupa. (a) Frontal apotome. (b) Spur on T VIII. (c–e) Abdomen, in dorsal view. (c) Tergites I–III. (d) Tergites IV–VI. (e) Tergites VII–Anal lobe. Scale bars = 250 μm.



802

803 **Fig. 6.** *Stenochironomus* (*Petalopholeus*) sp. 3 (Diptera: Chironomidae), larva. (a) Labrum, PE, Pecten
804 epipharyngis; LL, Labral lamellae. (b) Mandible. (c) Labiohypopharynx (d) Antennae. (e) Ventromental
805 plate and mentum. Scale bars = 50 μm.

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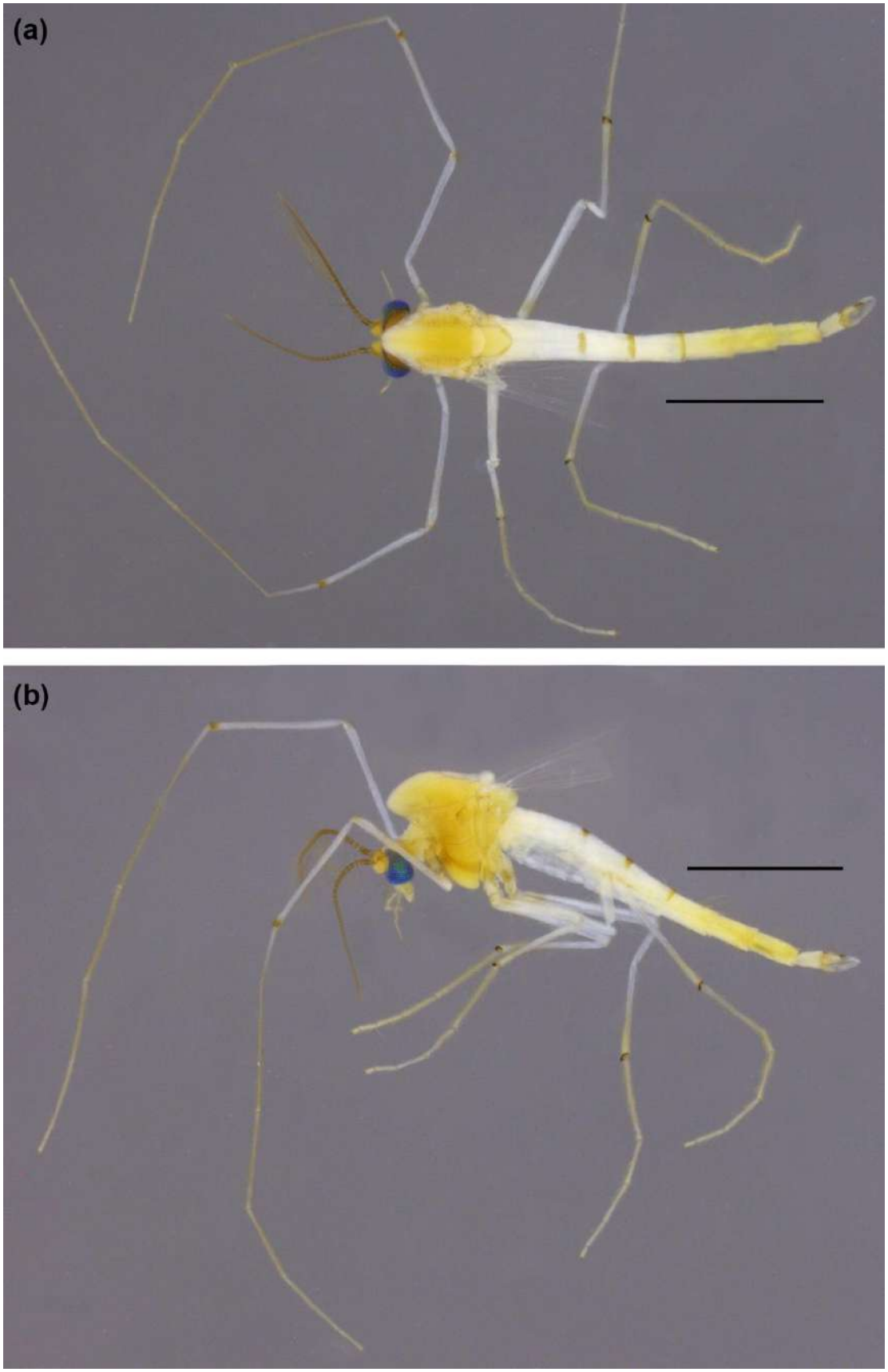


Fig. 7. *Stenochironomus* (*Petalopholeus*) sp. 4 (Diptera: Chironomidae), male adult, habitus. (a) Dorsal view. (b) Lateral view. Scale bars = 1 mm.

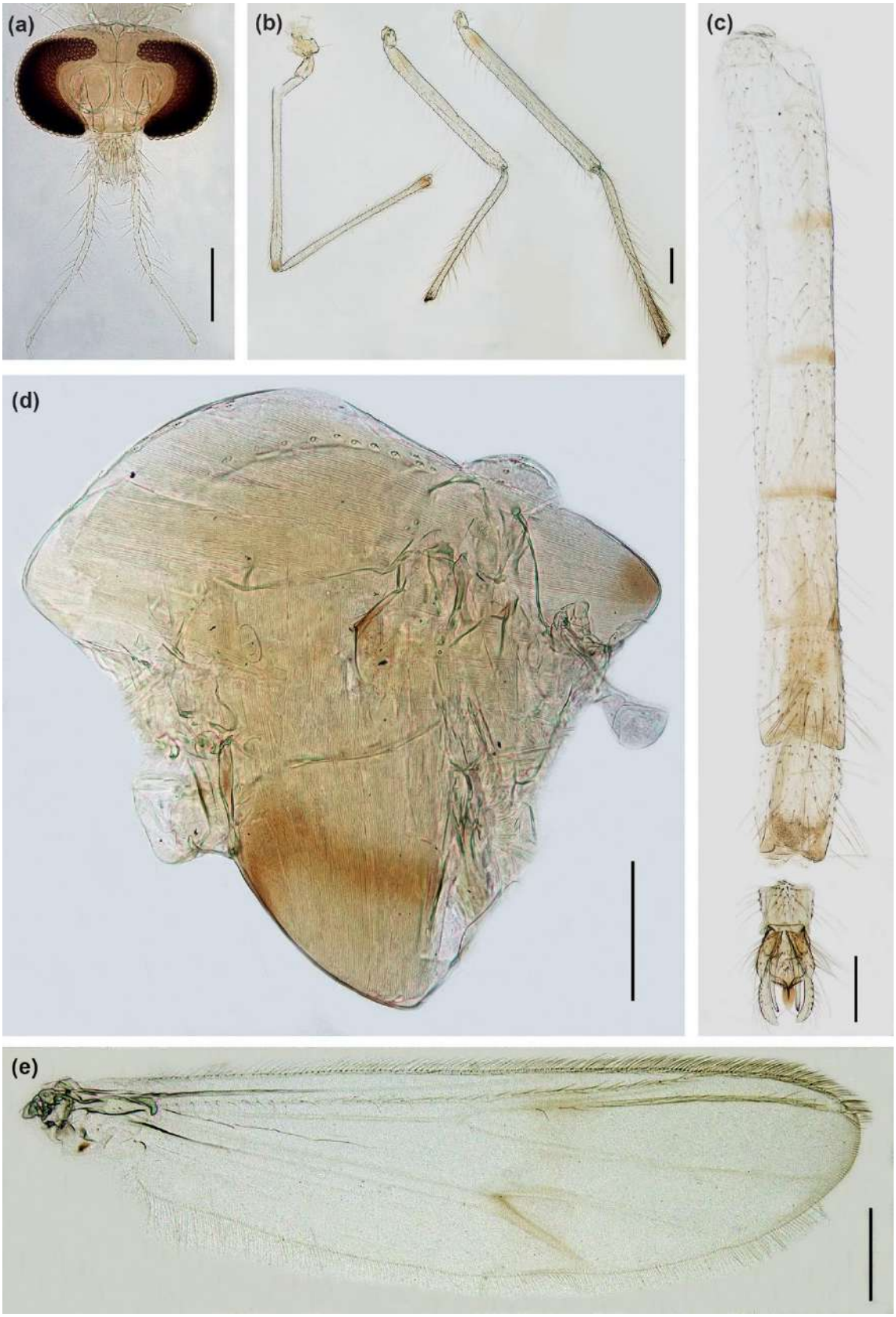
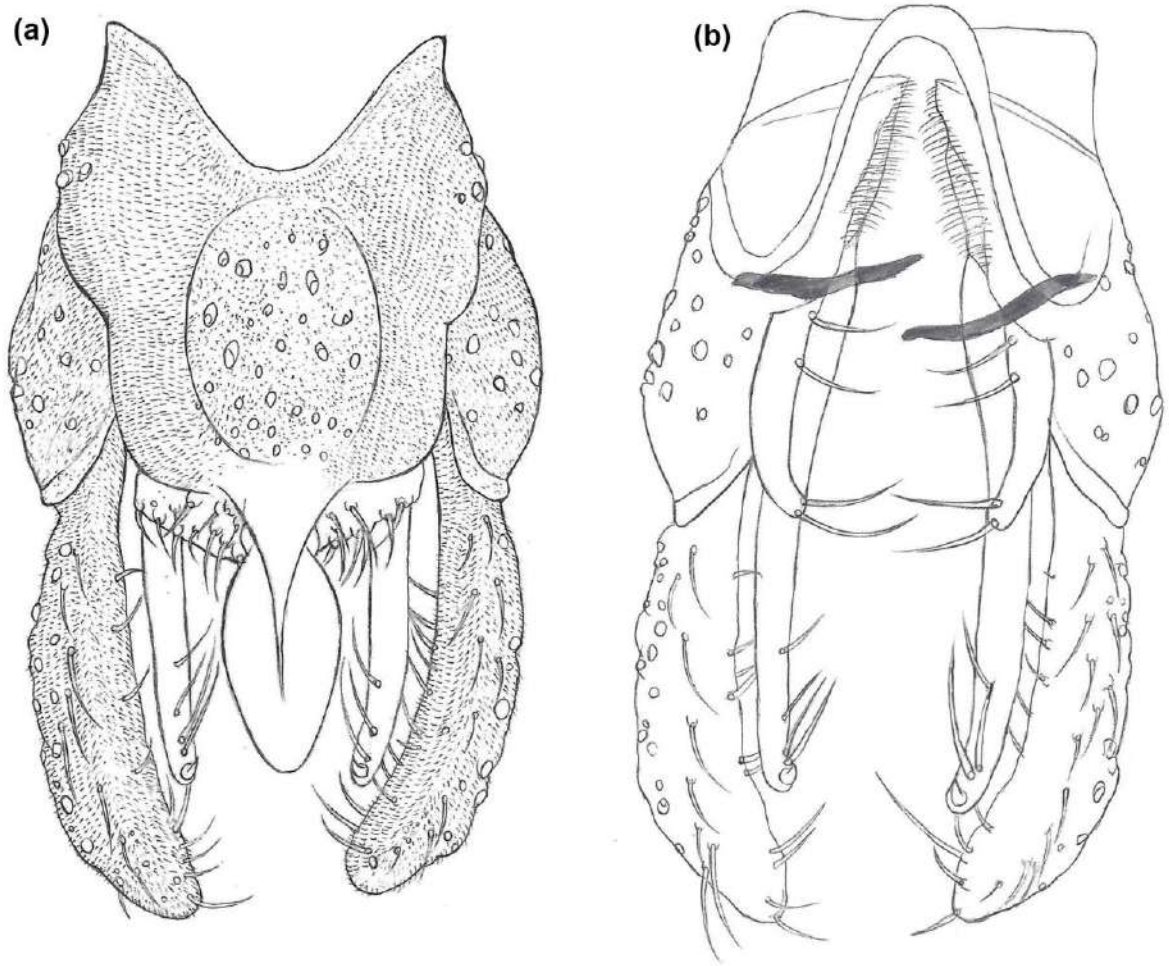


Fig. 8. *Stenochironomus* (*Petalopholeus*) sp. 4 (Diptera: Chironomidae), male adult. (a) Head, frontal view. (b) Legs (femur and tibia), from left to right, fore, mid, and hindleg. (c) Thorax, lateral view. (d) Abdomen, dorsal view. (e) Wing. Scale bars = 200 µm.



816

817 **Fig. 9.** *Stenochironomus* (*Petalopholeus*) sp. 4 (Diptera: Chironomidae), male adult. (a) Hypopygium,
818 dorsal view. (b) Hypopygium, with tergite IX removed, dorsal view.

