CRISTIANO LOPES ANDRADE

CLASSIFICAÇÃO DE CIIDAE (COLEOPTERA: TENEBRIONOIDEA)

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

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APROVADA: 24 de outubro de 2007.

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A Teresinha e Maria Clara,
as mulheres da minha vida,
dedico.

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SUMÁRIO

RESUMO

LOPES-ANDRADE, Cristiano, D.Sc., Universidade Federal de Viçosa, outubro de 2007. **Classificação de Ciidae (Coleoptera: Tenebrionoidea).** Orientador: Carlos Frankl Sperber. Co-orientadores: Adilson Ariza Zacaro e Og Francisco Fonseca de Souza.

Ciídeos (Coleoptera: Ciidae) são pequenos besouros que se alimentam e se abrigam em corpos-de-frutificação de macrofungos coriáceos (orelhas-de-pau), durante todo o ciclo de vida. A família Ciidae possui distribuição mundial, ocorrendo em quase todas as terras continentais e insulares do planeta. Por apresentarem alta diversidade e abundância, ocorrerem em todos os ecossistemas terrestres, e serem agente-chave no processo de degradação de orelhas-de-pau, os ciídeos são ótimos modelos para estudos de larga escala em ecologia e evolução. Contudo, os ciídeos são pouco estudados devido ao parco conhecimento taxonômico da família, principalmente dos táxons tropicais. A solução da classificação supra-específica é o primeiro passo para continuar avançando no estudo dos ciídeos. O objetivo geral desta tese é propor um novo sistema de classificação para Ciidae. Cerca de 230 espécies de 31 gêneros foram comparadas, o que equivale a 35% das espécies e 80% dos gêneros descritos de Ciidae. Quando possível, macho(s) e fêmea(s) de cada espécie foram dissecados para se estudar a morfologia de genitália. Quando pertinente, aparelho bucal, asas e pernas também foram dissecados e montados em lâminas para comparação. Dois gêneros e 22 espécies novas são descritos. Dois gêneros são redescritos. Duas tribos e duas subtribos novas são propostas. Diversos gêneros são transferidos de Ciinae para Orophiinae *sensu novo.* Prováveis homologias são sugeridas e discutidas para todos os táxons supra-específicos estudados, principalmente os incluídos em Orophiinae. Espera-se que esta tese tenha forte impacto na classificação de Ciidae, por resolver graves problemas taxonômicos e propor diversas ferramentas metodológicas para estudos subseqüentes sobre a sistemática da família. Espera-se, também, que o avanço na sistemática de Ciidae, advindo desta tese, incentive o uso de ciídeos como objetos e modelos de estudo em diversas áreas da Biologia.

ABSTRACT

LOPES-ANDRADE, Cristiano, D.Sc., Universidade Federal de Viçosa, october, 2007. **Classification of Ciidae (Coleoptera: Tenebrionoidea).** Adviser: Carlos Frankl Sperber. Co-advisers: Adilson Ariza Zacaro and Og Francisco Fonseca de Souza.

Ciids (Coleoptera: Ciidae) are minute beetles that feed and live in fruiting-bodies of coriaceus macrofungi (bracket fungi), during all their life-cycle. The family Ciidae is worldwidely distributed, occurring in almost all continental and insular lands of the Earth. Due to their high diversity and abundance, occurring in all terrestrial ecosystems, and being a key-agent in the process of degradation of bracket fungi, ciids serve as a model for large-scale ecological and evolutionary studies. However, the ciids are barely studied due to the scarce taxonomical knowledge of the family, mainly of its tropical taxa. The solution of the supraspecific classification is the first step to keep advancing in the study of ciids. The main objective of the present thesis is to propose a new classification system for Ciidae. Around 230 species and 30 genera were compared, which correspond to 35% of the species and 80% of the described genera of Ciidae. When possible, male(s) and female(s) of each species were dissected to study the morphology of genitalia. When necessary, mouthparts, wings and legs were also dissected and mounted in slides for comparison. Two genera and twenty-two new species are described. Two genera are redescribed. Two tribes and two new subtribes are proposed. Several genera are transferred from Ciinae to Orophiinae *sensu novo.* Homologies are hypothesized and discussed for all the studied supraspecific taxa, mainly the ones included in Orophiinae. This thesis is expected to have strong impact on the Ciidae classification, as it solves serious taxonomic problems and proposes several methodological tools to subsequent systematic studies of Ciidae. It is also expected that the advances on Ciidae systematics, generated by this thesis, promote the use of ciids as objects and models of study in several disciplines of Biology.

INTRODUÇÃO GERAL

Nos últimos anos, cresceu em muito o interesse pelos insetos micetócolos, que são aqueles que possuem algum grau de associação com fungos. Esse interesse advém da alta diversidade desses insetos, do potencial de uso como bioindicadores, ou como modelos para estudos em ecologia e evolução. Ademais, o estudo dos insetos micetócolos ajuda a preencher uma lacuna dentro da biologia: há muito mais trabalhos sobre insetos fitófagos e predadores do que com micetócolos ou mesmo saproxílicos _ e isso é desproporcional se levarmos em conta o papel ecológico desses grupos funcionais.

