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Revisão taxonômica das espécies de *Cis* Latreille do grupo *tricornis* (Coleoptera: Ciidae)

Paula Vieira Borlini
Doctor Scientiae

VIÇOSA - MINAS GERAIS
2025

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Tese apresentada à Universidade Federal de Viçosa, como parte das exigências do Programa de Pós-Graduação em Biologia Animal, para obtenção do título de *Doctor Scientiae*.

Orientador: Cristiano Lopes Andrade

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APROVADA: 25 de julho de 2025.

Assentimento:

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Paula Vieira Borlini
Autora

_____

Cristiano Lopes Andrade
Orientador

À Elizabeth (mãe) e Íris (filha),
por tanto amor.
Dedico.

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RESUMO

BORLINI, Paula Vieira, D.Sc., Universidade Federal de Viçosa, julho de 2025. **Revisão taxonômica das espécies de *Cis* Latreille do grupo *tricornis* (Coleoptera: Ciidae)**. Orientador: Cristiano Lopes Andrade.

Ciidae é uma família de besouros fungívoros diminutos, mundialmente distribuídos. Nesta família há cerca de 780 espécies e 56 gêneros viventes descritos, dos quais 180 espécies e 22 gêneros são Neotropicais. O gênero *Cis* Latreille, 1797 abarca aproximadamente 360 espécies e quase 40% das espécies neotropicais da família. Parte de suas espécies é organizada em grupos, dos quais os principais representantes neotropicais são dos grupos *comptus*, *pallidus*, *taurus*, *tricornis* e *vitulus*. O objetivo geral da tese foi realizar a revisão taxonômica do grupo de espécies *Cis tricornis*. Os objetivos específicos foram: (i) revisar as espécies de *Cis* do grupo *tricornis* e delimitar as características morfológicas do grupo; (ii) redescrever espécies; (iii) designar lectótipos para as espécies *Ceracis tricornis* Gorham, 1883 e *Cis nasicornis* Reitter, 1878; (iv) descrever espécies novas para a região Neotropical; (v) fornecer dados de distribuição e de uso de fungo hospedeiro e outras informações pertinentes. Os resultados são apresentados em três capítulos. O primeiro capítulo descreve duas novas espécies do grupo *tricornis* para a região Neotropical, *Cis caipora* sp. nov. na Costa Rica e *Cis guarani* sp. nov. no Brasil. O segundo capítulo define os limites morfológicos, propõe a transferência das espécies do gênero *Cis* (e desuso do grupo *tricornis*) e descreve dois gêneros novos, *Sacis* gen. nov. e *Urupecis* gen. nov.. Além disso, são designados lectótipos para as espécies *Ceracis tricornis* e *Cis nasicornis*. O terceiro capítulo descreve cinco novas espécies brasileiras da região Sul e Sudeste de Mata Atlântica, pertencentes ao gênero *Urupecis*, sendo elas: *U. paradisus* sp. nov., *U. iris* sp. nov., *U. caissara* sp. nov., *U. rufulus* sp. nov. e *U. euthynus* sp. nov., aprimorando conhecimento sobre a fauna Neotropical.

Palavras-chave: Ciinae; besouros; Neotropical; taxonomia

ABSTRACT

BORLINI, Paula Vieira, D.Sc., Universidade Federal de Viçosa, July, 2025. **Taxonomic review of the *Cis* Latreille species of the *tricornis* group (Coleoptera: Ciidae)**. Adviser: Cristiano Lopes Andrade.

Ciidae is a family of minute fungivorous beetles with worldwide distribution. Nearly 780 described species and 56 extant genera have been described, of which 180 species and 22 genera are Neotropical. The genus *Cis* Latreille, 1797 comprises approximately 360 species, representing almost 40% of the Neotropical Ciidae species. Several *Cis* species are organized into groups, the main Neotropical representatives belonging to the *bilamellatus*, *comptus*, *pallidus*, *taurus*, *tricornis*, and *vitulus* groups. The general aim of this thesis is to provide a taxonomic review of the *Cis tricornis* species-group. The specific objectives are to: (i) review the species of *Cis tricornis* group and delimit morphological features of the group; (ii) redescribe species; (iii) designate lectotypes for *Ceracis tricornis* Gorham, 1883 and *Cis nasicornis* Reitter, 1878; (iv) describe new species from the Neotropical region; (v) provide data on geographic distribution, host fungi, and other relevant information. The results are presented in three chapters. The first chapter describes two new species of the *tricornis* species-group from the Neotropical region, *Cis caipora* sp. nov. from Costa Rica and *Cis guarani* sp. nov. from Brazil. The second chapter establishes the morphological limits of the group and proposes transferring species of the *Cis tricornis* group to two new genera, describing *Sacis* gen. nov. and *Urupecis* gen. nov., thereby discontinuing the *tricornis* group. In addition, lectotypes are designated for *Ceracis tricornis* and *Cis nasicornis*. The third chapter describes five new Brazilian species from the Atlantic Forest of the South and Southeast Regions, belonging to *Urupecis* gen. nov., namely: *U. paradisus* sp. nov., *U. iris* sp. nov., *U. caissara* sp. nov., *U. rufulus* sp. nov. e *U. euthynus* sp. nov., thereby contributing to the knowledge of the Neotropical fauna.

Keywords: Ciinae; minute-beetles; Neotropical; taxonomy

SUMÁRIO

1. INTRODUÇÃO GERAL

A ordem Coleoptera é a mais diversa no mundo, com mais de 400.000 espécies descritas, e compreende insetos comumente conhecidos como besouros (Ślipiński et al., 2011). Este táxon apresenta uma ampla variedade de hábitos alimentares, como herbivoria, predação, saprofagia e fungivoria (Lawrence & Ślipiński, 2013). A fungivoria se refere ao consumo de tecidos fúngicos, como esporos, hifas, micélio e basidiomas (Lawrence, 1989), sendo considerada um provável hábito alimentar ancestral em Coleoptera (Leschen & Buckley, 2007; Lawrence, 1989).

As interações com fungos desempenharam um papel importante na história evolutiva dos besouros, visto que a fungivoria surgiu em diferentes períodos e em linhagens distantes dentro de Coleoptera (Rainford & Mayhew, 2015; Schigel, 2012). A ordem inclui alguns dos principais consumidores de basidiomas de macrofungos, sendo que mais de um terço das famílias possuem espécies fungívoras, algumas das quais são predominantemente associadas a macrofungos como Ciidae, Erotylidae, Ptinidae (Dorcatominae) e Tenebrionidae (Diaperinae, Nilioninae) (Kobayashi & Sota, 2021; Hammond & Lawrence, 1989; Crowson, 1981). Dentre os insetos fungívoros, Ciidae é uma família diversa, abundante e de alta biomassa nos basidiomas de macrofungos (Lopes-Andrade, 2007), sendo suas associações com fungos hospedeiros relativamente bem estudada (Rosa-Oliveira & Lopes-Andrade, 2024; Araujo, 2014; Orledge & Reynolds, 2005; Lawrence, 1973).

Ciidae é uma família cosmopolita de besouros diminutos, muitos dos quais são obrigatoriamente associados a macrofungos durante os estágios de vida de larva e adulto, utilizando os basidiomas como recurso alimentar, hábitat, local de cópula e oviposição (Rosa-Oliveira, Borlini & Lopes-Andrade, 2024; Lawrence & Lopes-Andrade, 2010; Lawrence, 1971; Paviour-Smith, 1960). Atualmente, são conhecidas 775 espécies viventes descritas de Ciidae organizadas em 56 gêneros, dos quais 180 espécies e 22 gêneros ocorrem na região Neotropical *sensu* Morrone and Ebach (2022) (Souza-Gonçalves & Lopes-Andrade, 2025; Souza-Gonçalves et. al, 2025; Araujo & Lopes-Andrade, 2024; Lopes-Andrade, 2024).

O gênero *Cis* Latreille, 1797 compreende quase metade das espécies conhecidas na família (413 espécies viventes) e aproximadamente 40% das espécies neotropicais (Souza-Gonçalves & Lopes-Andrade, 2025; Rosa-Oliveira & Lopes-Andrade, 2023; Souza-Gonçalves *et al*., 2018; Lawrence, 2016, 2019). Embora o gênero seja considerado polifilético, alguns dos seus grupos de espécies são monofiléticos, como os grupos *Cis boleti* e *Cis castaneus* (Souza-Gonçalves & Lopes-Andrade, 2017; Lopes-Andrade & Grebennikov, 2015; Buder *et al*., 2008). Esses grupos se baseiam em similaridades morfológicas, funcionando como ferramentas organizacionais sem validade taxonômica formal. Ressalta-se que nem todas as espécies de *Cis* estão organizadas em grupos (Oliveira *et al*., 2013; Lawrence, 1971), embora a maioria das espécies neotropicais esteja incluída em algum grupo. Na região Neotropical, os grupos mais comuns são *billamelatus*, *comptus*, *pallidus*, *taurus*, *tricornis* e *vitulus* (Rosa-Oliveira & Lopes-Andrade, 2023; Borlini *et al*., 2018; Oliveira *et al*., 2013; Lawrence, 1971).

1.1. O grupo de espécies *Cis tricornis*

O grupo de espécies *Cis tricornis*, aqui chamado de “grupo *tricornis*”, foi proposto por Lawrence (1971) para reunir espécies morfologicamente semelhantes a *Cis tricornis* (Gorham, 1883). Originalmente, o grupo incluía *Cis delicatulus* (Jacquelin-Duval, 1857), *Cis tricornis* (Gorham, 1883) e *Cis miles* (Casey, 1898), sendo os dois primeiros neotropicais e o último restrito à região Neártica. Posteriormente, foram incorporadas ao grupo as espécies *Cis nasicornis* Reitter, 1878 e *Cis amazonicus* Lopes-Andrade & Sandoval-Gómez, 2017 (Lopes-Andrade & Sandoval-Gómez, 2017), e, mais recentemente, duas novas espécies neotropicais: *Cis caipora* Borlini & Lopes-Andrade, 2023 e *Cis guarani* Borlini & Lopes-Andrade, 2023 (Borlini & Lopes-Andrade, 2023).

Cis tricornis, a espécie que nomeia o grupo, foi originalmente descrita no gênero *Ceracis* Mellié, 1849, sendo transferida para *Cis* por Lawrence (1967: 98). Sua descrição foi baseada em uma série de síntipos (número total não mencionado) proveninentes da Guatemala (“San Juan in Verapaz”, “Tamahu” e “Zapote”) e México (“Teapa” e “Cordova”). Um desenho de um espécime macho foi incluído na descrição original (Gorham, 1883: tab. X, fig. 27) (Fig. 1, a seguir). No Museu de História Natural de Londres (Reino Unido), um espécime de San Juan, Vera Paz, está etiquetado como

“Type” e “Type. Sp. figured.” (J.F. Lawrence, comunicação pessoal), correspondendo ao exemplar ilustrado em Gorham (1883), que pode ser preferencialmente designado como lectótipo – embora ainda não tenha sido formalmente designado.

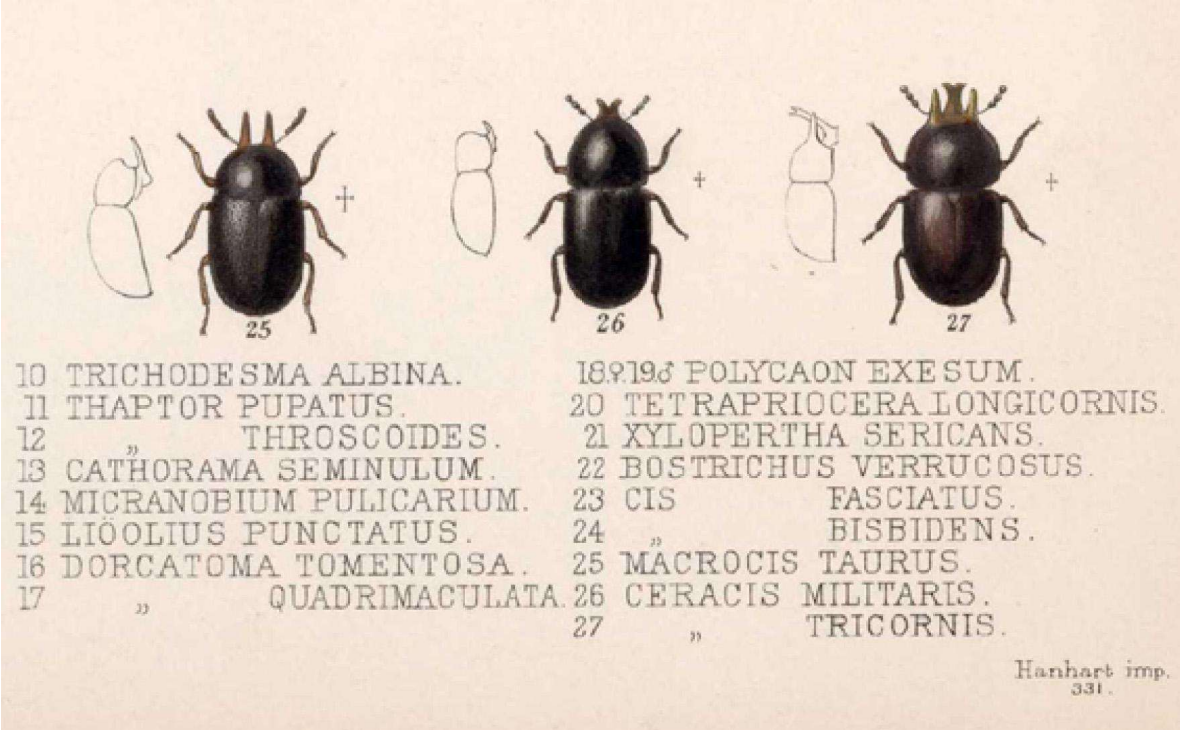

Figura 1: Extraído de Gorham (1883: tab. X, figs 25–27) no livro “Biologia Centrali-Americana, Insecta, Coleoptera”, mostrando o contorno da vista lateral e o desenho colorido da vista dorsal de três espécies de Ciidae descritas no trabalho, incluindo *Cis tricornis* (Gorham, 1883: tab. X, fig. 27).

Cis delicatulus foi descrito no gênero *Ennearthron* Mellié, 1847, e posteriormente transferido para *Cis* por Lawrence (1971: 438). A descrição foi baseada em uma série de síntipos (número total não mencionado) de Cuba. A descrição da espécie por Jacquelin-Duval (1857a, b) foi publicada em dois livros, um em francês e outro em espanhol. Acessamos os arquivos em PDF de ambas as publicações, sendo o primeiro aquele que contém as pranchas ilustrativas. O contorno da vista dorsal de um macho *Cis delicatulus* é apresentado (Jacquelin-Duval, 1857a: tab. 9, fig.13) (Fig. 2, a seguir), juntamente com desenhos de uma antena e das pernas anteriores e posteriores. No entanto, como *lapsus brutus*, essas figuras foram atribuídas erroneamente a *Ennearthron taurulus* Jacquelin-Duval, 1857, descrito na mesma obra. Esse erro pode ser constatado pela leitura das descrições originais e

pelo exame das respectivas séries-tipo (ver *Abebaeocis taurulus* em Souza-Gonçalves & Lopes-Andrade, 2025).

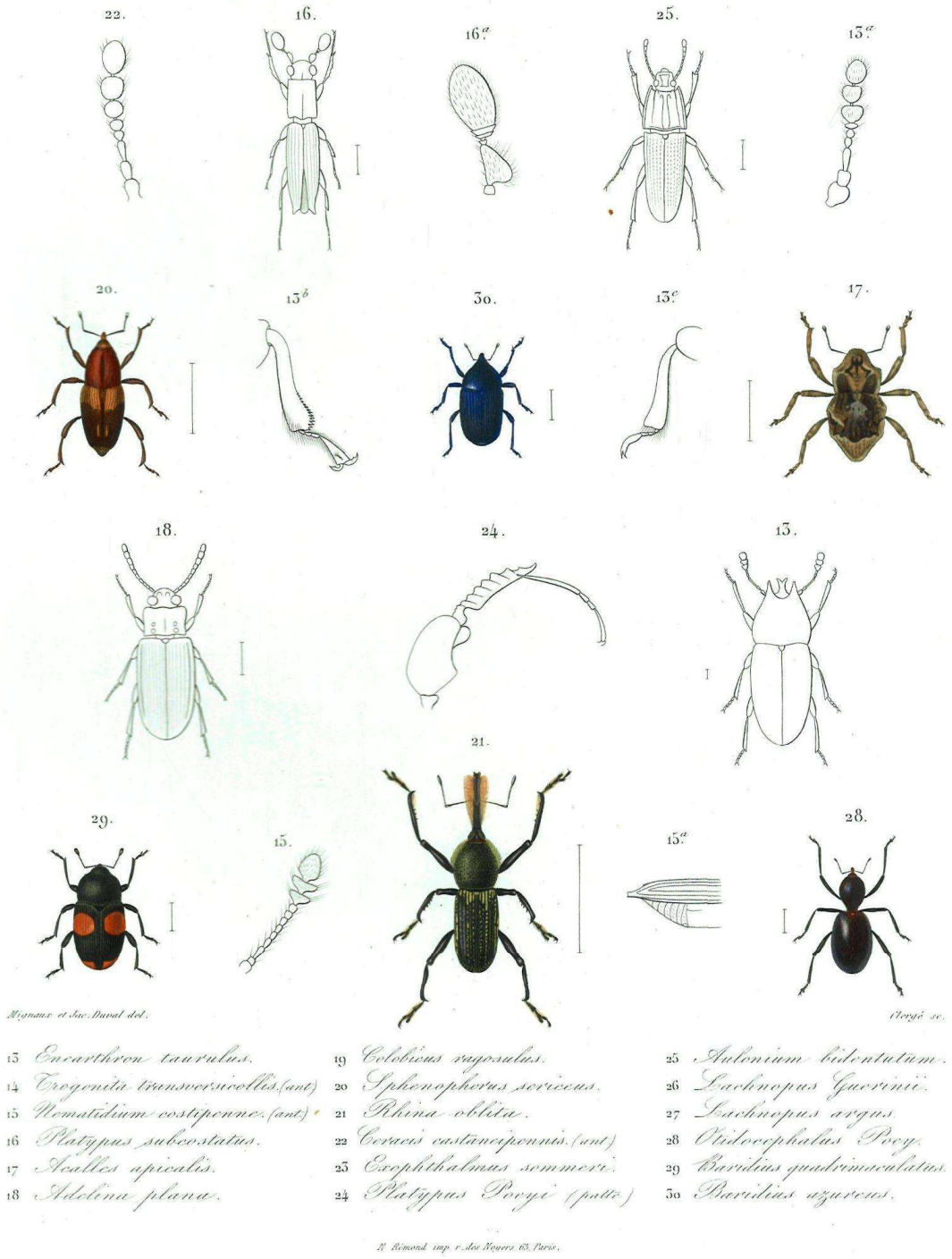

Figura 2: Extraído de Jacquelin-Duval (1857: tab. 9, figs 13–30) no livro “Histoire Physique, Politique et Naturelle de l’Ile de Cuba. Tome 7.”, mostrando desenhos e contornos de corpo e partes dissecadas de várias espécies de besouros, incluindo *Cis delicatulus* (Jacquelin-Duval, 1857: tab. 9, fig.13a–c), erroneamente nomeado como *Enearthron taurulus*” [sic] na prancha.

Cis miles foi descrito no gênero *Xestocis* Casey, 1898, e transferido para *Cis* por Lawrence (1971: 438, 467). É a única espécie neártica do grupo *tricornis*. O holótipo é proveniente da “Pennsylvania (Westmoreland Co.)” e a espécie está distribuída no leste da América do Norte, com fronteiras nos estados de Nova Iorque, Flórida, Louisiana e Arkansas (Lawrence, 1971).

Cis nasicornis Reitter, 1878 é conhecido apenas por uma pequena série de síntipos oriundos de “Columbia (La Luzera)”, atualmente depositada na Coleção Oberthür, no Museu Nacional de História Natural (MNHN), em Paris. Entre os espécimes, há um etiquetado como lectótipo, embora sua designação oficial ainda não tenha sido publicada. Essa espécie foi incluída no grupo *tricornis* por Lopes-Andrade & Sandoval-Gómez (2017) e é, até o momento, a única do grupo cujos machos podem não apresentar projeções conspícuas no pronoto.

Cis amazonicus Lopes-Andrade & Sandoval-Gómez, 2017 foi incluído no grupo *tricornis* em sua descrição original. A localidade-tipo é no Parque Estadual do Utinga, Belém, Pará, mas a espécie também tem registros em Manaus, no estado do Amazonas. A série-tipo tem sete espécimes de Belém, entre eles o holótipo, e oito espécimes de Manaus. Essa foi a primeira espécie do grupo *tricornis* descrita para o Brasil.

1.2. Limites morfológicos do grupo *tricornis*

Quando o grupo *tricornis* foi proposto, juntamente com muitos outros grupos de espécies dentro do gênero *Cis* (Lawrence, 1971), não foi fornecida nenhuma definição formal. Por se tratar de um agrupamento artificial de espécies, não é obrigatória a apresentação de diagnoses, uma vez que grupos de espécies não possuem validade taxonômica. Tais agrupamentos funcionam apenas como ferramentas para organizar as espécies, facilitando o trabalho taxonômico (Oliveira *et al*., 2013; Lopes-Andrade, 2008). No entanto, definições morfológicas desses grupos auxiliam no reconhecimento de outras espécies morfologicamente similares.

Indivíduos adultos do grupo *tricornis* podem ser reconhecidos por possuírem as seguintes características (adaptado de Lopes-Andrade & Sandoval-Gómez, 2017):

dorso subglabro, com cada pontoação acompanhada por uma cerda muito curta, visível apenas sob alta ampliação óptica ou em microscopia eletrônica de varredura; pontoação elitral e pronotal não uniforme; prosterno fortemente elevado na região mediana, além do nível das procoxas, com o disco carenado; processo prosternal estreito, mas não laminado, geralmente curvado para dentro; machos com um chifre cefálico conspícuo, voltado para cima e bifurcado no ápice (não bifurcado em *C. nasicornis*), dois chifres pronotais (ausente em *C. nasicornis*) e uma marca sexual conspícua e emarginada nos machos, situada posteriormente ao centro do primeiro ventrito abdominal.

Um gênero que apresenta similaridades morfológicas com o grupo *tricornis* é *Grossicis* Antunes-Carvalho et al., 2012, que também apresenta prosterno carenado, dorso subglabro, pontoação elitral fina e esparsa, protíbias com espinhos apicais e ângulo apical externo projetado, formando um dente. Além disso, os machos possuem dois chifres laterais na margem anterior do pronoto, uma longa lâmina anterocefálica e um edeago semelhante em forma e tamanho (Antunes-Carvalho, Sandoval-Gómez & Lopes-Andrade, 2012).

1.3. Estudos filogenéticos

As espécies do grupo *tricornis* não foram incluídas em nenhum dos estudos filogenéticos moleculares realizados para Ciidae (Buder et al., 2008; Lopes-Andrade & Grebennikov, 2015; Kobayashi & Sota, 2021), principalmente devido à dificuldade de obtenção de material genético adequado. Recentemente, foi realizado o primeiro estudo filogenético de Ciidae baseado exclusivamente em caracteres morfológicos (Souza-Gonçalves & Lopes-Andrade, 2025), com foco no gênero *Ceracis*. A espécie *Cis delicatulus* foi incluída nessa análise como grupo externo, além de terem sido considerados caracteres morfológicos observados em outras espécies do grupo *tricornis* que não estão presentes em *C. delicatulus*.

Embora não formalmente incluídas nesses estudos filogenéticos, uma espécie não descrita de *Cis*, provavelmente do grupo *tricornis*, encontra-se registrada na plataforma pública de dados moleculares BOLD SYSTEM (dx.doi.org/10.5883/DS-

SYNCOSM), sob os códigos JN311579 e JN311580 (Lopes-Andrade & Grebennikov, 2015). Essa espécie aparece próxima a *Orthocis reflexicolis* (Abeille de Perrin, 1874), embora tal relação não seja bem sustentada (Lopes-Andrade & Grebennikov, 2015). Vale ressaltar que o gênero *Orthocis* Casey, 1898 foi considerado polifilético por Lopes-Andrade & Grebennikov (2015) e por Kobayashi & Sota (2021).

Outro ponto relevante é que o grupo *tricornis* compartilha algumas similaridades morfológicas com o gênero *Grossicis*, que foi incluído nas filogenias de Lopes-Andrade & Grebennikov (2015) e Kobayashi & Sota (2021), com base nos mesmos espécimes de *Grossicis diadematus* (Mellié, 1849) disponíveis no BOLD SYSTEM. Em ambos os estudos, *Grossicis diadematus* apareceu próximo a *Cis fiuzai* Almeida & Lopes-Andrade, 2004, uma espécie pertencente ao grupo *comptus*, embora o clado resultante tenha sido fracamente sustentado.

É importante destacar que a maioria dos dados moleculares disponíveis para as espécies de Ciidae consiste em sequências curtas do gene COI. Embora essas sequências possam ser úteis como marcadores moleculares para identificação de espécies, elas não são ideais para a reconstrução de histórias filogenéticas de clados mais amplos. Para tal finalidade, recomenda-se a análise de múltiplos genes (Buder *et al*., 2008; Kobayashi & Sota, 2021).

1.4. Comportamento

A única publicação com descrições comportamentais de espécies de Ciidae foi apresentada como um capítulo de livro escrito por Eberhard (1979). O autor observou o comportamento de quatro espécies de Ciidae, incluindo uma identificada como "*Cis* sp. near *tricornis*". Com base na figura apresentada (Fig. 3, a seguir), trata-se possivelmente de uma espécie não descrita do grupo *tricornis* (observação pessoal).

Eberhard (1979) descreveu o comportamento de "*Cis* sp. near *tricornis*" da seguinte forma: "Os machos dessa espécie possuem um longo chifre na cabeça, projetando-se dorsalmente (Fig. 15A), e um par de chifres torácicos voltados para frente (Fig. 15B). Machos que atacavam outros besouros lateralmente ou por trás geralmente abaixavam a cabeça, frequentemente inserindo seus chifres cefálicos sob o corpo do oponente e avançando para colocar os chifres torácicos em contato.

Normalmente, executavam uma série de empurrões e investidas curtas sem mover os pés, em contraste com os empurrões sustentados de *Ceracis cucullatus*. Em pelo menos alguns casos, era possível observar que as investidas tinham um componente ascendente, produzido pela elevação de toda a parte anterior do corpo (em vez de apenas flexionar a cabeça para cima, como ocorre nos Dynastinae). Em outras ocasiões, os machos não abaixavam a cabeça e usavam a superfície frontal do chifre cefálico para empurrar, esfregar e golpear os oponentes. As batalhas corpo a corpo entre machos agressivos lembravam as de *Ceracis* sp. próximo a *furcifer*, com rápidos avanços e recuos combinados a movimentos laterais. Em certos momentos, ambos os machos se empurravam repetidamente com a cabeça abaixada, enganchando os chifres protorácicos ao protórax um do outro".

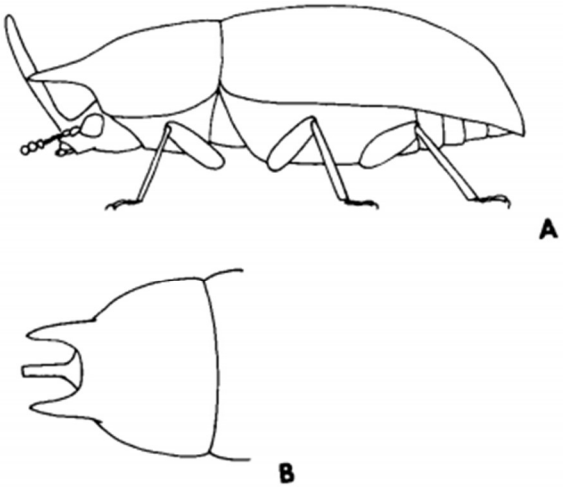

Fig. 15. Lateral view (A) and dorsal view of head and prothorax (B) of a large male Cis *sp. near* tricornis *(Ciidae).*

Figura 3. Extraído de Eberhard (1979), no livro "Sexual Selection and Reproductive Competition.", mostrando um contorno da vista lateral de uma espécie do grupo *tricornis*, e um detalhe da vista dorsal de sua cabeça e pronoto.

2. JUSTIFICATIVA

O grupo de espécies *Cis tricornis* foi proposto sem uma diagnose formal, e algumas de suas espécies possuem descrições antigas e genéricas, dificultando sua identificação e o reconhecimento de espécies similares. Dessa forma, a revisão do grupo, com definição de seus limites morfológicos, redescrição padronizada e detalhada das espécies e a descrição de espécies novas, contribuirá significativamente para o conhecimento sobre Ciidae, especialmente os neotropicais e brasileiros.

3. OBJETIVOS

O objetivo geral da tese foi revisar taxonomicamente o grupo de espécies *Cis tricornis*. Os objetivos específicos foram: (i) Revisar as espécies de *Cis* do grupo *tricornis*; (ii) Delimitar as características morfológicas do grupo; (iii) Redescrever espécies; (iv) Designar lectótipos para *Ceracis tricornis* Gorham, 1883 e *Cis nasicornis* Reitter, 1878; (v) Descrever espécies novas da região Neotropical; (vi) Fornecer dados de distribuição geográfica e de fungos hospedeiros.

4. RESULTADOS

Os resultados dessa tese estão organizados em três capítulos, todos redigidos no formato de manuscritos científicos. A seguir, apresenta-se uma breve descrição do conteúdo de cada capítulo.

Capítulo 1: Duas novas espécies neotropicais do grupo de espécies *Cis tricornis* (Coleoptera: Ciidae)

Explicação: Este artigo foi o ponto de partida para o estudo das espécies de *Cis* do grupo *tricornis*, destacando o desafio de trabalhar com um grupo tão diverso e com espécies morfologicamente semelhantes. O objetivo inicial era selecionar uma única

espécie para descrever. No entanto, após reunir os exemplares disponíveis do grupo e realizar análises morfológicas detalhadas, ficou evidente que havia mais de uma espécie na série analisada. Assim, foram descritas duas novas espécies neotropicais: uma da Costa Rica e outra do Brasil. **Importância:** Até então, apenas uma espécie do grupo *tricornis* era registrada formalmente para o Brasil, especificamente para a região Norte. Este trabalho apresentou uma nova espécie brasileira, desta vez com ocorrências nas regiões Sul e Sudeste. O grande número de espécies do grupo *tricornis* ainda não descritas ressalta a necessidade de estudos mais aprofundados, a fim de oficializar a diversidade da fauna brasileira e neotropical.

Capítulo 2: Revisão do grupo de espécies *Cis tricornis* (Coleoptera: Ciidae), com descrições *Sacis* gen. nov. e *Urupecis* gen. nov

Explicação: Nesse estudo, foram definidos os limites morfológicos das espécies de *Cis* anteriormente incluídas no grupo *tricornis*. Esse grupo foi estabelecido há décadas sem uma diagnose formal, evidenciando a necessidade de revisão. O artigo publicado por Borlini & Lopes-Andrade (2023; Capítulo 1 desta tese) marcou o início desse processo. Durante a pesquisa, observou-se que as espécies atribuídas ao grupo *Cis tricornis* não compartilhavam características típicas do gênero *Cis*, especialmente quando comparadas à espécie-tipo *Cis boleti* (Scopoli, 1763). As hipóteses iniciais sugeriam que tais espécies poderiam estar relacionadas ao gênero *Grossicis* Antunes-Carvalho, Sandoval-Gómez & Lopes-Andrade, 2012, ou até mesmo constituir um novo gênero. A análise das terminálias abdominais dos representantes do grupo revelou a existência de dois conjuntos distintos de espécies, suficientes para justificar a proposição de dois novos gêneros. **Importância:** O estudo estabeleceu os limites morfológicos entre dois conjuntos de espécies do grupo *tricornis*, originando os gêneros *Sacis* e *Urupecis*, e encerrando formalmente o grupo de espécies *Cis tricornis*. Isso permitirá que novas espécies sejam adequadamente alocadas nesses gêneros, além de contribuir para a organização do gênero *Cis*. Além disso, algumas das características morfológicas diagnósticas identificadas nesses novos gêneros apresentam potencial filogenético e poderão ser úteis em estudos sistemáticos futuros.

Capítulo 3: Novas espécies de *Urupecis* Borlini & Lopes-Andrade da Floresta Atlântica Brasileira

Explicação: O gênero *Urupecis* foi descrito após a revisão do grupo *Cis tricornis*. Até então, as espécies de *Urupecis* eram conhecidas apenas para o norte da região Neotropical e sul da região Neártica, sem registros para o sul Neotropical. Neste capítulo, são apresentadas cinco novas espécies do gênero, todas com ocorrência nas Regiões Sul e Sudeste do Brasil, em áreas de Mata Atlântica. **Importância:** Este estudo reporta um gênero a mais para a fauna brasileira, representado por cinco espécies novas. Este é um incremento considerável, visto que a fauna brasileira de Ciidae possuía, até então, 70 espécies descritas.

CAPÍTULO 1: Duas novas espécies neotropicais do grupo *Cis tricornis* (Coleoptera: Ciidae)

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Two new Neotropical species of the *Cis tricornis* species-group (Coleoptera: Ciidae)

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Abstract

The *Cis tricornis* species-group is restricted to the American continent and has five described species, one Nearctic and four Neotropical. Here we describe two new Neotropical species of the group: *Cis caipora* Borlini & Lopes-Andrade **sp. nov.** (Costa Rica); and *Cis guarani* Borlini & Lopes-Andrade **sp. nov.** (South and Southeast regions of Brazil).

Key words: Ciinae, taxonomy, minute tree-fungus beetles, mycetobiont

Introduction

The minute tree-fungus beetles (Coleoptera: Ciidae) comprise about 760 described species, of which more than 420 are included in the genus *Cis* Latreille, 1796 (Oliveira *et al.* 2013; Lawrence 2016; Souza-Gonçalves & Lopes-Andrade 2018). *Cis* is polyphyletic (Buder *et al.* 2008; Lopes-Andrade & Grebennikov 2015) and some species are artificially organized into species-groups. Among these, the *Cis tricornis* species-group has five described species (Lopes-Andrade & Sandoval-Gómez 2017), as follows: *Cis miles* (Casey, 1898) from eastern North America; *Cis tricornis* (Gorham, 1883) from Guatemala, Mexico (states of Tabasco and Veracruz) and Panama (Barro Colorado Island); *Cis delicatulus* (Jacquelin-Duval, 1857) from Cuba; *Cis nasicornis* Reitter, 1878 from Colombia; and *Cis amazonicus* Lopes-Andrade & Sandoval-Gómez, 2017 from the North region of Brazil. A morphological delimitation and a brief taxonomic history of the *tricornis* group are provided by Lopes-Andrade & Sandoval-Gómez (2017).

Our aim in the present work is to describe two new species of the *Cis tricornis* species-group from the Neotropical region: *Cis caipora* Borlini & Lopes-Andrade **sp. nov.** from Costa Rica; and *Cis guarani* Borlini & Lopes-Andrade **sp. nov.** from the South and Southeast regions of Brazil. We compare the new species with those previously included in the *tricornis* group and provide available information on their host fungi.

Material and Methods

Museum acronyms are as follows:

BMNH The Natural History Museum (London, United Kingdom)

CAMB Coleção Ayr de Moura Bello (Rio de Janeiro, Rio de Janeiro, Brazil)

CELC Coleção Entomológica do Laboratório de Sistemática e Biologia de Coleoptera da Universidade Federal de Viçosa (Viçosa, Minas Gerais, Brazil)

CERPE Coleção Entomológica da Universidade Federal Rural de Pernambuco (Recife, Pernambuco, Brazil)

FMNH Field Museum of Natural History (Chicago, Illinois, USA)

MNHN Muséum National d'Histoire Naturelle (Paris, France)

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We examined all the material studied by Lopes-Andrade & Sandoval-Gómez (2017), representing all the species currently included in the *Cis tricornis* species-group, as follows: the holotype and paratypes of *C. amazonicus* held in the CELC; syntypes of *C. delicatulus* (MNHN); named specimens compared to the type series of *C. miles*; named specimens compared to the type series of *C. nasicornis*; and images of a male syntype of *C. tricornis* (BMNH) from San Juan, Vera Paz (Guatemala), the same specimen figured in Gorham (1883).

Terms for external morphology and male terminalia of ciids follow Lawrence *et al.* (2011), Lawrence (2016) and Lopes-Andrade & Lawrence (2005, 2011), but see also Oliveira *et al.* (2013) for an explanation on the use of "tegmen". The term "anterocephalic edge" is used in place of "frontoclypeal ridge" to refer to the anterior part of the dorsum of the head, the constitution of which is not clearly known (Souza-Gonçalves & Lopes-Andrade 2020b). The term "single punctation" describes a punctation made of punctures that fall into one size class, while "dual punctation" describes a punctation made of punctures that fall into two different size classes. Both terms are traditionally used in the taxonomy of Ciidae (Souza-Gonçalves & Lopes-Andrade 2020a). The following abbreviations are used for measurements (in mm) and ratios: BW (width of anterior edge of scutellar shield), CL (length of antennal club measured from base of the eighth to apex of the tenth segment), EL (elytral length along the midline), EW (greatest width of elytra), FL (length of antennal funicle measured from base of the third to apex of the seventh segment), GD (dorso-ventral height of body measured in lateral view, from the surface of elytra to that of the metaventrite), GW (greatest diameter of eye), PL (pronotal length along midline), PW (greatest pronotal width), SL (length of scutellar shield), TL (total length counted as EL+PL, i.e. excluding head). The GD/EW and TL/EW ratios indicate the degree of body convexity and elongation, respectively. Sums and ratios of measurements of antennae are based on gross values, while measurements of each segment are based on approximate values.