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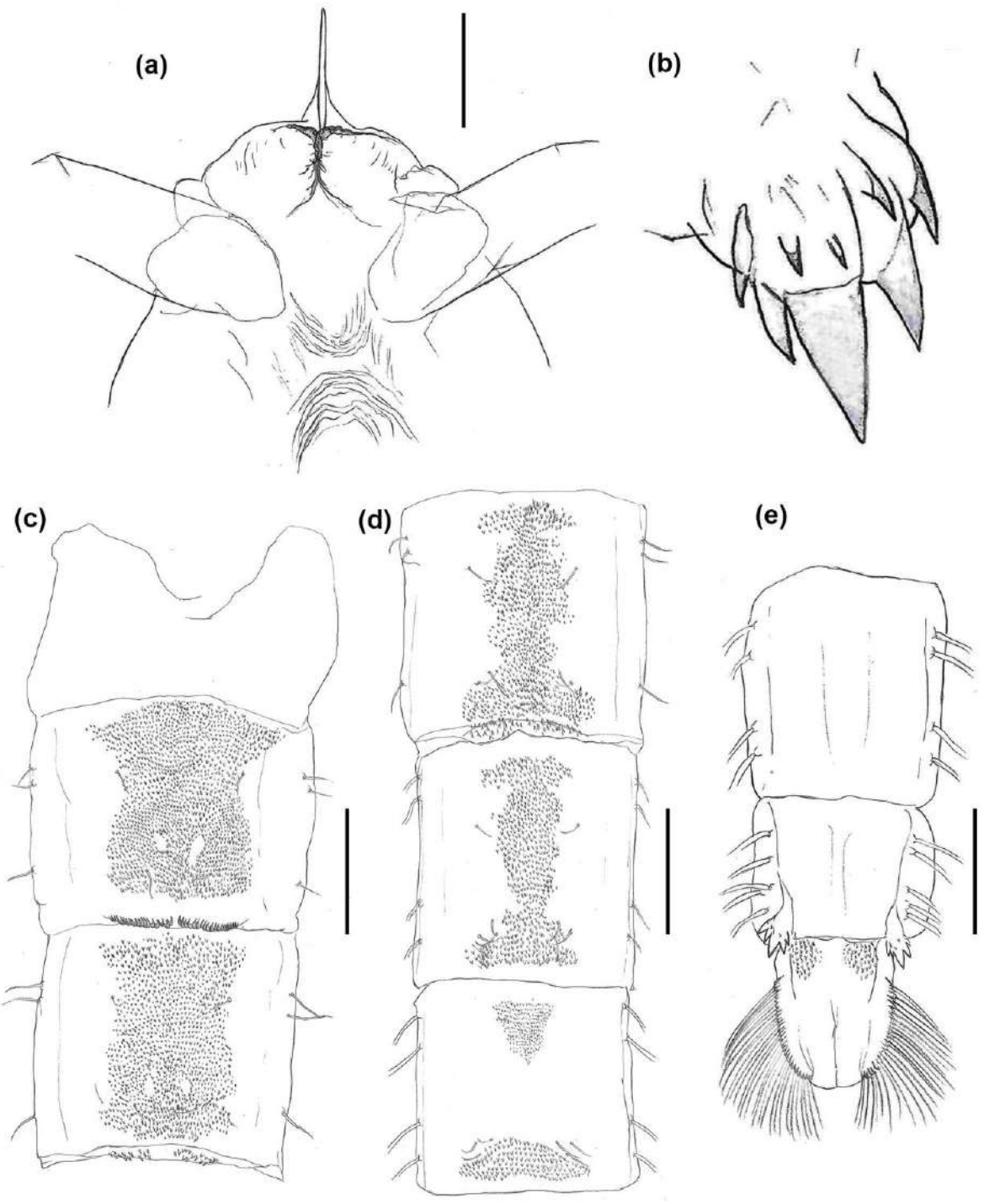
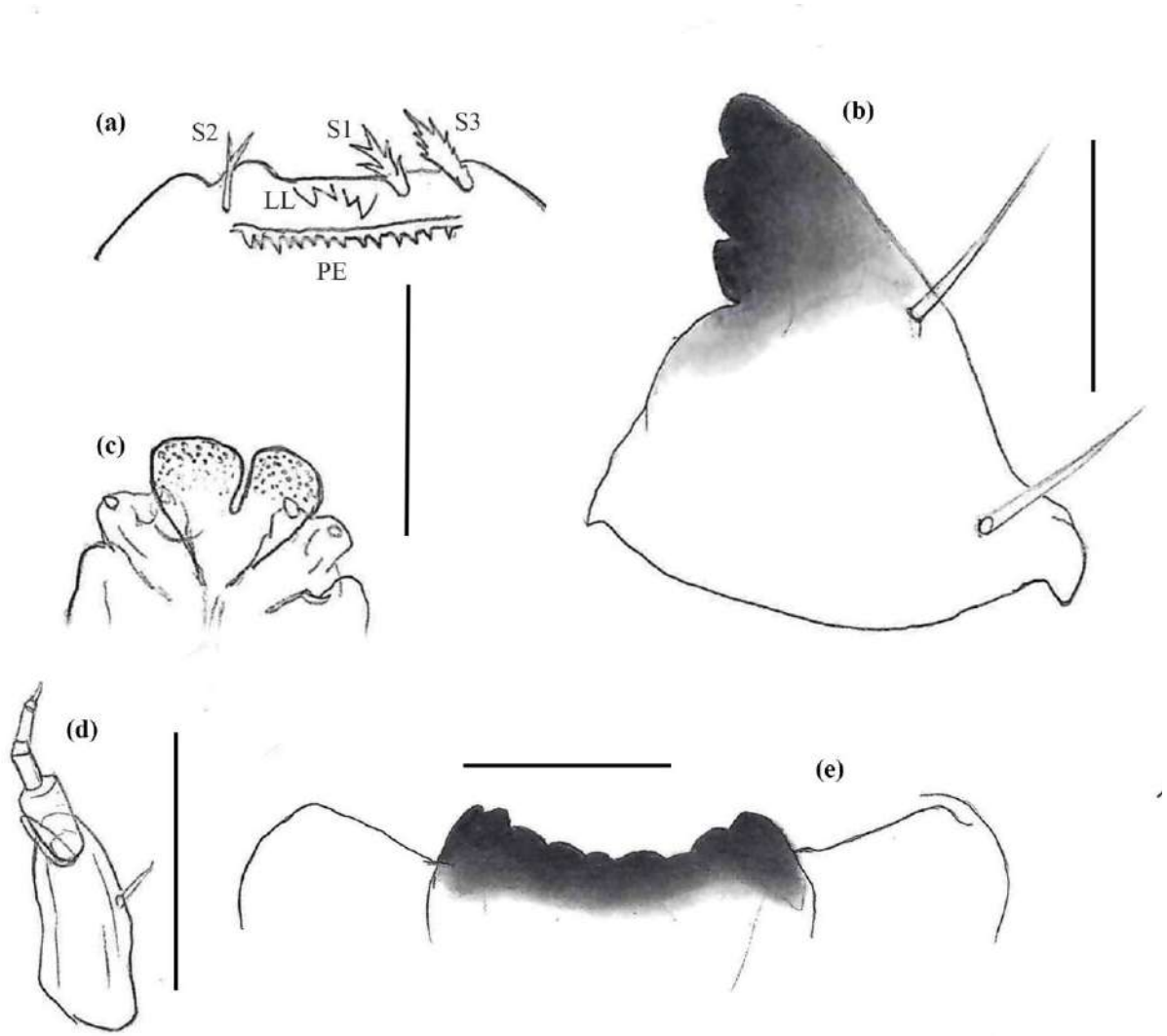


820

821 **Fig. 10.** *Stenochironomus* (*Petalopholeus*) sp. 4 (Diptera: Chironomidae), pupa. (a) Frontal apotome. (b)
822 Spur on S VIII. (c–e) Abdomen, in dorsal view. (c) Tergites I–III. (d) Tergites IV–VI. (e) Tergites VII–
823 Anal lobe. Scale bars = 250 μm.

824



825

826 **Fig. 11.** *Stenochironomus* (*Petalopholeus*) sp. 4 (Diptera: Chironomidae), larva. (a) Labrum, PE, Pecten
827 epipharyngis; LL, Labral lamellae. (b) Mandible. (c) Labiohypopharynx (d) Antennae. (e) Ventromental
828 plate and mentum. Scale bars = 50 μm.

829

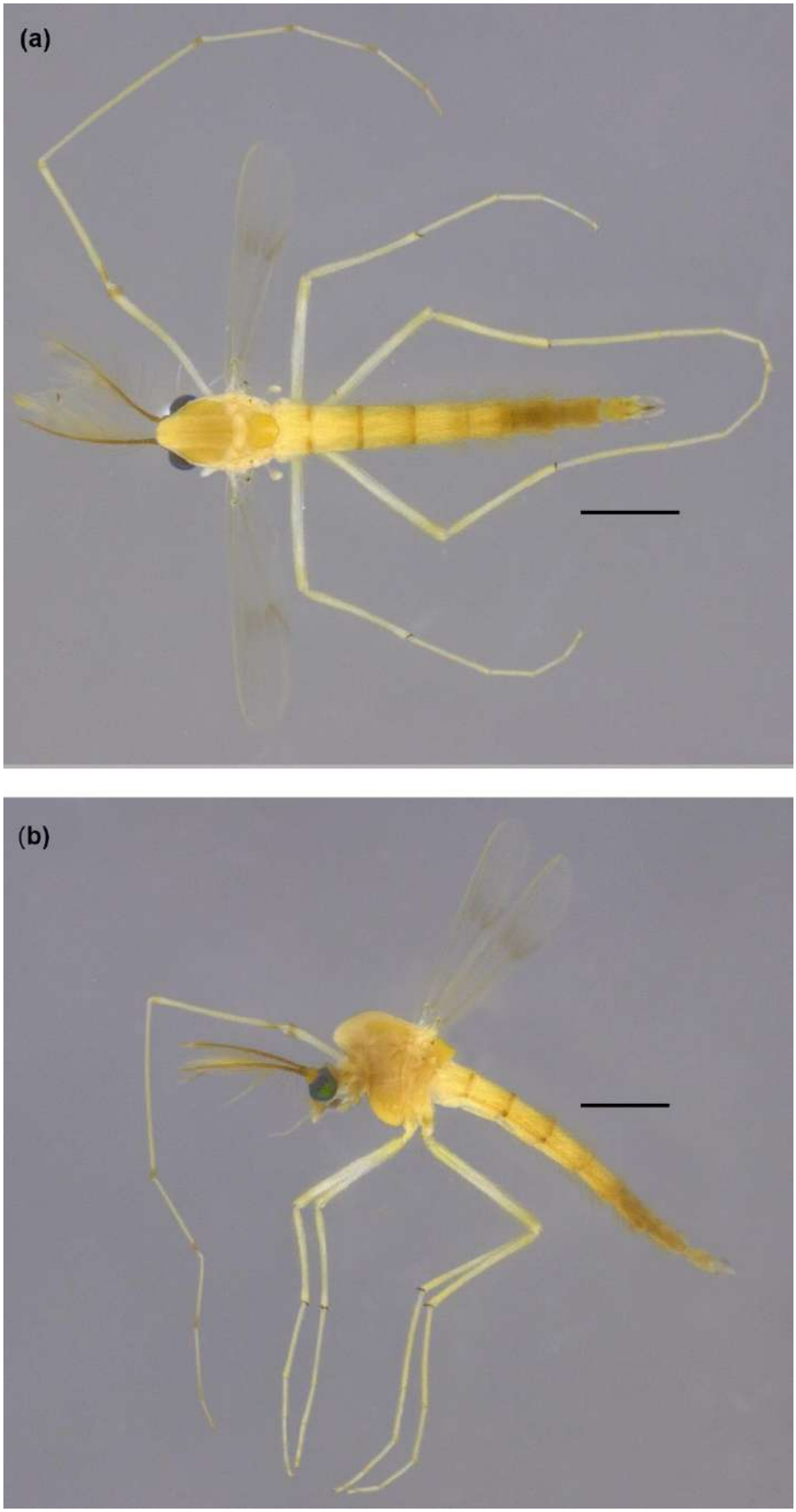


Fig. 12. *Stenochironomus* (*Petalopholeus*) sp. 5 (Diptera: Chironomidae), male adult, habitus. (a) Dorsal view. (b) Lateral view. Scale bars = 1 mm.