Transcription of labels, dissection, photography and measurement of specimens followed the methods provided by Araujo & Lopes-Andrade (2016). We measured specimens of the new species from all localities. Differences are given in "Variation", together with standard measurements (mean and standard deviation) and ratios. Data on host fungi extracted from labels are summarized in the corresponding section and fungus names were updated consulting the database Index Fungorum (www.indexfungorum.org/). The corresponding number of records were placed in the same section, indicating breeding records. The recognition of breeding records follows the criteria provided in Orledge & Reynolds (2005).

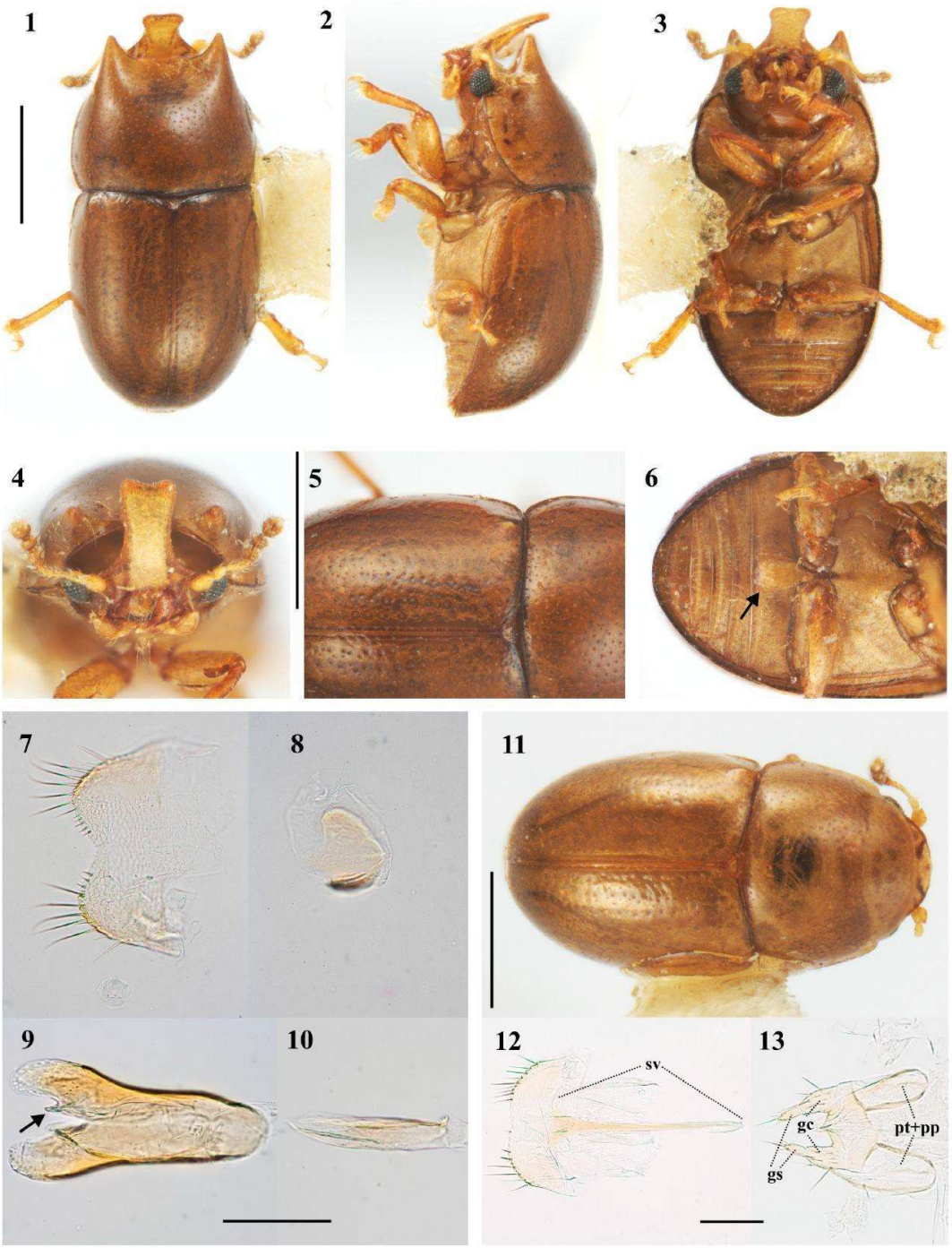
The abdominal terminalia of the following paratypes were extracted: one male and one female of *Cis caipora* **sp. nov.** from Turrialba (Costa Rica); one male (completely dissected) and one female of *Cis caipora* **sp. nov.** from Heredia (Costa Rica); four males (one male completely dissected) and one female of *Cis guarani* **sp. nov.** from Canela (Rio Grande do Sul, Brazil); one male of *Cis guarani* **sp. nov.** from Atílio Vivacqua (Espírito Santo, Brazil). Their remaining parts were stored in separate vials containing 70% alcohol.

Taxonomy

Cis caipora Borlini & Lopes-Andrade sp. nov.
Figs 1–13

Etymology. "Caipora" is a Brazilian folkloric character. For the Tupi-Guarani people, Caipora is a female entity who lives in dense forests as a guardian of animals, protecting them from hunters. Noun in apposition.

Diagnosis. *Cis caipora* is unique among described species in the *tricornis* group, including *C. guarani* **sp. nov.** described below, in the markedly dual elytral punctation (Figs 1–2, 5). *Cis caipora* is morphologically most similar to *C. guarani* **sp. nov.**, differing in the microreticulate pronotum (Fig. 5), males with disc of the first abdominal ventrite tumid at the anterior portion (Fig. 2), and females with baculi of proctiger longer than the gonocoxites and gonostyli together (Fig. 13). In *C. caipora*, the body is longer than that of *C. amazonicus* (TL 0.78–1.20 mm), *C. delicatulus* (TL ~1.20 mm) and *C. tricornis* (0.75–1.00 mm); and *Cis miles* has comparatively denser and deeper punctation on pronotum and elytra. In males of *C. caipora* and *C. guarani* the pronotal plate is shallowly emarginate, forming two short lateral horns when seen from above (Fig. 1), while in males of *C. amazonicus*, *C. delicatulus*, *C. miles* and *C. tricornis* the anterior pronotal plate is broadly and deeply emarginate, forming two long lateral horns when seen from above; males of *C. nasicornis* lack conspicuous pronotal projections.



FIGURES 1–13. *Cis caipora* **sp. nov.**, male holotype (1–6), male paratype from Turrialba, Costa Rica (7–10), female paratypes from Turrialba (11–13). **1.** Dorsal view. **2.** Lateral view. **3.** Ventral view. **4.** Frontal view of head, showing the anterocephalic horn. **5.** Part of the elytra and pronotum. **6.** Part of the abdominal ventrites, showing the setose sex patch at the first ventrite. **7.** VIII sternite. **8.** Basal Piece. **9.** Tegmen. **10.** Penis. **11.** Dorsal view. **12.** VIII sternite with its spiculum ventrale (sv). **13.** Ovipositor showing the proctiger plus paraprocts (pt + pp), gonocoxites (gc) and gonostyli (gs). Scale bars: 0.5mm (1–6, 11), 0.1mm (7–10, 12–13).

Description. Holotype. Adult in good condition. Measurements in mm: TL 1.47; PL 0.59; PW 0.80; EL 0.88; EW 0.82; GD 0.7. Ratios: PL/PW 0.74; EL/EW 1.07; EL/PL 1.49; GD/EW 0.85; TL/EW 1.79. **Body** convex, suboval, ventral and dorsal surface yellowish brown; cephalic horn, antennae, palpi and tarsi light yellowish brown, except for dark antennal club; dorsal vestiture of very minute decumbent setae barely visible even at high magnification; ventral vestiture of decumbent slender setae. **Head** concealed by pronotal plate, except for anterocephalic edge; anterocephalic edge strongly projected upward forming a horn (Figs 2, 4), 1.76x longer than wide, with decumbent short setae; apical edge of horn slightly curved inward, with rounded corners; dorsum microreticulate, punctate; venter convex, with some punctures; gula 0.54x as wide as head (measured in a dissected paratype from Heredia), with gular structures broadly bowed; submentum narrow, barely delimited. **Antennae** with 10 antennomeres, as follows (in mm, left antenna measured): 0.06; 0.04; 0.04; 0.03; 0.02; 0.02; 0.01; 0.04; 0.05; 0.07 (FL 0.12; CL 0.16; FL/CL 1.33). **Eyes** with subcircular contour; coarsely facetted, each with about 60 ommatidia; GW 0.13 mm. **Pronotum** 1.4x wider than long; sides arcuate; anterolateral corners rounded, not projected forward; lateral margins barely explanate, simple (not crenulate), visible for their entire lengths when seen from above; anterior edge projected forward as a plate; corners of plate projected forward as short triangular horns with acute apex (Fig. 1); anterior area between horns, impressed, forming conspicuous concavity; punctation single (Figs 1, 5); punctures separated from each other by approximately two to three puncture-widths; interspaces of punctures microreticulate; vestiture indiscernible, consisting of minute light-coloured setae. **Scutellar shield** subtriangular; smooth; punctation, fine; BW 0.09 mm. **Elytra** suboval; punctation markedly dual, denser than that on pronotum (Fig. 5); macropunctures apparently aligned (subseriate), more evident on first two-thirds of elytra; each macropuncture lacking a seta; each micropuncture with one minute light-coloured seta; interspaces of punctures smooth; humeral calli conspicuous. **Metathoracic wings** fully developed. **Hypomera** markedly microreticulate, inconspicuously punctate; punctures sparse, shallow, each with one slender seta. **Prosternum** in front of coxae short, markedly microreticulate, impunctate; disc with slender setae, carinate at the longitudinal midline. **Prosternal process** narrow (but not laminate; Fig. 3), about 1.5x as long as prosternum at disc; with sparse slender setae. **Protibiae** expanded to apex, 3.1x as long as wide; slender setae regularly distributed at most of their lengths, but concentrated at inner edge; inner apical angle with a row of spines; outer edge straight, lacking spines; outer apical angle projected as an acute tooth. **Meso-and metatibiae** barely expanded to apex, more than 3x as long as wide; with regularly distributed slender setae; outer edge straight, without spines; outer apical angle not projected; apical edge with a row of spines. **Metaventrite** microreticulate, with long slender setae; discrimen very short. **Abdominal ventrites** microreticulate, with regularly distributed long slender setae; length of ventrites (in mm, from base to apex at the longitudinal midline) as follows: 0.22; 0.06; 0.06; 0.07; 0.08; first abdominal ventrite tumid at disc at the anterior portion (more conspicuous in lateral view; Fig. 2), with a large, marginated setose sex patch (Fig. 6, arrow; length, 0.06 mm; width, 0.04 mm) closest to the posterior margin. **Male abdominal terminalia in paratypes** (Figs 7–10) as follows: **sternite VIII** (Fig. 7) very membranous, posterior edge with broad V-shape emargination at middle, forming two lobes with slender setae at their apices; **basal piece** (Fig. 8) membranous, about 0.2x the length of tegmen; **tegmen** (Fig. 9) about twice as long as wide (at the widest portion), lateral margins sinuous, apical portion about 2x as wide as base, emarginate at middle forming two lateral lobes with rounded apices, each inner edge of the emargination with one conspicuous protuberance (Fig. 9, arrow); **penis** (Fig. 10) about 5x as long as wide, subparallel-sided, slightly tapered to apex, about 0.6x as long as tegmen.

Females. Without cephalic and pronotal projections (Fig. 11). Anterior edges of head and pronotum broadly rounded. Eyes visible from above. Gula smaller than in males, 0.44x as wide as head (female from Turrialba dissected); submentum narrow, barely discernible. First abdominal ventrite not tumid at disc and setose patch absent. **Female abdominal terminalia** (Figs 12–13) as follows: **VIII sternite** (Fig. 12) width about 0.8x the length of spiculum ventrale, posterior edge slightly sinuous (but not emarginate), posterior corners with long slender setae; **paraprocts** (Fig. 13) slightly shorter than gonocoxites and gonostyli together; baculi of proctiger (Fig. 13) about twice as long as baculi of paraprocts; **gonocoxites** (Fig. 13) transversely divided forming two folds at each side, with pair of gonostyli about one-third the length of gonocoxites together.

Type Series. Holotype: (FMNH) \Turrialba COSTA RICA VIII-28-66 \ J.F.Lawrence Lot 1845 \ Robin Andrews Collector \ ex *Polyporus supinus* \ *Cis caipora* Borlini & Lopes-Andrade HOLOTYPUS [red paper]. Paratypes: 4♂♂ and 3♀♀ (2♂♂ , 2♀♀ CELC; 2♂♂, 1♀ FMNH), same data as the holotype; 5♂♂ and 8♀♀ (3♂♂ and 4♀♀ CELC; 2♂♂ and 4♀♀ FMNH) "C. RICA: Heredia Finca La Selva May-June. 1974 M. Thayer, coll. \ J. F. Lawrence Lot 3628 \ ex *Polyporus supinus"*.

Variation. Measurements and ratios: Males, measurements in mm (n = 10): TL 1.26–1.59 (1.48 ± 0.10), PL 0.49–0.66 (0.58 ±0.05), PW 0.65–0.88 (0.08 ± 0.06), EL 0.77–0.96 (0.90 ± 0.06), EW 0.70–0.91 (0.83 ± 0.06), GD 0.62–0.76 (0.70 ± 0.04), PL/PW 0.70–0.76 (0.73 ± 0.02), EL/EW 1.06–1.12 (1.08 ± 0.03), EL/PL 1.40–1.67 (1.55 ± 0.10), GD/EW 0.80–0.89 (0.84 ± 0.03), TL/EW 1.70–1.82 (1.78 ± 0.04). Females, measurements in mm (n = 11): TL 1.41–1.58 (1.51 ± 0.05), PL 0.54–0.63 (0.58 ± 0.03), PW 0.71–0.81 (0.77 ± 0.03), EL 0.88–1.00 (0.93 ± 0.04), EW 0.71–0.90 (0.82 ± 0.05), GD 0.68–0.74 (0.71 ± 0.02), PL/PW 0.66–0.81 (0.75 ± 0.04), EL/EW 0.97–1.27 (1.13 ± 0.07), EL/PL 1.48–1.77 (1.61 ± 0.09), GD/EW 0.81–0.96 (0.86 ± 0.04), TL/EW 1.57–2.07 (1.84 ± 0.12).

Distribution. Known from only two localities within Costa Rica: "Finca La Selva", probably La Selva Biological Station (Sarapiquí canton, Heredia province); and Turrialba, probably referring to the Turrialba district within the Turrialba canton (Cartago province).

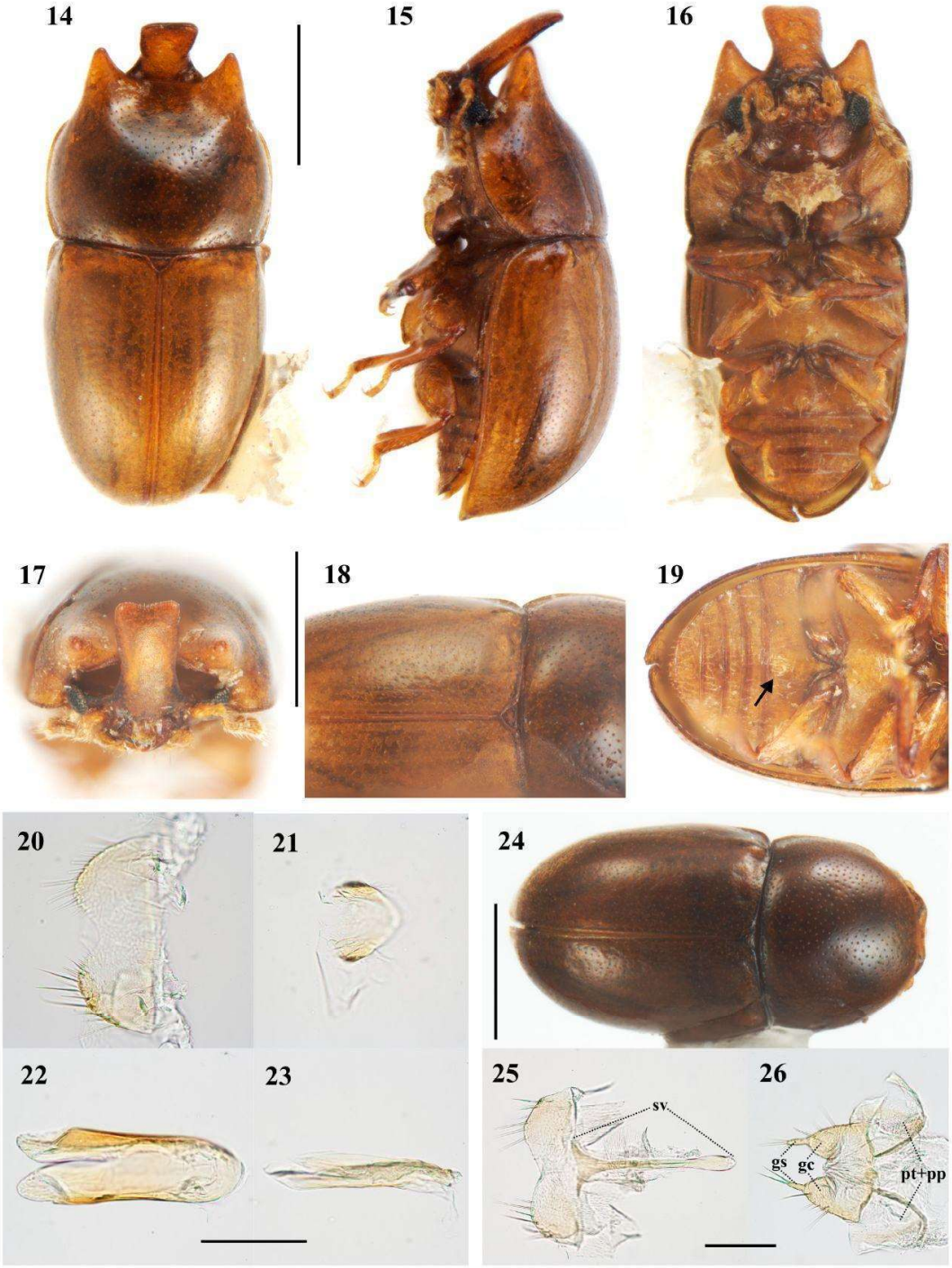
Host fungi. *Fomitella supina* (Sw.) Murrill (Polyporaceae; 2 breeding records).

Cis guarani Borlini & Lopes-Andrade sp. nov.
Figs 14–26

Etymology. Guarani are a group of indigenous peoples of South America, who originally lived in parts of Argentina, Paraguay, and in the South and Southeast regions of Brazil. Noun in apposition.

Diagnosis. *Cis guarani* is morphologically most similar to *C. caipora* **sp. nov.**, differing in the pronotum smooth on disc (Figs 14, 18), males with the first abdominal ventrite not tumid at disc, and females with baculi of proctiger shorter than the gonocoxites and gonostyli together (Fig. 26). In *C. guarani*, the body is usually longer than that of *C. amazonicus* (TL 0.78–1.20 mm), *C. delicatulus* (TL ~1.20 mm) and *C. tricornis* (0.75–1.00 mm); and *Cis miles* has comparatively denser and deeper punctation on pronotum and elytra. In males of *C. caipora* and *C. guarani* the pronotal plate is shallowly emarginate, forming two short lateral horns when seen from above (Fig. 14), while in males of *C. amazonicus*, *C. delicatulus*, *C. miles* and *C. tricornis* the anterior pronotal plate is broadly and deeply emarginate, forming two long lateral horns when seen from above; males of *C. nasicornis* lack conspicuous pronotal projections.

Description. Holotype. Adult in good condition, but right posterior leg glued on another triangle mounted at the same pin. Measurements in mm: TL 1.56; PL 0.63; PW 0.83; EL 0.93; EW 0.83; GD 0.70. Ratios: PL/PW 0.76; EL/EW 1.12; EL/PL 1.47; GD/EW 0.84; TL/EW 1.88. **Body** convex, suboval; dorsal surface yellowish brown; ventral surface light yellowish brown; horns, antennae, palpi and tarsi light yellowish brown, except for dark antennal club; dorsal vestiture of very minute decumbent setae, barely visible even in high magnifications; ventral vestiture of decumbent slender setae. **Head** concealed by pronotal plate, except for anterocephalic edge; anterocephalic edge strongly projected forming a horn (Figs 15, 17), 1.6x longer than wide, bearing decumbent short setae; apical edge of horn slightly curved inward, with rounded corners; dorsum microreticulate, punctate; venter convex, with some minute punctures; gula 0.52x as wide as head (measured in a dissected paratype from Rio Grande do Sul), with gular structures broadly bowed; submentum narrow, barely delimited. **Antennae** with 10 antennomeres, as follows (in mm, left antenna measured): 0.07; 0.05; 0.04; 0.03; 0.02; 0.02; 0.01; 0.04; 0.05; 0.07 (FL 0.12; CL 0.16; CL/FL 1.33). **Eyes** with subcircular contour; coarsely facetted, each with about 60 ommatidia; GW 0.12 mm. **Pronotum** 1.3x as long as wide, sides arcuate; anterolateral corners rounded, not projected forward; lateral margins barely explanate, simple (not crenulate), visible for their entire lengths when seen from above; anterior edge projected forward as a plate; corners of plate projected forward as short triangular horns with acute apex (Fig. 14); anterior area, between horns, impressed, forming conspicuous concavity; punctation fine, single (Figs 14, 18); punctures separated from each other by approximately three to four puncture-widths; interspaces of punctures smooth on disc and microreticulate close to edges; vestiture indiscernible, consisting of minute light-coloured setae. **Scutellar shield** subtriangular; microreticulate; impunctate; BW 0.07 mm. **Elytra** suboval; punctation indistinctly dual (usually noticeable as single, but in magnifications >100x there are slight differences among punctures, and macro- and micropunctures can be distinguished), confuse, finer and denser than that on pronotum (Figs 14, 18); each macropuncture lacking a seta; interspaces of punctures smooth; each micropuncture with one minute light-coloured seta (~0.006 mm); humeral calli conspicuous. **Metathoracic wings** fully developed. **Hypomera** markedly microreticulate, inconspicuously punctate; punctures sparse, shallow, each one slender seta. **Prosternum** in front of coxae short, microreticulate, impunctate; disc with slender setae, carinate at the longitudinal midline. **Prosternal**



FIGURES 14–26. *Cis guarani* **sp. nov.**, male holotype (14–19), male paratype from Canela, state of Rio Grande do Sul, Brazil (20–23), female paratypes from Canela, state of Rio Grande do Sul, Brazil (24–26). **14.** Dorsal view. **15.** Lateral view. **16.** Ventral view. **17.** Frontal view of head, showing the anterocephalic horn. **18.** Part of the elytra and pronotum. **19.** Part of the abdominal ventrites, showing the setose sex patch at the first ventrite. **20.** VIII sternite. **21.** Basal Piece. **22.** Tegmen. **23.** Penis. **24.** Dorsal view. **25.** VIII sternite with its spiculum ventrale (sv). **26.** Ovipositor showing the proctiger plus paraprocts (pt + pp), gonocoxites (gc) and gonostyli (gs). Scale bars: 0.5mm (14–19, 24), 0.1mm (20–23, 25–26).

process narrow (but not laminate, Fig. 16), about 1.5x as long as prosternum at disc; with sparse slender setae. **Protibiae** expanded to apex, 3x as long as wide (widest portion without tooth); slender setae regularly distributed at most of their lengths, but concentrated at inner edge; inner apical angle with a row of spines; outer edge straight, without spines; outer apical angle projected as an acute tooth. **Meso-and metatibiae** barely expanded to apex, 3x as long as wide, with regularly distributed slender setae; outer edge straight, lacking spines; outer apical angle not projected; apical edge with a row of spines. **Metaventrite** microreticulate; disc with long slender setae; discrimen indiscernible. **Abdominal ventrites** microreticulate; with regularly distributed long slender setae; length of ventrites (in mm, from base to apex at the longitudinal midline) as follows: 0.22; 0.07; 0.06; 0.07; 0.08; first abdominal ventrite with a large, marginated setose sex patch (Fig. 19, arrow; length, 0.06 mm; width, 0.06 mm). **Male abdominal terminalia in a paratype** (Figs 20–23) as follows: **sternite VIII** (Fig. 20) very membranous, posterior edge with broad U-shaped emargination at middle, forming two lobes with slender setae at their apices; **basal piece** (Fig. 21) membranous, about 0.4x the length of tegmen; **tegmen** (Fig. 22) about 3x as long as wide, lateral margins slightly sinuous, apical portion with V-shaped emargination at middle forming two short lateral lobes with rounded apices; **penis** (Fig. 23) about 4.5x as long as wide, straight-sided, apical portion subtriangular, apex acute, about 0.9x as long as tegmen.

Females. Without cephalic and pronotal projections (Fig. 24). Anterocephalic edge microreticulate, not projected, but slightly emarginate at middle forming two rounded and very short plates. Anterior pronotal edge broadly rounded. **Head** with single punctation, with short and decumbent setae. Gula smaller than that of males, 0.40x as wide as head (female from Rio Grande do Sul dissected); submentum barely visible. Elytral and pronotal punctation similar to those of male. First abdominal ventrite lacking sex patch. **Female abdominal terminalia** (Figs 25–26) as follows: **VIII sternite** (Fig. 25) as wide as length of spiculum ventrale, posterior edge emarginate at middle forming two lobes with slender setae at their apices; **paraprocts** (Fig. 26) about 0.8x the length of gonocoxites and gonostyli together; baculi of proctiger (Fig. 26) about as long as baculi of paraprocts; **gonocoxites** (Fig. 26) transversely divided forming two folds at each side, with pair of gonostyli about one-third the length of gonocoxites together.

Type Series. Holotype (CELC): \BRASIL: RS, Canela, "Área CEEE" [29º22'45"S e 50º43'47"W] 28.xi.2015; A. G. Mezzomo, leg. \ *Cis guarani* Borlini & Lopes-Andrade HOLOTYPUS [red paper]\. Paratypes: 9♂♂ and 4♀♀ (1♂ and 1♀ CAMB; 7♂♂ and 2♀♀ CELC; 1♂ and 1♀ CERPE) "Brasil: RS, Canela "Área CEEE" [29º22'45"S e 50º43'47"W] 28.xi.2015; A. G. Mezzomo, leg. \ *Trametes membranacea* \ B304; 4♂♂ and 2♀♀ (CELC) "Brasil: RS, Canela "Área CEEE" [29º22'45"S e 50º43'47"W] 22.x.2015; A. G. Mezzomo, leg. \ *Trametes membranacea* \ B243; 2♂♂ and 2♀♀ (CELC) "BRASIL: ES, Atílio Vivacqua 15.iv.2007 K. S. Furieri leg". All paratypes additionally labeled \ *Cis guarani* Borlini & Lopes-Andrade PARATYPUS [yellow paper]\.

Variation. Measurements and ratios: Males, measurements in mm (n = 13): TL 1.17–1.56 (1.33 ± 0.11), PL 0.45–0.63 (0.51 ± 0.05), PW 0.62–0.83 (0.68 ± 0.06), EL 0.70–0.95 (0.82 ± 0.07), EW 0.63–0.83 (0.73 ± 0.05), GD 0.51–0.70 (0.60 ± 0.05), PL/PW 0.71–0.79 (0.75 ± 0.03), EL/EW 1.05–1.21 (1.12 ± 0.05), EL/PL 1.48–1.79 (1.62 ± 0.11), GD/EW 0.73–0.89 (0.83 ± 0.04), TL/EW 1.73–1.89 (1.83 ± 0.06). Females, measurements in mm (n = 7): TL 1.37–1.53 (1.43 ± 0.03), PL 0.50–0.59 (0.54 ± 0.03), PW 0.66–0.79 (0.73 ± 0.05), EL 1.00–0.82 (0.89 ± 0.06), EW 0.72–0.85 (0.79 ± 0.05), GD 0.55–0.70 (0.63 ± 0.05), PL/PW 0.69–0.83 (0.75 ± 0.05), EL/EW 1.06–1.27 (1.13 ± 0.07), EL/PL 1.49–1.89 (1.65 ± 0.13), GD/EW 0.76–0.83 (0.80 ± 0.03), TL/EW 1.71–1.94 (1.82 ± 0.08).

Distribution. Known from only two localities within the Brazilian Atlantic Forest biome: Canela, in the state of Rio Grande do Sul (South region of Brazil); and Atílio Vivacqua, in the state of Espírito Santo (Southeast region of Brazil).

Host fungi. *Trametes membranaceae* (Sw.) Kreisel (Polyporaceae; two records, of which one is a breeding record).

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species examined by us; and Ítalo Salvatore de Castro Pecci-Maddalena, who kindly photographed the holotype of *C. tricornis* in the BMNH. Our research was financed by Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq; research grants number 308432/2018-5 and 304339/2022-9 to the junior author), Fundação de Amparo à Pesquisa do Estado de Minas Gerais (FAPEMIG; Edital 02/2018—Programa Pesquisador Mineiro XII—PPM-00314-18) and Coordenação de Aperfeiçoamento de Pessoal de Nível Superior—Brasil (CAPES; Finance Code 001; doctorate grant to the senior author).

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CAPÍTULO 2: Revisão do grupo de espécies *Cis tricornis* (Coleoptera: Ciidae), com descrições *Sacis* gen. nov. e *Urupecis* gen. nov

(Manuscrito a ser submetido para publicação na revista científica Annales Zoologici. A apresentação deste manuscrito como capítulo de tese não é considerada válida de acordo com o Código Internacional de Nomenclatura Zoológica – ICZN)

REVIEW OF THE *CIS TRICORNIS* SPECIES-GROUP (COLEOPTERA: CIIDAE), WITH DESCRIPTIONS OF *SACIS* GEN. NOV. AND *URUPECI*S GEN. NOV.

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Abstract.— The *Cis tricornis* species-group has been regarded as an artificial aggregation of seven described species, predominantly Neotropical, with one species from the Nearctic region. These species only marginally conform to the diagnostic limits of the genus *Cis* Latreille and partially resemble the genus *Grossicis* Antunes-Carvalho, Sandoval-Gómez et Lopes-Andrade. Here, we review the species previously included in the *tricornis* group and describe two new genera: *Sacis* **gen. nov.**, with the type species *Sacis guarani* (Borlini et Lopes-Andrade, 2023) **comb. nov.**, also comprising *Sacis amazonicus* (Lopes-Andrade et Sandoval-Gómez, 2017) **comb. nov.**, *Sacis caipora* (Borlini et Lopes-Andrade, 2023) **comb. nov.**, and *Sacis tricornis* (Gorham, 1883) **comb. nov.** from the Neotropical region; and *Urupecis* **gen. nov.**, with the type species *Urupecis delicatulus* (Jacquelin-Duval, 1857) **comb. nov.**, also including *Urupecis nasicornis* (Reitter, 1878) **comb. nov.** from the Neotropical region and *Urupecis miles* (Casey, 1898) **comb. nov.** from the Nearctic region. Four species are redescribed: *S. tricornis*, *U. delicatulus*, *U. miles* and *U. nasicornis*. Updated diagnoses are provided for all studied species, along with diagnostic charts summarizing the morphological characteristics for identifying the genera and their respective species. Additionally, lectotypes are designated for *Ceracis tricornis* Gorham, 1883, and *Cis nasicornis* Reitter, 1878.

Key-words.— Ciinae, minute tree-fungus beetles, taxonomy, new combinations, lectotypes

INTRODUCTION

The genus *Cis* Latreille, 1797 encompasses more than half of the described species of Ciidae and is distributed worldwide. Part of the genus is organized into artificial groups to facilitate the recognition of species and their morphological affinities (Lawrence 1971, Oliveira et al. 2013). These species-groups are based on the shape of the body, prosternum, prosternal process and protibiae, in addition to the pronotal and elytral punctation and vestiture, and secondary sexual characteristics of males (Lawrence 1971, 2016). *Cis* is considered polyphyletic, but there is morphological and molecular evidence that some of its species groups are monophyletic, such as the *boleti* and *castaneus* groups (Buder et al. 2008, Lopes-Andrade and Grebennikov 2015, Souza-Gonçalves and Lopes-Andrade 2017, Kobayashi and Sota 2021). The *boleti* group includes *Cis boleti* (Scopoli, 1763), the type species of *Cis*, and is therefore the starting point for reviewing the limits of the genus. A redescription of *Cis* and a discussion of the composition and distribution of the most relevant species-groups are available in Lawrence (2016).

Within the Neotropical region (biogeographic regionalisation *sensu* Morrone and Ebach 2022), the most frequently collected *Cis* species are from the *bilamellatus*, *comptus*, *pallidus, taurus*, *tricornis* and *vitulus* groups (Lawrence 1971, Oliveira et al. 2013, Borlini et al. 2018, Rosa-Oliveira and Lopes Andrade 2023). The *tricornis* group was proposed by Lawrence (1971) for species morphologically related to the Neotropical *Cis tricornis* (Gorham, 1883), a species originally described in the genus *Ceracis* Mellié, 1849. Initially, the group also included the Neotropical *Cis delicatulus* (Jacquelin-Duval 1857) and the Nearctic *Cis miles* (Casey, 1898). Afterwards, the Neotropical *Cis nasicornis* Reitter, 1878 and *Cis amazonicus* Lopes-Andrade et Sandoval-Gómez, 2017 were also added to the group (Lopes-Andrade and Sandoval-Gómez, 2017). Recently, we described other two species of the group, the Neotropical *Cis caipora* Borlini et Lopes Andrade, 2023 and *Cis guarani* Borlini et Lopes Andrade, 2023 (Borlini and Lopes Andrade, 2023).

Our objectives in this work are twofold: to review the species included in the *tricornis* group to date and to propose two new genera to accommodate these species.

MATERIAL AND METHODS

Museum acronyms are as follows:

BMNH Natural History Museum (London, United Kingdom)

CELC Coleção Entomológica do Laboratório de Sistemática e Biologia de Coleoptera da Universidade Federal de Viçosa (Viçosa, Minas Gerais, Brazil)

CNCI Canadian National Collection of Insects (Ottawa, Canada)

FMNH Field Museum of Natural History (Chicago, Illinois, USA)

MFN Museum für Naturkunde (Berlin, Germany)

MNHN Muséum National d'Histoire Naturelle (Paris, France)

MPEG Museu Paraense Emílio Goeldi (Belém, Pará, Brazil)

MZSP Museu de Zoologia da Universidade de São Paulo (São Paulo, São Paulo, Brazil)

USNM United States National Museum (Washington DC, United States)

We examined all the material studied by Lopes-Andrade and Sandoval-Gómez (2017) and Borlini and Lopes-Andrade (2023), representing all the species currently included in the *Cis tricornis* species-group, as follows: the holotype and paratypes of *C. amazonicus* held in the MPEG and CELC, respectively; the holotype and paratypes of *C. caipora* held in the CELC; the holotype and paratypes of *C. guarani* held in the CELC; named specimens compared (CELC) to the type series of *C. delicatulus* held in the MNHN; named specimens (CELC) compared to the type series of *C. miles* held in the USNM; a male syntype of *C. nasicornis* (MNHN); and images of a male syntype of *C. tricornis* (BMNH) from "San Juan, Vera Paz" (Guatemala), the same specimen figured in Gorham (1883).

Terms for external morphology and male terminalia of ciids follow Lawrence et al. (2011), Lawrence (2016) and Lopes-Andrade and Lawrence (2005, 2011), but see also Oliveira et al. (2013) for an explanation on the use of "tegmen". The term "anterocephalic edge" is used in place of "frontoclypeal ridge" to refer to the anterior part of the dorsum of the head, the constitution of which is not clearly known (Souza-Gonçalves and Lopes-Andrade 2020b). The term "single punctation" and "dual punctation" are terms traditionally used in the taxonomy of Ciidae, which the former describes a punctation made of punctures that fall into one size class and the latter describes a punctation made of punctures that fall into two different size classes (Souza-Gonçalves and Lopes-Andrade 2020a, Rosa-Oliveira and Lopes Andrade 2023).

Photographs were taken using a Zeiss Discovery V20 stereomicroscope equipped with a Zeiss AxioCam 506 digital camera, and a Zeiss AxioLab compound microscope equipped

with a Nikon D90 digital camera. The maps were made on website SimpleMappr (Shorthouse, 2010) and enhanced in Corel Photo-Paint (licensed to the junior author). Measurements were taken under a Zeiss Stemi 2000C stereomicroscope equipped with a 2x objective lens and an ocular micrometer. The following abbreviations are used for measurements (in mm) and ratios (based on Souza-Gonçalves et al. 2020): BW (width of anterior edge of scutellar shield), CL (length of antennal club measured from base of the eighth to apex of the tenth antennomere), EL (elytral length along the midline), EW (greatest width of elytra), FL (length of antennal funicle measured from base of the third to apex of the seventh antennomere), GD (dorso-ventral height of body measured in lateral view, from the surface of elytra to that of the metaventrite), GW (greatest diameter of eye), PL (pronotal length along midline, including horns if present), PW (greatest pronotal width), SL (length of scutellar shield), TL (total length counted as EL+PL, i.e. excluding head). The GD/EW and TL/EW ratios indicate the degree of body convexity and elongation, respectively. Sums and ratios of measurements of antennae are based on gross values, while measurements of each antennomere are based on approximate values.