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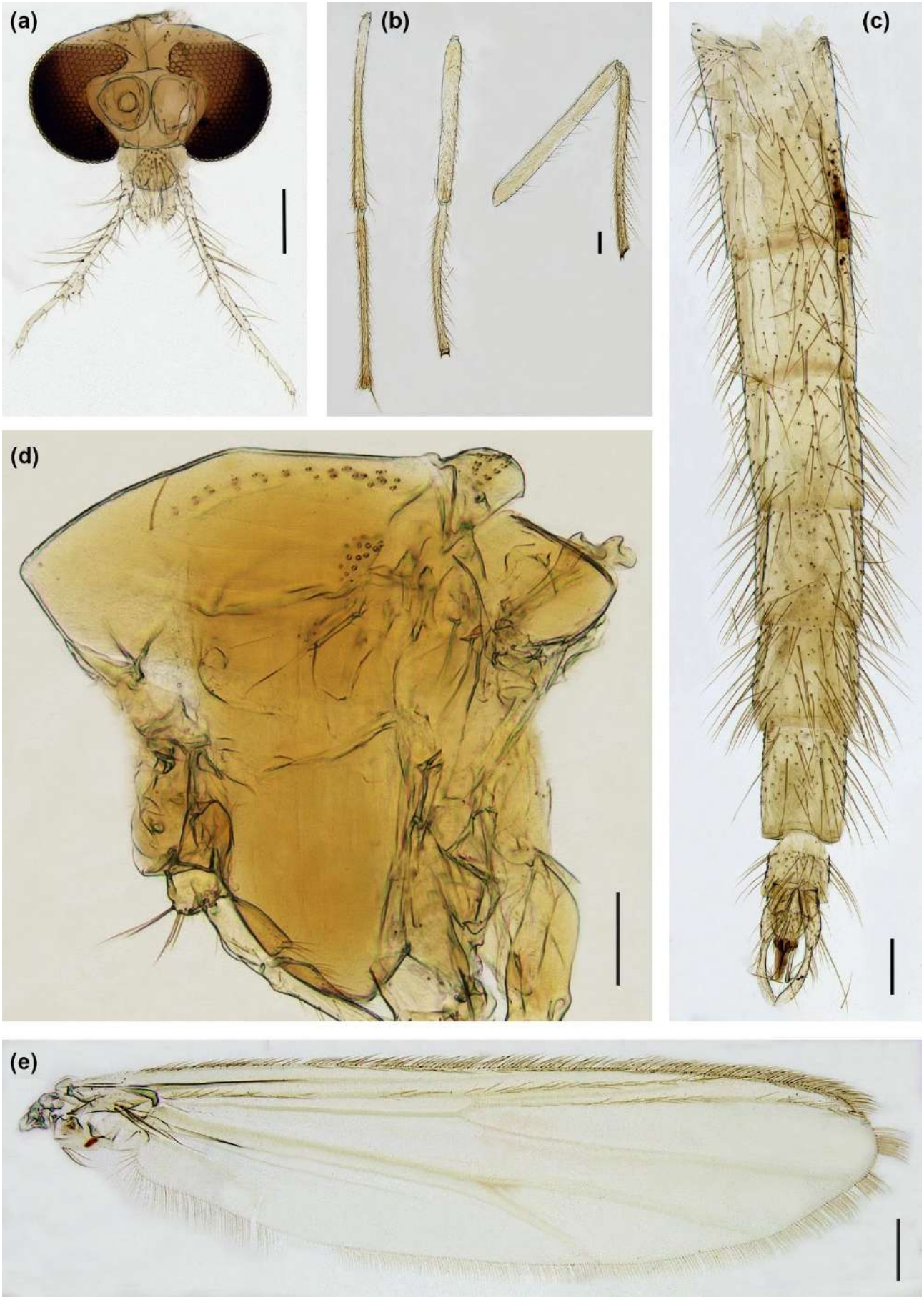
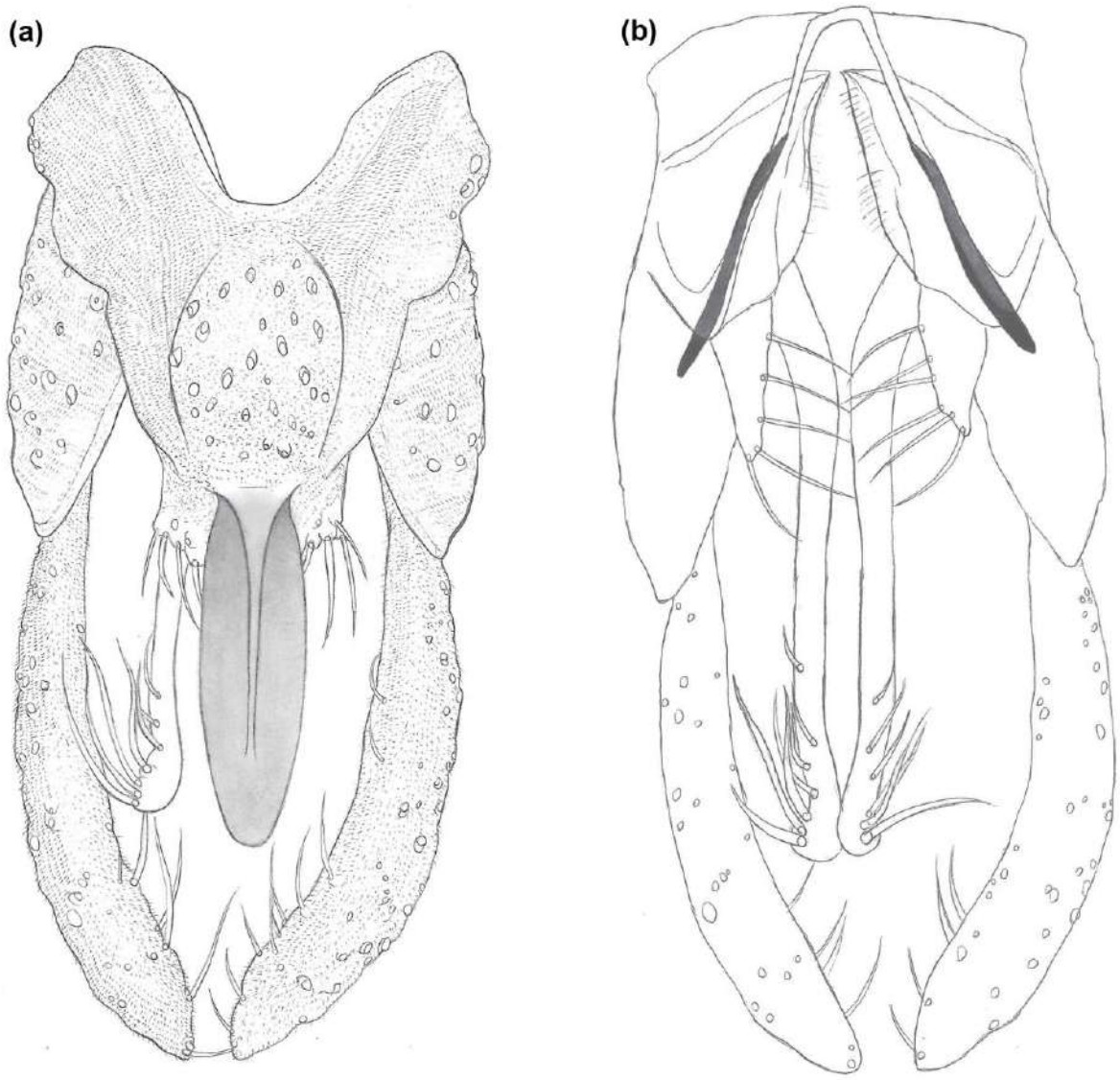


834

835 **Fig. 13**. *Stenochironomus* (*Petalopholeus*) sp. 5 (Diptera: Chironomidae), male adult. (a) Head, frontal
836 view. (b) Legs (femur and tibia), from left to right, fore, mid, and hindleg. (c) Thorax, lateral view. (d)
837 Abdomen, dorsal view. (e) Wing. Scale bars = 200 µm.
838



839
840 **Fig. 14.** *Stenochironomus* (*Petalopholeus*) sp. 5 (Diptera: Chironomidae), male adult. (a) Hypopygium,
841 dorsal view. (b) Hypopygium, with tergite IX removed, dorsal view.
842

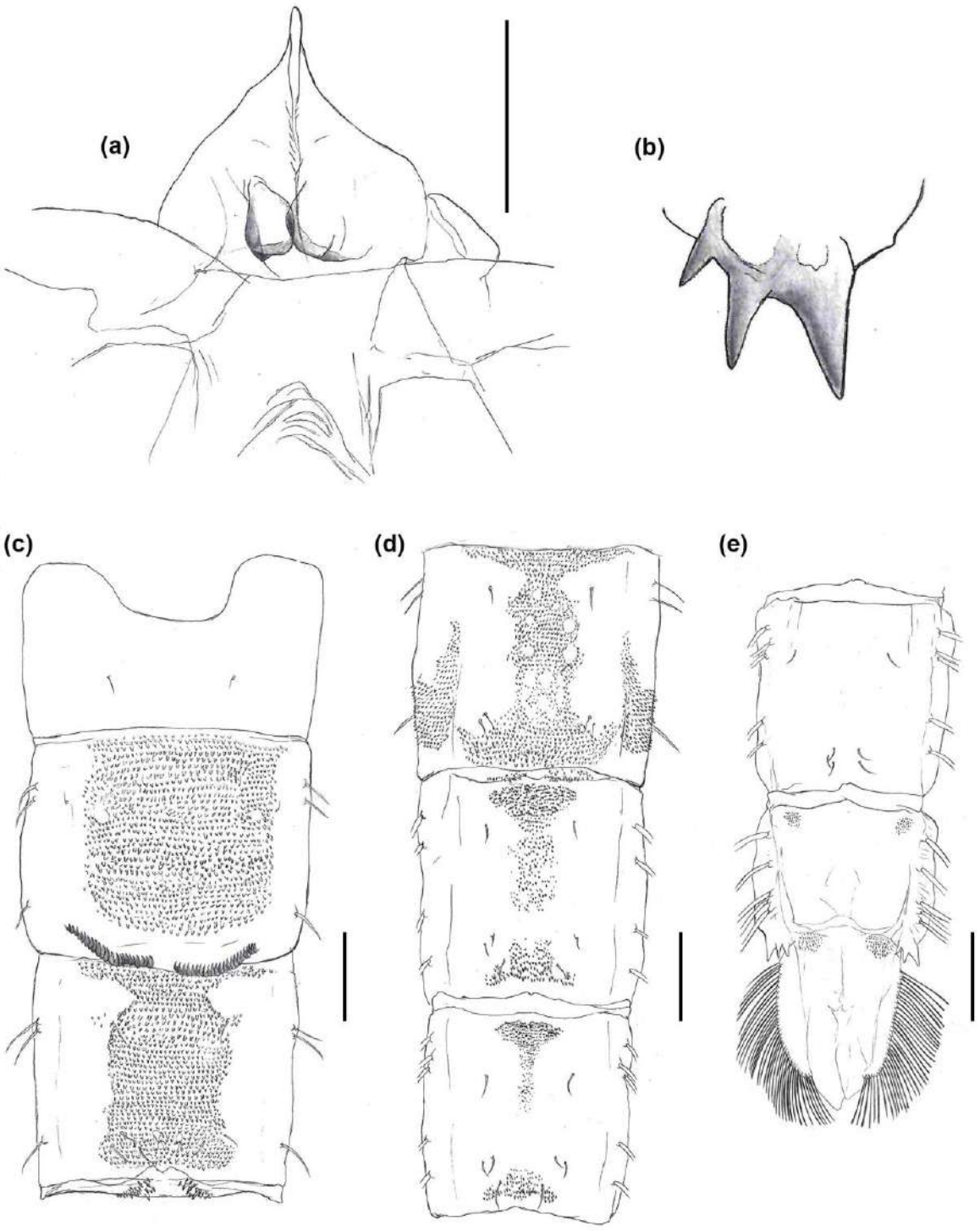


Fig. 15. *Stenochironomus* (*Petalopholeus*) sp. 5 (Diptera: Chironomidae), pupa. (a) Frontal apotome. (b) Spur on S VIII. (c–e) Abdomen, in dorsal view. (c) Tergites I–III. (d) Tergites IV–VI. (e) Tergites VII–Anal lobe. Scale bars = 250 μm.

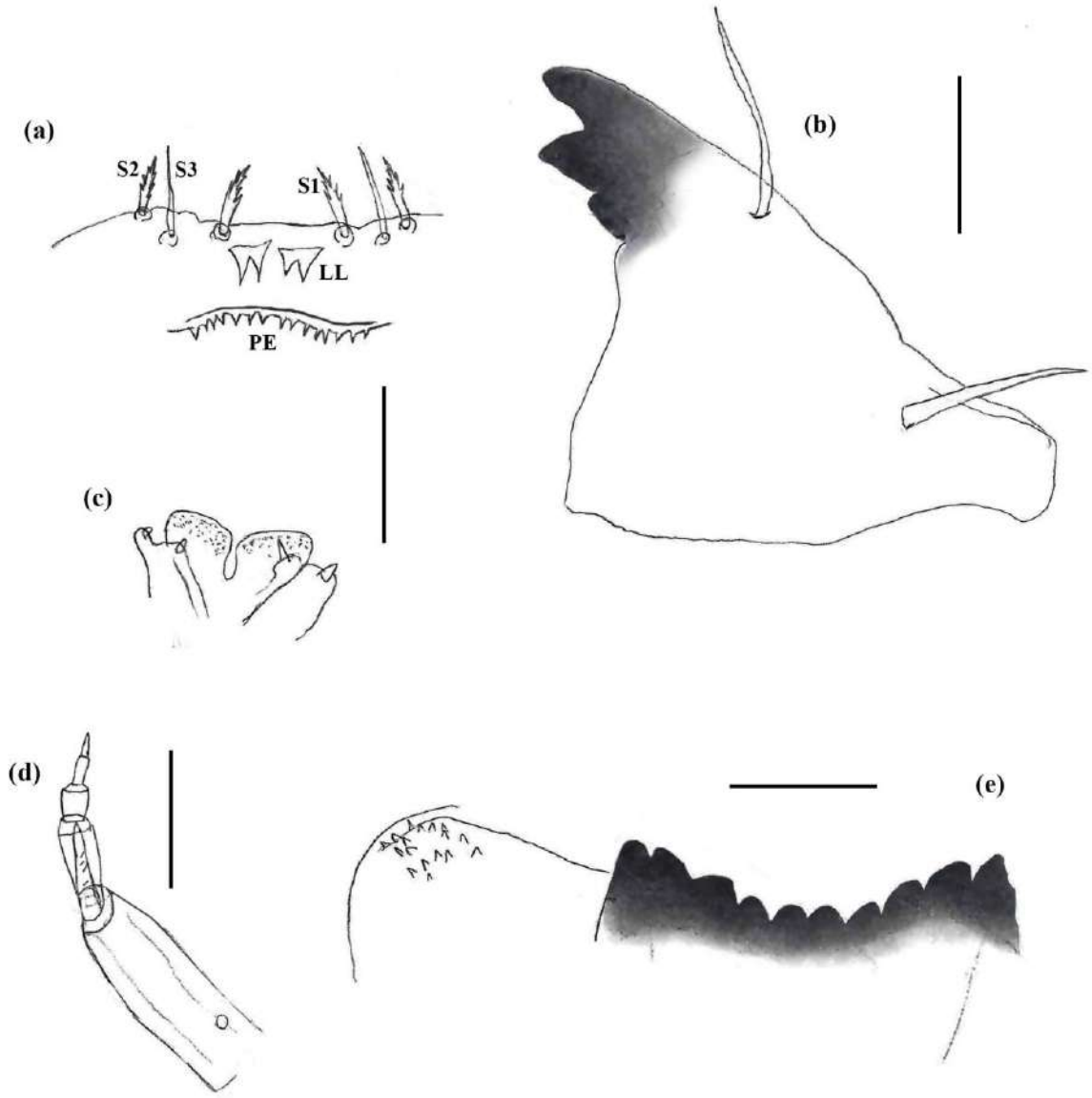


Fig. 16. *Stenochironomus* (*Petalopholeus*) sp. 5 (Diptera: Chironomidae), larva. (a) Labrum, PE, Pecten epipharyngis; LL, Labral lamellae. (b) Mandible. (c) Labiohypopharynx (d) Antennae. (e) Ventromental plate and mentum. Scale bars = 50 μm.

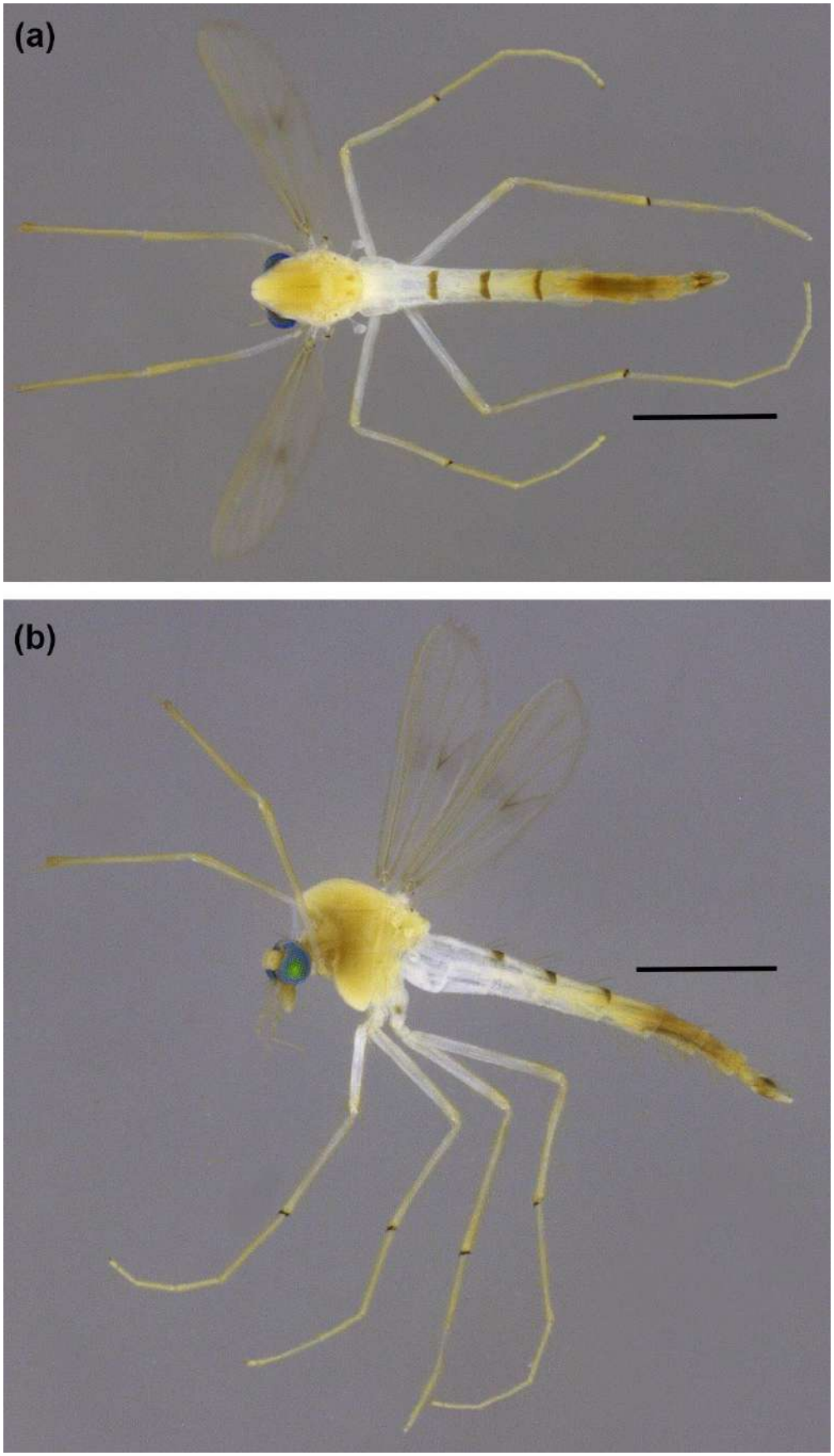


Fig. 16. *Stenochironomus* (*Petalopholeus*) sp. 6 (Diptera: Chironomidae), male adult, habitus. (a) Dorsal view. (b) Lateral view. Scale bars = 1 mm.

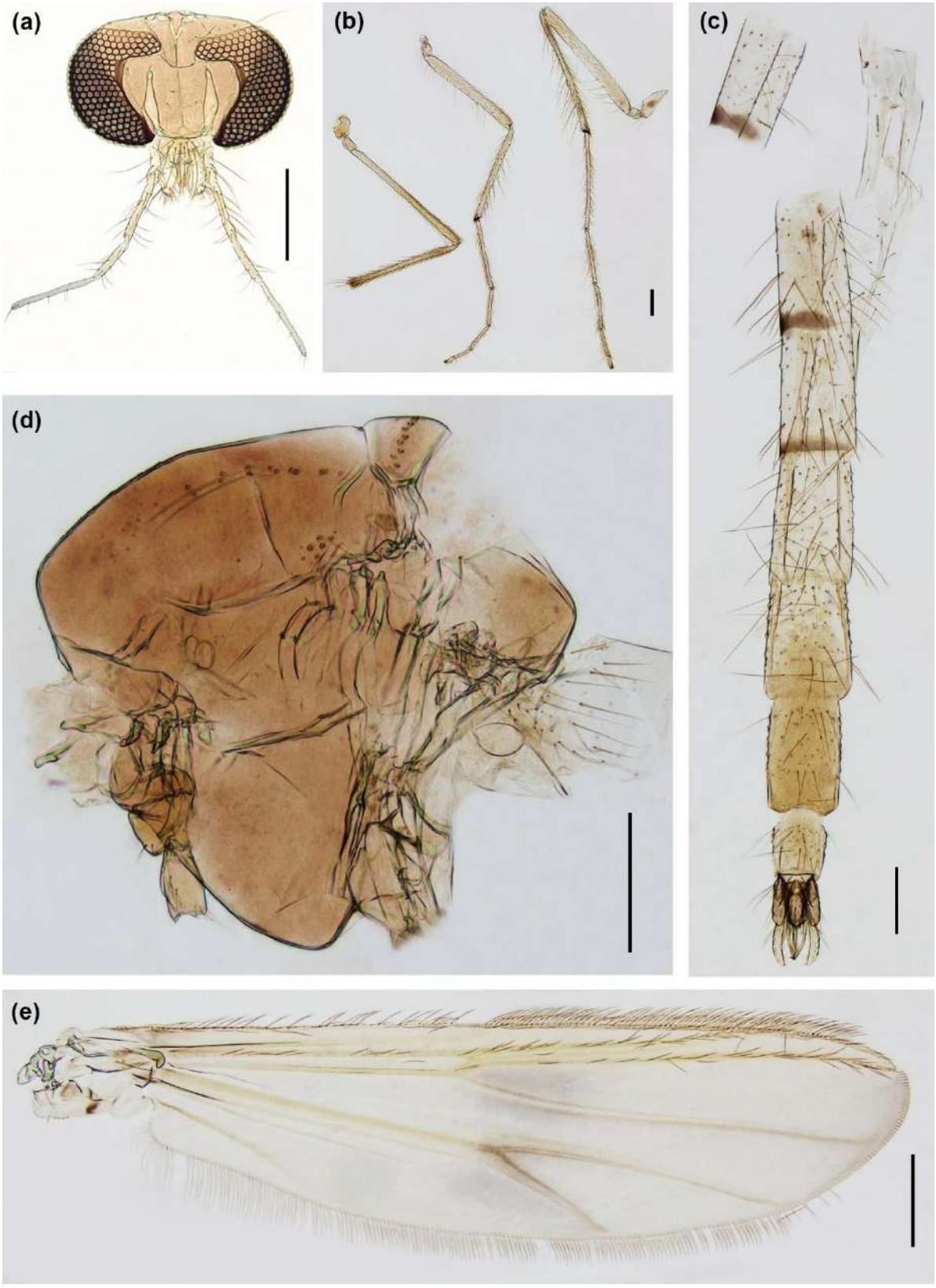


Fig. 17. *Stenochironomus* (*Petalopholeus*) sp. 6 (Diptera: Chironomidae), male adult. (a) Head, frontal view. (b) Legs (femur and tibia), from left to right, fore, mid, and hindleg. (c) Thorax, lateral view. (d) Abdomen, dorsal view. (e) Wing. Scale bars = 200 µm.

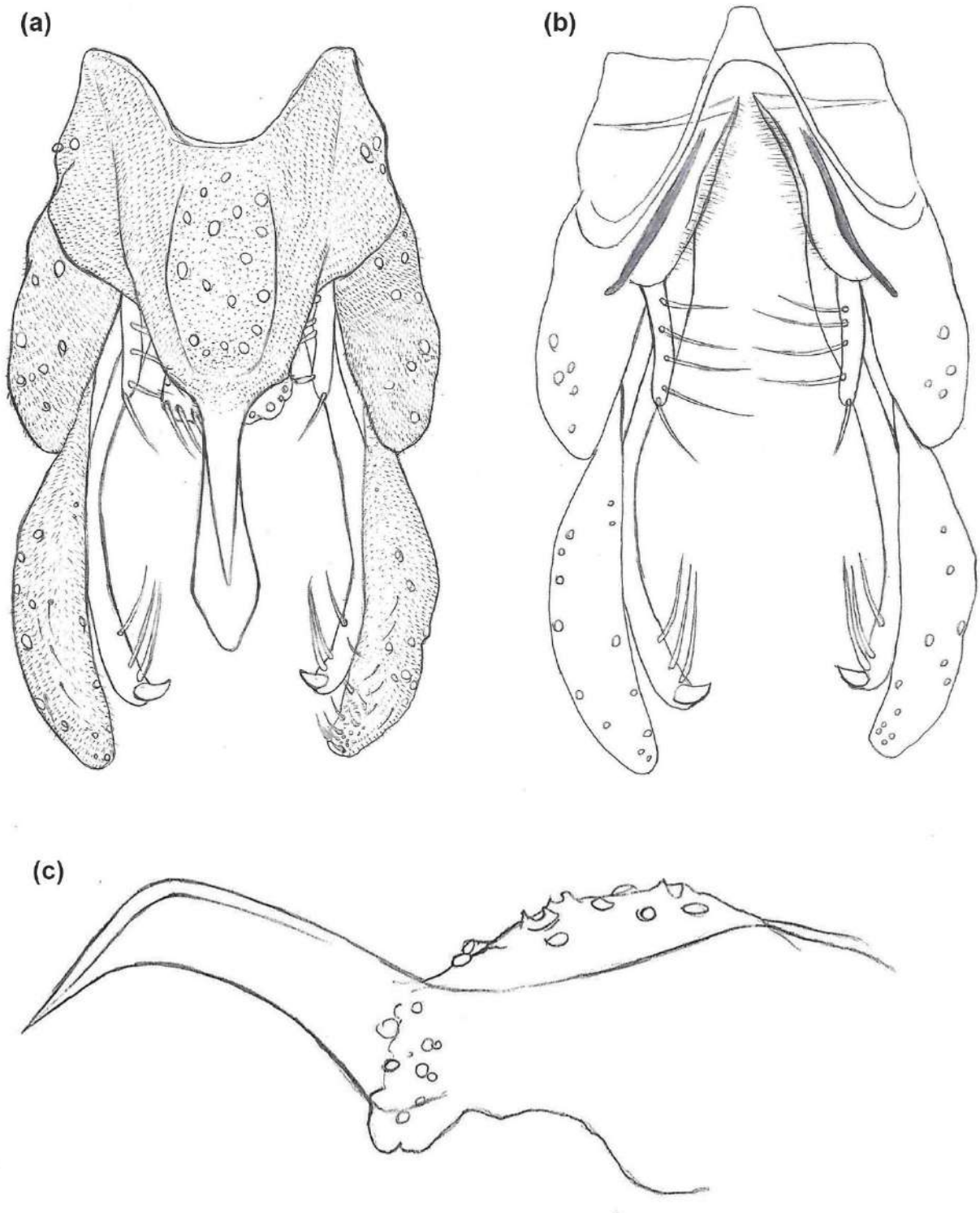


Fig. 18. *Stenochironomus* (*Petalopholeus*) sp. 6 (Diptera: Chironomidae), male adult. (a) Hypopygium, dorsal view. (b) Hypopygium, with tergite IX removed, dorsal view. (c) Anal point, lateral view.