Transcription of labels, dissection, photography and measurement of specimens followed the methods provided by Araujo and Lopes-Andrade (2016). Differences are given in “Variation”, together with standard measurements (mean and standard deviation) and ratios. The examined specimens are listed for each species on “type material” and/or “specimens examined”. When available, data on host fungi extracted from labels are summarized in the corresponding section and fungus names were updated by consulting the database Species Fungorum (https://www.speciesfungorum.org/Names/Names.asp). The corresponding number of records were placed in the same section, indicating breeding records. The recognition of breeding records follows the criteria provided in Orledge and Reynolds (2005).

The abdominal terminalia were extracted from the follows specimens: *Cis tricornis* from Mexico (2 ♂♂, one completely dissected; 1 ♀ from Coatepec, Veracruz); *Cis delicatulus* from Canal Zone in Panama (1 ♂ and 1 ♀ from Gamboa, the ♂ completely dissected; 1 ♂ from Madden Dan; 1 ♀ from Barro Colorado) and Jamaica (1 ♂ from Falmouth, Trelawny); *Cis miles* from United States (1 ♂ from Honey Bee, Kentucky and 1 ♀ from West Union, Oconee, South Carolina); and *Cis nasicornis* from Colombia (Arcabuco, Boyacá, 2 ♂♂, one completely dissected, and 1 ♀). We have also examined slide preparations of *Cis amazonicus*, *Cis caipora* and *Cis guarani* used in the studies of Lopes-Andrade and Sandoval-Gómez (2017) and Borlini and Lopes-Andrade (2023).

TAXONOMY

While describing *Cis caipora* and *Cis guarani*, we had noted that the *tricornis* species barely fit the morphological limits of *Cis* and possess many characteristics that are usually considered diagnostic for genera within Ciidae. We had also noted that the *tricornis* group is not homogeneous, and two morphological lineages are sufficiently distinct to be proposed as two new genera. A comparison between *Sacis* **gen. nov.** and *Urupecis* **gen. nov.** with the closely related *Grossicis* Antunes-Carvalho et al. (2012) is provided in Table 1.

Family **Ciidae** Leach, 1819
Subfamily **Ciinae** Leach, 1819
Tribe **Ciini** Leach, 1819

***Sacis* gen. nov.**

(Figs 1–7, Table 1)

Diagnosis. Body oblong (Figs 1a, 2e, 4a, 5a,d, 6g) with barely visible setae; apical maxillary palpomere abruptly expanded, with sensilla distributed along the apical edge (Figs 1g, 4a, 6c); elytra with single or dual punctation, the sutural flange not diverging near the apex (Fig. 5g); prosternum carinate, with the prosternal process extending inward to form a plate and projecting beyond the level of the prosternal disc (1b, 5b); protibial apex bearing a row of conspicuous spines, with the outer apical angle bearing a tooth (Figs 1h, 6d); meso- and metatibial apex each bearing a row of spines but lacking a tooth (Figs 1i–j, 6e–f); metaventrite short (the shortest distance between the meso- and metacoxae is 0.4–0.5x the longest lateral length of the metaventrite) (Fig 5b); males possessing an upward-directed anterocephalic horn (Figs 1b, 5b,e–f), and a forward-projecting pronotal plate emarginate apically to form two horns (Figs 1a–b, 4a, 5a–b,d); female terminalia short (combined length of gonostyli, gonocoxites, and paraprocts approximately 0.15–0.23 mm), with gonocoxites ventrally divided into two folds or not divided (Figs 2g, 6i). In *Grossicis* and *Urupecis* (Table 1) the sutural flange of elytra diverges near apex and the metaventrite is longer. Additionally, G*rossicis* differs in the pronotal plate of males emarginate at middle but not forming two

separate horns; *Urupecis* differs in the pyriform apical maxillary palpomere and elongate ovipositor.

Etymology. A free combination and contraction of the words "Saci", a Brazilian folkloric character, and “Cis”, the type genus of the family. Masculine. It is said that Saci turns into a bracket-fungi when he dies.

Type species. *Cis guarani* Borlini et Lopes-Andrade, 2023 (Figs 1a–j, 2a–g, 3).

Description. TL 0.94–1.75mm in males and 0.78–1.59 in females. **Body** oval, convex (Fig. 1a–c); subglabrous, with minute decumbent setae. **Head** anterior portion easily visible or barely visible from above; anterocephalic edge in males forming an upward-directed and laminate horn, with emarginate apex; in females, anterocephalic edge sinuous or rounded, lacking projections. **Antennae** (Fig. 1e) with 10 antennomeres; funicle with sparse slender setae; club longer or as long as, more setose than funicle, with 3 antennomeres; each antennomere of club with four sensillifers placed obliquely; apical antennomere longer than wide, the two precedents slightly wider than long. **Labrum** connate, with subquadrate clypeus. **Mandibular molae** well-developed. **Maxillary palps** (Fig. 1g) with four palpomeres; apical palpomere longer than the precedents and abruptly expanded, with sensilla along the edge. **Prementum** (Fig. 1f) longer than wide; ligula apparently absent. **Labial palps** (Fig. 1f) with three palpomeres; apical palpomere as long as wide and narrower than inflated preapical palpomere; basal palpomere shorter and wider than apical palpomere. **Gular sutures** bowed. **Pronotum** (Fig. 1a) lateral carinae narrow, visible for their entire lengths from above; punctation, single; each puncture with one minute decumbent seta; anterior edge in males projected forward to form a plate, with corners of plate projected forward forming two horns; anterior edge in females rounded, lacking projections (Fig. 2e). **Prosternum** carinate, with triangular anterior portion (less conspicuous in *S. tricornis*); about as long as the prosternal process at midline. **Prosternal process** narrow, about 0.13x as wide as a procoxal width; projected beyond the level of prosternal disc and procoxae (in lateral view). **Procoxae** subconical, projected but without surpassing the prosternal process (Fig. 1b). **Meso- and metacoxae** transverse. **Scutellar shield** (Fig.1a) conspicuous. **Elytra** (Fig. 1a–b) oval, a bit longer than wide (average 1.12 mm); punctation dual or single; sutural flange not diverging near apex. **Metathoracic wings** fully developed. **Mesocoxal cavities** (Fig. 1c) narrowly separated, completely closed, strongly transverse and slightly oblique. **Metaventrite** (Fig. 1b–c) convex, tumid at disc, longer than the first abdominal ventrite at midline; shortest distance between meso- and metacoxae 0.4x–0.5x the longest lateral length of metaventrite; posterior edge slightly notched. **Protibiae** (Figs 1h, 6d) enlarged at apex; outer edge straight,

devoid of spines; outer apical angle projected as an acute tooth; apical edge with a row of conspicuous spines. **Meso- and metatibiae** (Figs 1i–j, 6e–f) slightly enlarged at apex; outer edge straight, devoid of spines; outer apical angle not projected; apical edge with a row of spines. **First abdominal ventrite** longer than second and third ventrites combined, with sex patch in males (Fig. 2a–b). **Male terminalia** (Fig. 2c–d): tegmen longer than wide, apical edge bearing inner emargination; penis elongate, longer than or about as long as tegmen. **Female terminalia** (Fig. 2f–g): spiculum ventrale larger at base, except in *S. tricornis*, and bifurcated at base in *S. amazonicus* (Fig. 2f); ovipositor short, with paraprocts shorter than gonocoxites; gonocoxites transversely divided ventrally into two folds or not conspicuously divided; gonostyli short (as wide as long) or long (twice or more longer than wide) (Fig. 2g).

Distribution. The species of the genus are exclusively Neotropical (Fig. 3), with records from Brazil (states of Amazonas and Pará in the North Region; Espírito Santo in the Southeast Region; and Rio Grande do Sul in the South Region), Costa Rica (provinces of Heredia and Cartago), Guatemala (department of Alta Verapaz), and Mexico (states of Tabasco and Veracruz).

Included species. *Sacis amazonicus* (Lopes-Andrade et Sandoval-Gómez, 2017) **comb. nov.**, *Sacis caipora* (Borlini et Lopes-Andrade, 2023) **comb. nov.**, *Sacis guarani* (Borlini et Lopes-Andrade, 2023) **comb. nov.**, and *Sacis tricornis* (Gorham, 1883) **comb. nov.**.

Sacis tricornis (Gorham, 1883) comb. nov.

(Figs 4a–b, 5a–g, 6a–i, 7a–i)

Ceracis tricornis Gorham, 1883: p. 224 (description), tab. X, fig. 27 (dorsal view drawing of a male); Gorham 1898: 332 (record from St. Vicent); Lawrence 1967: 98 (transference to *Cis*). *Cis tricornis* (Gorham, 1883); Lawrence 1971: p. 422, 438 (proposition of the *Cis tricornis* group).

Diagnosis. *Sacis tricornis* is most similar to *S. amazonicus*, differing in the denser, slightly wider and more marked pronotal punctation. The elytral punctation is single as in *S. amazonicus*, while *S. caipora* and *S. guarani* have dual elytral punctation. The female terminalia are most similar to those of *S. amazonicus*, bearing short gonostyli, differing in the not bifurcated basis of the spiculum ventrale. The male genitalia conspicuously differs from

other species of *Sacis* in the J-shaped penis, 1.65–1.80x longer than tegmen, and in the tegmen bearing a X-shaped central sclerotization.

Redescription based on a male specimen from Coatepec, Veracruz, Mexico. Adult in good condition. Measurements in mm: TL 1.12, PL 0.43, PW 0.60, EL 0.69, EW 0.63, GD 0.55. Ratios: PL/PW 0.72, EL/EW 1.09, EL/PL 1.60, GD/EW 0.87, TL/EW 1.78. **Body** (Figs 4a, 5a–d) strongly convex, oval, dorsal and ventral surface dark yellowish brown; pronotal horns light yellowish brown; antennae light yellowish brown, except for dark antennal club; dorsal vestiture of light and very minute decumbent setae, smaller than a puncture width and barely visible even in high magnification (100x); ventral vestiture of light decumbent slender setae. **Head** with anterior edge visible from above; dorsum concave, glabrous, bearing sparse minute punctures with microreticulate interspaces; disc a bit tumid; whole anterocephalic edge projected upwards into a long horn, laminate in lateral view; apex wider than half width between eyes, emarginate to form two short and divergent subtriangular lobes (better seen in frontal view; Fig. 5e–f); venter convex; gula broad, approximately half as wide as head; submentum barely delimited, about 0.4x as wide as gula. **Antennae** bearing 10 antennomeres (Fig. 6a), as follows (in mm, left antenna measured): 0.05, 0.04, 0.03, 0.02, 0.02, 0.02, 0.01, 0.03, 0.03, 0.05 (FL 0.09, CL 0.11, CL/FL 1.22). **Eyes** with subcircular contour, coarsely facetted, with about 60 ommatidia; GW 0.1 mm. **Pronotum** punctation single; punctures distanced from each other by 1–2 puncture-widths; each puncture with one minute light-coloured seta; interspaces, smooth, but microreticulate next to lateral carinae; anterior edge projected forward as a plate; corners of plate projected forward as long microreticulate horns with acute apices (Figs 4a, 5a–d); lateral carinae simple, slightly explanate, anterior portion visible when seen from above; anterolateral corners rounded. **Scutellar shield** semicircular, microreticulate, impunctate; BW 0.06 mm. **Elytra** strongly convex, suboval, about 1.15x as long as pronotum; elytral vestiture light-colored, a bit longer than pronotal vestiture; punctation single, finer than that of pronotum; interspaces, smooth; humeral calli conspicuous; sutural flange not diverging near apex (Fig. 5g). **Hypomera** microreticulate, with single punctation, each puncture with a light-colored decumbent setae. **Prosternum** microreticulate. **Prosternal process** narrow, about twice as long as prosternum at midline; projected beyond procoxae and beyond the level of prosternal disc, curved and bent inward in lateral view; apex rounded. **Protibiae** about 2.5x as long as maximum width (Fig. 6d). **Meso- and metatibiae** about 4.5x as long as maximum width (Fig. 6e–f). **Metaventrite** apparently impunctate; microreticulate; discrimen indiscernible. **Abdominal ventrites** microreticulate; length of ventrites (in mm, from base to apex at the longitudinal midline) as follows: 0.16,

0.06, 0.05, 0.04, 0.07; first abdominal ventrite bearing a large, circular sex patch with a diameter of 0.05 mm (Fig. 7a). **Male terminalia** (Fig. 7b–i): sternite VIII very membranous, approximately 2x as wide as long, posterior edge with subtriangular corners bearing slender setae (Fig. 7b); tegmen 1.65x–2.22x as long as wide, with apex wider than base, tapering at middle, outer edge sclerotized, inner edges converging forming a X-shape sclerotized structure, apex bearing a V-shaped emargination forming two subtriangular lobes, 0.3–0.4x as long as tegmen, base rounded (Fig. 7d–e, g–h); basal piece semicircular, very membranous, wider than long (Fig. 7c); penis J-shaped in lateral view; almost twice as long as tegmen; sclerotized and almost straight at basal two-thirds, turning curved and membranous at the apical portion (Fig. 7f, i).

Females. Devoid of cephalic and pronotal projections (Fig. 6g). Anterocephalic edge not projected, but slightly emarginate at middle. Gula smaller than in males, about 0.45x as wide as head; submentum not delimited, about 0.4x as wide as gula. Anterior pronotal edge broadly rounded. First abdominal ventrite devoid of sex patch. **Female terminalia** (Fig. 6h–i) as follows: sternite VIII (Fig. 6h) wider than long, wider than half the length of spiculum ventrale, posterior edge with slender setae at apical corners; spiculum ventrale 2.5x longer than sternite VIII, not bifurcated at base (Fig. 6h); paraprocts shorter than gonocoxites; baculi of paraprocts shorter than baculi of proctiger (Fig. 6i); gonocoxites transversely divided ventrally forming two folds at each side, the distal fold a bit shorter than the basal, each with apex bearing a long seta (Fig. 6i); gonostyli 4x shorter than distal folds of gonocoxites, each with apex bearing two long setae, apical setae 3x the length of each gonostylus (Fig. 6i).

Measurements and ratios. Males, measurements in mm (n = 7): TL 1.12–1.34 (1.26 ± 0.08), PL 0.50–0.68 (0.59 ± 0.07), PW 0.48–0.65 (0.59 ± 0.05), EL 0.62–0.71 (0.67 ± 0.03), EW 0.50–0.70 (0.62 ± 0.06), GD 0.35–0.60 (0.52 ± 0.08), PL/PW 0.83–1.10 (0.99 ± 0.10), EL/EW 0.93–1.40 (1.09 ± 0.15), EL/PL 0.96–1.35 (1.16 ± 0.13), GD/EW 0.70–0.97 (0.84 ± 0.08), TL/EW 1.81–2.44 (2.04 ± 0.21). Females, measurements in mm (n = 3): TL 1.13–1.16 (1.15 ± 0.02), PL 0.44–0.47 (0.45 ± 0.02), PW 0.55–0.60 (0.57 ± 0.03), EL 0.66–0.72 (0.69 ± 0.03), EW 0.60–0.64 (0.62 ± 0.02), GD 0.53–0.55 (0.54 ± 0.01), PL/PW 0.75–0.82 (0.79 ± 0.04), EL/EW 1.06–1.20 (1.12 ± 0.07), EL/PL 1.40–1.64 (1.53 ± 0.12), GD/EW 0.85–0.92 (0.88 ± 0.03), TL/EW 1.80–1.93 (1.85 ± 0.07).

Type material. ♂ **Lectotype here designated** (BMNH; Fig. 4a–b) “Type [circular label with red outline] \ Type. Sp. figured. \ San Juan, Vera Paz. Champion. \ B.C.A., Col., III(2). Ceracis \ Ceracis tricornis ♂ [handwritten] \ NHMUK015009956”). **Paralectotypes:** ♂ and ♀ on same card (BMNH) “Zapote, Guatemala, G.C. Champion \ B.C.A., Col., III(2)

Ceracis tricornis Gorh."; ♂ (BMNH) "Tamahu, Verapaz. Champion \ Ceracis tricornis Gorham [handwritten] \ B.C.A., Col., III(2), Ceracis"; ♂ (BMNH) "Teapa [handwritten] \ Mexico, Salle Coll. \ 683 \ Ceracis tricornis Gorham \ B.C.A., Col., III(2), Ceracis"; ♀ (BMNH) "Teapa [handwritten] \ B.C.A., Col., III(2), Ceracis tricornis Gorh."; ♂ and ♀ on same card (MNHN) "San Juan, Verapaz. Champion. \ Ceracis tricornis Gorham ♂ [handwritten]"; ♂ (MNHN) "Zapote, Guatemala, G.C. Champion. \ C. tricornis ♂ [handwritten]".

Other specimens examined. 7 ♂♂ and 2 ♀♀ (CELC) "MEX: VER, Coatepec, "Cerro de las Culebras" 31.xii.2005 leg. C. Lopes-Andrade & F. Z. Vaz-de-Mello \ 19°27'25"N 96°57'38"W 1300m"; 1 ♂ "Mex: Veracruz, Coatzalcoalcos.10 mi.S.VII-10-63 \ J. Doyen, Collector \ J. F. Lawrence Lot [printed] 1255 [handwritten] \ ex Polyporus sanguineus"; 1 ♀ "Mex: Veracruz. Coatzalcoalcos. 10mi.S.VII-10-63 \ J. F. Lawrence Lot [printed] 1253 [handwritten] \ J. Doyen. Collector \ ex Polyporus sanguineus".

Host-fungi. One occasional record in *Fabisporus sanguineus* (L.) Zmitr.

Comments. The locality "GUATEMALA: San Juan in Vera Paz" (Gorham 1883), type locality of *S. tricornis* with the lectotype designation herein, was determined by Selander and Vaurie (1962) to be a small coffee plantation on the mountain slopes a few kilometers south of Senahú and north of the valley of the Río Polochic, 1,800 feet (approximately 0.55 Km) over the sea level, 15°24' N, 89°55' W, currently in the municipality of Senahú, Department of Alta Verapaz, Guatemala. The type series includes mixed species: the paralectotypes listed above belong to one or two distinct species, neither of which is the true *S. tricornis*. It is important to highlight that the male genitalia attributed to *Cis tricornis* in Lopes-Andrade and Sandoval-Gómez (2017) does not belong to *S. tricornis* as defined here. That specimen is from Barro Colorado, Panama, and belongs to an undescribed species morphologically similar to *S. tricornis*.

Sacis amazonicus (Lopes-Andrade and Sandoval-Gómez, 2017) comb. nov.

Cis amazonicus Lopes-Andrade and Sandoval-Gómez, 2017: p. 325 (description), fig. 1A–H, fig. 2A–G (images of male holotype, female paratype, and dissected terminalia of paratypes).

Diagnosis. *Sacis amazonicus* is most similar to *S. tricornis*, differing in the sparser and finer pronotal punctation. The elytral punctation is single as in *S. tricornis*, while *S. caipora* and *S. guarani* have dual elytral punctation. The female genitalia is most similar to

those of *S. tricornis*, bearing short gonostyli, differing in the bifurcated basis of the spiculum ventrale. The male genitalia have a membranous penis 1.45x longer than tegmen and a long tegmen with a short V-emargination at apex 0.10x as long as the tegmen.

Comments. See Lopes-Andrade and Sandoval-Gómez (2017) for the original description. We noticed a female paratypus which should not be held in the species, so the corrected measurements and ratios of females are provided below. The measurements and ratios of males were not modified, but are presented again for the sake of consistency.

Measurements and ratios. Males, measurements in mm (n = 6): TL 0.94–1.20 (1.08 ± 0.09), PL 0.41–0.56 (0.49 ± 0.06), PW 0.46–0.55 (0.50 ± 0.03), EL 0.50–0.68 (0.60 ± 0.07), EW 0.50–0.58 (0.53 ± 0.03), GD 0.38–0.46 (0.43 ± 0.03), PL/PW 0.87–1.02 (0.99 ± 0.05), EL/EW 1.00–1.29 (1.11 ± 0.11), EL/PL 1.14–1.29 (1.20 ± 0.07), GD/EW 0.71–0.84 (0.79 ± 0.05), TL/EW 1.88–2.29 (1.97 ± 0.15). Females, measurements in mm (n = 5): TL 0.78–1.05 (0.95 ± 0.10), PL 0.33–0.38 (0.38 ± 0.03), PW 0.43–0.49 (0.46 ± 0.03), EL 0.45–0.68 (0.59 ± 0.08), EW 0.44–0.53 (0.50 ± 0.04), GD 0.34–0.44 (0.43 ± 0.05), PL/PW 0.76–0.81 (0.78 ± 0.02), EL/EW 1.03–1.36 (1.15 ± 0.13), EL/PL 1.38–1.86 (1.57 ± 0.20), GD/EW 0.75–0.85 (0.81 ± 0.04), TL/EW 1.77–2.09 (1.90 ± 0.13).

Sacis caipora (Borlini and Lopes-Andrade, 2023) comb. nov.

Cis caipora Borlini and Lopes-Andrade, 2023: p. 566 (description)5, figs 1–13 (images of male holotype, male and female paratypes, and dissected terminalia of paratypes).

Diagnosis. *Sacis caipora* is unique in the genus in the markedly dual elytral punctation. It is morphologically most similar to *S. guarani*, differing in the microreticulate pronotal surface, and in males with tumid disc of the first abdominal ventrite. The male genitalia is also similar to those of *S. guarani*, with tegmen longer than penis, differing in the inner edge with a conspicuous protuberance, while *S. amazonicus* and *S. tricornis* have tegmen shorter than penis. The female genitalia have long gonostyli, as in *S. guarani*, differing in the baculi of proctiger longer than the gonocoxites and gonostyli combined.

Comments. See Borlini and Lopes-Andrade (2023) for the original description. The measurements of the males in the original paper did not include the pronotal horns, so the corrected values (including the pronotal horns) are provided below. The measurements and ratios of females were not modified, but are presented again for the sake of consistency.

Measurements and ratios. Males, measurements in mm (n = 10): TL 1.30–1.75 (1.62 ± 0.14), PL 0.53–0.80 (0.72 ±0.09), PW 0.65–0.88 (0.80 ± 0.06), EL 0.77–0.96 (0.90 ± 0.06), EW 0.70–0.91 (0.83 ± 0.06), GD 0.62–0.76 (0.70 ± 0.04), PL/PW 0.82–0.97 (0.90 ± 0.05), EL/EW 1.04–1.12 (1.08 ± 0.03), EL/PL 1.13–1.45 (1.26 ± 0.10), GD/EW 0.79–0.89 (0.84 ± 0.03), TL/EW 1.85–2.04 (1.94 ± 0.06). Females, measurements in mm (n = 11): TL 1.41–1.59 (1.51 ± 0.05), PL 0.54–0.63 (0.58 ± 0.03), PW 0.71–0.81 (0.77 ± 0.03), EL 0.88–1.00 (0.93 ± 0.04), EW 0.71–0.90 (0.82 ± 0.05), GD 0.68–0.74 (0.71 ± 0.02), PL/PW 0.66–0.81 (0.75 ± 0.04), EL/EW 0.97–1.27 (1.13 ± 0.07), EL/PL 1.48–1.77 (1.61 ± 0.09), GD/EW 0.81–0.96 (0.86 ± 0.04), TL/EW 1.57-2.07 (1.84 ± 0.12).

Sacis guarani (Borlini and Lopes-Andrade, 2023) comb. nov.

Cis guarani Borlini and Lopes-Andrade, 2023: p. 569 (description), figs 14–26 (images of male holotype, male and female paratypes, and dissected terminalia of paratypes).

Diagnosis. *Sacis guarani* is morphologically most similar to *S. caipora*, differing in the smooth pronotal disc. The dual elytral punctation is finer and denser than those of other *Sacis* species. The male genitalia is similar to those of *S. caipora*, with tegmen longer than penis, differing in the smooth inner edge, while *S. amazonicus* and *S. tricornis* have tegmen shorter than penis. The female terminalia have long gonostyli, as in *S. caipora*, and gonocoxites wider than half their length.

Comments. See Borlini and Lopes-Andrade (2023) for the original description. The measurements of the males in the original paper did not include the pronotal horns, so the corrected values (including the pronotal horns) are provided below. The measurements and ratios of females were not modified, but are presented again for the sake of consistency.

Measurements and ratios. Males, measurements in mm (n = 13): TL 1.19–1.66 (1.41 ± 0.13), PL 0.49–0.73 (0.59 ± 0.07), PW 0.62–0.83 (0.68 ± 0.06), EL 0.70–0.95 (0.82 ± 0.07), EW 0.63–0.83 (0.73 ± 0.05), GD 0.51–0.70 (0.60 ± 0.05), PL/PW 0.78–1.06 (0.87 ± 0.07), EL/EW 1.04–1.21 (1.12 ± 0.05), EL/PL 1.09–1.63 (1.39 ± 0.13), GD/EW 0.73–0.89 (0.83 ± 0.04), TL/EW 1.78–2.19 (1.94 ± 0.11). Females, measurements in mm (n = 7): TL 1.37–1.53 (1.43 ± 0.07), PL 0.50–0.59 (0.54 ± 0.03), PW 0.66–0.79 (0.73 ± 0.05), EL 0.82–1.00 (0.89 ± 0.06), EW 0.72–0.85 (0.79 ± 0.05), GD 0.55–0.70 (0.63 ± 0.05), PL/PW 0.69–0.83 (0.75 ± 0.05), EL/EW 1.06–1.27 (1.13 ± 0.07), EL/PL 1.49–1.89 (1.65 ± 0.13), GD/EW 0.76–0.83 (0.80 ± 0.03), TL/EW 1.71–1.94 (1.82 ± 0.08).

Other specimens examined. Not including the material listed by Borlini and Lopes-Andrade (2023). 1 ♂ and 1 ♀ (CELC) "BRASIL: RJ Teresópolis, "P N Serra dos Órgãos"; 14.XI.2011 leg. L. S. Araujo"; 1 ♂ (CELC) "BRASIL: RS, Santa Tereza RPPN Vale do Moinho Brum [29°09'29"S e 51°41'49"W] 12.xii.2015; A. G. Mezzomo leg.] \ B305"; 1 ♂ "PERUIBE, SP XI. 1985 EXC. MZSP col \ Porculus Gen. 4 [handwritten]"; 1 ♂ "PERUIBE, SP XI. 1985 EXC. MZSP col \ Gen. 4 [handwritten]".

Urupecis gen. nov.

(Figs 8–17, Table 1)

Diagnosis. Body oval to elongate (Figs 8a,d, 10a, 12a, 13a,d, 15a, 16a, 17a), with barely visible setae; apical maxillary palpomere pyriform, with sensilla restricted to the apical tip (Figs 9c, 14c); elytra with dual punctation, the sutural flange diverging near the apex (Figs 8g, 13g, 16e); prosternum carinate, with the prosternal process at the same level as the prosternal disc (Figs 8b, 12b, 13b; 16b); protibial apex bearing a row of spines, with the outer apical angle bearing a tooth (Figs 9d, 14d); meso- and metatibial apex each bearing a row of spines but lacking a tooth (Figs 9e–f, 14e–f); metaventrite long (the shortest distance between the meso- and metacoxae is approximately 0.6x the longest lateral length of the metaventrite) (Fig. 12b); males possessing an upward-directed anterocephalic horn (Figs 8b,e, 12b, 13b,e–f, 16b,d), and a forward-projecting pronotal plate emarginate apically to form two horns (Figs 8a–b,d, 13d, 16a–b), or anterior pronotal edge simple, lacking horns (Figs 12a–b, 13a–b); female terminalia long (combined length of gonostyli, gonocoxites, and paraprocts 0.39–0.43 mm), with gonocoxites ventrally divided into three folds (Figs 10d, 15d, 17c). *Urupecis* differs from *Grossicis* and *Sacis* mainly in the elongate female terminalia and in the pyriform apical maxillary palpomere (Table 1).

Etymology. A free combination of the Tupi-Guarani word "Urupê", which means fungi, and "Cis", the type genus of the family. Masculine.

Type species. *Ennearthron delicatulum* Jacquelin-Duval, 1857.

Description. TL 0.83–1.61mm in males and 0.75–1.71mm in females. **Body** (Fig. 8a–d; but also see *U. miles*) elongated or oval (see *U. nasicornis*), convex; subglabrous, with minute decumbent setae. **Head** anterior portion visible from above; anterocephalic edge in males forming an upward-directed horn (Fig. 8e–f); in females, slightly sinuous, lacking projections. **Antennae** with 10 antennomeres (Fig. 9a); funicle with sparse slender setae;

antennal club a bit longer and more setose than funicle, with 3 antennomeres; each antennomere of club with four sensillifers placed obliquely; apical antennomere subrounded to oval, longer than the precedent. **Labrum** connate with clypeus, slightly longer than wide, subtruncate. **Mandibular molae** well-developed. **Maxillary palps** (Fig. 9c) with four palpomeres; apical palpomere pyriform (Fig. 9c), with a circular patch of sensilla at apex. **Prementum** longer than wide (Fig. 9b); ligula apparently absent. **Labial palps** 3-segmented; apical palpomere as long as and narrower than inflated preapical palpomere; basal palpomere short (Fig. 9b). **Gular sutures** bowed. **Pronotum** lateral carinae narrow, barely visible for their entire lengths from above (Fig. 8a), or expanded, visible for their entire lengths from above (see *U. miles* and *U. nasicornis*); punctation single, each puncture with one minute seta; anterior edge in males projected forward as a plate, with corners of plate projected forward forming two horns (Fig. 8a) (or lacking horns as intraspecific variation in *U. nasicornis*); anterior edge in females rounded, lacking projections (Fig. 10a). **Prosternum** short, carinate at the longitudinal midline of the disc. **Prosternal process** narrow, subparallel-sided, projected beyond procoxae, at the same level as prosternal disc, with apex bent inwardly. **Procoxae** subconical, projected without surpassing the prosternal process (Fig. 8b). **Meso- and metacoxae** transverse. **Scutellar shield** conspicuous. **Elytra** elongate; punctation, dual; sutural flange diverging near apex (Fig. 8g); humeral calli conspicuous. **Metathoracic wings** well-developed. **Mesocoxal cavities** narrowly separated, completely closed, strongly transverse and slightly oblique. **Metaventrite** (Fig. 8b) convex, tumid at disc; shortest distance between meso- and metacoxae about 0.6x the longest lateral length of the metaventrite; posterior edge slightly notched; discrimen short, about one third or less the length of metaventrite at midline. **Protibiae** (Fig. 9d) enlarged at apex; outer edge straight, devoid of spines; outer apical angle projected as an acute or angulate tooth; apical edge with a barely visible row of spines (partially concealed by tarsus). **Meso- and metatibiae** (Figs 9e–f) slightly enlarged; outer edge straight, devoid of spines; outer apical angle not projected; apical edge with a barely visible row of spines. **First abdominal ventrite** longer than second and third ventrites combined, with a margined sex patch in males (Fig. 9g–h). **Male terminalia** (Fig. 9i–l): elongate, emarginate in apical portion; penis shorter than tegmen, subparallel-sided, with basal portion truncate and apical portion membranous. **Female terminalia** (Fig. 10c–d): elongate, with paraprocts longer than gonocoxites; gonocoxites transversely divided into three folds ventrally, the distal fold longer than the precedents combined; gonostyli approximately 4x longer than wide.

Distribution. Species of the genus occur in the Neotropical and Nearctic regions (Fig. 11). *Urupecis miles* is the only Nearctic species, found in eastern USA, from New York south to central Florida, and west to Arkansas and Louisiana (Lawrence, 1971); *U. delicatulus* is broadly distributed in the northern Neotropical region, in Costa Rica, Cuba, Jamaica, Mexico, Panama, and Puerto Rico; and *U. nasicornis* is recorded from Panama and Colombia.

Included species. *Urupecis delicatulus* (Jacquelin-Duval, 1857) **comb. nov.**, *Urupecis nasicornis* (Reitter, 1878) **comb. nov.**, and *Urupecis miles* (Casey, 1898) **comb. nov.**.

Urupecis delicatulus (Jacquelin-Duval, 1857) comb. nov.

(Figs 8a–g, 9a–l, 10a–d)

Ennearthron delicatulum Jacquelin-Duval, 1857a (edition in French): p. 244 (description), tab. 9, fig. 13, fig. 13a–c (drawings of dorsal view of a male, antenna, pro- and metatibia with tarsus; erroneously attributed to *Ennearthron taurulus* Jacquelin-Duval, 1857 in text and legend); Jacquelin-Duval, 1857b (edition in Spanish): p. 101 (description), lám. 9, fig. 13 (dorsal view drawing of a male; erroneously attributed to *Ennearthron taurulus* Jacquelin-Duval, 1857 in text and legend).
Cis delicatulus (Jacquelin-Duval, 1857); Lawrence , 1971: p. 438 (transference to *Cis*).

Diagnosis. *Urupecis delicatulus* is most similar to *U. miles*, differing in the anterocephalic horn with a wider apex and divergent lobes, smooth pronotal surface, and very tiny dual elytral punctation. In the tegmen of male genitalia of *U. delicatulus*, the apical emargination is very deep, approximately 0.5x as long as the tegmen, while in other *Urupecis* species it is 0.35x or less. The gonocoxites of the female terminalia are approximately 0.65x as wide as long, while in the other *Urupecis* species they are more than 0.75x as wide as long.

Redescription based on a male specimen from Falmouth, Trelawny, Jamaica. Adult fully pigmented and in good condition, except for lacking the last antennomere of the left antenna. Measurements in mm: TL 1.13, PL 0.38, PW 0.53, EL 0.75, EW 0.60, GD 0.44. Ratios: PL/PW 0.71, EL/EW 1.25, EL/PL 2.00, GD/EW 0.73, TL/EW 1.88. **Body** (Fig. 8a–d) suboval, convex and elongate;--- dorsal surface dark reddish brown; ventral surface dark reddish brown; pronotal and anterocephalic horns lighter than the body; antennae, palpi and tarsi yellowish brown; dorsal vestiture of very minute decumbent setae, about one puncture-width long, barely visible even in high magnification (100x); venter subglabrous, with decumbent slender setae barely visible on hypomera and abdominal ventrites. **Head** with

anterior edge and corners visible from above; dorsum concave, glabrous, microreticulate, lacking minute punctures at the longitudinal midline; disc a bit tumid; whole anterocephalic edge (between eyes) projected upwards into a long horn, laminate in lateral view, narrowed at middle and larger on apex; width at apex 0.6x the distance between eyes; apex emarginate forming two short, slightly divergent lobes with rounded apices (better in frontal view; Fig. 8e–f); venter convex, gula 0.65x as wide as head, with gular structures broadly bowed; submentum broadly rounded, about half as wide as gula. **Antennae** bearing 10 antennomeres (Fig. 9a), as follows (in mm, right antenna measured): 0.05, 0.04, 0.03, 0.02, 0.02, 0.01, 0.01, 0.03, 0.04, 0.06 (FL 0.09, CL 0.13, CL/FL 1.44). **Eyes** with subcircular contour, coarsely facetted, bearing about 50 ommatidia; GW 0.1 mm. **Pronotum** with fine, single punctation; punctures separated from each other by about 1 puncture-width; interspaces, smooth on disc, microreticulate close to sides; setae hardly visible under high magnification (100x); anterior edge projected forward as a plate, emarginate apically to form two narrow, long triangular horns with acute apices, microreticulate; lateral carinate narrow, simple, barely visible for the entire lengths when seen from above (Figs 8a–d). **Scutellar shield** pentagonal to subtriangular, punctate and microreticulate; BW 0.06. **Elytra** elongate, 2x as long as pronotum; punctation, dual, finer than that of pronotum; punctures separated from each other by about 2 puncture-widths; interspaces, smooth; each macropuncture with one minute decumbent light seta visible under 50x magnification, micropunctures lacking seta. **Hypomera** short, microreticulate, with stretched reticulation; light decumbent setae barely visible; apparently impunctate. **Prosternum** in front of coxae microreticulate, with stretched reticulation, impunctate; disc with slender setae. **Prosternal process** as long as prosternal disc at midline; apparently lacking setae; apex rounded. **Protibiae** (Fig. 9d) about 3.5x as long as maximum width; outer apical angle projected as an acute tooth. **Meso-and metatibiae** (Fig. 9e–f) about 4.8x as long as maximum width. **Metaventrite** microreticulate, glabrous, apparently impunctate; discrimen very short, about 0.2x as long as metaventrite at the longitudinal middle. **Abdominal ventrites** microreticulate, with slender setae; length of ventrites (in mm, from base to apex at the longitudinal midline) as follows: 0.17, 0.05, 0.05, 0.06, 0.06; first abdominal ventrite bearing a large, rounded, marginated sex patch with a diameter of 0.06 mm (Fig. 9g, variation in Fig. 9h). **Male terminalia** (Figs 9i–l): sternite VIII membranous, 2x as wide as long, posterior edge broadly curved inward, subtriangular corners with slender setae (Fig. 9i); basal piece membranous, wider than long (not separated from tegmen during dissection; Fig. 9l); tegmen 2.5x as long as wide, widering to apex, outer edge emarginate inward close to apical portion, apex with a V-shaped emargination about half the

length of tegmen, forming two long lobes, base rounded (Fig. 9j, l); penis about 0.7x as long as tegmen, 4x as long as wide, subparallel-sided, apical portion with two short, rounded lobes (Fig. 9k).