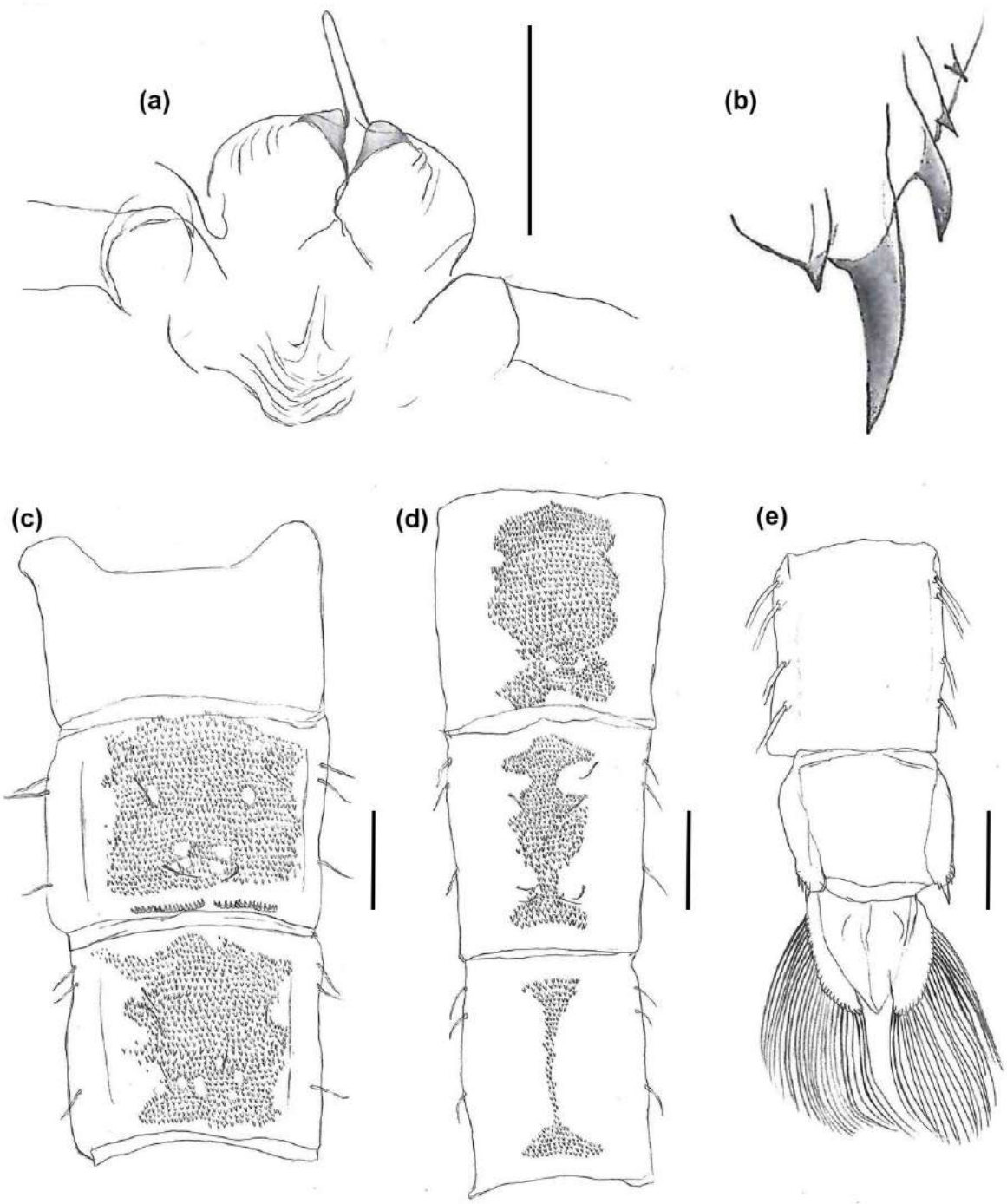
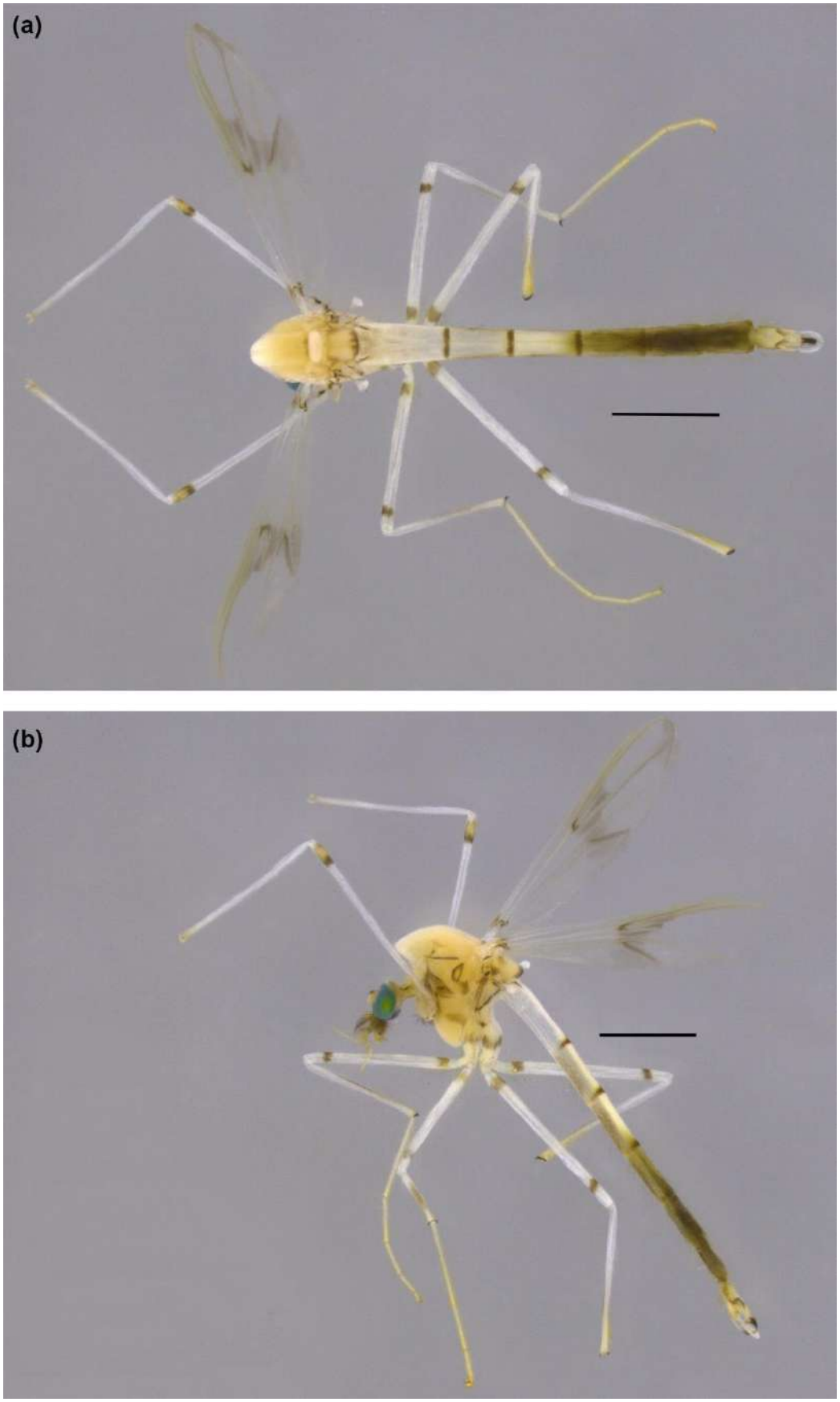


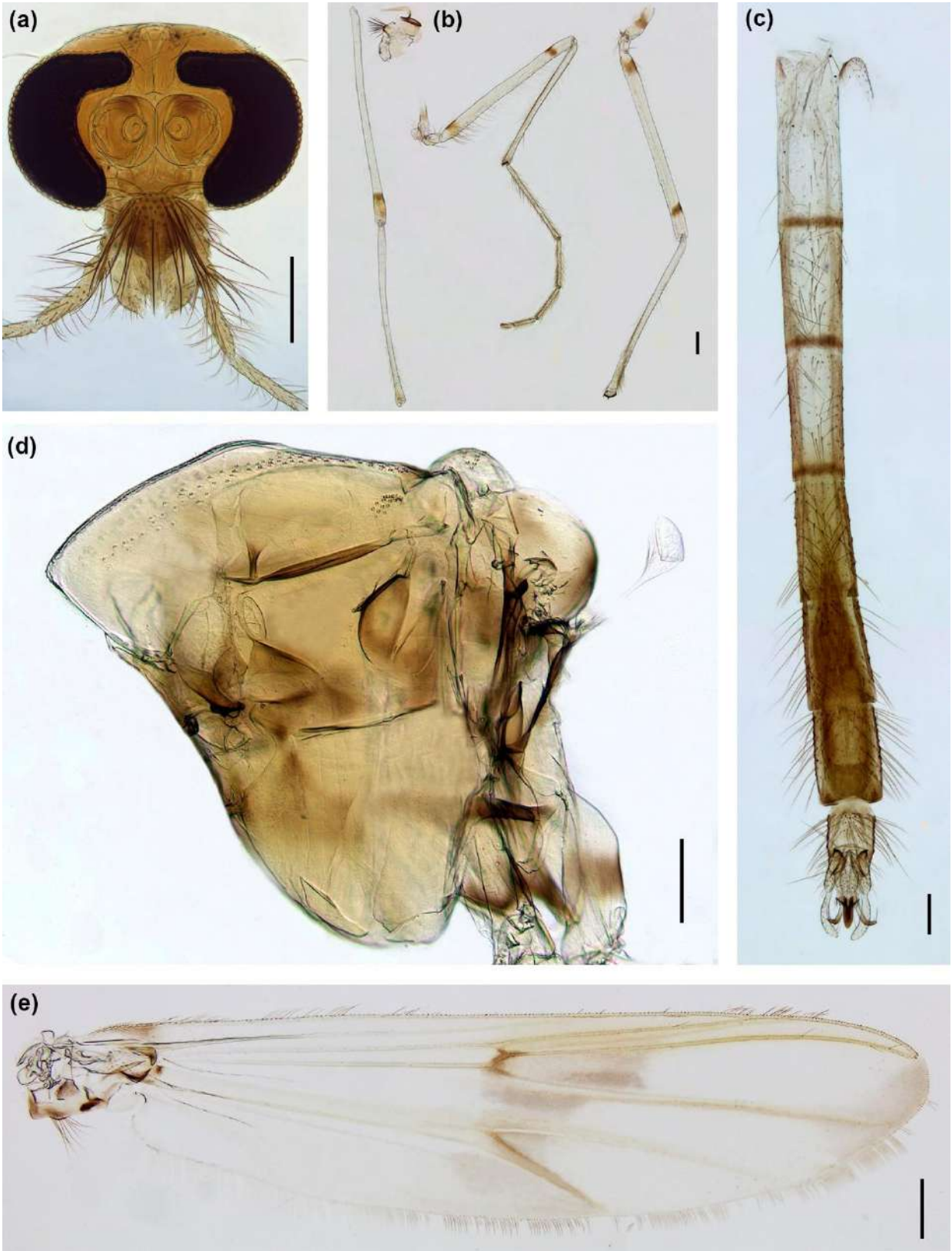
Fig. 19. *Stenochironomus* (*Petalopholeus*) sp. 6 (Diptera: Chironomidae), pupa. (a) Frontal apotome. (b) Spur on S VIII. (c–e) Abdomen, in dorsal view. (c) Tergites I–III. (d) Tergites IV–VI. (e) Tergites VII–Anal lobe. Scale bars = 250 μm.



871

872 **Fig. 20.** *Stenochironomus* sp. 7 (Diptera: Chironomidae), male adult, habitus. (a) Dorsal view. (b) Lateral
873 view. Scale bars = 1 mm.

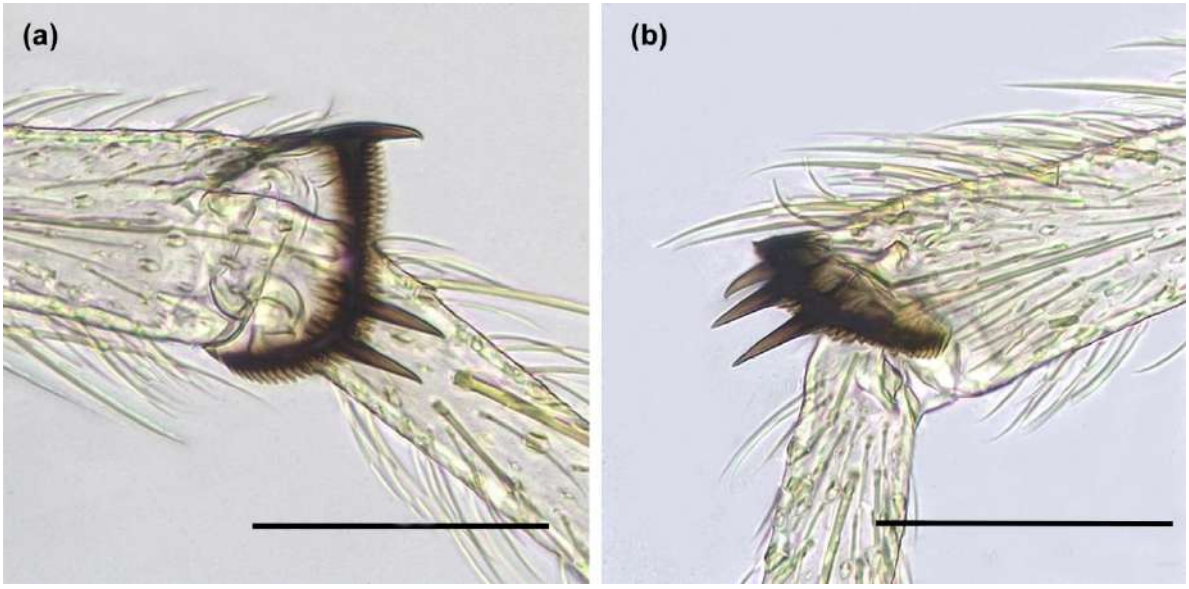
874



875

876 **Fig. 21.** *Stenochironomus* sp. 7 (Diptera: Chironomidae), male adult. (a) Head, frontal view. (b) Legs
877 (femur and tibia), from left to right, fore, mid, and hindleg. (c) Thorax, lateral view. (d) Abdomen, dorsal
878 view. (e) Wing. Scale bars = 200 µm.

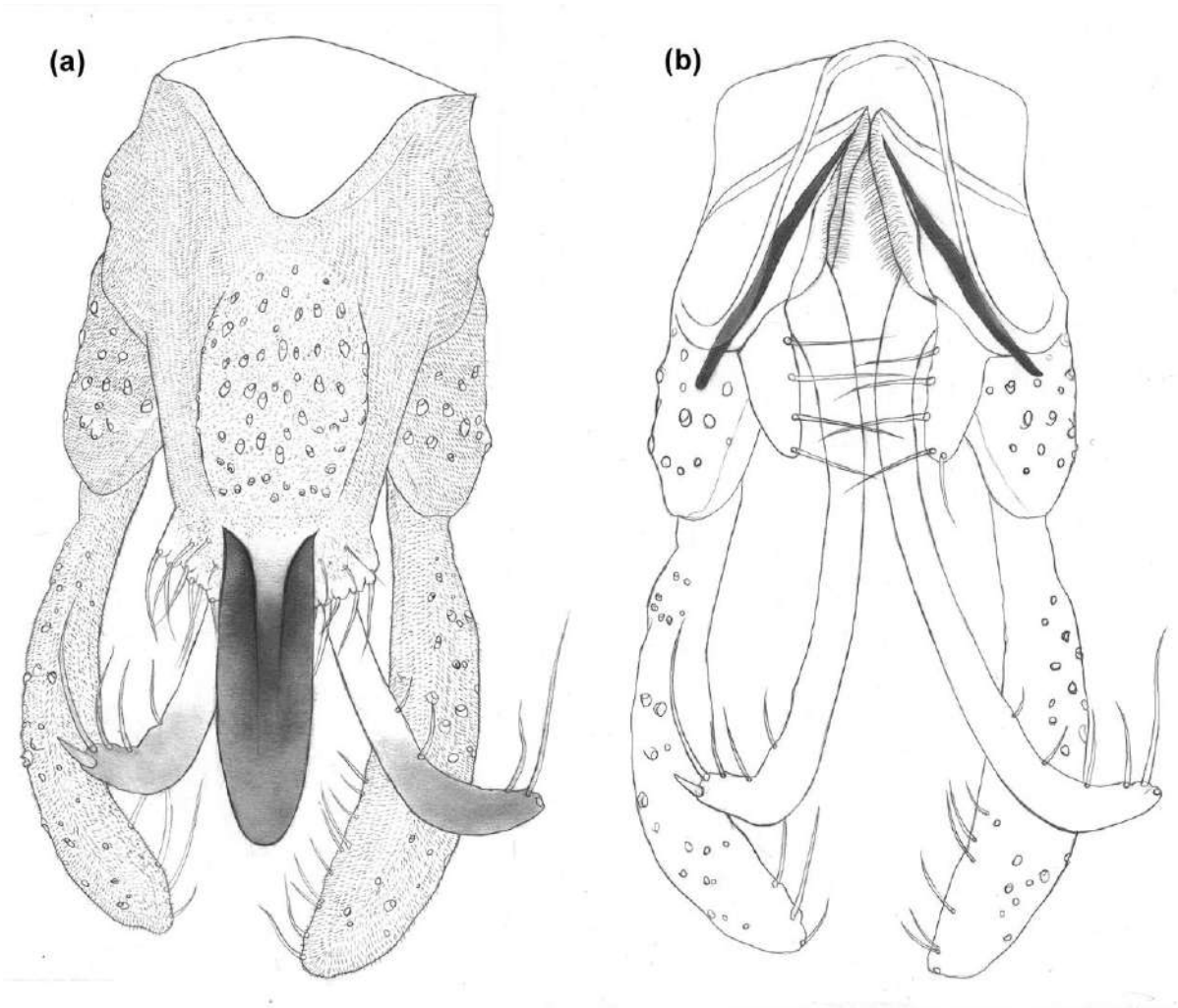
879



880

881 **Fig. 22.** *Stenochironomus* sp. 7 (Diptera: Chironomidae), male adult. (a) Spurs on mid femur (left). (b)