Females (Fig. 10). Devoid of cephalic and pronotal ornaments (Fig. 10a). Anterocephalic edge not projected, only slightly emarginate. Gula smaller than that of males, half as wide as head; submentum barely visible, about half as wide as gula. Anterior pronotal edge broadly rounded. First abdominal ventrite devoid of sex patch. **Female terminalia** (Figs 10b–d) as follows: sternite VIII about 2x as wide as long; posterior edge curved inward; corners with slender setae at apex (Fig. 10c); **s**piculum ventrale about as long as paraprocts and gonocoxites combined; base conspicuously bifurcated, with emargination reaching about 0.25x its length (Fig. 10b–c); paraprocts longer than gonocoxites; baculi of paraprocts as long as baculi of proctiger (Fig. 10d); gonocoxites (Fig. 10d) transversely divided ventrally forming three folds at each side, distal folds 1.5x longer than the precedents combined, apices bearing setae (Fig. 10d); gonostyli about one-third the length of distal fold of gonocoxites, each bearing a slender seta at apex (Fig. 10d).

Measurements and ratios. Males, measurements in mm (n = 48): TL 0.83–1.40 (1.15 ± 0.13), PL 0.32–0.68 (0.51 ± 0.08), PW 0.40–0.59 (0.50 ± 0.04), EL 0.48–0.75 (0.64 ± 0.06), EW 0.42–0.66 (0.53 ± 0.05), GD 0.32–0.50 (0.41 ± 0.04), PL/PW 0.73–1.60 (1.03 ± 0.13, EL/EW 0.85–1.37 (1.20 ± 0.08), EL/PL 0.75–1.84 (1.26 ± 0.16), GD/EW 0.61–1.07 (0.77 ± 0.06), TL/EW 1.41–2.67 (2.16 ± 0.18). Females, measurements in mm (n = 31): TL 0.75–1.15 (1.00 ± 0.09), PL 0.30–0.44 (0.37 ± 0.03), PW 0.33–0.56 (0.48 ± 0.05), EL 0.38–0.75 (0.63 ± 0.08), EW 0.45–0.65 (0.54 ± 0.05), GD 0.33–0.53 (0.42 ± 0.04), PL/PW 0.68–1.33 (0.78 ± 0.11), EL/EW 0.76–1.37 (1.18 ± 0.13), EL/PL 1.03–1.91 (1.70 ± 0.20), GD/EW 0.57–0.98 (0.80 ± 0.07), TL/EW 1.45–2.12 (1.88 ± 0.14).

Specimens examined. 5 ♂♂ and 1 ♀ (CELC) “Windsor, 10mi.S Falmouth, Trelawny Par.Jam. IV-5-68 \ J. F. Lawrence Lot. [printed] 2556 [handwritten] \ Peck & Fiske Collectors \ ex Polyporus maximus”; ♂ (CELC) “Turrialba COSTA RICA VIII-30-66 \ J. F. Lawrence Lot [printed] 1847 [handwritten] \ Robin Andrews Collector \ ex Polyporus occidentalis”; ♂ and ♀ (CELC) PANAMA: Panama Cerro Azul 2000’ VI.21-22.1976 A. Newton \ J. F. Lawrence Lot No. [printed] 4129 [handwritten] \ Daedalea elegans”; ♂ (CELC) MEXICO, Chiapas San Quintin700’ 19°20’-16°14’ Rain-forest II. 5-20. 1966 \ George E. Ball D. R. Whitehead collectors”; ♀ (CELC) “MEXICO, Chiapas San Quentin700’ Feb. 5-20, 1966”; 5 ♂♂ and 4 ♀♀ (CELC) CANAL ZONE 4mi.NW Gamboa Feb. 23, 1975 Lawrence, Erwin \ J. F. Lawrence Lot [printed] 3805 [handwritten] \ Coriolus membranaceus”; 3 ♂♂ and 2 ♀♀

(CELC) “Madden Dan CANAL ZONE VII-18-1969 \ J. F. Lawrence Lot. [printed] 2901 [handwritten] \ ex Daedalea elegans”; 7 ♂♂ and 4 ♀♀ (CELC) “Madden Dan CANAL ZONE VII-18-1969 \ J. F. Lawrence Lot [printed] 2906 [handwritten] \ Coriolus sp.”; 5 ♂♂ and 5 ♀♀ (CELC) “Barro Colorado Is. Canal Zone Panama, Iv-7-67 \ Polyporus tenuis”, 3 ♂♂ and 2 ♀♀ additionally labeled “J. F. Lawrence Lot [printed] 2131 [handwritten]” and 2 ♂ and 3 ♀ “J. F. Lawrence Lot [printed] 2142 [handwritten]”; ♂ “Barro Colorado Is. CANAL ZONE April 7, 1967 \ J. F. Lawrence Lot. 2142 \ Polyporus tenuis”; 3 ♂♂ and 4 ♀♀ “Barro Colorado Is. CANAL ZONE Feb. 21. 1968 \ J. F. Lawrence Lot. [printed] 2470 [handwritten]”; 1 ♂ (CELC) “Barro Colorado Is. CANAL ZONE Feb. 10, 1968 \ J. F. Lawrence Lot. [printed] 2367 [handwritten] \ Polyporus tenuis”; 4 ♂♂ (CELC) “Barro Colorado Is. CANAL ZONE Feb. 21, 1968 \ J. F. Lawrence Lot. [printed] 2470 [handwritten]”; 2 ♂♂ and 1♀ (CELC) “Barro Colorado Is. CANAL ZONE July 13 1969 \ J. F. Lawrence Lot [printed] 2861 [handwritten] \ Polyporus tenuis”; 1♂♂ and 3 ♀♀ (CELC) “Barro Colorado Is. CANAL ZONE July 14 1969 \ J. F. Lawrence Lot [printed] 2874 [handwritten] \ Coriolus sp.”; 10♂♂ and 3 ♀♀ “CANAL ZONE: Is. Barro Colorado II/19-III/9-75 Lawrence, Erwin”, additionally labeled 5 ♂♂ and 3 ♀♀ (CELC) “J. F. Lawrence Lot [printed] 3821 [handwritten] \ Coriolus membranaceus”, 3 ♂♂ J. F. Lawrence Lot [printed] 3793 [handwritten] \ Coriolus membranaceus”, 1 ♂♂ “J. F. Lawrence Lot [printed] 3857 [handwritten] \ Coriolopsis occidentalis” and 1 ♂♂ “J. F. Lawrence Lot [printed] 3894 [handwritten] \ Pycnoporus sanguineus”; 2 ♂♂ and 2 ♀♀ (MNHM) “Cuba Ennearthron delicatulum Jaq [square label with green outline, handwritten]”; 3 ♂♂ and 2 ♀♀ (MFN) “Portorico Krug. S. G [printed, rectangular blue card] \ 113 Ennearthron Mellié taurulus Jacq. Duv” [handwritten, blue lateral line] (four cards with a pair of specimens glued on it. *Urupecis delicatulus* nov. comb. are the males and female glued on first and third cards, and the male on the second card)”; ♂ (MNHN) “Cuba Garnier [handwritten] \ Ex. COLL. HAAG.”; ♂ (MNHN) “Cuba Kraat [handwritten] \ Ex. COLL. HAAG. \ delicatulus J.Duv. [handwritten, black outline]”; ♂ (MNHN) “Ennearthron delicatulus ♂ Cuba Cast. [Castelnau?] 38 [1838?] [green circle, handwritten] \ nnearth. [sic] taurulus Jac.Duv. Cuba [handwritten]”.

Host-fungi. Breeding records in *Trametes membranacea* (Sw.) Kreisel (3); *Trametes maxima* (Mont.) A. David & Rajchenb (1) and *Coriolus* sp. (1). Occasional records in *Coriolopsis occidentalis* (Klotzsch) Murrill (2); *Fabisporus sanguineus* (L.) Zmitr. (1); *Trametes elegans* (Spreng.) Fr. (2) and *Coriolus* sp (2).

Urupecis nasicornis (Reitter, 1878) new combination

(Figs 12a–d, 13a–g, 14a–k, 15a–d)

Cis nasicornis Reitter, 1878: p. 34 (description); Lopes-Andrade and Sandoval-Gómez, 2017: p. 324 (inclusion in the *tricornis* group).

Diagnosis. *Urupecis nasicornis* is the only species in the genus in which the males have a narrow anterocephalic horn not emarginate apically, with or without pronotal horns. If present, the male pronotal horns are very short. The dual elytral punctuation is conspicuous in the basal one-third, then becomes almost unnoticeable at the apical portion, while the size of punctures in *U. delicatulus* and *U. miles* do not change. The male and female terminalia are similar to those of other *Urupecis* species, differing in the apical portion of tegmen markedly emarginate and the distal folds of the gonocoxite with a sclerotized curve at the inner edge, next to the vaginal aperture.

Redescription based on a male specimen from Arcabuco, Boyacá, Colombia. Adult fully pigmented and in good condition. Measurements in mm: TL 1.20, PL 0.40, PW 0.60, EL 0.80, EW 0.68, 0.55. Ratios: PL/PW 0.67, EL/EW 1.18, EL/PL 2.00, GD/EW 0.81, TL/EW 1.76. **Body** (Fig 12a–c, 13a–d) convex, oval; dorsal surface dark yellowish brown; ventral dark yellowish brown; legs, palpi and antennae light yellowish brown; dorsal vestiture of very minute decumbent setae, visible in magnification of 50x; ventral vestiture of decumbent slender setae, most conspicuous on metaventrite and abdominal ventrites. **Head** with anterior edge and corners visible from above; dorsum tumid, with inconspicuous minute setae, punctures and smooth interspaces at disc; whole anterocephalic edge (between eyes) projected upwards into a narrow horn, larger at base, with acute apex bearing setae (Fig. 13e–f) (variation: long horn projected upwards with straight sides); venter convex; gula 0.5x as wide as head, with gular sutures joined to submentum forming a pentagon-like shape. **Antennae** bearing 10 antennomeres (Fig 14a), as follows (in mm, left antenna measured): 0.05, 0.04, 0.04, 0.03, 0.02, 0.02, 0.01, 0.04, 0.05, 0.06 (FL 0.12, CL 0.15, CL/FL 1.25). **Eyes** with subcircular contour, coarsely facetted, bearing about 60 ommatidia; GW 0.10 mm. **Pronotum** with conspicuous, single punctation; punctures distanced from each other by about 1 puncture-width; interspaces, smooth; vestiture of very minute decumbent setae half as long as a puncture-width; anterior edge rounded, not projected forward (variation: in larger males, anterior edge projected forward as a short plate emarginate at apex, forming two subtriangular, narrow and short lateral horns); lateral carinae explanate forming conspicuous

margins, enlarging from the posterior to the anterior portion, visible for the entire lengths when seen from above (Figs 12a, 13a, d). **Scutellar shield** pentagonal, with a few punctures and minute setae; BW 0.08 mm. **Elytra** suboval, with dual punctation; micropunctures smaller than those of pronotum, distanced from each other by at least 2 micropuncture-widths; each micropuncture with one minute decumbent seta a bit longer than the puncture; macropunctures lacking setae, apparently sublinear on the basal one-third, their widths progressively reduced to the posterior portion where they become even smaller than micropunctures and are almost inconspicuous; interspaces, smooth; **Hypomera** microreticulate, glabrous, impunctate. **Prosternum** microreticulate, impunctate. **Prosternal process** with broad and rounded apex, half as long as prosternal disc at the midline. **Protibiae** (Fig. 14d) about 4x as long as maximum width; outer apical angle acute, not toothed. **Meso- and metatibiae** (Fig. 14e–f) about 5x as long as maximum width. **Metaventrite** microreticulate, punctate; each puncture bearing a light slender setae; discrimen very short. **Abdominal ventrites** microreticulate, punctate; each puncture bearing a decumbent light seta; length of ventrites (in mm, from base to apex at the longitudinal midline) as follows: 0.17, 0.06, 0.06, 0.06, 0.07; first abdominal ventrite bearing a large sex patch (Fig. 14g), somewhat transversely oval, with length of 0.05 mm and width of 0.06mm. **Male terminalia** (Fig. 14h–k): sternite VIII (Fig. 14h) membranous, wider than long, posterior edge with a shallow inward emargination at middle, forming two short subtriangular lobes at corners with slender setae; tegmen (Fig. 14j) sclerotized, about 3x as long as wide, with rounded base, enlarging at basal two-thirds, then slightly constricted, apex narrowly emarginate; basal piece (Fig. 14i) membranous**,** wider than long; penis (Fig. 14k) about 5x as long as wide, almost as long as tegmen, wider at middle and tapering to apex, bearing slightly membranous flaps on outer edges from middle to apex; posterior edge concave.

Females. Lacking cephalic and pronotal projections (Fig. 15a). Anterocephalic edge sinuous, not projected. Gula smaller than in males, 0.45x as wide as head; submentum narrow and short, about half as wide as gula. Pronotum with anterior edge broadly rounded and lateral edges explanate, less wide at the anterior portions than in males. Elytral and pronotal punctation similar to those of males. First abdominal ventrite devoid of sex patch. **Female terminalia** (Fig. 15b–d) as follows: sternite VIII (Fig 15b–c) wider than long, very membranous, posterior edge bearing slender setae at apex; spiculum ventrale (Fig. 15b–c) 5x longer than sternite VIII, bifurcated at base; paraprocts (Fig. 15d) longer than gonocoxites, baculi of paraprocts as long as baculi of proctiger; gonocoxites (Fig. 15d) transversely divided ventrally forming three folds at each side; each distal fold 1.5x longer than the precedents

combined, with sclerotized curve inward at inner edge, next to vaginal aperture; apex bearing setae; gonostyli (Fig. 15d) about one-third the length of the distal fold of gonocoxites, each bearing a long seta.

Measurements and ratios. Males, measurements in mm (n = 7): TL 1.20–1.61 (1.47 ± 0.15), PL 0.40–0.58 (0.50 ± 0.06), PW 0.60–0.76 (0.69 ± 0.05), EL 0.80–1.09 (0.97 ± 0.10), EW 0.68–0.90 (0.79 ± 0.08), GD 0.55–0.71 (0.63 ± 0.06), PL/PW 0.66–0.79 (0.73 ± 0.05), EL/EW 1.12–1.40 (1.23 ± 0.09), EL/PL 1.72–2.16 (1.93 ± 0.17), GD/EW 0.76–0.93 (0.81 ± 0.06), TL/EW 1.76–1.21 (1.87 ± 0.16). Females, measurements in mm (n = 5): TL 1.30–1.71 (1.49 ± 0.16), PL 0.45–0.63 (0.54 ± 0.06), PW 0.63–0.72 (0.69 ± 0.04), EL 0.76–1.09 (0.95 ± 0.13), EW 0.65–0.90 (0.81 ± 0.10), GD 0.58–0.73 (0.66 ± 0.06), PL/PW 0.63–0.89 (0.79 ± 0.11), EL/EW 1.08–1.36 (1.17 ± 0.11), EL/PL 1.42–2.11 (1.76 ± 0.28), GD/EW 0.76–0.88 (0.82 ± 0.05), TL/EW 1.59–2.14 (1.85 ± 0.22).

Type material. ♂ **Lectotype here designated** (MNHN) “La Luzera [handwritten] \ Cis nasicornis. m. Colombia. [handwritten] \ 914 [handwritten] \ TYP. REITTER \ Ex Coll. REITTER \ LECTOTYPE [printed] Cis nasicornis Reitter [red label, handwritten]”.

Other specimens examined. 7 ♂♂ and 10 ♀♀ (CELC) “COLOMBIA: Boyacá, Arcabuco. 2700m. Bosque *Quercus humboldti*. 03.xii.2007 Vaz-de-Mello, Arias, González & Delgado leg.; 1 ♂ (CNCI) “PAN: Chiri; 1550m 15kmNW HatoVolcan Hartmann Finca 25.v.77, S&J.Peck Ber369, u. bark”.

Host-fungus. Unknown.

Urupecis miles (Casey, 1898) new combination

(Figs 16a–i, 17a–c)

Xestocis miles Casey, 1898: p. 85 (description).
Cis miles (Casey, 1898); Lawrence, 1971: p. 467 (transference to *Cis*); Lawrence, 1973: p. 196 (host fungi).

Diagnosis. *Urupecis miles* is most similar to *U. delicatulus*, differing in the microreticulate pronotal surface and in the male anterocephalic horn with parallel sides and apical lobes not diverging. The tegmen of the male genitalia is subparallel-sided, while in the other species the sides of tegmen are conspicuously sinuous in slide preparations. In the female terminalia, the paraprocts are 0.9x as wide as long, while in *U. delicatulus* and *U. nasicornis* they are conspicuously longer than wide.

Redescription based on a male specimen from Honey Bee, Kentucky, United States. Fully pigmented and in good condition, but abdomen extracted for dissection. Measurements in mm: TL 1.46, PL 0.64, PW 0.54, EL 0.82, EW 0.59, GD 0.55. Ratios: PL/PW 1.19, EL/EW 1.39, EL/PL 1.28, GD/EW 0.93, TL/EW 2.47. **Body** (Fig. 16a–c) convex, elongated, dorsal and ventral surface yellowish brown; dorsal vestiture of very minute decumbent setae, barely visible even in 100x magnification; ventral vestiture of decumbent slender setae on ventrites. **Head** with anterior edge and corners visible from above; dorsum concave, glabrous, with minute punctures; interspaces, microreticulate; disc a bit tumid; whole anterocephalic edge (between eyes) projected upwards into a long horn, laminate in lateral view, larger at base, parallel-sided; apex slightly emarginate forming two short rounded lobes (better in frontal view; Fig. 16d); horn apex about one third as wide as distance between eyes; venter convex; gula 0.61x as wide as head, with gular structures broadly bowed; submentum conspicuous, about 0.45x as wide as gula. **Antennae** bearing 10 antennomeres, as follows (in mm, left antenna measured): 0.05, 0.04, 0.03, 0.02, 0.02, 0.02, 0.02, 0.03, 0.04, 0.05 (FL 0.10, CL 0.12, CL/FL 1.26). **Eyes** with subcircular contour, coarsely facetted, bearing about 60 ommatidia; GW 0.1 mm. **Pronotum** punctation dense, single; punctures distanced from each other by 1 puncture-width; interspaces, microreticulate; anterior edge projected forward as a plate, emarginate apically forming two lateral, narrow and long triangular horns with acute apices; lateral carinae explanate, not crenulate, visible when seen from above (Fig. 16a–c). **Scutellar shield** pentagonal, microreticulate, with setae, apparently impunctate; BW 0.1 mm. **Elytra** elongate; punctation dual, confuse, denser than that of pronotum; punctures distanced from each other by less than 1 puncture-width; micropunctures smaller than those on pronotum, each with a very minute decumbent light seta; macropunctures lacking setae; interspaces, smooth. **Hypomera** microreticulate, apparently glabrous and impunctate. **Prosternum** longer on sides, strongly carinate at longitudinal middle; microreticulate and impunctate. **Prosternal process** 0.6x as long as prosternum at midline; bearing sparse slender setae; rounded apex. **Protibiae** almost 3.5x as long as maximum width; outer apical angle projected as an acute tooth. **Meso-and metatibiae** about 4.5x as long as maximum width. **Metaventrite** microreticulate, apparently impunctate; discrimen indiscernible. **Abdominal ventrites** microreticulate; length of ventrites (in mm, from base to apex at the longitudinal midline) as follows: 0.20, 0.07, 0.07, 0.07, 0.07; first abdominal ventrite tumid on center, bearing a circular sex patch with diameter of 0.05mm (Fig. 16f). **Male terminalia** (Fig. 16g–i): sternite VIII (Fig. 16g) membranous, wider than long, posterior edge bearing a broad emargination at middle forming two conical lobes with slender setae at apex (Fig. 16g);

tegmen (Fig. 16h) membranous, 3.5x as long as wide, base truncate, apical portion with an inward emargination forming two lobes, almost 0.35x the total length, straight inner edge forming a posterior angle (Fig. 16h); basal piece (Fig. 16h) membranous (not separated from tegmen during dissection and barely discernible in slide preparations); penis (Fig. 16i) about 4.5x as long as wide, shorter than tegmen, narrow at the base, apex slightly rounded with membranous sides.

Females. Without cephalic and pronotal projections (Fig. 17a). Anterocephalic edge sinuous, not projected. Pronotum barely microreticulate; anterior pronotal edge broadly rounded; lateral edges similar to those of males. Elytral punctation smoother than that of males. Gula trapezoidal, smaller than in males, about half as wide as head; submentum about one-third as wide as gula. First abdominal ventrite tumid, devoid of sex patch. **Female terminalia** (Fig. 17b–c) as follows: sternite VIII damaged during dissection; spiculum ventrale (Fig. 17b) bifurcated at base, also damaged during dissection, but assumed to be longer than paraprocts; paraprocts (Fig. 17c) longer than gonocoxites, baculi of paraprocts as long as baculi of proctiger; gonocoxites (Fig. 17c) transversely divided ventrally forming three folds at each side, the distal folds 1.4x longer than the precedents combined, with sclerotized inner edge next to vaginal aperture, apex bearing setae; gonostyli (Fig. 17c) about one-third the length of distal fold of gonocoxites, each with apex bearing a long seta.

Measurements and ratios. Males, measurements in mm (n = 2): TL 1.44–1.46 (1.45 ± 0.01), PL 0.64–0.64 (0.64 ± 0.00), PW 0.54–0.62 (0.58 ± 0.06), EL 0.80–0.82 (0.81 ± 0.01), EW 0.59–0.68 (0.64 ± 0.06), GD 0.43–0.55 (0.49 ± 0.08), PL/PW 1.03–1.19 (1.11 ± 0.11), EL/EW 1.18–1.39 (1.28 ± 0.15), EL/PL 1.25–1.28 (1.27 ± 0.02), GD/EW 0.63–0.93 (0.78 ± 0.21), TL/EW 2.12–2.47 (2.30 ± 0.25). Females, measurements in mm (n = 2): TL 1.27–1.28 (1.28 ± 0.01), PL 0.46–0.47 (0.47 ± 0.01), PW 0.59–0.62 (0.61 ± 0.02), EL 0.80–0.82 (0.81 ± 0.01), EW 0.68–0.70 (0.69 ± 0.01), GD 0.54–0.55 (0.55 ± 0.01), PL/PW 0.74–0.80 (0.77 ± 0.04), EL/EW 1.14–1.21 (1.17 ± 0.04), EL/PL 1.70–1.78 (1.74 ± 0.06), GD/EW 0.79–0.79 (0.79 ± 0.01), TL/EW 1.81–1.88 (1.85 ± 0.05).

Specimens examined. ♂ and ♀ (CELC) Honey Bee McCreary Co. KY. v-24-72 \ J. F. Lawrence Lot. [printed] 3360 [handwritten] \ ex Polyporus versicolor"; ♂ (CELC) "Santee St. Pk. Orangeburg Co. S.CAR.VII-3-65 \ J. F. Lawrence Lot. [printed] 1545 [handwritten]"; ♀ (CELC) "West Union Oconee Co., S.Car. [printed] v-22-67 [handwritten] \ J. F. Lawrence Lot [printed] 2522 [handwritten] \ C. Parsons Collector \ ex Lenzites betulina".

Host-fungi. There are occasional records in *Lenzites betulinus* (L.) Fr. (1) and *Trametes versicolor* (L.) Lloyd (1). Lawrence (1971) provided breeding records in the two

previously cited fungi, and has indicated *Fomitella supina* (Sw.) Murrill and *Stereum ostrea* (Blume & T. Nees) Fr. as occasional records.

DISCUSSION

The genus *Cis* has been redescribed by Lawrence (2016), but it still lacks an exclusive combination of characteristics. With a diversity of about 420 valid species, nearly 55% of all described Ciidae up to date, *Cis* stands up as black hole for all those species possessing antennae of 10 antennomeres, procoxae transverse or globular not extending beyond the level of the prosternal process, prosternal disc usually not longer than the prosternum process, prosternal process extending beyond middle of coxae (not tapering and not laminate), outer edge of protibiae devoid of spines, and males with secondary sexual features in head and/or pronotum. Therefore, the species included in *Cis* are basically the ones which have characteristics observed in most Ciini but do not fit in the other defined genera within the tribe. It shall be emphasized that the problem is not the number of species itself, but the fact that the definition of the genus *Cis* is based mostly on features that are shared with many other genera. That's why we suggest that a solution for *Cis* is first to look at *Cis boleti*, its type species, and aggregate the species with morphological and molecular evidence supporting a closest relationship. There is evidence that the *Cis boleti* species-group is monophyletic and that they form a clade with the also monophyletic *Cis fuscipes* species-group (Lopes-Andrade and Grebennikov 2015; Kobayashi and Sota 2021). There are other species-groups of *Cis* that resemble the *boleti* and *fuscipes* groups in body shape, dorsal punctation and vestiture, configuration of the prosternum and its posterior process, and morphology of the protibiae (e.g., the *bilamellatus*, *comptus*, *fagi*, *melliei*, *multidentatus*, *neserorum*). These are candidates to compose a new definition of *Cis* in a strict sense. But there are other species-groups that deserve attention and may not share a close phylogenetic history with *Cis boleti*, such as the *castaneus*, *pacificus* and *taurus* groups. Species in these three groups share a carinate prosternum, antennae of 10 antennomeres, and a dentate protibial apex. The first two were tentatively separate in the genus *Eridaulus* Thomson, 1863 by Lawrence (1965) and the later was considered a separate genus, *Macrocis* Reitter, 1878, until both were synonymized with *Cis* by Lawrence (1967, 1971). Interestingly, Lawrence (1967) mentioned that *Ceracis tricornis*, here transferred to *Sacis*, would be placed in the genus *Eridaulus* as he delimited in 1965, but he recognized the genus was not sufficiently homogeneous. Our suggestion is to

systematically choose exemplar species within each of these groups for molecular and morphological analyses aiming to produce evidence for a broad taxonomic revision of the genus *Cis*.

In the description of *Grossicis*, it was noted the great resemblance of the genus to the three species included in the *tricornis* species-group by that time (Antunes-Carvalho et al. 2012), here treated as *S. tricornis*, *U. delicatulus* and *U. miles*. However, by that time few specimens of the *tricornis* group were available to the authors (Lopes-Andrade pers. obs.). While describing *C. caipora* and *C. guarani*, here transferred to *Sacis*, we confirmed that these two and other described and undescribed *tricornis* species had features that could distinguish them from the other *Cis*, as the expanded apical maxillary palpomeres, carinate prosternum, narrowed prosternal process, and reduced female terminalia. The surprise came while reviewing all the species included in the group so far, while it showed that besides the most obvious resemblance, especially the cephalic and pronotal configurations of males, we were dealing with two distinct genera within the *tricornis* group.

The female terminalia of certain Ciidae, characterized by elongate paraprocts supported by two baculi, gonocoxites transversely divided into three or four conspicuous folds ventrally, conspicuous gonostyli, and a proctiger supported by two baculi with proctigeral opening terminating before the gonocoxites, can be inferred as the ancestral condition. This morphology is observed in various other tenebrionoid families, such as Tenebrionidae (e.g. Aloquio and Lopes-Andrade 2017; Aloquio et al. 2019). Within Ciidae, this fundamental morphology is present in species of the genera *Cis*, *Ennearthron*, *Falsocis* Pic, 1916, *Ferecis* Lopes-Andrade, 2024, *Orthocis* Casey, 1898, *Porculus* Lawrence, 1987, *Strigocis* Dury, 1917, and others (Lopes-Andrade 2007; Lawrence and Lopes-Andrade 2010; Lawrence 2016; Rosa-Oliveira and Lopes-Andrade 2023; Lopes-Andrade 2024a; Rosa-Oliveira et al. 2024). However, this structure has undergone significant reduction and modification in several lineages. Examples include certain Ciini genera, such as *Ceracis*, *Malacocis* Gorham, 1886, *Grossicis*, *Paraxestocis* Miyatake, 1954, and *Sulcacis* Dury, 1917 (Antunes-Carvalho et al. 2012; Araujo and Lopes-Andrade 2024; Lopes-Andrade 2024b; Souza-Gonçalves and Lopes-Andrade 2024, 2025), Orophiini genera, including *Octotemnus* Mellié, 1847, *Paratrichapus* Scott, 1926, *Ropalodontus* Mellié, 1847 and *Xylographus* Mellié, 1847 (Lawrence and Lopes-Andrade 2010), and in Xylographellinae genera (Lopes-Andrade 2008). Notably, similar trends in the reduction and modification of female terminalia are also observed within Tenebrionidae (e.g. Aloquio and Lopes-Andrade 2016; 2019).

In *Sacis* species, the female terminalia are reduced and modified similarly to *Grossicis*. In contrast, species of *Urupecis* retain the basic tenebrionoid type of female terminalia. Such reductions and modifications in female terminalia within Ciidae likely evolved independently multiple times as adaptations for oviposition in different substrates following host fungi shifts. It is hypothesized that longer, more conservative female terminalia are better suited for egg-laying in deep tubular structures, such as the pores of thick hymenophores (see Rosa-Oliveira et al. 2024). Conversely, reduced terminalia may facilitate egg-laying in shallow tubes or holes in gallery walls carved by ciids within basidiomes. Comparative studies of the oviposition behavior of ciid species with differing terminalia types are needed to test this hypothesis.

The elytral sutural flange diverging near the apex in *Urupecis* is also observed in *Ferecis*, *Grossicis*, *Orthocis* and most *Strigocis* (Antunes-Carvalho et al. 2012; Lopes-Andrade 2011, 2024a; Lopes-Andrade et al 2010). While an interesting taxonomic character, it remains underexplored within the family (Lopes-Andrade 2024a). Additionally, as far as can be determined, *Grossicis* and *Sacis* are the only Ciidae genera with enlarged apical maxillary palpomere with sensilla along the apical edge.

Urupecis nasicornis was previously included in the *Cis tricornis* species-group by Lopes-Andrade and Sandoval-Gómez (2017). It possesses a more oval body, lacks a distinctly produced protibial apex forming a tooth, and most males lack the prominent anterior pronotal projections seen in other congeners. However, the largest males may develop anterior pronotal horns (Fig. 13d). At this time, there is no justification for placing *U. nasicornis* in a separate genus.

Most host fungi records for *Sacis* and *Urupecis* species involve basidiomes of *Trametes* species and other fungi within the *Trametes* ciid host-use group (sensu Orledge and Reynolds 2005). Field collections emphasizing *Trametes* and *Trametes*-like basidiomes can significantly enhance the discovery of *Sacis* and *Urupecis* species, as evidenced by undescribed Neotropical species in hand. These fungi, often termed “trametoid fungi”, are defined by their annual or persistent, sessile to effused-reflexed basidiomes with coriaceous to suberose consistency and tubular hymenophore (Zmitrovich 2018). In the Neotropical region, trametoid basidiomes typically host species of the *comptus*, *pallidus*, and *vitulus* species-groups of *Cis*, the *Ceracis furcifer* species-group, and the invasive *Cis chinensis* Lawrence, 1991, *Cis caramelo* Rosa-Oliveira, Borlini et Lopes-Andrade, 2024, and *Ennearthron victori* Lopes-Andrade et Zacaro, 2003 (Almeida and Lopes-Andrade 2004; Lopes-Andrade 2008; Graf-Peters et al. 2011; Araujo et al. 2015; Pecci-Maddalena and Lopes-Andrade 2017;

Borlini et al. 2018). Occasionally, these fungi also host other species-groups of *Ceracis* and *Cis* or even other genera of Ciidae (Rosa-Oliveira and Lopes-Andrade 2024). Interestingly, they also harbor species of *Grossicis*, a genus morphologically similar to *Sacis* and *Urupecis* (Antunes-Carvalho et al. 2012). Undescribed Neotropical species of the *Cis taurus* species-group are also associated with trametoid fungi (C. Lopes-Andrade pers. obs.).

CONCLUSIONS

The species within the *Cis tricornis* group were previously considered somewhat related to the genus *Grossicis*, although they did not conform to its morphological limits. The group was treated as a morphologically homogeneous assemblage. However, our investigation revealed significant heterogeneity within the *tricornis* group, particularly in features such as the shape of the apical maxillary palpomeres, prosternum, metaventrite, and female terminalia. These morphological differences warranted the establishment of two new genera, *Sacis* and *Urupecis*, effectively discontinuing the use of the *tricornis* as a taxonomic tool. We believe that future discoveries of American Ciidae species, which might have previously been placed in the *tricornis* group, can now be more accurately assigned to the genera *Grossicis*, *Sacis*, or *Urupecis*, each defined by clear morphological boundaries. This study represents another step forward in addressing the taxonomic challenges of the *Cis* genus and provides valuable insights for subsequent efforts to refine and restructure the genus.

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FIGURE CAPTIONS

Figure 1. Male holotype of *Sacis guarani* (Borlini & Lopes-Andrade, 2023) **comb. nov.**, the type-species of *Sacis* Borlini & Lopes-Andrade **gen. nov.**, from Canela, state of Rio Grande do Sul, Brazil, in dorsal (a) lateral (b), ventral (c) view and labels (d). Dissected parts (e–j) of

male from the same locality, showing antenna (e), labial palpi (f), maxilla (g) and pro- (h), meso- (i) and metatibiae (j). Scale bars: 0.1 mm (e, f–g, h–j), 0.5 mm (a–c).

Figure 2. Males abdominal ventrites and male genitalia of *Sacis guarani* (Borlini & Lopes-Andrade, 2023) **comb. nov.** from Canela, state of Rio Grande do Sul, Brazil (a–d). Abdominal ventrites showing a big sex patch (a) and a small sex pacth (b). Male genitalia showing tegmen (c) and penis (d). Female of *Sacis guarani* (Borlini & Lopes-Andrade, 2023) **comb. nov.** from the same locality, in dorsal view (e) and genitalia (f–g) showing sternite VIII and spiculum ventrale (f) and ovipositor (g). Scale bars: 0.1 mm (a–b, c–d, f–g), 0.5 mm (e). Abbreviations: VIII-st = sternite VIII, s.v = spiculum ventrale, b.pp = baculi of paraproct, b.pt = baculi of proctiger, gc = gonocoxite, gs = gonostyli.

Figure 3. Geographic distribution of species of *Sacis* Borlini & Lopes-Andrade **gen. nov.** in Central and South America. The species are labeled as follows: *S. tricornis* (Gorham, 1883) in red, *S. caipora* (Borlini & Lopes-Andrade, 2023) in green, *S. amazonicus* (Lopes-Andrade & Sandoval-Gómez, 2017) in blue and *S. guarani* (Borlini & Lopes-Andrade, 2023) in yellow.

Figure 4. Lectotype of *Sacis tricornis* (Gorham, 1883) **comb. nov.** here designated from San Juan, Vera Paz (Mexico) in dorsal view (a) with black setae showing the maxillary palp with expanded apex, and labels (b). The images were courtesy of Dmitry Telnov from Natural History Museum, London, UK. Scale bar: absent.

Figure 5. Male of *Sacis tricornis* (Gorham, 1883) **comb. nov.** from Coatepec, Veracruz (Mexico) in dorsal (a), lateral (b) and ventral view (c). Male from the same locality in dorsal view (d), showing variation in size and horns. Frontal view (e–f), showing the variation in the horns. Rear view (g) showing the sutural flange of elytra with white setae. In the lateral view (b) the red lines are indicating the shortest distance between the meso- and metacoxae (ɑ) and the longest lateral length of the metaventrite (β). Scale bars: 0.1 mm (e–g), 0.5 mm (a–d).

Figure 6. Dissected parts (a–f) of male of *Sacis tricornis* (Gorham, 1883) **comb. nov.** from Coatepec, Veracruz (Mexico). Antennae (a), labial palpi (b), maxilla with maxillary palp (c), and part of legs showing pro- (d), meso- (e) and metatibiae (f). Female of *Sacis tricornis* (Gorham, 1883) **comb. nov.** from the same locality in dorsal view (g) and female abdominal terminalia showing sternite VIII and spiculum ventrale (h) and ovipositor (i). Scale bars: 0.1 mm (a, b–c, d–f, h–i), 0.5 mm (g). Abbreviations: st = sternite, s.v = spiculum ventrale, b.pp = baculi of paraproct, b.pt = baculi of proctiger, gc = gonocoxite, gs = gonostyli.

Figure 7. Abdominal ventrites and genitalia (a, g–i) of male of *Sacis tricornis* (Gorham, 1883) **comb. nov.** from Coatepec, Veracruz (Mexico). Abdominal ventrites showing a small sex patch (a) on the first ventrite, stretched tegmen (g), fresh tegmen (h), and penis (i). Abdominal terminalia of another male from the same locality showing VIII sternite (b), basal piece (c), part of tegmen (d), tegmen (e), and penis (f). Scale bars: 0.1 mm (a, b–f, g–i).

Figure 8. Male of *Urupecis delicatulus* (Jacquelin-Duval, 1857) **comb. nov.** from Falmouth, Trelawny (Jamaica) in dorsal (a), lateral (b) and ventral view (c). Male from Gamboa, Canal Zone (Panama) in dorsal view (d), showing variation in size of body and horns. Frontal view (e–f) showing the variation in the horns. Rear view (g) showing the sutural flange of elytra with white setae. Scale bars: 0.1 mm (e–g), 0.5 mm (a–d).

Figure 9. Dissected parts of males of *Urupecis delicatulus* (Jacquelin-Duval, 1857) **comb. nov.** from Gamboa (a–g, i–k) and from Madden Dan (h, l), both from Panama. Antennae (a), labial palpi (b) and maxilla with maxillary palp (c). Part of legs showing pro- (d), meso- (e) and metatibiae (f). Part of males abdominal ventrites (g–h) showing a large and marginated sext patch (g) and the last showing a small and marginated sex patch (h) on the first ventrite. Abdominal terminalia (i–k) with sternite VIII (i), tegmen (j) and penis (k). Tegmen with attached basal piece (l). Scale bars: 0.1 mm (a, b–c, d–f, g–h, i–l).

Figure 10. Female of *Urupecis delicatulus* (Jacquelin-Duval, 1857) **comb. nov.** from Falmouth, Trelawny (Jamaica) in dorsal view (a). Abdominal terminalia of females of *Urupecis delicatulus* (Jacquelin-Duval, 1857) **comb. nov.** (b–c), the whole spiculum ventrale of female of from Gamboa (Panama) (b), and abdominal terminalia of female from Barro Colorado (Panama) (c–d) showing the spiculum ventrale damaged in dissection and sternite VIII (c), and the ovipositor (d). Scale bars: 0.1 mm (b–d), 0.5 mm (a). Abbreviations: st = sternite, s.v = spiculum ventrale, b.pp = baculi of paraproct, b.pt = baculi of proctiger, gc = gonocoxite, gs = gonostyli.

Figure 11. Geographic distribution of species of *Urupecis* Borlini & Lopes-Andrade **gen. nov.** in South, Central and North America. The species are labeled as follows: *U. miles* (Casey, 1898) in green (frontiers), *U. delicatulus* (Jacquelin-Duval, 1857) in blue and *U. nasicornis* (Reitter, 1878) in red.

Figure 12. Lectotype of *Urupecis nasicornis* (Reitter, 1878) **comb. nov.** here designated from La Luzera (Colombia) in dorsal (a), lateral (b), ventral view (c), and labels (d). In the lateral view (b) the red lines are indicating the shortest distance between the meso- and metacoxae (ϑ) and the longest lateral length of the metaventrite (β). Scale bar: 0.5 mm (a–c).

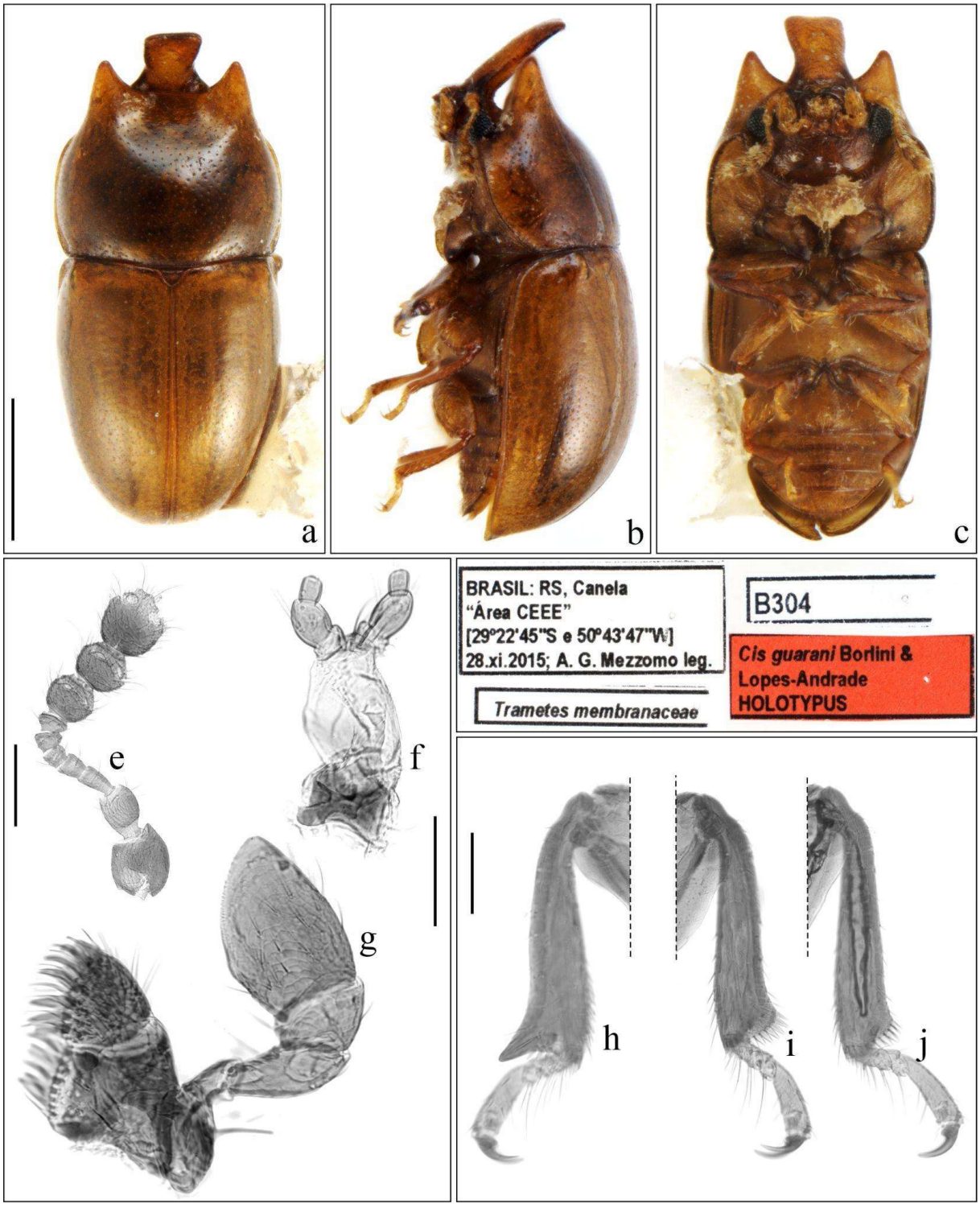
Figure 13. Male of *Urupecis nasicornis* (Reitter, 1878) **comb. nov.** from Arcabuco, Boyacá (Colombia) lacking pronotal horns in dorsal (a), lateral (b), ventral (c), frontal (f) and rear view (g) . Male of *Urupecis nasicornis* (Reitter, 1878) **comb. nov.** with pronotal horns from the same locality in dorsal (d) and frontal view (e). Frontal view (e–f) showing the variation in the horns. Rear view (g) showing the sutural flange of elytra with white setae. Scale bars: 0.5 mm (a–d), 0.1 mm (e–g).

Figure 14. Dissected parts of male of *Urupecis nasicornis* (Reitter, 1878) **comb. nov.** from Arcabuco, Boyacá (Colombia) (a–f, g, i). Antennae (a), labial palpi (b) and maxilla with maxillary palp (c). Part of legs showing pro- (d), with black setae indicating the not toothed apex, meso- (e) and metatibiae (f). Abdominal terminalia of male of *Urupecis nasicornis* (Reitter, 1878) **comb. nov.** from the same locality (h, j–k). Abdominal ventrites showing a large sex patch (g) on the first ventrite and abdominal terminalia showing VIII sternite (h), basal piece (i), tegmen (j) and penis (k). Scale bars: 0.1 mm (a, b–c, d–f, g, h–k).

Figure 15. Female of *Urupecis nasicornis* (Reitter, 1878) **comb. nov.** from Arcabuco, Boyacá (Colombia) in dorsal view (a) and abdominal terminalia of female from the same locality (b–c), showing the sternite VIII and spiculum ventrale in lateral (b) and dorsal view (c), and the ovipositor (d). Scale bars: 0.1 mm (b–d), 0.5 mm (a). Abbreviations: st = sternite, sv = spiculum ventrale, b.pp = baculi of paraproct, b.pt = baculi of proctiger, gc = gonocoxite, gs = gonostyli.

Figure 16. Male of *Urupecis miles* (Casey, 1898) **comb. nov.** from Honey Bee, Kentucky (USA) in dorsal (a), lateral (b), ventral (c), frontal (d), and female from the same locality in rear view (e) showing the sutural flange of elytra with white setae. Abdominal ventrites of male showing a circular sex patch (f) on the first ventrite. Male abdominal terminalia showing sternite VIII (g), tegmen with basal piece attached (h), and penis (i). Scale bars: 0.1 mm (d–e, f, g–i), 0.5 mm (a–c).