882 Spurs on mid femur (right). Scale bars = 100 µm.

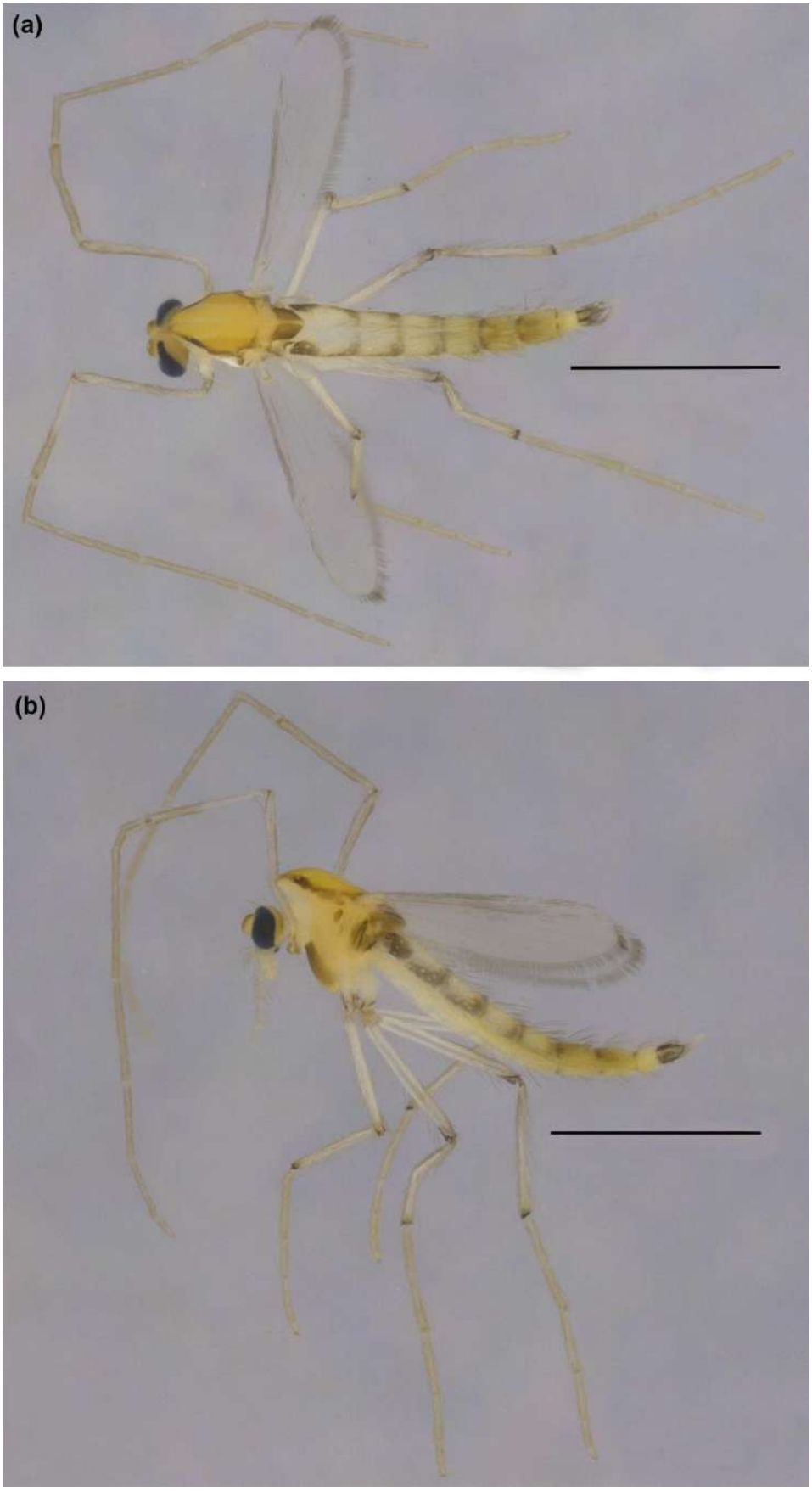


883

884 **Fig. 23.** *Stenochironomus* sp. 7 (Diptera: Chironomidae), male adult. (a) Hypopygium, dorsal view. (b)

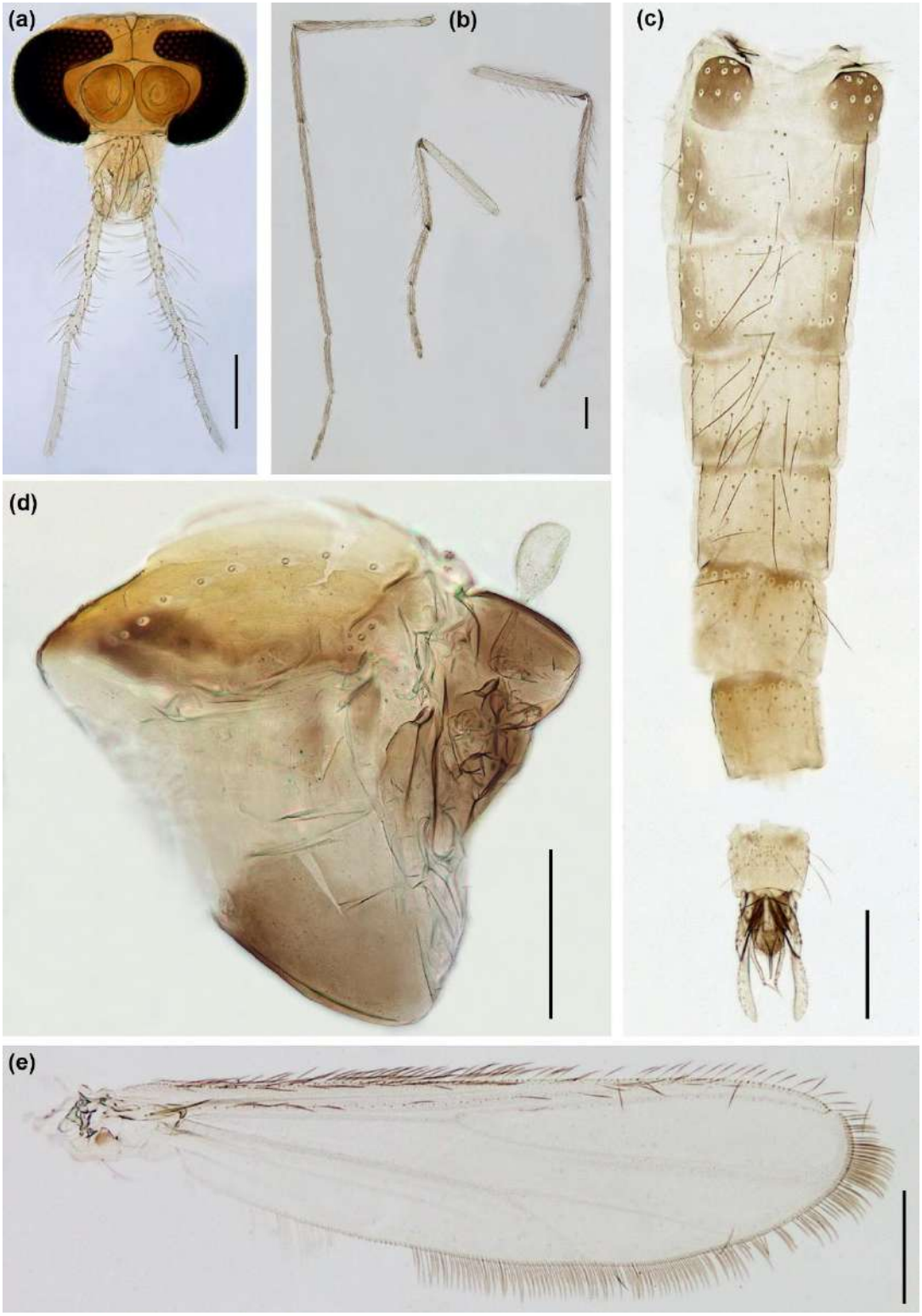
885 Hypopygium, with tergite IX removed, dorsal view.

886



887

888 **Fig. 24.** *Stenochironomus* sp. 8 (Diptera: Chironomidae), male adult, habitus. (a) Dorsal view. (b) Lateral
889 view. Scale bars = 1 mm.
890



891

892 **Fig. 25.** *Stenochironomus* sp. 8 (Diptera: Chironomidae), male adult. (a) Head, frontal view. (b) Legs
893 (femur and tibia), from left to right, fore, mid, and hindleg. (c) Thorax, lateral view. (d) Abdomen, dorsal
894 view. (e) Wing. Scale bars = 200 µm.

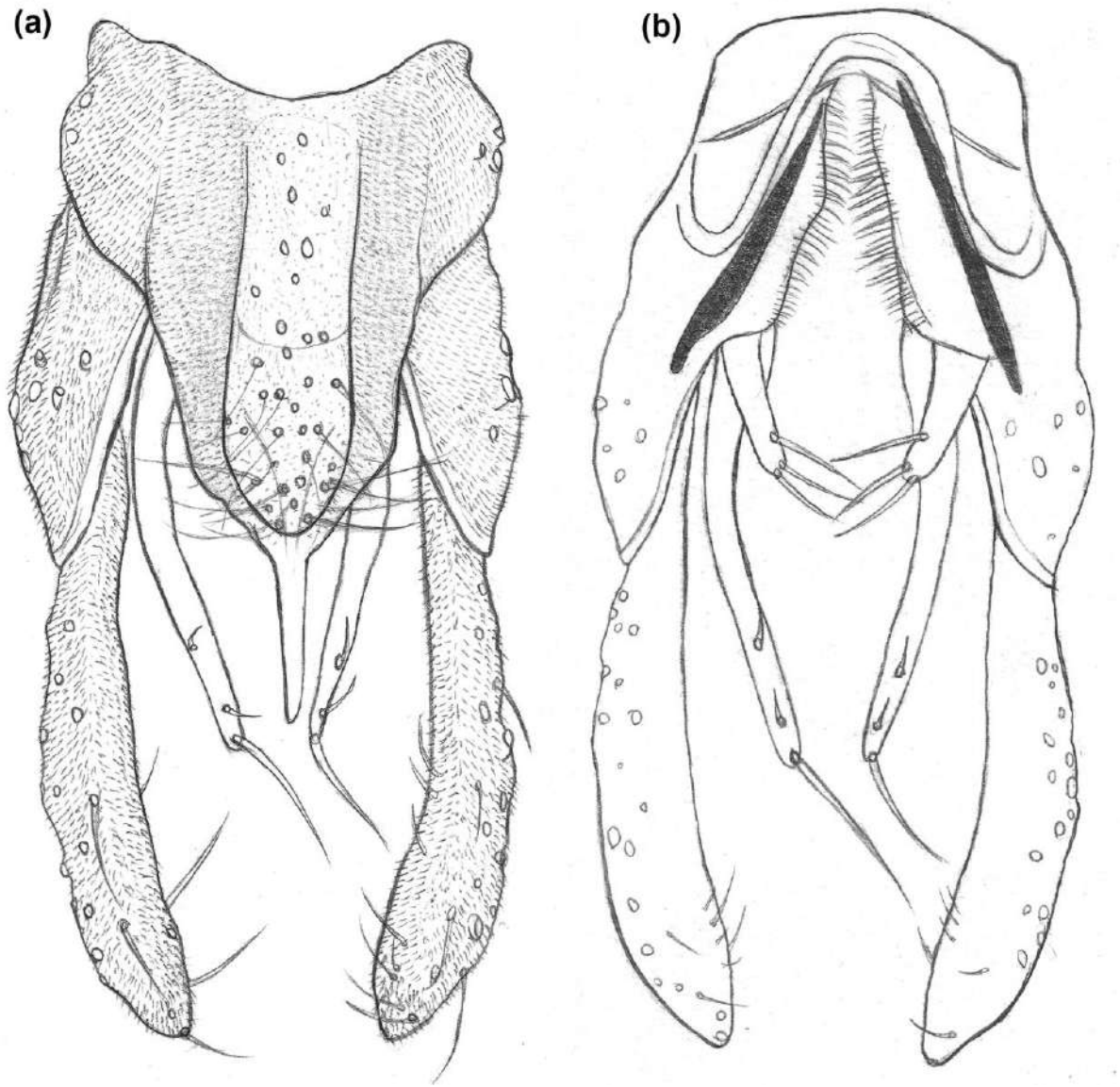


Fig. 26. *Stenochironomus* sp. 8 (Diptera: Chironomidae), male adult. (a) Hypopygium, dorsal view. (b) Hypopygium, with tergite IX removed, dorsal view.

CONCLUSÕES GERAIS

O presente estudo descreve oito novas espécies de *Stenochironomus* neotropicais, das quais sete são exclusivas da Amazônia brasileira, com exceção de *Stenochironomus* sp. 1, que também ocorre no Cerrado (Goiás). Assim, após um inventário taxonômico, o número de espécies desse gênero foi ampliado de 39 para 47 na região Neotropical, de 30 para 38 no Brasil e de 27 para 35 na região Amazônica.

Seis das novas espécies descritas (*Stenochironomus* (*Petalopholeus*) sp. 1, *Stenochironomus* (*Petalopholeus*) sp. 2, *Stenochironomus* (*Petalopholeus*) sp. 3, *Stenochironomus* (*Petalopholeus*) sp. 4, *Stenochironomus* (*Petalopholeus*) sp. 5 e *Stenochironomus* (*Petalopholeus*) sp. 6) foram alocadas no subgênero *S.* (*Petalopholeus*), proposto por Borkent (1984), com base em características dos estágios imaturos. Tais características incluem a presença de uma fileira posterior de ganchos restrita à porção medial no segmento T II do abdome pupal e linhas dorsolaterais originadas próximo à base da listra dorsomediana na cápsula cefálica da larva de quarto instar. Embora a larva de *Stenochironomus* sp. 6 ainda seja desconhecida, sua exúvia pupal é compatível com a diagnose do subgênero e foi obtida em folhas submersas. Por isso, até o momento, essa espécie foi incluída no subgênero *Stenochironomus* (*Petalopholeus*).

As espécies restantes, *Stenochironomus* sp. 7 e *Stenochironomus* sp. 8, não foram atribuídas a nenhum subgênero, uma vez que seus estágios imaturos e hábitos larvais permanecem desconhecidos. Atualmente, das 47 espécies de *Stenochironomus* descritas para a região Neotropical, 29 são conhecidas em sua fase pupal, e 23 possuem registros da fase larval. Assim, quase metade das espécies neotropicais é conhecida exclusivamente com base nos adultos.

Embora este trabalho tenha associado os estágios imaturos de seis novas espécies, outras duas foram descritas apenas com base em exemplares adultos, já que não foram obtidas durante as coletas de substratos em corpos d'água, e sim, somente em armadilhas de captura de adultos.

Estudos futuros sobre o gênero *Stenochironomus* devem priorizar a associação de estágios imaturos das espécies já conhecidas, com ênfase na coleta de substratos adequados. Essa abordagem permitirá ampliar o conhecimento taxonômico, biológico e geográfico do grupo, contribuindo significativamente para a compreensão de sua biodiversidade e ecologia na região Neotropical.

ANEXOS

Anexo 1 - Normas da revista Annales Zoologici Fennici, na qual já foi publicado o capítulo I dessa Dissertação

Detailed Instructions to Authors

It is expected that the authors make the data underlying published articles available on request. Any impediments to data sharing should be brought to the attention of the editors at the time of submission.

Ethical compliance: Details of animal experimentation permission, or its equivalent along with the name of the institution that granted permission for the study should be given in the paper. We also recommend that authors familiarize themselves with e.g., "Guidelines for the treatment of animals in behavioural research and teaching" (**Animal Behaviour 83: 301□309**), and **AVMA Guidelines for the Euthanasia of Animals.**

Submissions

The entire manuscript (incl. figures and tables) should be converted into PDF and sent by e-mail as one PDF file along with a properly-completed submission form directly to the Editorial Office. For details please select 'SUBMISSION' from the menu above.

Revised or final versions of manuscripts

When sending a corrected/finalised version of a manuscript, use short filenames **including the article ID number** always ending in appropriate extensions added by the programme with which the files have been created. Do not use the article title for a filename. The article (i.e., text, tables, figure captions) should be sent as MSWord .doc or .rtf file. Before saving (e.g. MSWord), remove all comments and accept all track changes. See HERE for details on figure preparation and graphic file formats. As a reference, a PDF file of the entire article should also be provided.

Use either **British or American English** consistently throughout the text. Change the language settings for the document accordingly. Write in a clear style and preferably avoid the use of passive voice. Instead, the pronouns I (we), me (us), and my (our) should be used thus indicating the responsibility of the author(s) towards the study. The authors bear full responsibility for the quality

of the language. If English is not your first language, make sure that the manuscript is checked by a native English speaker preferably familiar with the subject and terms used in the paper. We routinely check the language of all accepted manuscripts and if we find it to be inadequate, manuscripts are returned for further corrections. Certain elements of the manuscript layout that are requested in the instructions below — but not present in the published articles — are necessary to facilitate the typesetting process.

Tenses [top]

In scientific writing, only two tenses — present simple and past simple — are normally used. So-called 'perfect tenses' (e.g. present perfect) should be avoided. Thus, there are the following rules that should be observed:

Established knowledge (results of previous studies) is given in the present simple tense;
Description of methods and results in the current paper are in the past simple tense;
Attributions (e.g. Jones (1995) reported that ...) are in the past simple tense.

Dashes [top]

- **A hyphen** (the shortest dash "-") is used for example in hyphenation and compound words,
- **An en-dash** ("–"; coded in a manuscript with two hyphens "--") is chiefly used as a minus in subtraction (5 – 2 same as five minus two; NOTE: spaces before and after the dash) or in ranges of values or dates (2–5 same as from two to five; NOTE: no spaces before and after the dash),
- **An em-dash** (the longest dash "—"; coded in a manuscript with three hyphens "---") is chiefly used to separate an explanatory phrase in a sentence or in references (see below).

Numbers [top]

- Always use decimal points '.', NOT commas ','.
- Always use leading zeros in decimal fractions.
- In long numerals (five and more digits), the digits should be marked off in groups of three by spaces (not commas!), starting from the left (e.g., 15 369).
- Numbers from 1 to 10 (also ordinals) in a text should be written out (not '5' but 'five').

Symbols [top]

- **One-letter symbols** representing variables or constants, regardless of their position (normal, in subscript or superscript), must always be italicised.
- **Multi-letter symbols** representing variables or constants, regardless of their position (normal, in subscript or superscript), are never italicised.
- **Vectors** are set in boldface italic.
- **Matrices** are set in boldface but not italics.
- Usage of a multiplication symbol 'x' is not recommended. If, however, its presence in an equation is required for reasons of clarity please use 'x' instead of a dot.
- Abbreviations or acronyms (e.g., 'tot' meaning 'total') are not italicised.
- Check that the same symbol does not have multiple meanings (e.g., P = phosphorus and P = significance level or N = nitrogen and N = number of samples).
- **Improper typesetting of symbols may result in misinterpretations.**

Italicisation [top]

- Latin names of genera and lower taxa (e.g., Salmo trutta).
- Words which are originally not English (e.g., in vitro).
- Ship (vessel) names.
- Titles of books.
- For italicisation of symbols see above.

Units [top]

- Only SI system units should be used (with some exceptions e.g., 1 □m not 10--6 m).
- In composite units, use numbers in superscript instead of divisions (e.g., 30 m s--1 not 30 m/s) consistently throughout the entire article (also in figures and tables).
- The above style should be used consistently throughout the entire article (also in figures and tables).
- If units follow axes titles in figures, they should be given in parentheses '()' not brackets '[]' or after a comma.

Dates [top]

- Dates should be written according to the following format: day.month.year (e.g., 12 Dec. 1972 or 12 December 1972 or 12.XII.1972, not December 12, 1972).
- Months should be written in full (e.g., January), abbreviated (e.g., Jan.) or expressed with roman numerals (January "I", February "II" and so on).
- Years should never be abbreviated (eg. 2003 not 03).

Time [top]

- The 24-hour system should exclusively be used. The day begins at midnight (00:00) and ends at 23:59.

Abbreviations and acronyms [top]

- Each abbreviated word should end in a full stop (e.g., Professor = Prof., Volume = Vol.).
- There is no punctuation used in acronyms unless the English grammar rules dictate otherwise.

Geographic nomenclature [top]

- Always use internationally recognised and existing names. In questionable cases, refer to the Times Atlas of the World or Merriam-Webster's Geographic Dictionary to make sure that a name you intend to use is listed in their indexes, and its spelling is correct. Use of coordinates (latitude and longitude) is strongly recommended.

Text [top]

- Use exclusively your word processor's **NORMAL** style settings for the entire manuscript (default font Times New Roman, size 12 points, no indentation, no boldface, no capitalisation, left justified, without multiple spaces or tabulators, or other unusual formatting).
- Insert a blank line before each element of the text (headings, subheadings, paragraphs, tables and so on)
- Remove section and page breaks from the text.

- Number chapter headings as follows:
- Chapter headings (Introduction, Material and methods, Results, Discussion and other headings) are numbered decimally starting with "1.". Abstract, References and Acknowledgements, are not numbered.
- Sub-chapter headings should be numbered e.g.: "1.1.", "1.1.1.", and so on, depending on how many levels of sub-chapters you have in your article.
- Numbering of chapters is for editorial purposes only and will not appear in published papers, hence DO NOT REFER TO PARTS OF YOUR OWN ARTICLE USING CHAPTER NUMBERS.
- Graphics (except for equations) should not be placed within the text file.
- Refer to tables and figures parenthetically.
- **Title:** Not capitalised or in boldface, not centred; short version of the title. The title of an article descibing a new species should include the new species Latin name.
- **Author:** For all authors, first name in full followed by initials (if any) and surname (James T. Brown, not J. T. Brown) should be given. **Authors should be arranged according to the degree of their contributions to the research and writing of the paper with the first contributing the most and the last, the least. The authors' order should not be changed after submission. Please note that there can be only one corresponding author.**
- **Address:** As complete as possible (including e-mail). Each author's affiliation should be identified with numbers in superscript. Please note that an institutional affiliation is not only an address for correspondence, but also indicates the institution (1) where the actual research work was done and (2) which financed (in full or in part) the research. If those two conditions are not fulfilled, a private not institutional address should be provided.
- **Abstract:** Should consist of only one paragraph of up to 150 words. References to literature are not allowed in abstracts.
- **Conclusions** should conclude the paper, not be a subsection of Discussion. Keep in mind that the most readers have read the paper, when they read the conclusions, hence avoid statements like "we have shown this and that by using this and that method" because this is what the read has just read. Proper conclusions should tell the reader what can be done with the newly acquired knowledge. Answer the question "So what?".
- **Appendixes:** They should present data that are helpful but not essential to comprehending the research and its results. If there is only one appendix, it can be referred to in the text as 'Appendix' without the number; otherwise, appendices should be numbered. **All supplementary material (tables and figures) should be presented in appendixes.**

- **Footnotes:** They are allowed only in tables (rarely in the text).
- **Equations:** Each equation occupies a separate line. Place an equation's number on the right-hand side e.g.: N = 0.3Wln(a + b) (1). Equations should be referred to as "Eq.", followed by an equation number. Please remember that there is only limited space for equations (column width); therefore, if equation is unusually long, it should be split in two or more parts connected with operators. Equations embedded in the text should preferably be written with either MSEquation Editor of MathType.

Tables [top]

Detailed instruction as to how tables should be prepared and saved are available HERE (PDF file, Acrobat Reader 7 or higher needed for viewing and printing). Other requirements to be considered are:

- **Tables should be sized so as to fit a B5-sized page in portrait orientation; landscape-oriented tables are not allowed.**
- Vertical lines in tables are not allowed.
- As tables are entirely text elements, no other background than white is allowed.
- Tables with their captions should be comprehensible without reference to the main text.
- Do not place tables within the text. They should be placed at the end of the text file (after references).
- A TABLE SHOULD NOT BE DIVIDED INTO PARTS OR SECTIONS IDENTIFIED WITH LETTERS. THE PARTS SHOULD EITHER BE JOINED OR EACH SECTION OF SUCH A TABLE SHOULD BE PRESENTED AS A SEPARATE TABLE.
- All tables should be referred to in the text in the proper numerical order (e.g., the first reference to Table 2 cannot precede the first reference to Table 1).
- Refer to tables parenthetically; e.g. '... (Table 1)'. 'Table 1 shows ...' type statements should be avoided.
- IF YOU REFER TO TABLES PUBLISHED ELSEWHERE, THE REFERENCE SHOULD BE FOLLOWED BY 'table' (note that the lowercase □t□ should be used).

Figures (photographs, computer-generated images and scanned drawings) [top]

Detailed instruction as to how figures should be prepared and saved are available HERE. Other requirements to be considered are:

- **Photographs** for publishing purposes should be taken with a high quality DSLR or compact camera. If needed, they should be processed with an appropriate software. True resolution of a photograph or a figure comprising several photographs should not be lower than 300 dpi. Preferred file formats ar TIF or JPG format
- **Computer-generated images** (graphs, drawings and the like) should be submitted as vector graphics. File formats supporting vector graphics are EPS, PDF, WMF, EMF or SVG (please note that those file formats can also hold bitmaps, thus even if a figure is saved in a correct format it does not automatically mean that it is vector graphics). **File formats such as JPG, TIF, PNG, BMP or GIF cannot be used to submit computer-generated images.**
- **Scanned drawings** should be submitted in TIF or JPG format.
- **Preferred figure widths** (max. height 21 cm) are as follows: 7 cm (colums width), 10.5 cm and 15 cm (page width). Figures exceeding those widths must withstand size reduction.
- Figures with their captions should be comprehensible without reference to the text.
- Figures of any type must always be referred to as "Fig.", followed by a number.
- **Refer to figures parenthetically; e.g. '... (Fig. 1)'. 'Fig. 1 shows ...' type statements should always be avoided when referring to figures presenting results.**
- All figures should be referred to in the text in numerical order (e.g., the first reference to Fig. 2 cannot precede the first reference to Fig. 1).
- IF YOU REFER TO FIGURES PUBLISHED ELSEWHERE, THE REFERENCE SHOULD BE FOLLOWED BY 'fig.' (note the lowercase 'f') e.g.: Turchin et al. 2003: fig. 3.
- All figure captions should be placed at the end of the article (after references).
- Avoid fancy designs (especially 3-D).
- Avoid presenting data in pie-charts; present these data in tables or bar charts.
- Use solid (colour or shades of grey) not pattern fillings in computer-generated figures.
- Use the same font in all figures and within a figure. Arial is recommended. Freehand lettering is unacceptable.
- The axes in graphs should always be named and units, if needed, should be given in parentheses.
- Axes titles should be placed parallel to the respecive axis.
- Explain all graphic symbols (e.g. squares, triangles and so on) within the figure, not in the caption. A legend should be placed under the figure not next to it.

- If a figure contains scale bars to indicate dimensions of object presented in the figure, the scale-bar lengths should be proportional to sizes of the respective objects.
- Relate the size of letters, the thickness of lines (preferably uniform for all figure items), and the size of other parts of a figure, to the size of the figure itself.
- Identify parts of a composite figure with capital letters, not numbers, preferably placed in the upper left corner of each part. In the figure itself, letters identifying panels (parts) of a composite figure should NOT be placed in parentheses. In photographs, letters, numbers and scale bars with numbers and units (if present) should be placed on the background, not on the object depicted in the image.
- In the figure caption, the letter identifying a panel in a composite figure should be placed in parentheses, e.g. (A), before the text describing the content of that panel (figure part) not after it.