Figure 17. Female of *Urupecis miles* (Casey, 1898) **comb. nov.** from Honey Bee, Kentucky (USA) in dorsal view (a) and abdominal terminalia of female from West Union, South Carolina (USA) showing the spiculum ventrale damaged in dissection (b), and the ovipositor (c). Scale bars: 0.1 mm (b–c), 0.5 mm (a). Abbreviations: s.v = spiculum ventrale, b.pp = baculi of paraproct, b.pt = baculi of proctiger, gc = gonocoxite, gs = gonostyli.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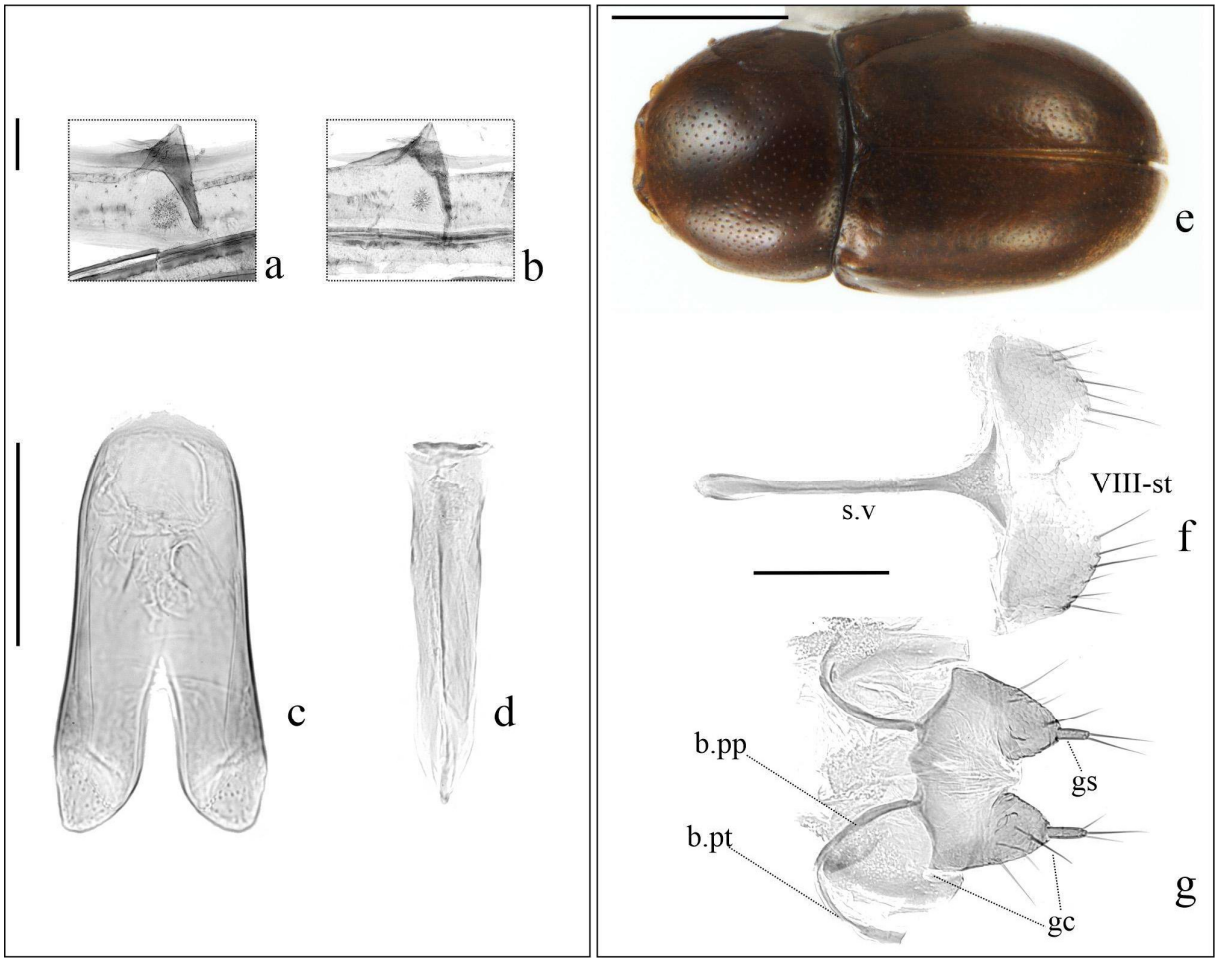
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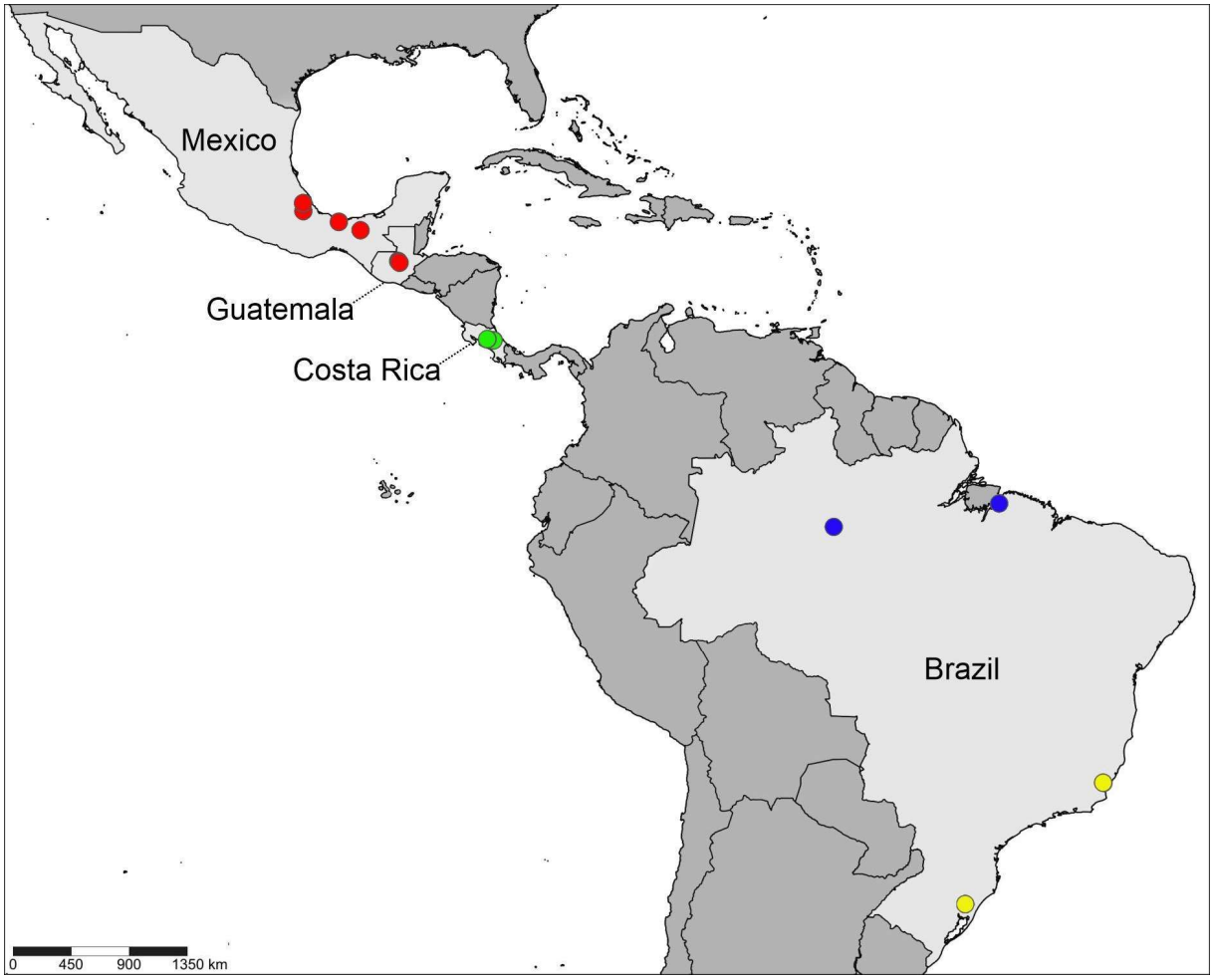
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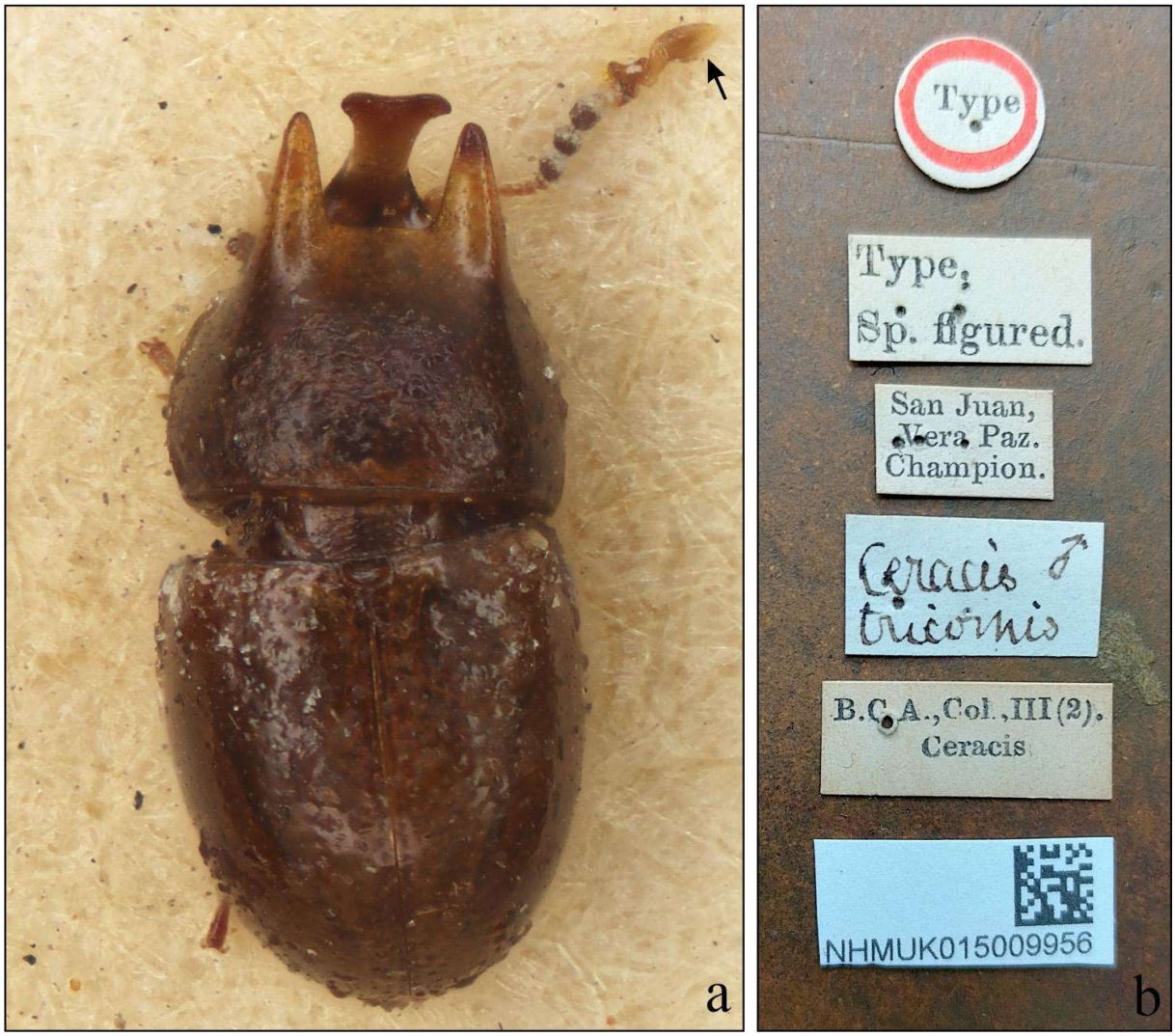
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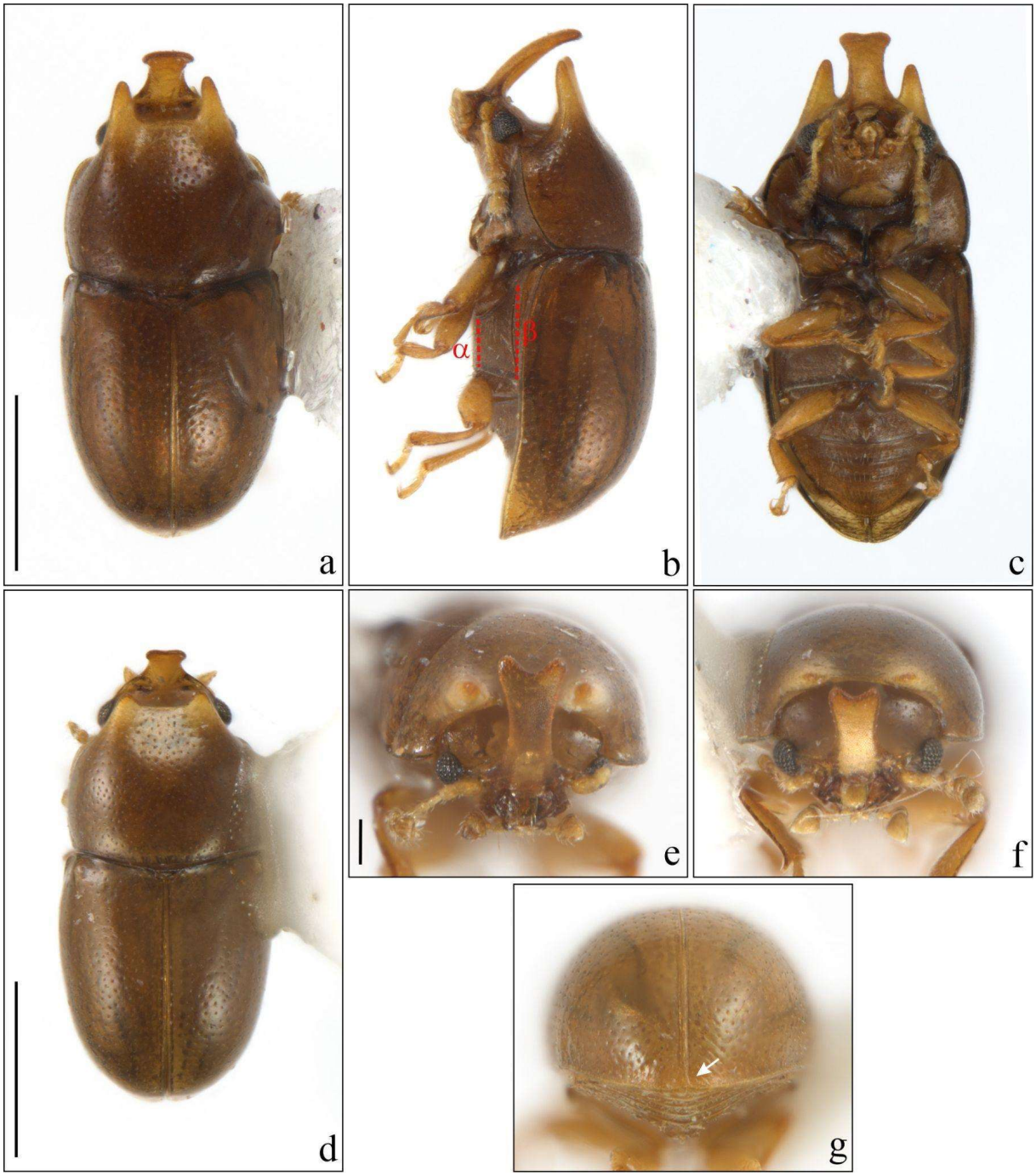
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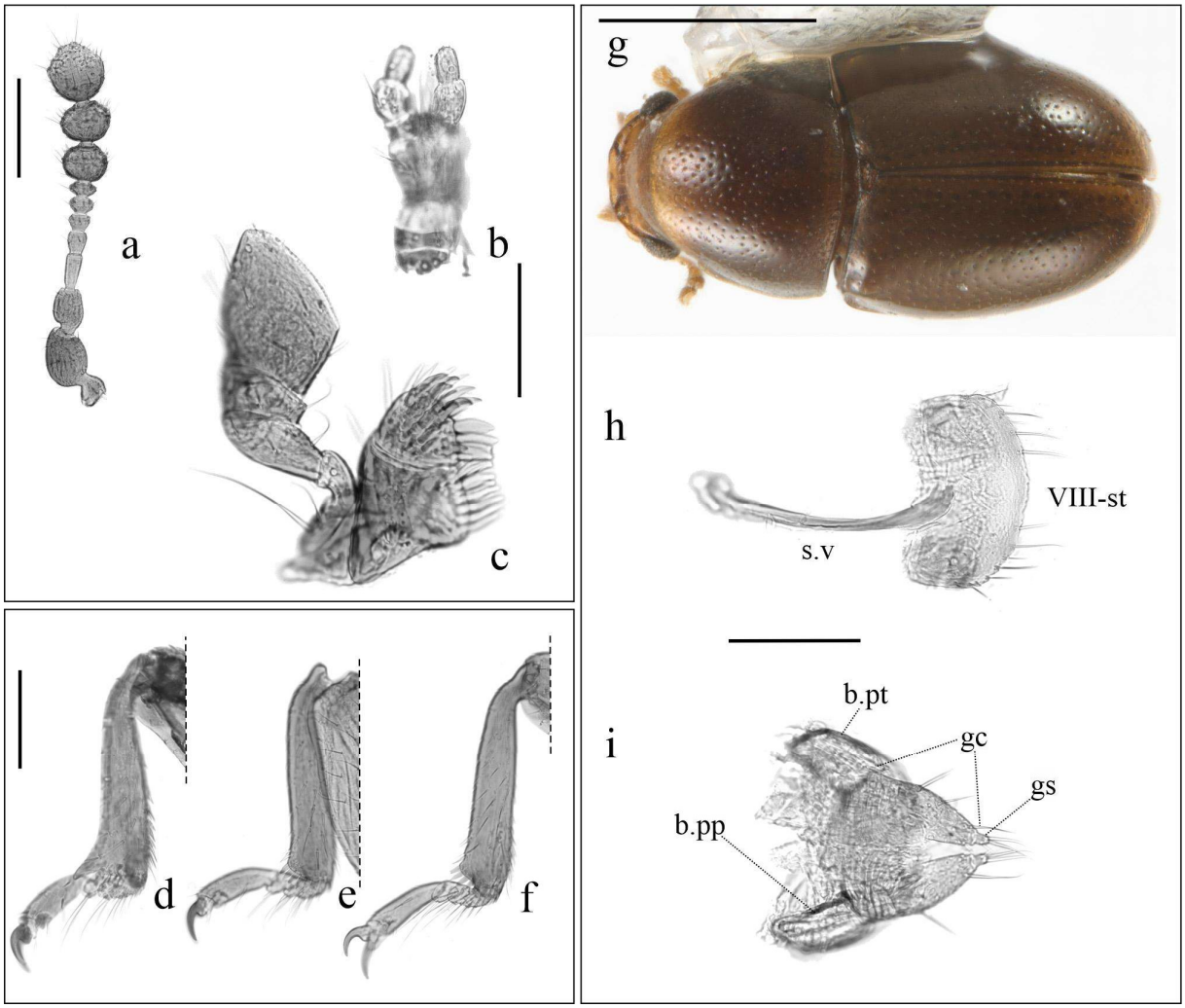
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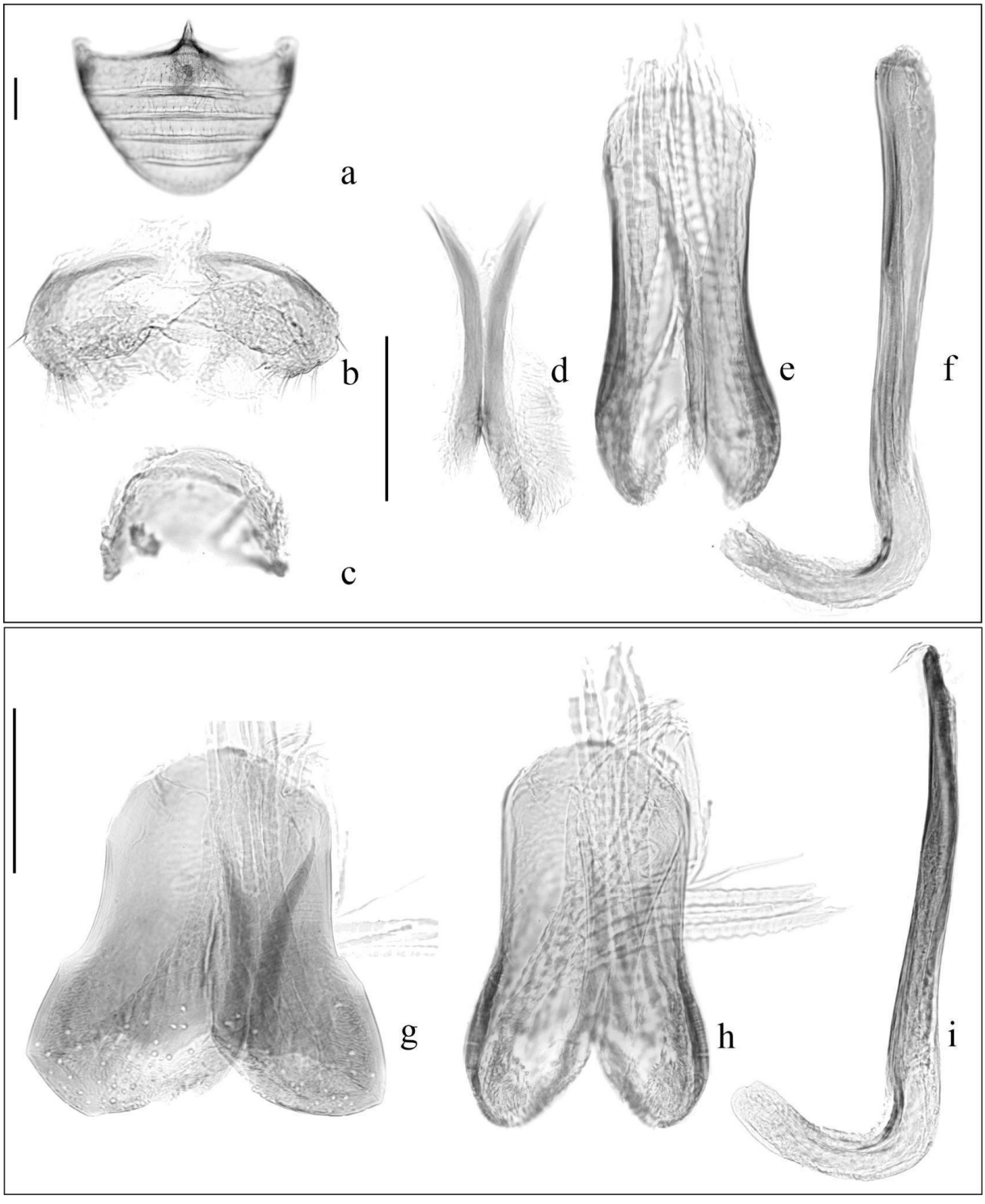
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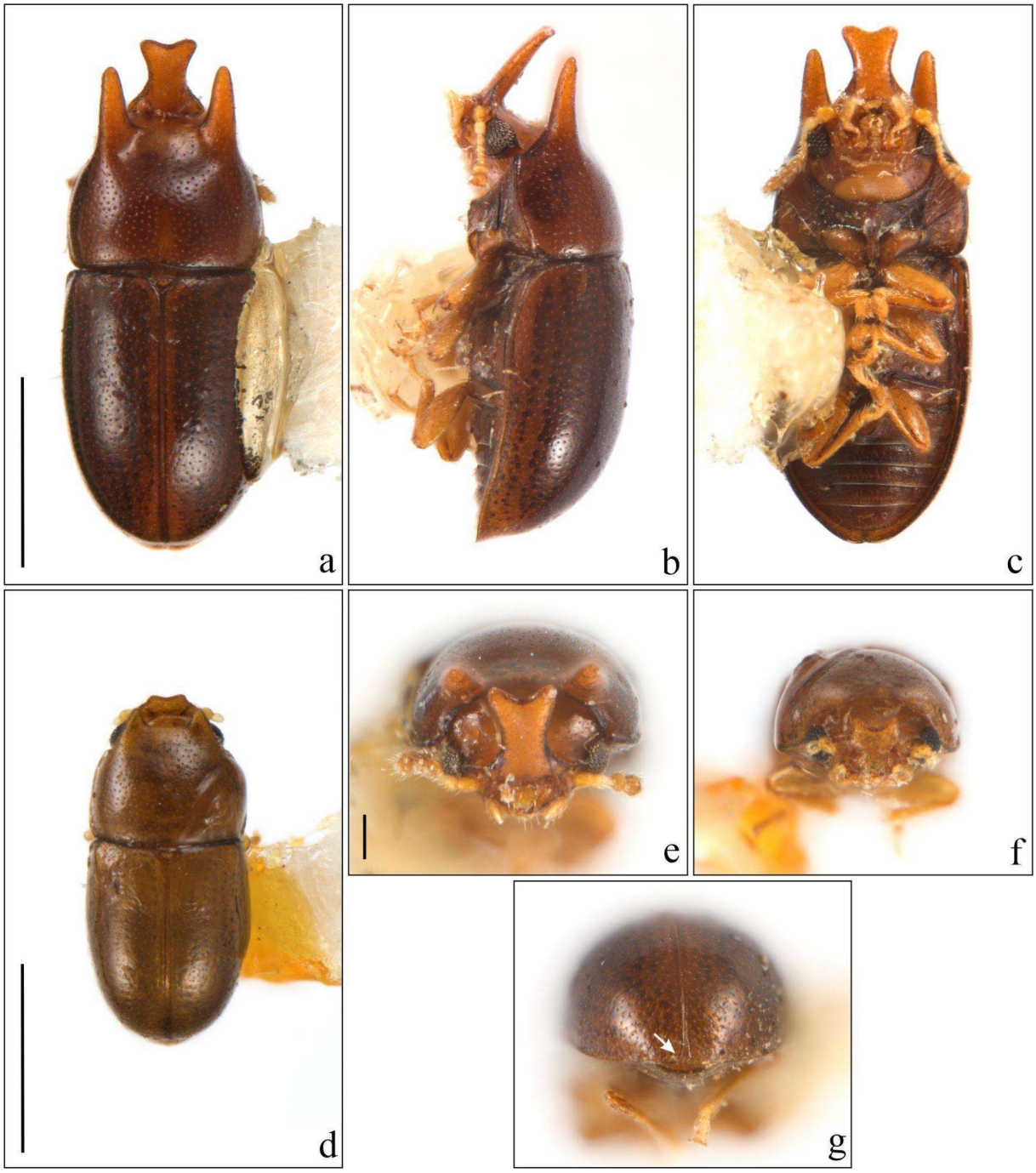
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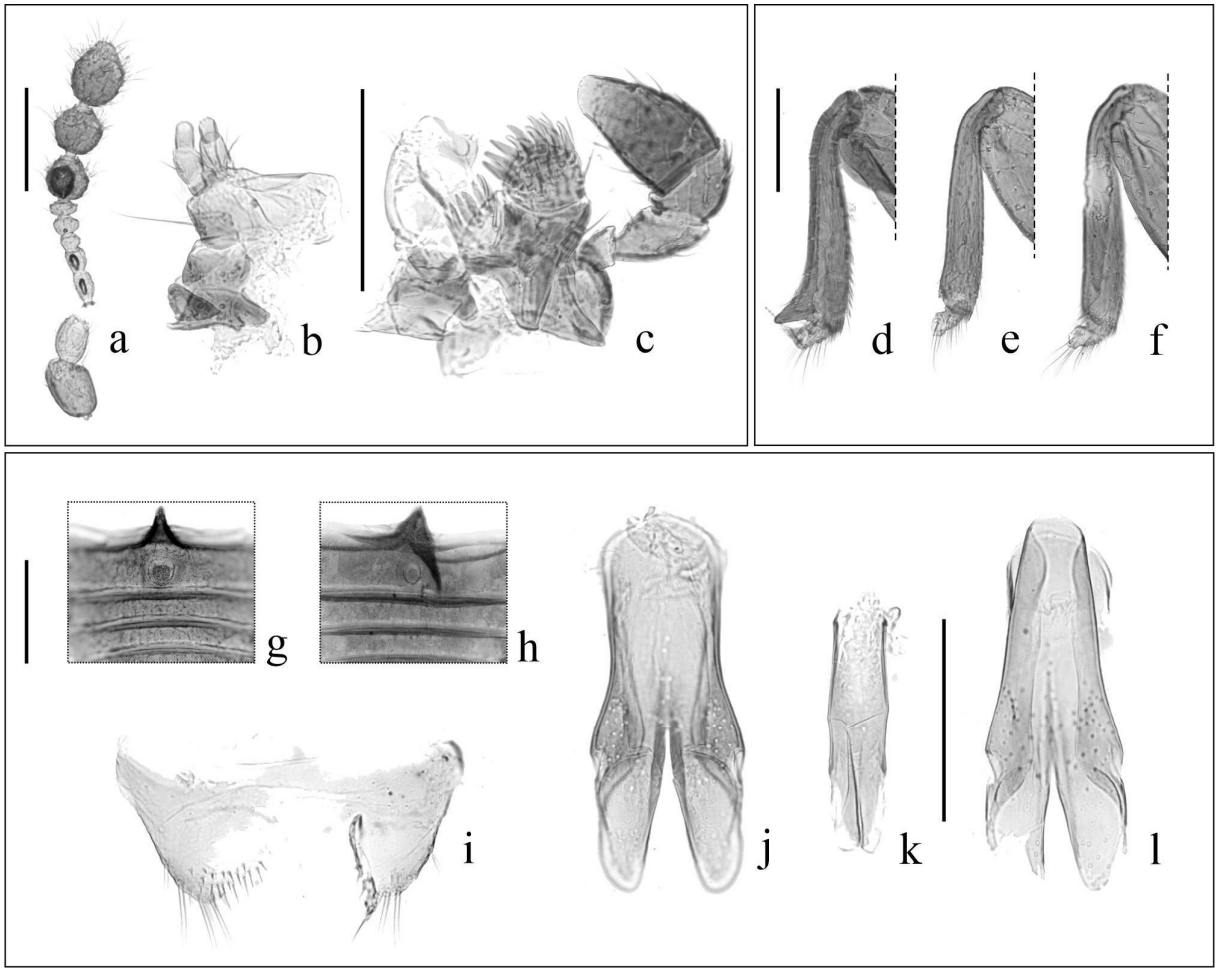
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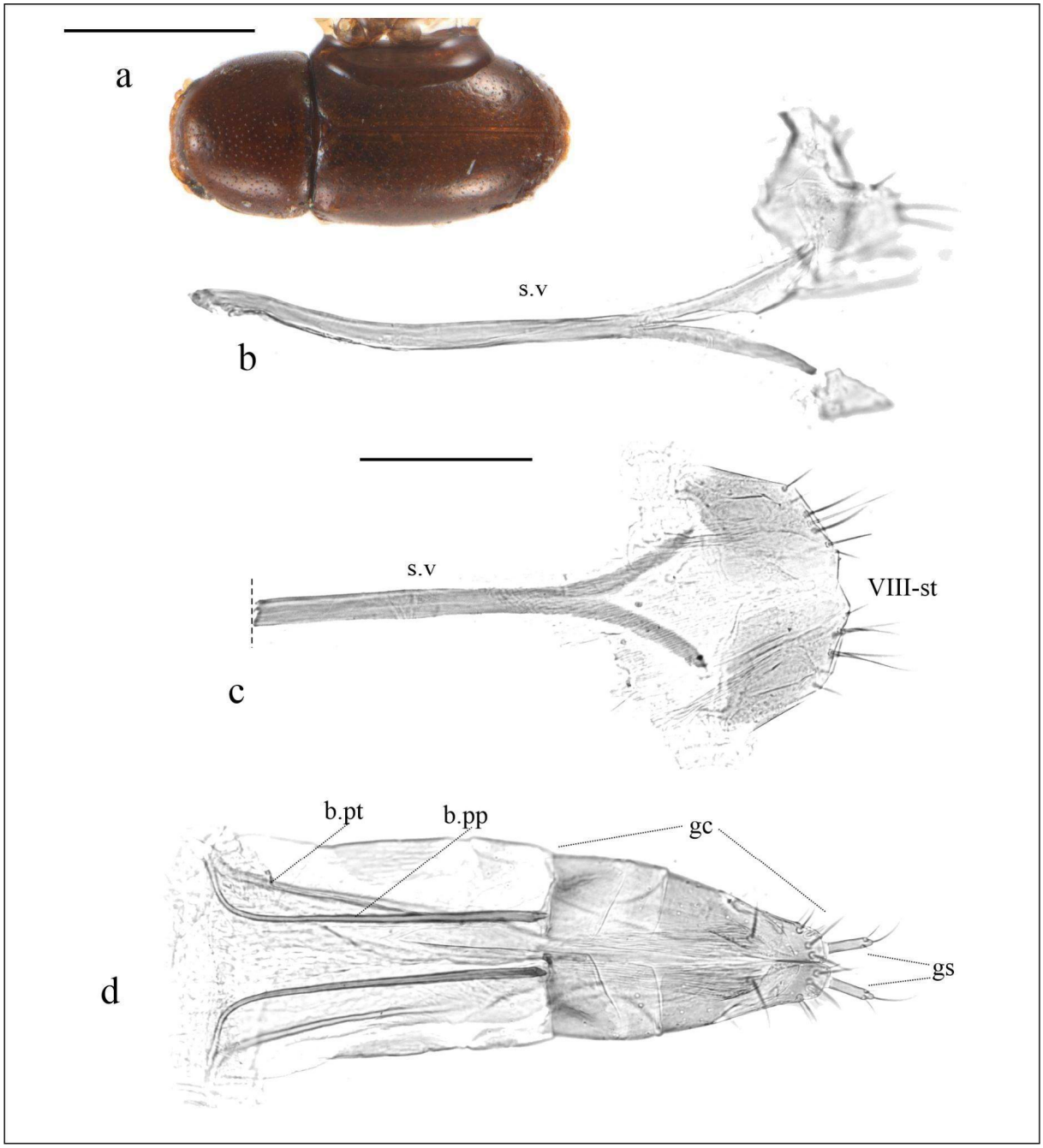
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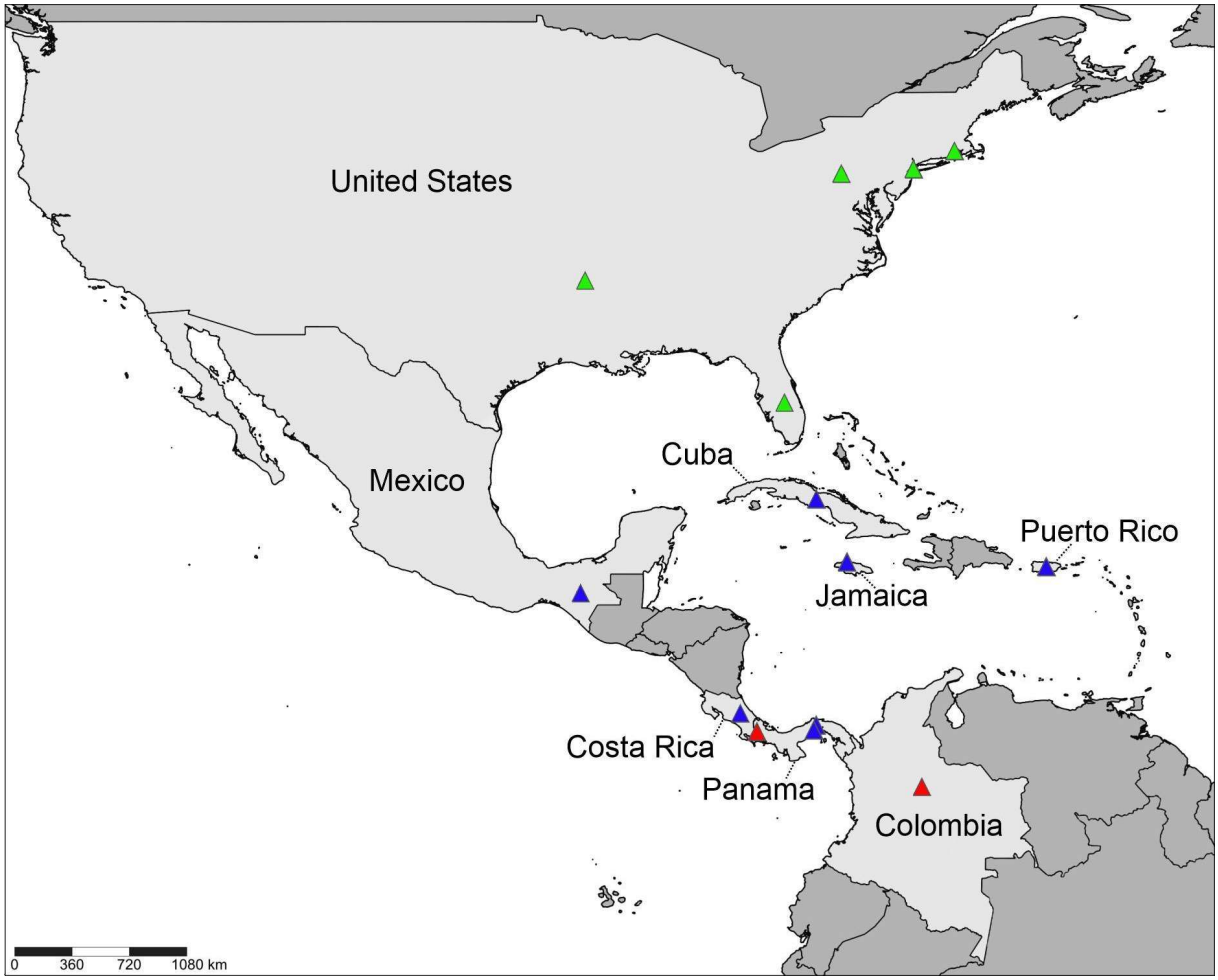
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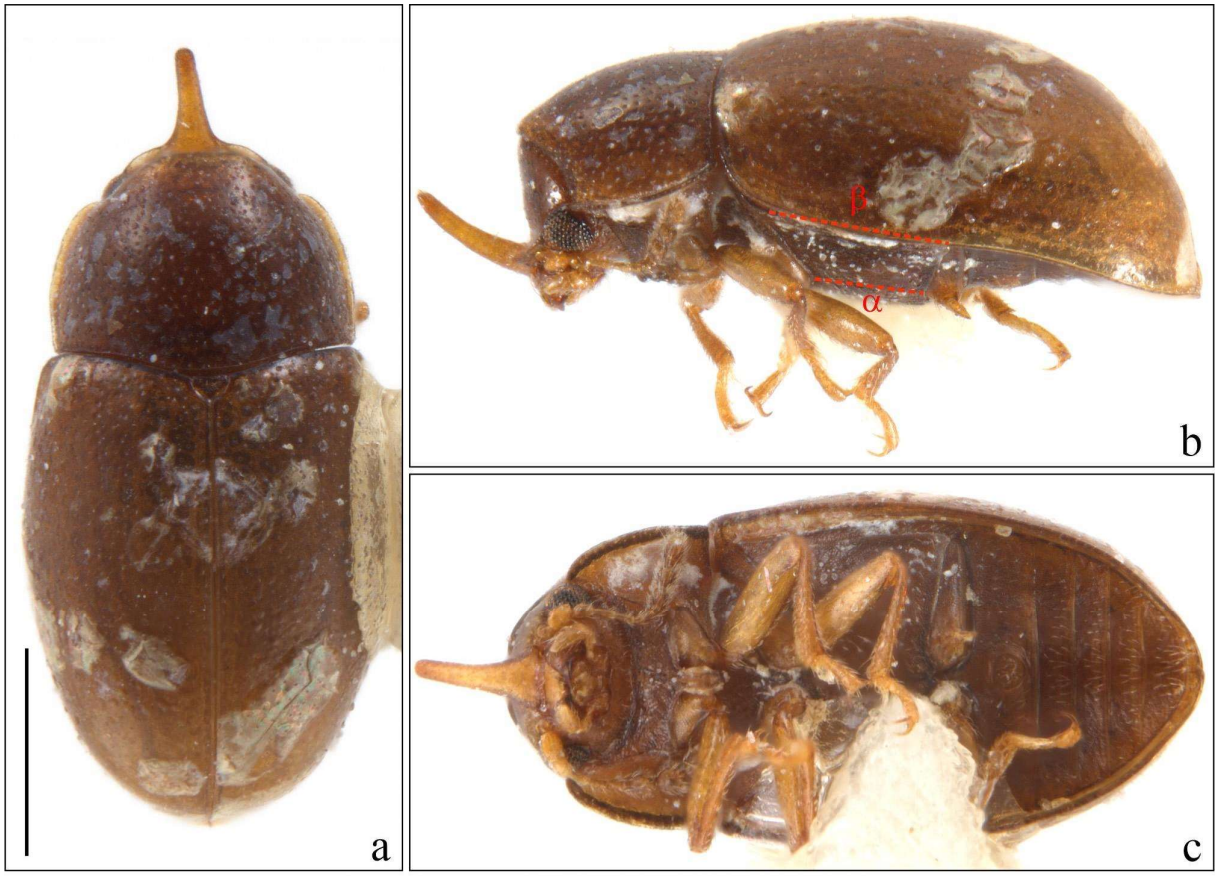
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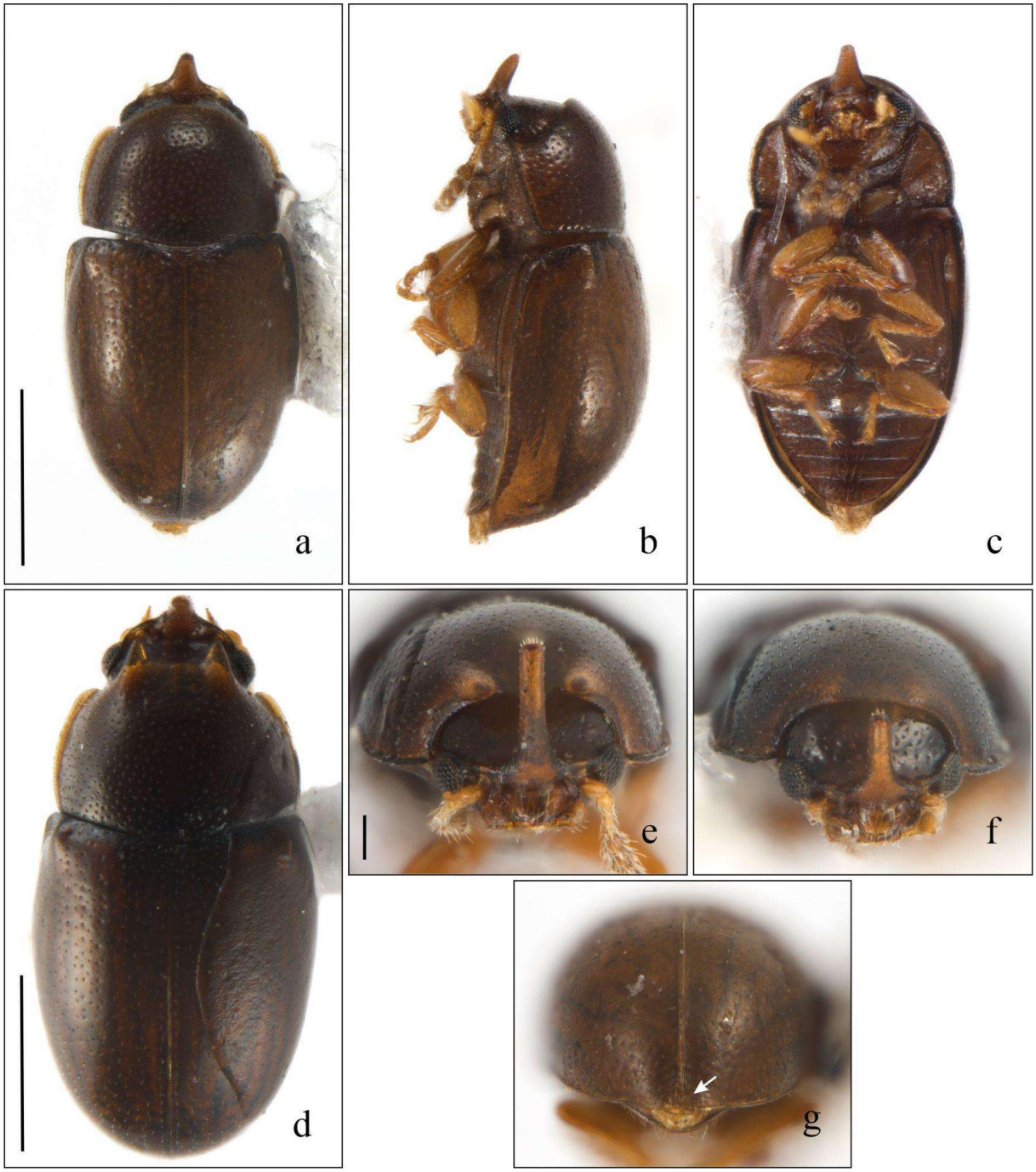
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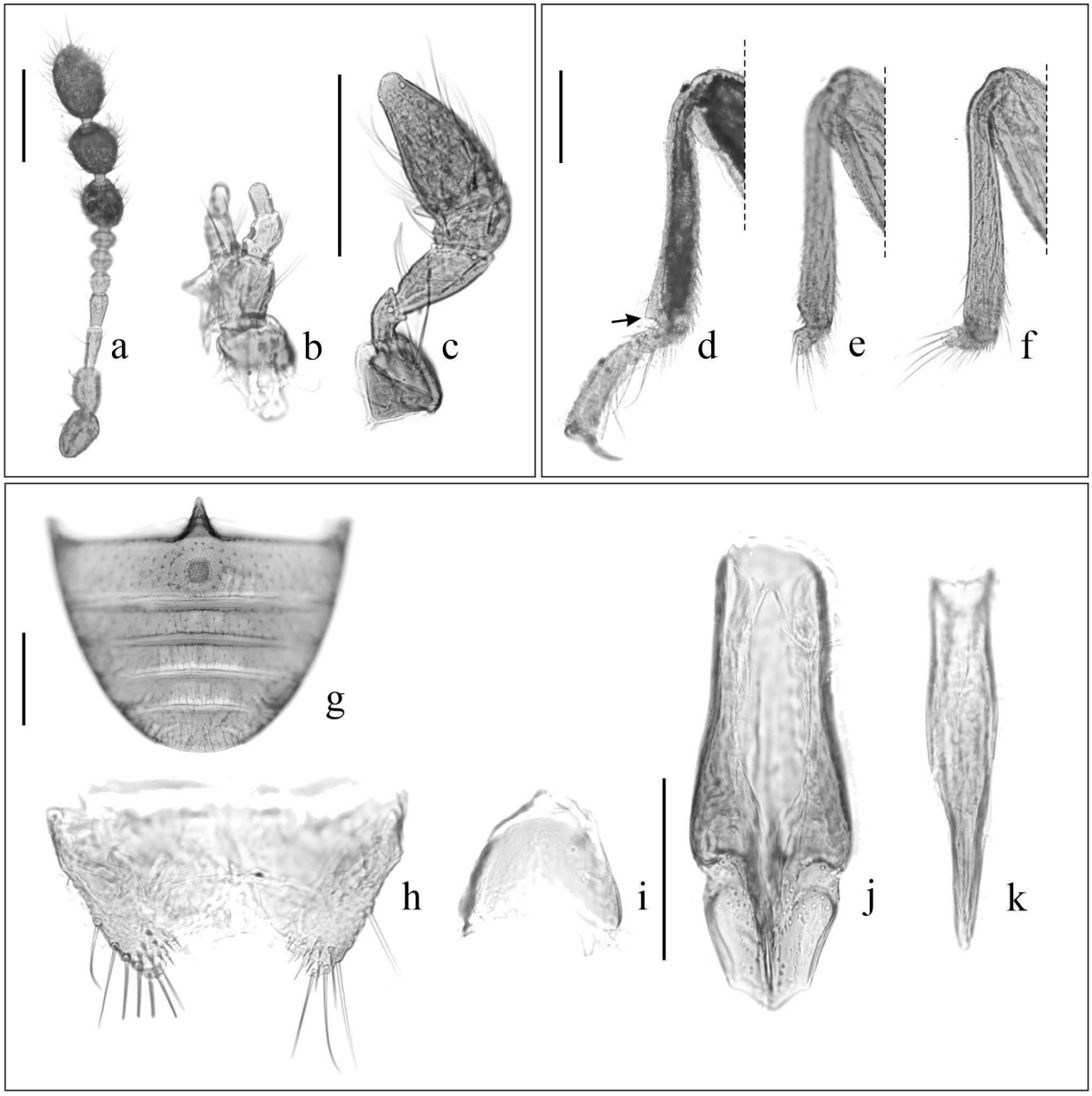
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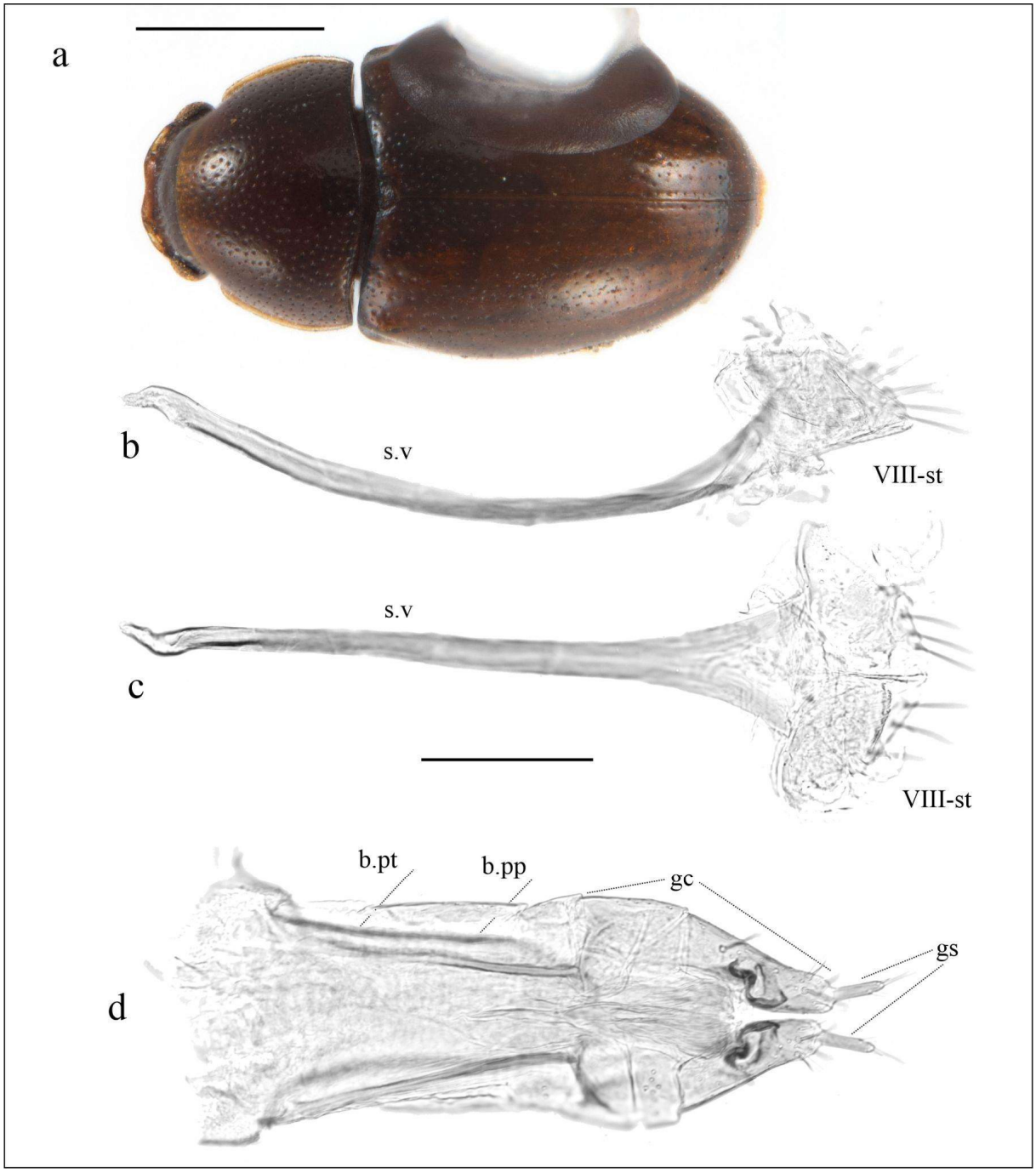
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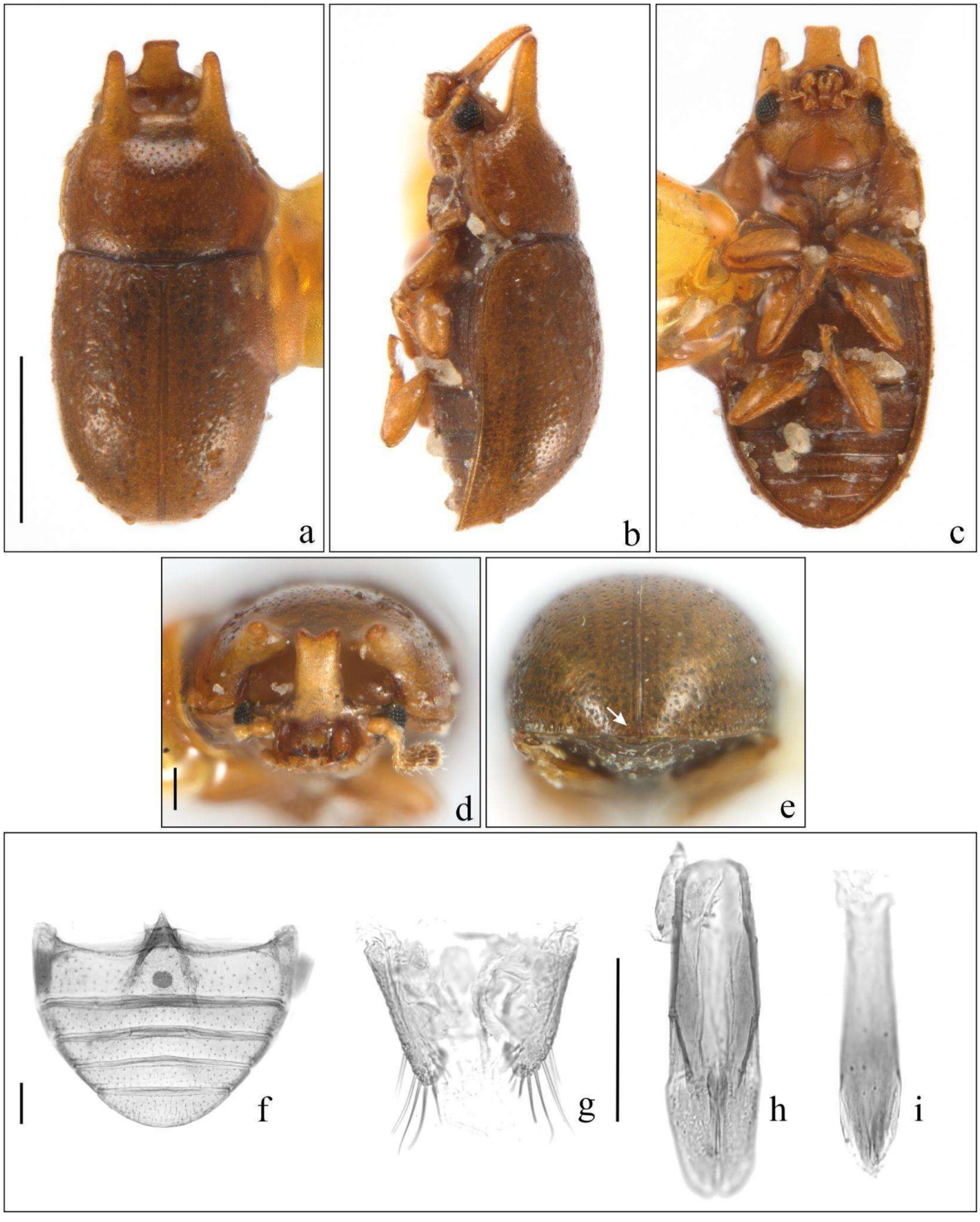
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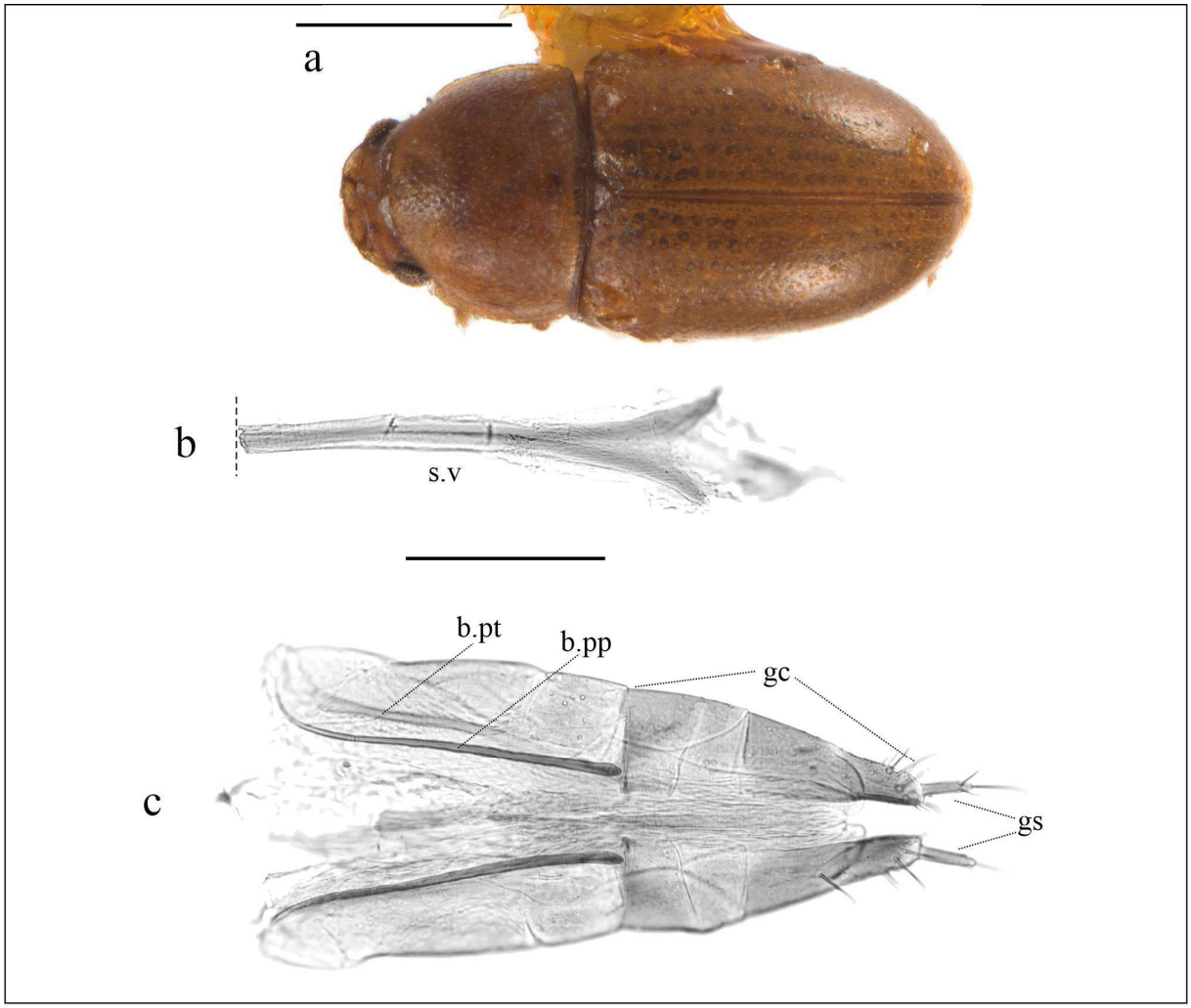
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Table 1: Summary of the diagnostic morphological characteristics of genera *Grossicis*, *Sacis* gen. nov. and *Urupecis* gen. nov..

Character	***Grossicis* Antunes-Carvalho, Sandoval-Gómez & Lopes-Andrade**	***Sacis* Borlini & Lopes-Andrade gen. nov.**	***Urupecis* Borlini & Lopes-Andrade gen. nov.**
Body, shape	oblong	oblong	oval to elongate
Apical maxillary palpomere	expanded apically	expanded apically	pyriform
Apical maxillary palpomere, sensilla	along the apical margin	along the apical margin	restricted to the apical tip
Prosternal process, level in relation to the prosternal disc	beyond the level	beyond the level	at the same level
Prosternal process, width	very narrow (but not laminate)	very narrow (but not laminate)	narrow, parallel
Elytra sutural flange near apex	diverging	not diverging	diverging
Metaventrite, shortest distance between meso- and metacoxae	long; 0.5–0.6x the longest lateral length of the metaventrite	short; 0.4–0.5x the longest lateral length of the metaventrite	long; about 0.6x the longest lateral length of the metaventrite
Female terminalia	short	short	long
Length of paraprocts in relation to gonocoxites combined	shorter than gonocoxites	shorter than gonocoxites; longer in *S. caipora* comb. nov.	longer than gonocoxites
Number of transversal divisions of gonocoxites ventrally	two folds	two folds or not divided	three folds
Gonostyli	long, longer than large	short (as wide as long in *S. amazonicus* comb. nov. and *S. tricornis* comb. nov.) or longer than large	long, longer than large
Length of penis in relation to tegmen	shorter than tegmen	conspicuously longer than tegmen in *S. amazonicus* comb. nov. and *S. tricornis* comb. nov.; or shorter than tegmen	shorter than tegmen

CAPÍTULO 3: Novas espécies de *Urupecis* Borlini & Lopes-Andrade da Floresta Atlântica Brasileira

(Manuscrito a ser submetido para publicação na revista científica Neotropical Entomology. A apresentação deste manuscrito como capítulo de tese não é considerada válida de acordo com o Código Internacional de Nomenclatura Zoológica – ICZN)

New species of *Urupecis* Borlini & Lopes-Andrade (Coleoptera: Ciidae) from the Brazilian Atlantic Forest

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Abstract

Urupecis Borlini & Lopes-Andrade i.l. is a recently described genus of Ciidae, comprising part of the species previously included in the *Cis tricornis* species-group. The genus initially comprised *U. delicatulus* (Jacquelin-Duval, 1857) (type-species), *U. miles* (Casey, 1898) and *U. nasicornis* (Reitter, 1878). The only Nearctic species is *U. miles*, found in the eastern United States. In the Neotropical region, *U. delicatulus* is widely distributed across Central America, while *U. nasicornis* has been recorded in both Central and South America. Here, we described five additional species of *Urupecis* from the Neotropical region, specifically from the Atlantic Forest in Brazil. These new species are: *U. paradisus* **sp. nov.** and *U. iris* **sp. nov.**, from the state of Minas Gerais; *U. caissara* **sp. nov.** and *U. euthynus* **sp. nov.**, from São Paulo; and *U. rufulus* **sp. nov.** from São Paulo and Santa Catarina.

Keywords Ciinae, minute-beetles, taxonomy, biodiversity, brazilian fauna.

Introduction

Urupecis Borlini and Lopes-Andrade i.l. is a recently described genus of Ciidae. Species of *Urupecis*, together with those of *Sacis* Borlini & Lopes-Andrade i.l., were formerly placed in the *Cis tricornis* species-group. These two genera resemble each other in the cephalic and pronotal configurations of males, but differ significantly in traits as the maxillary palpi, prosternal process, female abdominal terminalia, and elytral apex, as demonstrated by Borlini and Lopes-Andrade (unpublished). *Urupecis* is predominantly Neotropical in distribution: *U. delicatulus* is broadly distributed in the northern Neotropical region, occurring in Costa Rica, Cuba, Jamaica, Mexico, Panama, and Puerto Rico; *U. nasicornis* is known from Panama and Colombia; and *U. miles* is the only species recorded from the Nearctic region, found in the eastern United States, ranging from New York south to central Florida, and west to Arkansas and Louisiana (Lawrence 1971, Borlini and Lopes-Andrade unpublished).

Although species of *Sacis* have been described from Brazil (Lopes-Andrade and Sandoval-Gómez 2017, Borlini and Lopes-Andrade 2023), no species of *Urupecis* has been recorded from the country until now. Our objective in this work is to describe five new Neotropical species of *Urupecis* from the Atlantic Forest of the Southeast and South Regions of Brazil: *Urupecis paradisus* sp. nov. and *Urupecis iris* sp. nov. from the state of Minas Gerais; *Urupecis caissara* sp. nov. and *Urupecis euthynus* sp. nov. from the state of São Paulo; and *Urupecis rufulus* sp. nov. from the states of São Paulo and Santa Catarina.

Material and Methods

CELC Coleção Entomológica do Laboratório de Sistemática e Biologia de Coleoptera da Universidade Federal de Viçosa (Viçosa, Minas Gerais, Brazil)

MNRJ Museu Nacional do Rio de Janeiro (Rio de Janeiro, Rio de Janeiro, Brazil)

MZSP Museu de Zoologia da Universidade de São Paulo (São Paulo, São Paulo, Brazil)

We examined all the species included in the genus *Urupecis* and the corresponding material is listed by Borlini and Lopes-Andrade (unpublished). The new species described here are from the CELC and loans from the MNRJ and the MZSP.

Terms for external morphology and male terminalia of ciids follow Lawrence et al. (2011), Lawrence (2016) and Lopes-Andrade and Lawrence (2005, 2011), but see also Oliveira et al. (2013) for an explanation on the use of "tegmen". The term "anterocephalic edge" is used in place of "frontoclypeal ridge" to refer to the anterior part of the dorsum of the head, the constitution of which is not clearly known (Souza-Gonçalves and Lopes-Andrade 2020b; Souza-Gonçalves and Lopes-Andrade 2025). The term "single punctation" and "dual punctation" are terms traditionally used in the taxonomy of Ciidae, which the former describes a punctation made of punctures that fall into one size class and the latter describes a punctation made of punctures that fall into two different size classes (Souza-Gonçalves and Lopes-Andrade 2020a, Rosa-Oliveira and Lopes Andrade 2023).

Photographs were taken using a Zeiss Discovery V20 stereomicroscope equipped with a Zeiss AxioCam 506 digital camera, and a Zeiss AxioLab compound microscope equipped with a Nikon D90 digital camera. Images were stacked using Helicon software and enhanced in Corel Photo-Paint, while plates were arranged in CorelDRAW (all licensed to the junior

author). Measurements were taken under a Zeiss Stemi 2000C stereomicroscope equipped with a 2x objective lens and an ocular micrometer. The following abbreviations are used for measurements (in mm) and ratios (based on Souza-Gonçalves et al. 2020): BW (width of anterior edge of scutellar shield), CL (length of antennal club measured from base of the eighth to apex of the tenth antennomere), EL (elytral length along the midline), EW (greatest width of elytra), FL (length of antennal funicle measured from base of the third to apex of the seventh antennomere), GD (dorso-ventral height of body measured in lateral view, from the surface of elytra to that of the metaventrite), GW (greatest diameter of eye), PL (pronotal length along midline, including horns if present), PW (greatest pronotal width), SL (length of scutellar shield), TL (total length counted as EL+PL, i.e. excluding head). The GD/EW and TL/EW ratios indicate the degree of body convexity and elongation, respectively. Sums and ratios of measurements of antennae are based on gross values, while measurements of each antennomere are based on approximate values.