References [top]

The references should be verified by the author(s) against the original documents. If an article has not been read by the author(s) but its conclusions found in another publication (secondary source), it may be cited in the text only as follows: e.g. Miller's (1972) results as cited in Ashworth (1996) .... In the reference list, however, only the secondary source (i.e. Ashworth 1996) can be given.

- **Referring to literature in the text** [top]
  - Publication with one author only: H□nninen (1990) or (H□nninen 1990).
  - Publication with two authors: Kurt□n and Anderson (1980) or (Kurt□n & Anderson 1980).
  - Publication with more than two authors: Mihok et al. (1985) or (Mihok et al. 1985).
  - If you wish to indicate specific pages that contain information used in the paper, please give these page numbers after the reference (e.g. H□nninen 1990: 160).
  - When referring to more than one publication, arrange them as follows (numbered in order of precedence):
    - Year of publication (ascending),
    - Alphabetical order for the same year of publication.
- **The reference list [to download the EndNote template click HERE] [**top]
- Arrange the references as follows (numbered in order of precedence):
  - Alphabetical order and number of authors (ascending) for publications in which the first author is the same.
  - Year of publication for publications by the same author or authors.

- **In the references, with few exceptions (e.g., PLoS), journals' names should be given in full and italicised.**
  - **Article in a printed journal** (DOI can be added at the end if available):
    - **one author**: Adams, D. C. 2014: A generalized K statistic for estimating phylogenetic signal from shape and other high-dimensional multivariate data. --- Systematic Biology 63: 685--697.
    - **two authors** (note no comma before '&'): Martins, E. P. & Hansen, T. F. 1997: Phylogenies and the comparative method: a general approach to incorporating phylogenetic information into the analysis of interspecific data --- American Naturalist 149: 646--667.
    - **more than two authors** (note that all auhors should be given regardless of their numbers; in other words, there should be no 'et al.' in author's listing): Pagono, A. M., Cutting, A., Nicassio-Hiskey, N., Hash, A. & Williams, T. M. 2019: Energetic costs of aquatic locomotion in a subadult polar bear. --- Marine Mammal Science 35: 649--659.
    - **article in a foreign language with English summary or abstract:** Hyt□nen, J. & Wall, A. 1997: Metsitettyjen turvepeltojen ja viereisten suometsien ravinnem□□r□t [Nutrient amounts of afforested peat fields and neighbouring peatland forests]. --- Suo 48: 33--42. [In Finnish with English summary].
  - **Article in an online-only journal** (printed version does not exist; if DOI is not available, URL should be given instead): Kumar, V., Lammers, F., Bidon, T., Pfenninger, M., Kolter, L., Nilsson, M. A. & Janke, A. 2017: The evolutionary history of bears is characterized by gene flow across species. --- Scientific Reports 7, 46487, https://doi.org/10.1038/srep46487.
  - **Chapter in a book** (book's title italicised; all the authors and editors, regardless of their number, should always be listed; publisher's name and location should be given).
    - H□nninen, H. 1990: Modelling dormancy release in trees from cool and temperate regions. --- In: Dixon, R. K., Melhdahl, R. S., Ruak, G. A. & Warren, W. G. (eds.), Process modelling of forest growth responses to environmental stress: 159--165. Timber Press Portland.
    - Please note that page numbers are those of the first and last pages of the chapter that is refrerred to. If you wish to indicate specific pages that contain information used in the paper, please give these page numbers after the reference (e.g. H□nninen, H. 1990: 160).
  - **Book** (book's title italicised; all the authors or editors, regardless of their number, should always be listed; publisher's name and location should be given).
    - Anderson, R. M. & May, R. M. 1982: Population biology of infectious diseases. --- Springer-Verlag, Berlin.

- Finnish Meteorol. Inst. 1989: Climatological data 1988. --- Meteorol. Yearb. Finland 88.

- **Referring to websites**: URL (link) should be placed in the text where appropriate not in the reference list.
- **Article or book printed entirely in Cyrillic: Give the authors' names both transliterated and [in brackets] in Cyrillic**: Only English translation of the title should be given in brackets. If the title translation is not given in the publication please provide your own. Do not transliterate the title. Give the transliterated book publisher's name and place, or journal's title e.g.:
  - Abramov, A. L. & Abramov, I. I. [Абрамов А.Л. & Абрамов И.И.] 1956: [Mnium immarginatum (Lindb.) Broth. from Mongolia]. --- Bot. Zh. 41: 89- -91. [In Russian].
- **Article or book printed entirely in non-Roman scripts other than Cyrillic (e.g. Arabic, Chinese, Japanese):** Give the transliterated authors' names. Only English translation of the title should be given in brackets. If the title translation is not given in the publication please provide your own. Do not transliterate the title. Give the transliterated book publisher's name and place, or journal's title e.g.:
  - Ho, T. N. 1985: [A study on the genus Gentiana of China, IV]. --- Bulletin of Botanical Research 5(4): 1--22. [In Chinese].
- **Article or book printed in non-Roman scripts but with English summary or abstract**: Give the transliterated authors' names. Only English translation of the title should be given. If the title translation is not given in the publication please provide your own. Do not transliterate the title. Give the transliterated book publisher's name and place, or journal's title e.g.:
  - Korbut, V. V. 1989: Nest building of hooded crows. 1. Utilisation of different substrata. --- Zool. Zh. 68: 88--95. [In Russian with English summary].
- **An article in press** may be included in the references list. The name of the journal and the publication year (possibly also the volume number) must, however, be given. "[In press]" should be added at the end of the reference.
- **Material in preparation, unpublished or submitted** cannot be included in the reference list, and can only be referred to in the text using author's initial(s) and name followed by "unpubl. data" or "pers. comm.".

Proofs [top]

The corresponding author will receive by e-mail proofs (PDF file) of the article. Errors caused by editorial or linguistic alterations will be corrected free of charge. Other errors, especially if their

correction affects the layout, may be corrected for a fee. We do not assume responsibility for misinterpretation of illegibly marked corrections. Annotated PDF file should be returned to the Editorial Office exclusively by e-mail within 48 hours of their arrival. Errors found after the proofs had been returned may not be corrected.

Anexo 2 - Normas da revista Austral Entomology, na qual foi preparado para submissão o capítulo II dessa Dissertação

Austral Entomology

Your Open Access fees might be covered

Effective with the 2019 volume, this journal will be published in an online-only format.

Print subscription and single issue sales are available from Wiley's Print-on-Demand Partner. To order online click through to the ordering portal from the journal's subscribe and renew page on WOL.

CONTENTS

1. SUBMISSION

Thank you for your interest in *Austral Entomology*. Please read the complete Author Guidelines carefully prior to submission. Note that submission implies that the content has not been published or submitted for publication elsewhere except as a brief abstract in the proceedings of a scientific meeting or symposium, or presented in a non-peer reviewed journal.

Submission Checklist

Before submitting your manuscript, please check that:

□ The reference section is in the proper format.
□ All references cited in the text are included in the reference section.
□ All figures and tables are cited in the text.
□ The pages are numbered.

The journal has also put together a **checklist for authors submitting Taxonomic Papers**, to reduce changes required at revision stages.

Once you have prepared your submission in accordance with the Guidelines, manuscripts should be submitted online via the Research Exchange submission portal: https://wiley.atyponrex.com/journal/aen.

For technical help with the submission system, please review our FAQs or contact submissionhelp@wiley.com.

You are strongly encouraged to download and follow the structure outlined in the templates for **Original Articles** and **Taxonomic Articles**. Use of these templates will make it much easier for you to prepare your paper in a manner conforming to the journal's requirements.

The submission system will prompt you to use an ORCiD (a unique author identifier) to help distinguish your work from that of other researchers. Click **here** to find out more.

We look forward to your submission.

2. AIMS AND SCOPE

Austral Entomology is a scientific journal of entomology for the Southern Hemisphere. It publishes Original Articles that are peer-reviewed research papers from the study of the behaviour, biology, biosystematics, conservation biology, ecology, evolution, forensic and medical entomology, molecular biology, public health, urban entomology, physiology and the use and control of insects, arachnids and myriapods. The journal also publishes Reviews on research and theory or commentaries on current areas of research, innovation or rapid development likely to be of broad interest – these may be submitted or invited. Book Reviews will also be considered provided the works are of global significance. Manuscripts from authors in the Northern Hemisphere are encouraged provided that the research has relevance to or broad readership within the Southern Hemisphere. All submissions are peer-reviewed by at least two referees expert in the field of the submitted paper. Special issues are encouraged; please contact the Chief Editor for further information.

Austral Entomology is the official publication of the **Australian Entomological Society**, an incorporated non-profit Australian company limited by guarantee. Membership of the Society is open to any person interested in entomology in its broadest sense. Application forms are available from the Australian Entomological Society website (**http://www.austentsoc.org.au/**).

3. MANUSCRIPT CATEGORIES AND REQUIREMENTS

Austral Entomology publishes the following article types:

- Original Articles
- Research Communications
- Reviews
- Book Reviews
- Editorials

Original Articles

Original Articles are peer-reviewed research papers from the study of the behaviour, biology, biosystematics, conservation biology, ecology, evolution, forensic and medical entomology, molecular biology, public health, urban entomology, physiology and the use and control of insects, arachnids and myriapods.

Please click on this link for further details on how Original Articles should be formatted: **Template for Original Articles**.

Original Articles (Taxonomic Papers)

For taxonomic papers, authors must follow the International Code of Zoological Nomenclature (ICZN). Revisionary papers and small monographs will be accepted provided they occupy no more than 25 printed journal pages due to competition for space. The Introduction of all taxonomic papers must provide a clear statement outlining the context and purpose of the paper - why the work was done and what it aims to achieve. Further detail about requirements for taxonomic papers are available here: **Template for Taxonomic Papers**.

The journal has also put together a **checklist for authors submitting Taxonomic Papers**, to reduce changes required at revision stages.

Research Communications

Austral Entomology also accepts Research Communications to allow publication of quality articles that break new ground but either:

- contain a smaller data set than Original Articles
- are largely observational in nature
- relate to development or improvement of scientific methods

Generally, Research Communications are shorter, non-taxonomic papers and are no longer than six type-set pages. They should contain an abstract of no more than 300 words and a limit of up to 8 figures and/or tables. There is no limit on the number of references.

Reviews

Reviews may be invited or submitted by prospective authors on any research topic provided they are of broad interest. Commentaries or overviews on current areas of research, innovation or rapid development are particularly welcome. The structure of Review papers is optional, but they must include an Abstract and Introduction, and preferably end with a Conclusion and/or Future Directions. Page length is optional, but Reviews are typically 5,000–20,000 words. Note that one or two Review papers will be made freely available to the general public each year based on the recommendation of the Chief Editor.

Book Reviews

Book Reviews will be considered provided the works are of global significance. Book Reviews are typically less than 2,000 words.

Editorials

Editorials are opinion pieces or commentaries on particular topics of broad interest prepared by the Chief Editor.

4. PREPARING YOUR MANUSCRIPT

You are strongly encouraged to download and follow the structure outlined in the templates for **Original Articles** and **Taxonomic Articles**. Use of these templates will make it much easier for you to prepare your paper in a manner conforming to the journal's requirements.

Style and Formatting

Manuscripts can be uploaded either as a single document (containing the main text, tables and figures), or with figures and tables provided as separate files. Should your manuscript reach revision stage, figures and tables must be provided as separate files. The main manuscript file can be submitted in Microsoft Word (.doc or .docx) format.

Name the manuscript file as: **authorname.doc**.

- Submissions should be typed in 12 pt Times New Roman and have 1.5 line spacing.
- All margins should be set to 2.5 cm.
- The first paragraph under each heading is not indented; indent following paragraphs, with no blank line between paragraphs.
- Ensure that all mark-up ('Track Changes') done during manuscript preparation is removed ('Accept All Changes' on Reviewing Toolbar) so that reviewers have a clean copy on which to insert suggested changes and comments.

Abbreviations and Units

SI units (metre, kilogram etc.), as outlined in the latest edition of *Units, Symbols and Abbreviations: A Guide for Medical and Scientific Editors and Authors* (Royal Society of Medicine Press, London), should be used wherever possible. Give statistics and measurements in figures; that is, 10 mm, except where the number begins the sentence. When the number does not refer to a unit measurement, it is spelt out, except where the number is greater than nine. Use only standard abbreviations. Shorten the word 'Figure' to Fig. unless starting a sentence.

The journal uses Australian spelling and authors should therefore set the Language in MS Word to English (Australia) (accessible under the Tools menu in MS Word) and follow the latest edition of the Macquarie Dictionary. Manuscripts that do not conform to this requirement and the following format will be returned to the author prior to review for correction.

Parts of the Manuscript

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(Figs)
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***Platisus* Erichson, 1842**
(Figs 1–6)

Platisus Erichson, 1842: 216 (type species: *Platisus obscurus* Erichson, 1842, by monotypy).
Ipsaphes Pascoe, 1863: 39, pl. 3, fig. 9 (type species: *Ipsaphes moerosus* Pascoe, 1863, by monotypy);
Blackburn 1903: 136 (synonymy).

***Platisus moerosus* (Pascoe, 1863)**
(Figs 1c, 2c, 3c, 4c, 5c, 6c)

Ipsaphes moerosus Pascoe, 1863: 40, pl. 3, fig. 9.
Platisus moerosus (Pascoe). – Blackburn 1903: 136.

***Pachygrontha austrina* Kirkaldy, 1908**

Pachygrontha austrina Kirkaldy, 1908: 771; Slater 1955: 61; Slater 1964: 719; Slater 1966: 57; Cassis 1993: 113; Cassis & Gross 2002: 264.

***Alotanypus* Roback, 1971**
(Fig. 1)

Alotanypus Roback, 1971: 95.
Alotanypus Roback. – Roback 1978: 162 (as subgenus of *Macropelopia* Thienemann, 1916).
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(Figs 4, 6AC, 7)

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O*ncocladosoma castaneum castaneum* (Attems). – Jeekel 1985: 27; Nguyen & Sierwald 2013: 1174.
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Oncocladosoma clavigerum Jeekel, 1985: 31–33, figs 8, 9; Jeekel 2002: 72, fig. 8; Nguyen & Sierwald 2013: 1174, syn. nov.
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♂ "Merredin, WA, L.J. Newman"; "TYPE: *Omoplatica holopolia* Turner" (ANIC).

Paratypes / Paralectotypes

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Other material

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