Transcription of labels, dissection, photography and measurement of specimens followed the methods provided by Araujo and Lopes-Andrade (2016). Differences are given in “Variation”, together with standard measurements (mean and standard deviation) and ratios. The examined specimens are listed for each species on “type-series”. When available, data on host fungi extracted from labels are summarized in the corresponding section, with number of records and breeding records. The recognition of breeding records follows the criteria provided in Orledge and Reynolds (2005).

The abdominal terminalia was extracted from the follows specimens: 1 ♂ and 1 ♀ *Urupecis paradisus* sp. nov. from Mata do Paraíso (Viçosa, Minas Gerais); *Urupecis iris* sp. nov., 1 ♂ and 1 ♀ from downtown Viçosa (downtown) and 1 ♂ from Mata da Biologia, Viçosa (Minas Gerais); 1 ♂ *Urupecis caissara* sp. nov. from Ilha da Vitória (São Paulo); 1 ♂

and 1 ♀ *Urupecis euthynus* sp. nov. from São Roque (São Paulo); and 1 ♂ and 1 ♀ *Urupecis rufulus* sp. nov. from Nova Teutônia (Santa Catarina).

Results

Taxonomy

Family Ciidae Leach, 1819

Subfamily Ciinae Leach, 1819

Tribe Ciini Leach, 1819

Genus *Urupecis* Borlini & Lopes-Andrade, unpublished

(Figs. 1–7)

Urupecis paradisus Borlini & Lopes-Andrade **sp. nov.**

(Fig. 1a–j)

Diagnosis. *Urupecis paradisus* **sp. nov.** resembles *U. caissara* **sp. nov.** and *U. rufulus* **sp. nov.** in dorsal view (Figs. 1a, 4a, 5a). However, in the first two species males have a straight-sided anterocephalic horn (Figs. 1d, 4d) whereas in *U. rufulus* **sp. nov.** they have an anterocephalic horn slightly constricted near the mid-length (Fig. 5d). In the male genitalia (Fig. 1e–g), although the tegmen of *U. paradisus* **sp. nov.** (Fig. 1f) is similar to that of *U. rufulus* **sp. nov.** (Fig. 5e,h–i), it is shorter, and the apical lobe is smaller and less slender. In the female terminalia (Fig. 1i–j), the spiculum ventrale of both *U. paradisus* **sp. nov.** (Fig. 1i) and *U. rufulus* **sp. nov.** (Fig. 6b) has a conspicuous basal bifurcation, approximately 0.3x its

length. However, *U. paradisus* **sp. nov.** is the only species of *Urupecis* in which the baculi of the proctiger is 0.6x the length of the paraproct (Fig. 1j).

Etymology. From the Latin noun "paradisus", meaning "paradise", referring to "Mata do Paraíso", the forest remnant where the species was collected. Noun in apposition.

Description. Holotype male (Fig. 1a–g)**.** Adult fully pigmented and in good condition. Measurements in mm: TL 1.45, PL 0.57, PW 0.65, EL 0.88, EW 0.68, GD 0.56. **Body** (Fig. 1a–c) suboval, convex and elongate;--- dorsal surface dark reddish brown, with elytra lighter than pronotum; ventral surface dark reddish brown; antennae, palpi and tarsi yellowish brown; dorsal vestiture of very minute decumbent setae, about 1 puncture-width long, visible in high magnification (50x); venter glabrous, with decumbent slender setae on abdominal ventrites. **Head** with anterior edge visible from above; dorsum concave, glabrous, smooth, with inconspicuous minute punctures at disc; disc a bit tumid; whole anterocephalic edge projected upwards into a horn, laminate in lateral view, parallel-sided, with apex emarginate forming two short lobes (better seen in frontal view; Fig. 1d); venter convex, gula 0.6x as wide as head, with gular structures broadly bowed; submentum trapezoidal, less than half the gula width. **Antennae** with 10 antennomeres, as follows (in mm, right antenna measured): 0.06, 0.04, 0.03, 0.03, 0.02, 0.02, 0.02, 0.05, 0.04, 0.07 (FL 0.11, CL 0.15, CL/FL 1.36). **Eyes** with subcircular contour, coarsely facetted, with about 60 ommatidia; GW 0.12 mm. **Pronotum** with fine, single, confuse punctation; punctures separated from each other by 1 to 2 puncture-widths; interspaces, smooth; setae hardly visible under high magnification (100x); anterior edge projected forward as a plate, emarginate apically to form two large triangular horns, microreticulate; lateral carinae narrow, simple, visible for the entire lengths when seen from above (Fig. 1a,b). **Scutellar shield** pentagonal, punctate; BW 0.06. **Elytra** elongate, 1.5x as long as pronotum; punctation indistinctly dual, finer than that of pronotum; punctures separated from each other by about 2 puncture-widths; interspaces, smooth; micropunctures

bearing one minute decumbent light seta visible under 50x magnification, macropunctures shallow, lacking seta. **Hypomera** short, microreticulate; light decumbent setae barely visible; apparently impunctate. **Prosternum** in front of coxae microreticulate, impunctate; disc with slender setae. **Prosternal process** as long as prosternal disc at midline; apparently lacking setae; apex rounded. **Protibiae** about 2.4x as long as maximum width; outer apical angle projected as an acute tooth. **Meso-and metatibiae** about 5.5–6x as long as maximum width. **Metaventrite** microreticulate, glabrous, with inconspicuous punctation; discrimen very short, about 0.15x as long as metaventrite at the longitudinal midline. **Abdominal ventrites** microreticulate, with slender setae; length of ventrites (in mm, from base to apex at the longitudinal midline) as follows: 0.18, 0.07, 0.07, 0.07, 0.07; first abdominal ventrite tumid, with a small and oval sex patch with a diameter of 0.04 mm (Fig. 1c). **Male terminalia** (Fig. 1e–g): sternite VIII membranous, trapezoidal, 1.75x as wide as long, posterior edge curved inward at middle, with rounded corners with slender setae (Fig. 1e); basal piece not observed; tegmen 3x as long as wide, subparallel, with subtriangular base, apical portion with a V-shaped emargination at middle, 0.2x as long as tegmen, forming one small lobe in each side, outer edge of each lobe with a short emargination, like a lateral fold (Fig. 1f); penis about 0.7x as long as tegmen, about 3x as long as wide, subparallel-sided, with truncate base, apical portion wider than base, subtriangular (Fig. 1g).

Females (Fig. 1h–j). Devoid of cephalic and pronotal ornaments (Fig. 1h). Anterocephalic edge not projected, only slightly emarginate. Gula smaller than that of males, half as wide as head; submentum barely visible, less than half the gula width. Anterior pronotal edge broadly rounded. First abdominal ventrite devoid of sex patch. **Female terminalia** (Figs. 1i–j) as follows: sternite VIII almost 2x as wide as long; posterior edge apparently rounded; corners with slender setae at apex (Fig. 1i); spiculum ventrale longer than paraprocts and gonocoxites combined; base conspicuously bifurcated, with emargination

reaching about 0.3x its length (Fig. 1i); paraprocts 1.7x longer than gonocoxites; baculi of paraprocts about 1.5x longer than baculi of proctiger (Fig. 1j); gonocoxites (Fig. 1j) transversely divided ventrally forming three folds at each side, distal folds 1.5x longer than the precedents combined, one seta on each side at middle of distal fold and setae on apices; gonostyli about one-third the length of distal fold of gonocoxites, each bearing a slender seta at apex (Fig.1j).

Measurements and ratios. Males, measurements in mm (n = 6): TL 1.38–1.56 (1.45 ± 0.07), PL 0.50–0.62 (0.56 ± 0.04), PW 0.60–0.65 (0.64 ± 0.02), EL 0.83–0.94 (0.88 ± 0.03), EW 0.66–0.73 (0.69 ± 0.003), GD 0.50–0.57 (0.54 ± 0.03), PL/PW 0.83–0.95 (0.89 ± 0.05), EL/EW 1.24–1.29 (1.27 ± 0.02), EL/PL 1.49–1.76 (1.57 ± 0.10), GD/EW 0.74–0.82 (0.78 ± 0.03), TL/EW 2.03–2.14 (2.08 ± 0.04). Females, measurements in mm (n = 7): TL 1.33–1.48 (1.40 ± 0.06), PL 0.49–0.55 (0.51 ± 0.02), PW 0.59–0.68 (0.64 ± 0.03), EL 0,78–0.95 (0.89 ± 0.06), EW 0.65–0.75 (0.71 ± 0.03), GD 0.56–0.61 (0.57 ± 0.02), PL/PW 0.74–0.93 (0.81 ± 0.06), EL/EW 1.19–1.30 (1.25 ± 0.05), EL/PL 1.42–1.83 (1.73 ± 0.14), GD/EW 0.77–0.86 (0.81 ± 0.03), TL/EW 1.85–2.05 (1.98 ± 0.07).

Type-series. Holotype: (CELC) \ "BRASIL: MG, Viçosa, Mata do Paraíso, Trilha dos Gigantes 03.xii.2019. Rosa-Oliveira, A. leg. \ *Trametes villosa* \ *Urupecis paradisus* Borlini & Lopes-Andrade HOLOTYPUS [red paper]". Paratypes: 6 ♂♂ and 7 ♀♀ (CELC), same data as the holotype.

Distribution. Known only from "Mata do Paraíso", the largest Atlantic Forest remnant of Viçosa, in the state of Minas Gerais, Southeast Region of Brazil.

Host-fungi. One breeding record in *Trametes villosa* (Sw.) Kreisel.

Comments. Previously listed as "*Cis* sp. H (gp. *tricornis*)" by Rosa-Oliveira and Lopes-Andrade (2024).

Urupecis iris Borlini & Lopes-Andrade **sp. nov.**

(Figs. 2a–n, 3a–c)

Diagnosis. Males of *Urupecis iris* **sp. nov.** are similar to those of *U. delicatulus* and *U. rufulus* **sp. nov.** in possessing an anterocephalic horn slightly constricted near the mid-length and long pronotal horns (Figs. 2a,d, 5a,d). They differ, however, by having yellowish pronotal horns. The dual elytral punctation also distinguishes these species: in *U. iris* **sp. nov.**, each micropuncture bears a seta and macropunctures are shallow and lack setae; in *U. delicatulus* each macropuncture bears a seta and micropunctures lack setae; and *U. rufulus* **sp. nov.** has indistinct dual punctation. On the first abdominal ventrite of males *U. iris* **sp. nov.**, there is a large, rounded, and unmargined sex patch (Fig. 2e,k), differing from that of *U. delicatulus*, which is marginated, and from *U. rufulus* **sp. nov.**, which has an oval sex patch (Fig. 5c). In the male terminalia, the tegmen of *U. iris* **sp. nov.** is similar to that of *U. miles* in having closed apical lobes (Fig. 2g,m). However, in *U. iris* **sp. nov.** the tegmen is slightly sinuous with a rounded base, while in *U. miles* it is subparallel-sided with a truncate base. In the female terminalia, the spiculum ventrale of *U. iris* **sp. nov.** is shorter than in other species of *Urupecis* (Fig. 3b), with a length equal to that of the paraprocts, rather than as long as the paraprocts and gonocoxites combined, as in the others. The ovipositor also bears a slender protuberance on the distal fold of the gonocoxite (Fig. 3c), near the vaginal opening, a feature not observed in other *Urupecis* species, except for *U. nasicornis* which has sclerotizations near the vaginal opening.

Etymology. Named in honor of the first author's daughter, Íris, who is already a little explorer of insects. Additionally, "iris" derives from the Greek and Latin, referring to colorful or rainbow-like things, in reference to the yellowish pronotal horns of males of this species.

Description. Holotype male. Adult fully pigmented and in good condition. Measurements in mm: TL 1.32, PL 0.57, PW 0.55, EL 0.75, EW 0.60, GD 0.45. **Body** (Fig.

2a–c) suboval, convex and elongate;--- dorsal surface dark yellowish brown; ventral surface dark yellowish brown; pronotal horns, antennae, palpi and legs light yellowish brown; dorsal vestiture of very minute decumbent setae, about 1 puncture-width long, visible in high magnification (50x); venter glabrous. **Head** with anterior edge visible from above; dorsum concave, glabrous, smooth, with minute punctures at disc; disc a bit tumid; whole anterocephalic edge projected upwards into a long horn, laminate in lateral view, slightly constricted near the mid-length, apex approximately 0.6x as wide as distance between eyes (better seen in frontal view; Fig. 2d); venter convex; gula 0.65x as wide as head, with gular structures broadly bowed; submentum subtriangular, less than half the gula width. **Antennae** bearing 10 antennomeres, as follows (in mm, right antenna measured): 0.05, 0.04, 0.03, 0.02, 0.02, 0.02, 0.02, 0.04, 0.04, 0.06 (FL 0.11, CL 0.15, CL/FL 1.36). **Eyes** with subcircular contour, coarsely facetted, with about 50 ommatidia; GW 0.10 mm. **Pronotum** with fine and single punctation, becoming sparser and finer on the plate between horns; punctures at disc separated from each other by 1 to 2 puncture-widths; interspaces, matte; setae visible under high magnification (100x); anterior edge projected forward as a plate, emarginate apically to form two long yellowish horns with acute apex, microreticulate; lateral carinate slightly narrow, simple, visible for the entire lengths when seen from above (Fig. 2a,b). **Scutellar shield** pentagonal, microreticulate, punctation not conspicuous; BW 0.06. **Elytra** elongate, 1.3x as long as pronotum; punctation dual and confuse, finer and denser than that of pronotum; punctures separated from each other by 1–2 puncture-widths; interspaces, smooth; micropunctures each with one minute decumbent light seta visible under 50x magnification; macropunctures shallow, lacking seta. **Hypomera** short, microreticulate; apparently impunctate. **Prosternum** in front of coxae microreticulate, impunctate. **Prosternal process** as long as prosternal disc at midline; apparently lacking setae; apex rounded. **Protibiae** about 3.3x as long as maximum width; outer apical angle projected as an acute tooth. **Meso-and**

metatibiae about 5x as long as maximum width. **Metaventrite** microreticulate, glabrous; punctation, inconspicuous; discrimen very short, about 0.3x as long as metaventrite at the longitudinal middle. **Abdominal ventrites** barely microreticulate; length of ventrites (in mm, from base to apex at the longitudinal midline) as follows: 0.16, 0.06, 0.06, 0.06, 0.06; first abdominal ventrite bearing a large, rounded sex patch with a diameter of 0.05 mm (Fig. 2e,k). **Male terminalia** (Figs. 2f–h,l–n): sternite VIII not observed; basal piece membranous, wider than long, semicircular (Fig. 2f,l); tegmen about 3x as long as wide, slightly enlarging to apex, apical portion with sinuous and membranous edges, apex with an inner straight emargination about 0.3x the tegmen length, lobes not diverging (Fig. 2g,m); penis about 0.65x as long as tegmen, 3x as long as wide, enlarging to apex, apex subtriangular with membranous edge (Fig. 2h,n).

Females (Fig. 3a–c). Devoid of cephalic and pronotal ornaments (Fig. 3a). Anterocephalic edge not projected, only slightly emarginate. Gula smaller than that of males, half as wide as head; submentum barely visible, less than half the gula width. Anterior pronotal edge broadly rounded. First abdominal ventrite devoid of sex patch. **Female terminalia** (Fig. 3b–c) as follows: sternite VIII semicircular, with slender setae on corners (Fig. 3b); spiculum ventrale as long as paraprocts; base large, tapering straight to apex, base with small concave bifurcation (Fig. 3b); paraprocts longer than gonocoxites; baculi of paraprocts longer than baculi of proctiger (Fig. 3c); gonocoxites (Fig. 3c) transversely divided ventrally forming three folds at each side, distal folds 1.3x longer than the precedents combined, with a small slender sclerotized protuberance at the middle of distal fold next to the vaginal aperture, apices bearing setae (Fig. 3c); gonostyli about half the length of the distal fold of gonocoxites, each bearing a slender seta at apex (Fig. 3c).

Measurements and ratios. Males, measurements in mm (n = 2): TL 1.14–1.32, PL 0.49–0.57, PW 0.50–0.55, EL 0.65–0.75, EW 0.55–0.60, GD 0.41–0.45, PL/PW 0.98–1.04,

EL/EW 1.18–1.25, EL/PL 1.32–1.33, GD/EW 0.75–0.75, TL/EW 2.07–2.20. Females, measurements in mm (n = 2): TL 1.12–1.15, PL 0.36–0.39, PW 0.49–0.58, EL 0.76–0.76, EW 0.48–0.60, GD 0.40–0.45, PL/PW 0.67–0.73, EL/EW 1.27–1.58, EL/PL 1.95–2.11, GD/EW 0.75–0.83, TL/EW 1.92–2.33.

Type-series. Holotype: (CELC) \ "BRASIL: MG, Viçosa, Rua Maria Euzébia, 28.v.2023, Chaul, J. leg \ *Urupecis iris* Borlini & Lopes-Andrade HOLOTYPUS [red paper]". Paratypes: 1 ♂ and 2 ♀♀ (CELC), same data as the holotype; 1 ♂ (CELC) \ "BRASIL: MG, Viçosa, Mata da Biologia 03.ii.2012 Lopes-Andrade et al. leg".

Distribution. Known from a small Atlantic Forest remaining called "Mata da Biologia" located in Viçosa and from downtown Viçosa, Minas Gerais, Brazil.

Host-fungi. Unknown.

Comments. Interestingly, one of the two collections of the species was made within the urban area of Viçosa — a rare occurrence among Brazilian *Sacis* and *Urupecis* species, which are more commonly found in well-preserved forest habitats. Moreover, in the same sample there was a unique female of *Grossicis diadematus* (Mellié, 1849).

Urupecis caissara Borlini & Lopes-Andrade **sp. nov.**

(Fig. 4a–g)

Diagnosis. *Urupecis caissara* **sp. nov.** resembles *U. paradisus* **sp. nov.** and *U. rufulus* **sp. nov.** in dorsal view (Figs. 4a, 1a, 5a, respectively). However, males of the first two species have a straight-sided anterocephalic horn (Figs. 1d, 4d), whereas the latter has an anterocephalic horn slightly constricted near the mid-length (Fig. 5d). In the male genitalia, the shape of the tegmen in *U. caissara* **sp. nov.** (Fig. 4f) resembles that of *U. delicatulus* due to the deep inner emargination reaching the middle of the tegmen, but differs in having apical lobes with curved apices and a less broad base. It also resembles *U. euthynus* **sp. nov.** (Fig.

7g) in the presence of apical lobes with curved apices, but differs by having a much longer inner emargination. Females of *U. caissara* **sp. nov.** are not yet known.

Etymology. From the Tupi-Guarani word "caissara" (or "caiçara"), referring to people who engage in fishing, agriculture, and/or craftwork and live in traditional communities in certain coastal areas of Brazil, such as in Ilha da Vitória, in the state of São Paulo, where the species was collected. Noun in apposition.

Description. Holotype. Adult fully pigmented and in good condition. Measurements in mm: TL 1.26, PL 0.54, PW 0.65, EL 0.72, EW 0.60, GD 0.46. **Body** (Fig. 4a–c) oblong, convex and elongate;--- dorsal surface light reddish brown; ventral surface dark reddish brown; antennae, palpi and legs yellowish brown; dorsal vestiture of very minute decumbent setae, about 1 puncture-width long, barely visible in high magnification (100x); venter glabrous, with decumbent slender setae on metaventrite and abdominal ventrites. **Head** with anterior edge visible from above; dorsum concave, glabrous, microreticulate, punctures conspicuous; disc a bit tumid; whole anterocephalic edge projected upwards into a large horn, laminate in lateral view, larger at base, parallel-sided from middle to apex, apex emarginate forming two lobes, apical width 0.6x the width between eyes (Fig. 4d); venter convex, gula 0.6x as wide as head, with gular structures broadly bowed; submentum barely delimited, less than half the gula width. **Antennae** incomplete, lacking the apical antennomere, 9 antennomeres as follows (in mm, right antenna measured): 0.05, 0.04, 0.03, 0.02, 0.02, 0.02, 0.02, 0.04, 0.04 (FL 0.11). **Eyes** with subcircular contour, coarsely facetted, with about 50 ommatidia; GW 0.10 mm. **Pronotum** with fine and single punctation; punctures separated from each other by 1 to 2 puncture-widths; interspaces, smooth; setae hardly visible under high magnification (100x); anterior edge projected forward as a plate, emarginate apically to form two large triangular horns, microreticulate, outer edge of horns slightly converging at apex; lateral carinae narrow, simple, barely visible at mid-length when seen from above (Fig.

4a,b). **Scutellar shield** pentagonal, microreticulate, impunctate; BW 0.06. **Elytra** elongate, 1.3x as long as pronotum; punctation dual, finer and denser than that of pronotum; punctures separated from each other by 1 to 3 puncture-widths; interspaces, smooth; each micropuncture with one minute decumbent light seta visible under 100x magnification; macropunctures shallow, lacking seta. **Hypomera** short, stretched microreticulate; glabrous, apparently impunctate. **Prosternum** in front of coxae microreticulate, impunctate; disc with long slender setae. **Prosternal process** as long as prosternal disc at midline; lacking setae; apex rounded. **Protibiae** about 2.8x as long as maximum width; outer apical angle projected as an acute tooth. **Meso-and metatibiae** about 5.3x as long as maximum width. **Metaventrite** microreticulate, glabrous; punctation, inconspicuous; discrimen short, about 0.3x as long as metaventrite at the longitudinal middle. **Abdominal ventrites** microreticulate, with slender setae; length of ventrites (in mm, from base to apex at the longitudinal midline) as follows: 0.17, 0.06, 0.06, 0.05, 0.06; first abdominal ventrite bearing a small, rounded and marginate sex patch with a diameter of 0.04 mm (Fig. 4e). **Male terminalia** (Fig. 4f–g): sternite VIII and basal piece not observed; tegmen 2.3x as long as wide, base rounded, enlarging to apex, apical portion sinuous, inner emargination about 0.45x the length of tegmen, forming two long lobes with apex curved inward (Fig. 4f); penis about 0.6x as long as tegmen, 3x as long as wide, base truncate, subparallel-sided, apical portion subtriangular, slightly wider than base (Fig. 4g).

Measurements and ratios. Males, measurements in mm (n = 3): TL 1.19–1.26 (1.23 ± 0.04), PL 0.45–0.54 (0.50 ± 0.05), PW 0.54–0.56 (0.55 ± 0.01), EL 0.72–0.74 (0.73 ± 0.01), EW 0.55–0.60 (0.57 ± 0.03), GD 0.42–0.49 (0.46 ± 0.04), PL/PW 0.83–0.96 (0.91 ± 0.07), EL/EW 1.20–1.35 (1.29 ± 0.08), EL/PL 1.33–1.64 (1.49 ± 0.16), GD/EW 0.76–0.88 (0.80 ± 0.06), TL/EW 2.10–2.21 (2.16 ± 0.06).

Type-series. Holotype: (MZSP) \ "Ilha da Victoria S. Paulo, Brazil 16-17.III.1964 \ *Urupecis caissara* Borlini & Lopes-Andrade HOLOTYPUS [red paper]". Paratypes: 2 ♂♂ (MZSP), same data as the holotype.

Distribution. Known only from Ilha da Vitória, an island of the archipelago of Ilhabela, in the state of São Paulo.

Host-fungi. Unknown.

Comments. The type locality, Ilha da Vitória, is located approximately 40 km from the mainland and 25 km from São Sebastião, the main island of the archipelago. It covers an area of about 2.5 km², with nearly 90% of well-preserved Atlantic Forest — making it one of the most pristine islands in the entire archipelago. This represents one of the few known records of insular ciid beetles in Brazil.

Urupecis rufulus Borlini & Lopes-Andrade **sp. nov.**

(Figs. 5a–i, 6a–c)

Diagnosis. *Urupecis rufulus* **sp. nov.** resembles *U. paradisus* **sp. nov.** and *U. caissara* **sp. nov.** (Figs. 5a, 1a, 4a, respectively). However, males of the latter two species have a straight-sided anterocephalic horn (Figs 1d, 4d). It is also similar to *U. delicatulus* in males having an anterocephalic horn slightly constricted near the mid-length (Fig. 5d) and long pronotal horns, but differs in elytral punctation: *U. rufulus* **sp. nov.** has indistinct punctation, whereas in *U. delicatulus* each macropuncture bears a seta and micropunctures lack seta. In the male genitalia, the tegmen of *U. rufulus* **sp. nov.** (Fig. 5e) is similar to that of *U. paradisus* **sp. nov.** (Fig. 1f) but is longer, and the apical lobes are more slender. The penis has a triangular apex (Fig. 5f). In the female genitalia, the spiculum ventrale has a conspicuous basal bifurcation, as in *U. paradisus* **sp. nov.**, approximately 0.3x its length (Figs. 6b, 1i). The ovipositor (Fig. 6c) has paraprocts proportionally longer than the gonocoxites compared to

other *Urupecis* species, resulting in gonocoxites that are about 0.6x length of the paraprocts, while in other species this proportion is 0.7x or greater.

Etymology. From Latin, “rufulus” is a diminutive adjective meaning “slightly reddish”, referring to the color of this species.

Description. Holotype male. Adult fully pigmented and in good condition. Measurements in mm: TL 1.70, PL 0.73, PW 0.80, EL 0.98, EW 0.74, GD 0.61. **Body** (Fig. 5a–c) suboval, convex and elongate; dorsal surface reddish brown; ventral surface reddish brown; antennae, palpi and legs yellowish brown; dorsal vestiture of very minute decumbent setae, more than 1 puncture-width long, visible in high magnification (100x); venter glabrous. **Head** with anterior edge visible from above; dorsum concave, glabrous, microreticulate, punctate; disc a bit tumid; whole anterocephalic edge projected upwards into a long horn, laminate in lateral view, slightly constricted near the mid-length , horn apex about 0.6x as wide as distance between eyes, apex emarginate forming two divergent lobes (better seen in frontal view; Fig. 5d); venter convex, gula 0.7x as wide as head, with gular structures broadly bowed; submentum trapezoidal, less than half the gula width. **Antennae** bearing 10 antennomeres, as follows (in mm, right antenna measured): 0.08, 0.05, 0.05, 0.03, 0.02, 0.02, 0.02, 0.05, 0.07, 0.08 (FL 0.14, CL 0.20, CL/FL 1.43). **Eyes** with subcircular contour, coarsely facetted, bearing about 60 ommatidia; GW 0.12 mm. **Pronotum** with fine, single, confuse punctation; punctures separated from each other by 1 to 2 puncture-widths; interspaces, smooth; setae hardly visible under high magnification (100x); anterior edge projected forward as a plate, emarginate apically to form two long triangular horns, microreticulate; lateral carinae very narrow, simple, barely visible for the entire lengths when seen from above (Fig. 5a,b). **Scutellar shield** subtriangular, microreticulate, impunctate; BW 0.08. **Elytra** elongate, 1.3x as long as pronotum; punctation indistinctly dual, finer than that of pronotum; punctures separated from each other by about 1–3 puncture-widths; interspaces,

rugged; each micropuncture with one minute decumbent light seta visible under 100x magnification; macropunctures shallow, lacking seta. **Hypomera** short, microreticulate; apparently impunctate. **Prosternum** in front of coxae microreticulate, impunctate. **Prosternal process** as long as prosternal disc at midline; apex rounded. **Protibiae** about 3.4x as long as maximum width; outer apical angle projected as an acute tooth. **Meso-and metatibiae** about 4.6–5x as long as maximum width. **Metaventrite** microreticulate, glabrous; punctation, inconspicuous; discrimen very short, about 0.17x as long as metaventrite at the longitudinal middle. **Abdominal ventrites** microreticulate, with slender setae; length of ventrites (in mm, from base to apex at the longitudinal midline) as follows: 0.24, 0.08, 0.08, 0.08, 0.08; first abdominal ventrite bearing a small and oval sex patch with a diameter of 0.04 mm (Fig. 5c). **Male terminalia** (Fig. 5e–f): sternite VIII and basal piece not observed; tegmen 3.5x as long as wide, subparallel, apical portion with an emargination at middle about 0.2x as long as the tegmen, forming one small and slender lobe on each side, each lobe with an emargination in the outer edge, like a lateral fold, base subtriangular (Fig. 5e); penis about 0.75x as long as tegmen, 4.2x as long as wide, subparallel-sided, apical portion triangular, base truncate (Fig. 5f).

Females (Fig. 6a–c). Devoid of cephalic and pronotal ornaments (Fig. 6a). Anterocephalic edge not projected, only slightly emarginate. Gula hidden under prosternum. Anterior pronotal edge broadly rounded. First abdominal ventrite devoid of sex patch. **Female terminalia** (Figs. 6b–c) as follows: sternite VIII about 2.3x as wide as long; hexagonal, corners with slender setae at apex (Fig. 6b); **s**piculum ventrale with base conspicuously bifurcated (Fig. 6b), with emargination reaching 0.3x the spiculum length; paraprocts longer than gonocoxites; baculi of paraprocts as long as baculi of proctiger (Fig. 6c); gonocoxites (Fig. 6c) transversely divided ventrally forming three folds at each side, distal folds about

1.4x longer than the precedents combined, apices bearing setae (Fig. 6c); gonostyli 0.3x the length of the distal folds of gonocoxites, each bearing a slender seta at apex (Fig. 6c).

Measurements and ratios. Males, measurements in mm (n = 11): TL 1.34–1.89 (1.69 ± 0.17), PL 0.53–0.84 (0.72 ± 0.09), PW 0.60–0.83 (0.75 ± 0.07), EL 0.81–1.13 (0.97 ± 0.09), EW 0.66–0.90 (0.80 ± 0.07), GD 0.55–0.74 (0.63 ± 0.06), PL/PW 0.88–1.05 (0.96 ± 0.06), EL/EW 1.16–1.32 (1.21 ± 0.05), EL/PL 1.21–1.58 (1.36 ± 0.12), GD/EW 0.65–0.89 (0.79 ± 0.08), TL/EW 1.97–2.31 (2.11 ± 0.11). Females, measurements in mm (n = 6): TL 1.31–1.93 (1.62 ± 0.24), PL 0.50–0.68 (0.59 ± 0.08), PW 0.63–0.88 (0.76 ± 0.10), EL 0.81–1.25 (1.04 ± 0.16), EW 0.69–1.00 (0.85 ± 0.11), GD 0.54–0.81 (0.68 ± 0.11), PL/PW 0.73–0.80 (0.78 ± 0.03), EL/EW 1.18–1.26 (1.22 ± 0.03), EL/PL 1.63–1.85 (1.76 ± 0.09), GD/EW 0.73–0.86 (0.80 ± 0.04), TL/EW 1.84–1.99 (1.92 ± 0.05).

Type-series. Holotype: (CELC) \ "Brasilien Nova Teutonia 27º11'B. 52º231L 300-500m XII.1960 Fritz Plaumann \ *Urupecis rufulus* Borlini & Lopes-Andrade HOLOTYPUS [red paper]". Paratypes: 2 ♂♂ and 3 ♀♀ (CELC), same data as the holotype; 2 ♂♂ (MZSP) \ "Brasilien Nova Teutonia Santa Catharina 5.1935 B. Pohl"; 7 ♂♂ (MNRJ) \ "Brasilien Nova Teutonia 27º11' B. 52º23' L. 9.1936 Fritz Plaumann" \ [one of them with two labels handwritten "Trichapus sp."]; 1 ♂ (CELC) \ Cantareira SP 15-XI-1906 H. Luderwaldt \ 6192 [handwritten]"; 1 ♀ (CELC) \ "Raiz da Serra S.P. 28.IX.1907 H. Luderwaldt \ 9975 [handwritten]"; 1 ♀ (CELC) \ "Raiz da Serra S.P. 20.V.1908 H. Luderwaldt \ 11.173 [handwritten]".

Distribution. Known from Serra da Cantareira and Raiz da Serra, in the state of São Paulo (Southeast Region), and from Nova Teutônia, in the state of Santa Catarina (South Region of Brazil).

Host-fungi. Unknown.

Comments. Among the species described in this study, *U. rufulus* has the most widely separated records, with the type locality, Nova Teutônia, located about 700 km south of the other sites, Cantareira and Raiz da Serra. The entire type series is also notable for its collectors: Fritz Plaumann (1902–1994) and Hermann Luederwaldt (1865–1934), both of whom made significant contributions to the collection of Brazilian insects, particularly in the Atlantic Forest.

Urupecis euthynus Borlini & Lopes-Andrade **sp. nov.**

(Fig. 7a–k)

Diagnosis. *Urupecis euthynus* **sp. nov.** is the most straight-sided species among *Urupecis* (Fig. 7a). It resembles *U. miles* in color but differs by having very fine elytral punctation and males with larger pronotal horns. In males *U. euthynus* **sp. nov.**, the anterocephalic horn is straight-sided as in *U. miles*, *U. paradisus* **sp. nov.** (Fig. 1d), *U. caissara* **sp. nov.** (Fig. 4d) and *U. nasicornis*, but it is larger and has an U-shaped apex (Fig. 7d). In contrast, the anterocephalic horn in males *U. delicatulus*, *U. iris* **sp. nov.** and *U. rufulus* **sp. nov.** is slightly constricted near the mid-length. The male terminalia are similar to those of *U. caissara* **sp. nov.** (Fig. 4f,g), but the tegmen and penis are proportionally longer, and the inner emargination of the tegmen shorter (Fig. 7g,h). The female ovipositor (Fig. 7k) measure 0.4mm and resembles those of *U. paradisus* **sp. nov.** in the relative lengths of the gonostyli and paraprocts; however, in *U. euthynus* **sp. nov.**, the gonostyli are almost 0.8x as wide as long, whereas in *U. paradisus* **sp. nov.** they are 0.7x.

Etymology. From the Greek adjective “euthynos”, meaning “straight”, combined with the Latinized suffix “-nus”, referring to the straight-sided body of this species.

Description. Holotype male. Adult fully pigmented, lacking the left antennae. Measurements in mm: TL 1.49, PL 0.64, PW 0.64, EL 0.85, EW 0.64, GD 0.52. **Body** (Fig.

7a–c) straight-sided, convex and elongate;--- dorsal surface light reddish brown; ventral surface light reddish brown; antennae and gula light yellow; dorsal vestiture of very minute light decumbent setae, a bit longer than 1 puncture-width, visible in high magnification (50x); venter glabrous. **Head** with anterior edge and corners visible from above; dorsum concave, glabrous, smooth, punctures conspicuous at the disc; disc a bit tumid; whole anterocephalic edge projected upwards into a long and large horn, laminate in lateral view, parallel-sided, apex emarginate forming two lobes and an "U" concavity between them (better seen in frontal view; Fig. 7d); venter convex, gula 0.6x as wide as head, with gular structures broadly bowed; submentum subquadrate, less than half the gula width. **Antennae** bearing 10 antennomeres, as follows (in mm, right antenna measured): 0.06, 0.05, 0.03, 0.02, 0.01, 0.01, 0.02, 0.04, 0.04, 0.06 (FL 0.09, CL 0.14, CL/FL 1.52). **Eyes** with subcircular contour, coarsely facetted, with about 70 ommatidia; GW 0.12 mm. **Pronotum** with fine, single, confuse punctation; punctures separated from each other by 1 to 2 puncture-widths; interspaces, smooth; setae hardly visible under high magnification (100x); anterior edge projected forward as a plate, emarginate apically to form two large triangular horns; lateral carinae narrow, simple, visible for the entire lengths when seen from above, more evident anteriorly (Figs 7a). **Scutellar shield** pentagonal, microreticulate, punctate; BW 0.09. **Elytra** elongate, 1.3x as long as pronotum; punctation dual, much finer than that of pronotum; punctures separated from each other by about 1–3 puncture-widths; interspaces, smooth; each micropuncture with one minute decumbent light seta visible under 80x magnification; macropunctures shallow, lacking seta. **Hypomera** short, stretched microreticulate; apparently impunctate. **Prosternum** in front of coxae microreticulate, impunctate; disc with slender setae. **Prosternal process** as long as prosternal disc at midline; apparently lacking setae; apex rounded. **Protibiae** about 3x as long as maximum width; outer apical angle projected as an acute tooth. **Meso-and metatibiae** about 4.4–5x as long as maximum width. **Metaventrite** microreticulate, glabrous;

punctation, inconspicuous; discrimen very short, about 0.3x as long as metaventrite at the longitudinal middle. **Abdominal ventrites** microreticulate, with slender setae; length of ventrites (in mm, from base to apex at the longitudinal midline) as follows: 0.18, 0.06, 0.06, 0.07, 0.08; first abdominal ventrite bearing a marginate and rounded sex patch with a diameter of 0.05 mm (Fig. 7e). **Male terminalia** (Fig. 7f–h): sternite VIII membranous, 1.7x as wide as long, posterior edge broadly curved inward, subtriangular corners with slender setae (Fig. 7f); basal piece not observed; tegmen 2.6x as long as wide, base rounded, enlarging to apex, apical portion sinuous, with straight and thin apical lobes slightly curved inward at apex, apical inner emargination about 0.3x the length of tegmen (Fig. 7g); penis about 0.6x as long as tegmen, about 3.6x as long as wide, subparallel-sided, base truncate, apical portion wider than base, with pointed apex (Fig. 7h).

Females (Fig. 7i–k). Devoid of cephalic and pronotal ornaments (Fig. 7i). Anterocephalic edge not projected, only slightly emarginate. Gula smaller than that of males, half as wide as head; submentum conspicuous, one third the gula width. Anterior pronotal edge broadly rounded. First abdominal ventrite devoid of sex patch. **Female terminalia** (Fig. 7j–k) as follows: sternite VIII about 2x as wide as long (sides bent in dissection); posterior edge rounded; corners with slender setae at apex (Fig. 7j); **s**piculum ventrale longer than paraprocts and gonocoxites combined; base bifurcated, with emargination reaching about 0.10x its length (Fig. 7j); paraprocts longer than gonocoxites; baculi of paraprocts as long as baculi of proctiger (Fig. 7k); gonocoxites transversely divided ventrally forming three folds at each side, distal folds 1.4x longer than the precedents combined, apices bearing setae (Fig. 7k); gonostyli about 0.30x the length of distal folds of gonocoxites, each bearing a slender seta at apex (Fig. 7k).

Measurements and ratios. Males, measurements in mm (n = 7): TL 1.33–1.54 (1.45 ± 0.08), PL 0.58–0.68 (0.63 ± 0.04), PW 0.55–0.64 (0.60 ± 0.03), EL 0.75–0.88 (0.82 ± 0.05),

EW 0.60–0.67 (0.63 ± 0.02), GD 0.46–0.58 (0.52 ± 0.04), PL/PW 1.00–1.07 (1.04 ± 0.02), EL/EW 1.25–1.40 (1.30 ± 0.05), EL/PL 1.26–1.40 (1.32 ± 0.04), GD/EW 0.73–0.92 (0.82 ± 0.07), TL/EW 2.21–2.40 (2.29 ± 0.07). Females, measurements in mm (n = 5): TL 1.18–1.33 (1.25 ± 0.06), PL 0.46–0.51 (0.48 ± 0.02), PW 0.47–0.58 (0.54 ± 0.05), EL 0.68–0.85 (0.77 ± 0.06), EW 0.49–0.64 (0.59 ± 0.06), GD 0.49–0.55 (0.50 ± 0.03), PL/PW 0.82–0.98 (0.89 ± 0.07), EL/EW 1.15–1.53 (1.31 ± 0.14), EL/PL 1.36–1.77 (1.61 ± 0.16), GD/EW 0.79–1.00 (0.86 ± 0.08), TL/EW 2.00–2.47 (2.13 ± 0.20).

Type-series. Holotype: (CELC) \ "Sio [sic] Roque (Mato Dendro) [sic], S. Paulo Brazil IX-1963 n. Pappavero [sic], coll." \ *Urupecis euthynus* Borlini & Lopes-Andrade HOLOTYPUS [red paper]". Paratypes: 2 ♂♂ and 2 ♀♀ (1 ♀ CELC; 2 ♂♂ and 1 ♀ MZSP) same data as the holotype [one male from MZSP with label "Cis spp. (tricornis gp.) det. J. F. Lawrence]; 4 ♂♂ and 3 ♀♀ (1 ♂ and 1 ♀ CELC; 3 ♂♂ and 2 ♀♀ MZSP) "Sao Roque (Mato Dentro), S. Paulo BRAZIL Sept.1963 N. Pappavero [sic], coll"; 1 ♂ (MZSP) \ "Peruibe, SP XI.1985 Exc.MZSP ♂".

Distribution. Known from São Roque and Peruíbe, in the state of São Paulo (Southeast Region of Brazil).

Host-fungi. Unknown.

Comments. The holotype and most of the type series were collected in São Roque by the Brazilian dipterologist Nelson Papavero (born 1942). The two known localities — São Roque and Peruíbe — are relatively close, approximately 85 km apart. They are located about 55 km and 80 km southwest of Cantareira and Raiz da Serra, respectively, two known localities of *U. rufulus*. It is possible that *U. rufulus* and *U. euthynus* co-occur in the forests of coastal São Paulo.

Discussion

The disentangling of the *Cis tricornis* species group into two distinct genera, *Sacis* and *Urupecis*, initially led to the impression that *Sacis* is widespread throughout tropical and subtropical forests of the Neotropical region, while *Urupecis* would be restricted to the northern Neotropics, reaching the Nearctic region with *U. miles*. However, this apparent distribution pattern for *Urupecis* is challenged by the five new species described here, all from the Atlantic Forest in the South and Southeast Regions of Brazil — part of the southern Neotropics.

It is more likely that both *Sacis* and *Urupecis* are highly diversified throughout the entire Neotropical region but remain significantly undersampled. Species of both genera are infrequently collected, likely due to their association with specific host fungi — typically trametoid fungi with sessile to effused-reflexed, and usually very thin, basidiomes. Such basidiomes are not easily detached from their woody substrates and are often overlooked by collectors, who tend to favor larger, more massive basidiomes bearing conspicuous feeding holes made by ciid beetles.

Additionally, thin, sessile to effused-reflexed basidiomes tend not to support large populations of ciids, unlike the more substantial sessile or pileate basidiomes used by genera such as *Ceracis* Mellié, 1849, *Cis* Latreille, 1797, and *Xylographus* Mellié, 1847. For example, a single basidiome of *Ganoderma zonatum* was recorded as hosting 10,519 larvae, pupae, and adults of *Ceracis similis* Horn, 1894 (Navarrete-Heredia 1987). In contrast, no species of *Sacis* or *Urupecis* is known from anything close to that number of specimens.

The new species described in this study are known from few specimens, sometimes from a single field collection. *Urupecis paradisus* was collected only once, while *U. iris* was collected twice — both times in Viçosa, in the state of Minas Gerais, despite this locality

having been extensively sampled for ciid species over the past 25 years (Lopes-Andrade et al. 2003, Lopes-Andrade 2007, Pecci-Maddalena et al. 2014, Araujo et al. 2015, Borlini et al. 2018, Rosa-Oliveira & Lopes-Andrade 2024). This highlights the difficulty of gathering even a small number of individuals from each *Urupecis* species. The type series of the other species reinforces this pattern: *U. caissara* is known from a single collection, while *U. euthynus* and *U. rufulus* are each known from two separate field collections. Among the previously described species, only *U. delicatulus* is relatively frequently collected.

Given that the species described here are restricted to one or two closely located localities, there appears to be a high likelihood of discovering new *Urupecis* species in nearly every targeted field survey — suggesting that the genus may be far more diverse in the Neotropical region than currently recognized. Particularly noteworthy is the discovery of *U. iris* within the urban area of Viçosa. The other known collection of this species was made in a nearby forest remnant. In the Neotropics, few ciid species are able to persist in urban areas — introduced species like *Cis chinensis* Lawrence, 1991 (Lopes-Andrade 2008), and some native species from natural open habitats, such as *Ceracis cornifer* (Mellié, 1849) and *Ceracis tabellifer* (Mellié, 1849) (Antunes-Carvalho and Lopes-Andrade 2013, Pecci-Maddalena and Lopes-Andrade 2017.

As discussed by Borlini & Lopes-Andrade (unpublished), both *Sacis* and *Urupecis* species appear to be associated with the basidiomes of trametoid fungi. Among the species described here, only *U. paradisus* has a host record — one breeding record in *Trametes villosa*. It would be highly valuable to attempt recollecting the other species to confirm whether this host association pattern holds true across the genus.

Additional Neotropical species of *Urupecis* remain to be described; therefore, a taxonomic key to the genus and its species will be developed in future studies. We hope that the hidden diversity of *Urupecis*, partially revealed here, will draw the attention of specialists

and stimulate further collection efforts focused on this fascinating genus in the Americas. The new species described in this study raises the number of known Brazilian ciids species from 70 (Araujo and Lopes-Andrade 2024, Lopes-Andrade 2024, Rosa-Oliveira et al. 2024, Souza-Gonçalves and Lopes-Andrade 2024, Souza-Gonçalves and Lopes-Andrade 2025, Souza-Gonçalves et al. 2025) to 75. In a recent survey of the Coleoptera of Brazil (Caron et al. 2024), 60 ciid species were recorded, representing a 25% increase in the number of described Brazilian ciid species in less than two years. We will continue our efforts to describe the ciid fauna of Brazil and believe the country will soon be recognized as harboring the most diverse Ciidae fauna in the world.

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Figure captions

Fig. 1 Male holotype of *Urupecis paradisus* Borlini & Lopes-Andrade **sp. nov.**, from Viçosa, state of Minas Gerais, Brazil, in dorsal (a) lateral (b), ventral (c) and frontal (d) views. Dissected parts (e–g) of male from the same locality, showing the sternite VIII (e), tegmen (f) and penis (g). Female paratype from the same locality in dorsal view (h) and genitalia (i–j), showing the sternite VIII and spiculum ventrale (i) and ovipositor (j). Scale bars: 0.1 mm (e–g, i–j), 0.2 mm (d), 0.5 mm (a–c, h).

Fig. 2 Male holotype of *Urupecis iris* Borlini & Lopes-Andrade **sp. nov.**, from downtown Viçosa, state of Minas Gerais, Brazil, in dorsal (a) lateral (b), ventral (c) and frontal (d) views. Dissected parts (e–h) of male from the same locality, showing abdominal ventrites with a large and rounded sex patch (e) on the first ventrite, basal piece (f), tegmen (g) and penis (h). Male from forested area in the same municipality (i–n), in partially dorsal (i) and in frontal (j) view, and dissected parts showing abdominal ventrites with a large and rounded sex patch (k), basal piece (l), tegmen (m) and penis (n). Scale bars: 0.1 mm (e, f–h, k, l–n), 0.2 mm (d, j), 0.5 mm (a–c, i).

Fig. 3 Female paratype of *Urupecis iris* Borlini & Lopes-Andrade **sp. nov.**, from downtown Viçosa, state of Minas Gerais, Brazil, in dorsal view (a) and dissected parts (b–c) of another female from the same locality showing the sternite VIII and spiculum ventrale (b) and ovipositor (c) with black setae showing the sclerotized protuberances on gonocoxites. Scale bars: 0.1 mm (b–c), 0.5 mm (a). Scale bars: 0.1 mm (b–c), 0.5 mm (a).

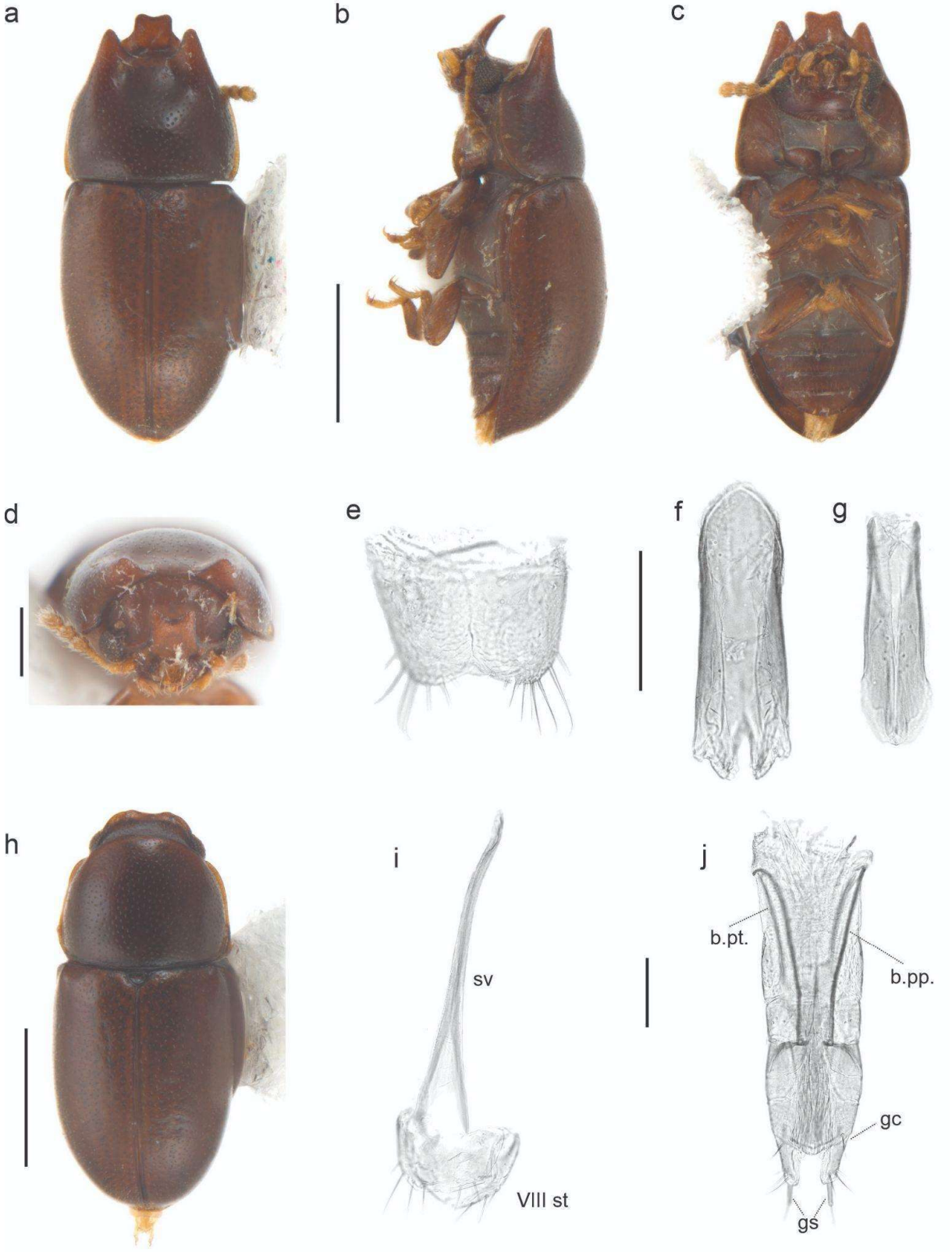
Fig. 4 Male holotype of *Urupecis caissara* Borlini & Lopes-Andrade **sp. nov.**, from Ilha da Vitória, state of São Paulo, Brazil, in dorsal (a) lateral (b), ventral (c) and frontal (d) views. Dissected parts (e–g) of male from the same locality, showing abdominal ventrites with a small and marginate rounded sex patch (e) on the first ventrite, tegmen (f) and penis (g). Scale bars: 0.1 mm (e–g), 0.2 mm (d), 0.5 mm (a–c).

Fig. 5 Male holotype of *Urupecis rufulus* Borlini & Lopes-Andrade **sp. nov.**, from Nova Teutônia, state of Santa Catarina, Brazil, in dorsal (a) lateral (b), ventral (c) and frontal (d) views. Dissected parts (e–f) of male from the same locality, showing tegmen (e) and penis (f). Male paratype from Serra da Cantareira, state of São Paulo in dorsal (g), ventral view (h)

focusing on the abdominal terminalia, and an illustration of this structure (i). Scale bars: 0.1 mm (e–f, h), 0.2 mm (d), 0.5 mm (a–c, g).

Fig. 6 Female paratype of *Urupecis rufulus* Borlini & Lopes-Andrade **sp. nov.** from Nova Teutônia, state of Santa Catarina, Brazil, in dorsal view (a) and dissected parts (b–c) of another female from the same locality showing the sternite VIII and spiculum ventrale (b) and ovipositor (c). Scale bars: 0.1 mm (b–c), 0.5 mm (a).

Fig. 7 Male holotype of *Urupecis euthynus* Borlini & Lopes-Andrade **sp. nov.**, from São Roque, state of São Paulo, Brazil, in dorsal (a) lateral (b), ventral (c) and frontal (d) views. Dissected parts (e–h) of male from the same locality, showing the abdominal ventrites with small and marginate sex patch (e), sternite VIII (f), tegmen (g) and penis (h). Female paratype in dorsal view (i), and dissected parts of another female (j–k), both from the same locality of the holotype, showing the sternite VIII and spiculum ventrale (j) and ovipositor (k). Scale bars: 0.1 mm (e, f–h, j–k), 0.2 mm (d), 0.5 mm (a–c, i).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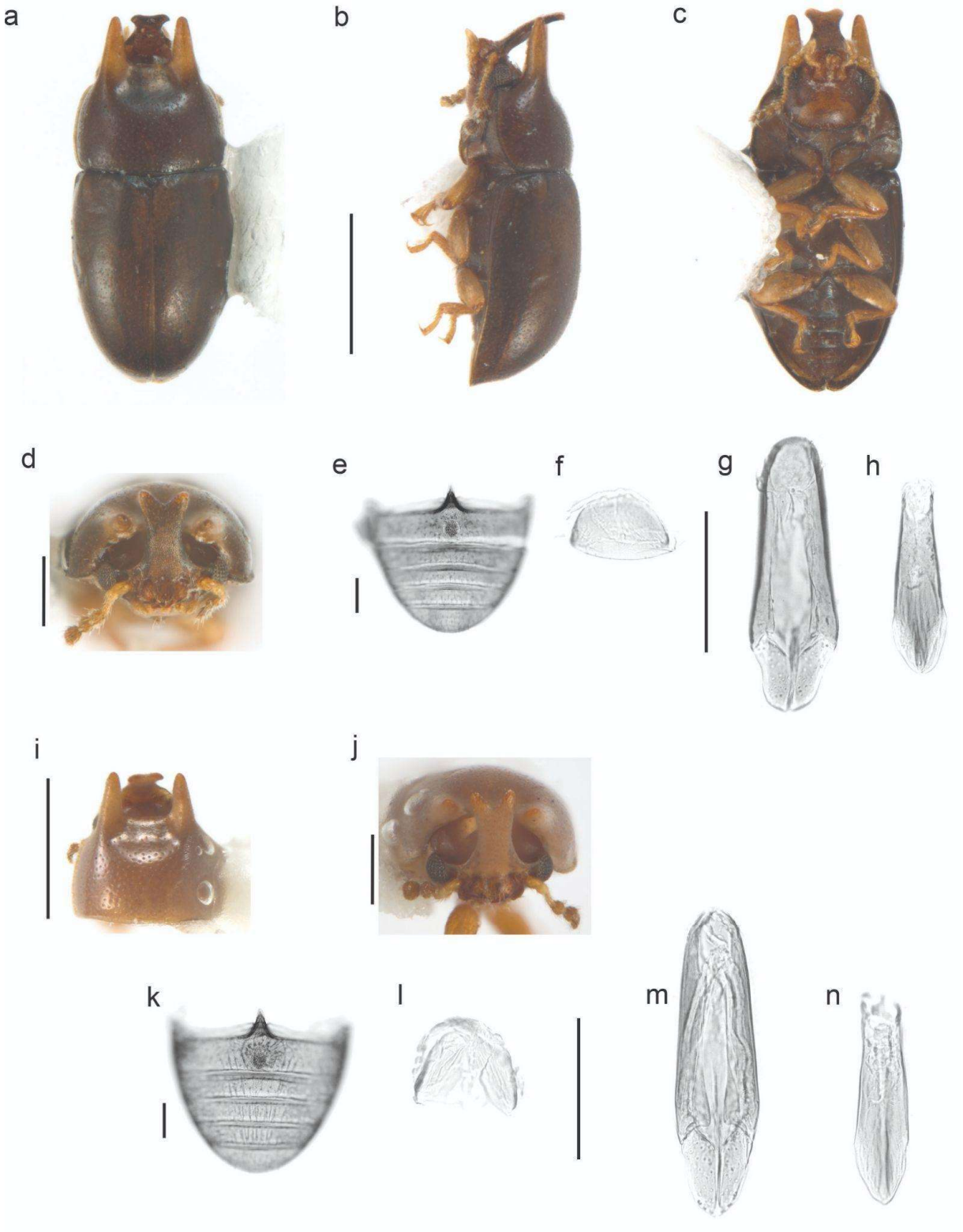
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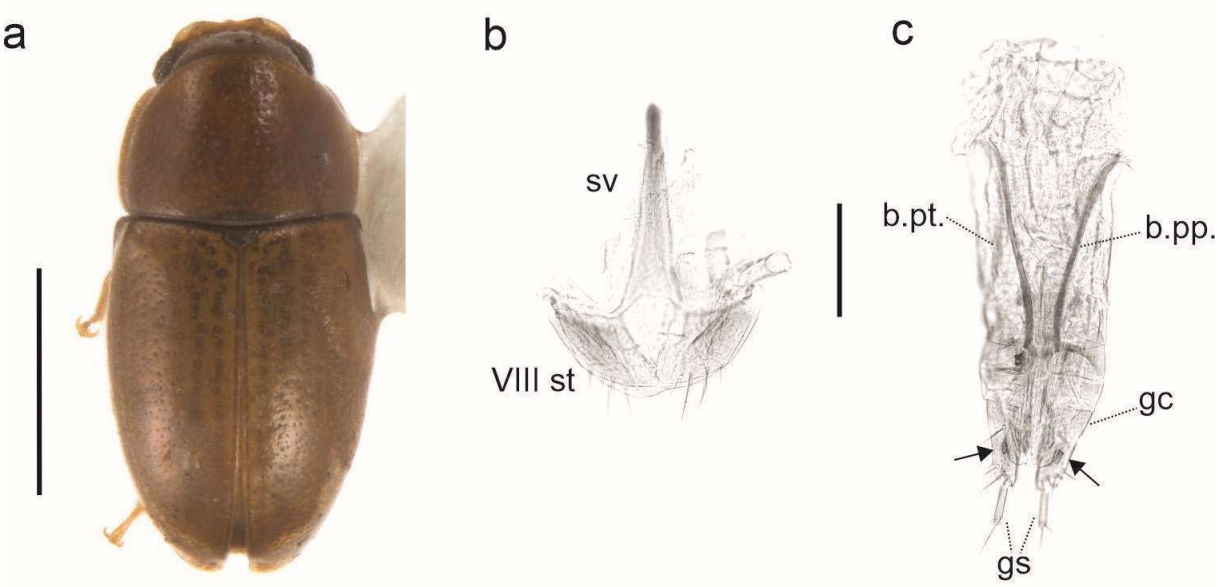
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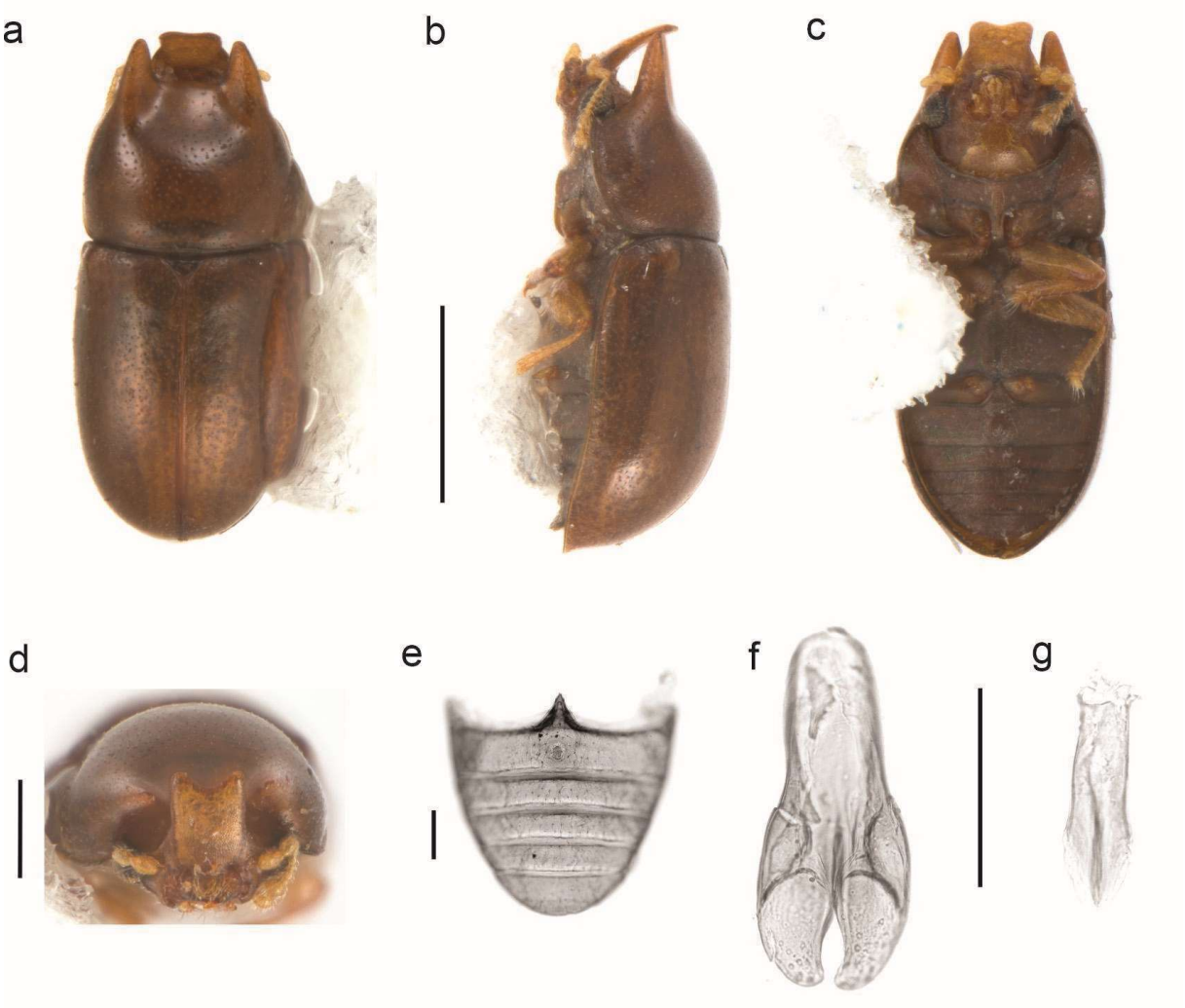
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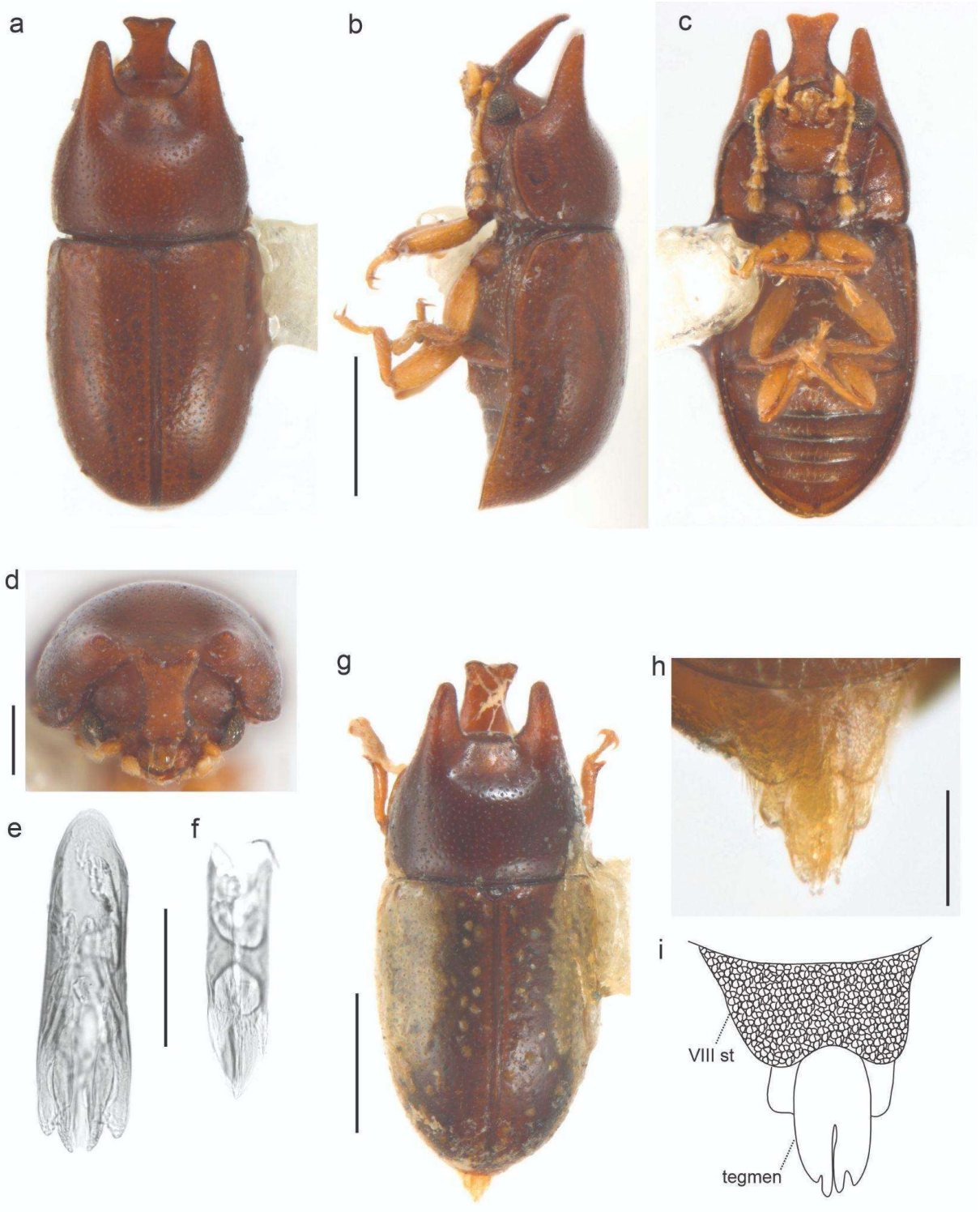
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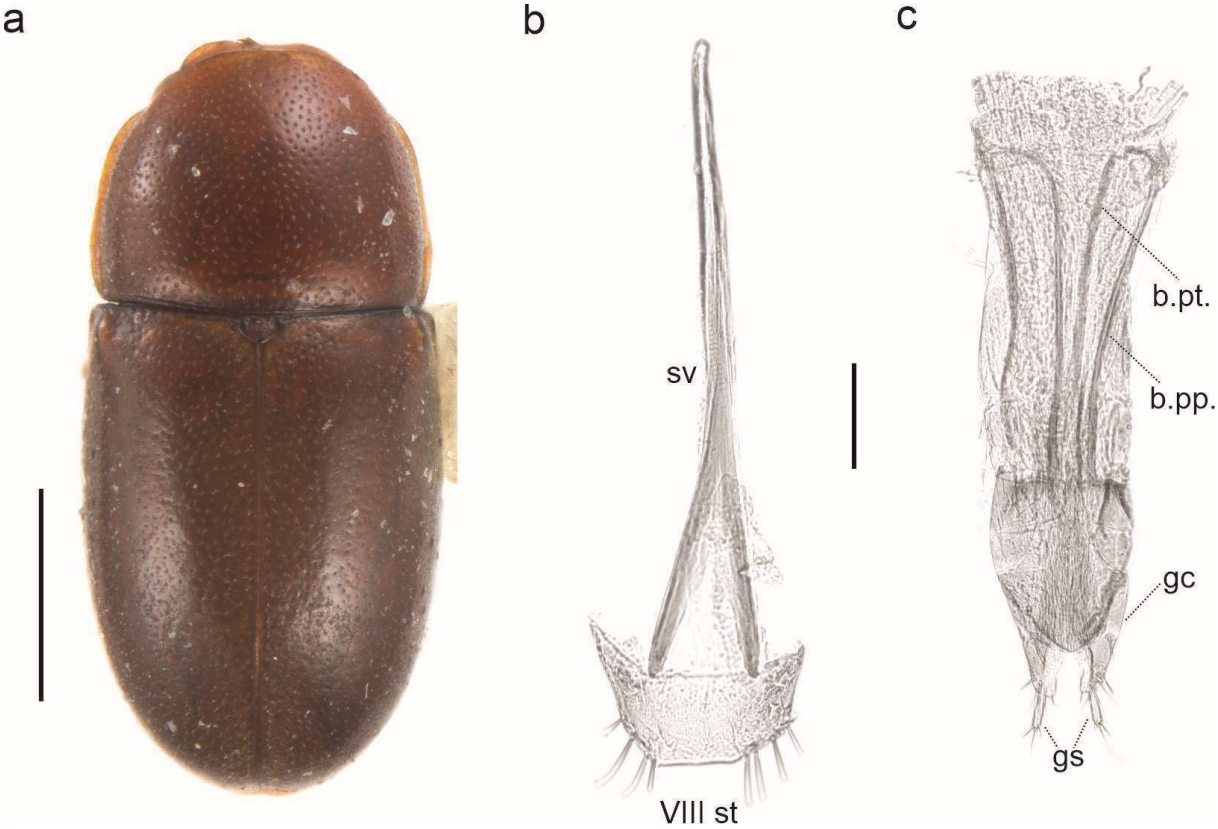
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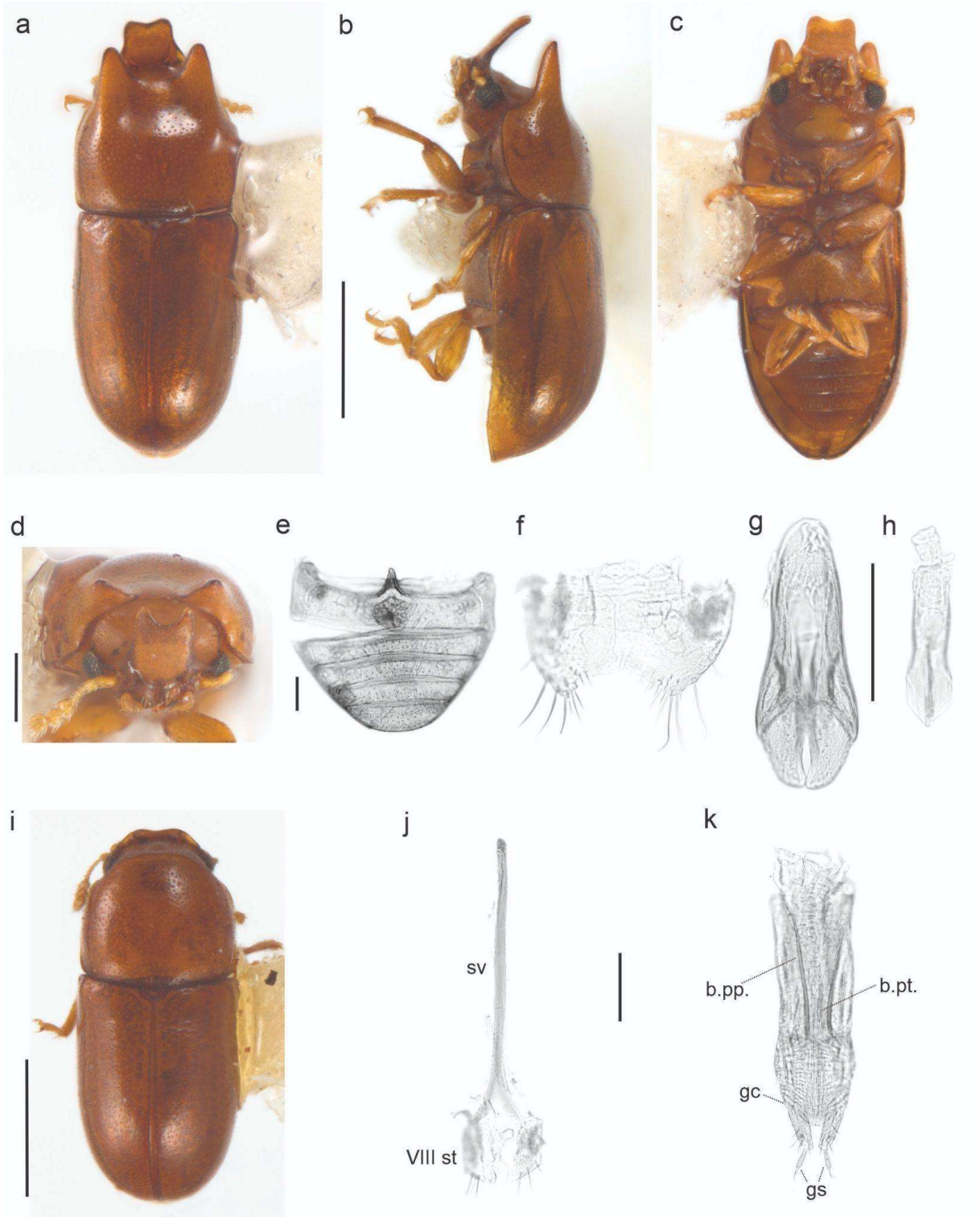
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5. CONSIDERAÇÕES FINAIS

Desde o início, os trabalhos desenvolvidos para a tese trouxeram resultados surpreendentes, para além dos objetivos propostos. No início, cogitou-se a possibilidade das espécies de *Cis* do grupo *tricornis* comporem um único gênero novo, próximo a *Grossicis*. No entanto, a revisão taxonômica do grupo, apresentada no segundo capítulo, revelou a existência de dois novos gêneros, *Sacis* e *Urupecis*, e com definições claras de seus limites morfológicos. Essa resolução encerra o uso do grupo *tricornis* e contribui para a organização do gênero *Cis*, o qual é reconhecidamente polifilético. Além disso, algumas das características morfológicas diagnósticas, identificadas nesses novos gêneros, têm potencial filogenético e podem ser úteis em futuros estudos sistemáticos. As novas espécies descritas, apresentadas no primeiro e terceiro capítulos, apontam para uma elevada riqueza de espécies de *Sacis* e *Urupecis* não somente no Brasil, mas em toda a região Neotropical. Ainda, se considerarmos que há inúmeras espécies de Ciidae depositadas em coleções científicas e que ainda não foram estudadas, é provável que essa diversidade aumente e o Brasil se torne o país mais diverso em espécies de Ciidae no mundo.

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