Os insetos micetócolos são normalmente divididos em: (i) micetoxenos, que visitam o fungo ocasionalmente; (ii) micetófilos, que são polífagos que se alimentam de diversos recursos em decomposição ou predadores de outros insetos que habitam os fungos; (iii) micetobiontes, insetos cuja associação com o fungo é obrigatória, já que tanto as larvas como os adultos dependem exclusivamente do fungo como alimento. Poucos grupos de insetos são predominantemente micetobiontes, e dentre os besouros vale citar Dorcatominae (Coleoptera: Anobiidae) e Ciidae (Coleoptera). A família Ciidae é reconhecidamente o grupo de micetobiontes mais diverso e abundante, representando grande parte da riqueza de espécies e biomassa de insetos presentes em macrofungos coriáceos.

A família Ciidae (Coleoptera: Tenebrionoidea)

Os ciídeos (Coleoptera: Tenebrionoidea: Ciidae) são pequenos besouros (comprimento de 1mm a 5mm) que vivem em corpos-de-frutificação persistentes (coriáceos) de macrofungos, principalmente aqueles conhecidos vulgarmente como orelhas-de-pau. A maior parte dos Ciidae (+ de 95% das espécies descritas) é comprovadamente micetobionte. Há poucos registros sobre adultos de ciídeos fora desses *habitats*, valendo citar alguns coletados em luz ou em armadilhas de interceptação de vôo (Lawrence 1971; Lopes-Andrade obs. pes.). Há, também, registros de coleta de espécies ápteras ou micrópteras em serapilheira e embaixo de troncos de árvores (*e.g.* Scott 1926; Israelson 1985). Pouco se sabe se essas espécies não-volantes vivem associadas a microfungos desses *habitats* ou se somente foram encontrados neles enquanto se dispersavam entre corpos-de-frutificação de macrofungos.

A maior parte dos dados sobre o uso de macrofungos por ciídeos é para espécies neárticas (Lawrence 1973), européias (Reibnitz 1999) e japonesas (Kawanabe 1995b, 1996c, 1998, 1999). A maioria dos ciídeos vive em fungos Aphyllophorales (Basidiomycetes: Schizophyllaceae, Stereaceae, Polyporaceae, Ganodermataceae, Hymenochaetaceae), e alguns poucos em Agaricales (Basidiomycetes: Pleurotaeae, Tricholomataceae, Bolbitiaceae). Porém, as espécies do gênero *Orthocis* Casey vivem principalmente em fungos da família Auriculariaceae (Basidiomycetes: Auriculariales). Alguns autores propõem que os fungos utilizados por espécies de ciídeos atuais podem ser filogeneticamente próximos dos fungos explorados por suas espécies ancestrais (*e.g.*, Gumier-Costa *et al.* 2003); essa hipótese já foi corroborada por análises de agrupamento de ciídeos e seus fungos hospedeiros (Orledge & Reynolds 2005).

Os dados sobre a dispersão de ciídeos são esparsos e inconclusivos. Diversos autores (Jonsell & Nordlander 1995; Fäldt *et al.* 1999; Guevara *et al.* 2000a,b) demonstraram que os ciídeos são atraídos por substâncias voláteis (mencionados também como odores) exalados pelos corpos-de-frutificação, e que as espécies de Ciidae apresentariam diferentes graus de resposta a esses voláteis. Jonsson *et al.* (1997) discutem que indivíduos colonizadores poderiam liberar feromônio(s) de agregação, atraindo conspecíficos. Esse feromônio seria liberado pela glândula abdominal dos machos. Contudo, o único estudo existente até o momento propõe que essa glândula libera feromônio sexual, e não de agregação (Lopes-Andade *et al.* 2003).

Como conseqüência da sua dependência por fungos, os ciídeos são afetados por qualquer modificação ambiental que interfira na disponibilidade de corpos-de-frutificação de macrofungos coriáceos (Thunes *et al.* 1999). Isto ocorre quando há alterações nas condições necessárias para o desenvolvimento desses fungos, ou quando diminui a qualidade e/ou quantidade de substrato onde esses fungos poderiam se desenvolver (Jonsell & Nordlander 1995; Fosslii & Andersen 1998; Rukke 2000). Muitos ciídeos são restritos à vegetação primária, não ocorrendo em vegetações secundárias ou áreas abertas alteradas (Gumier-Costa 2004; Lopes-Andrade obs. pessoal). Isto corre mesmo quando estas áreas se encontram próximas a áreas extremamente bem preservadas, e mesmo quando há muita disponibilidade de fungos. Se os ciídeos não consumirem os corpos-de-frutificação, ocorre o acúmulo gradativo dessas estruturas e a indisponibilidade de diversos nutrientes importantes aos sistemas florestais (Rukke 2000; Thunes *et al.* 1999).

Importância Econômica

Há poucos registros de Ciidae como espécie praga ou de importância econômica. Lohse & Reibnitz (1991) mencionaram *Cis multidentatus* (Pic) (originalmente descrita da China), coletada em cogumelos comestíveis de restaurantes chineses da Alemanha e Itália. Madenjian *et al.* (1993) mencionaram três espécies como pragas de cogumelos secos comestíveis: *Cis asiaticus* Lawrence; *Cis chinensis* Lawrence; e *Orthocis auriculariae* Lawrence. Todas foram encontradas em embalagens de fungos provenientes da Tailândia e China, mas adquiridas em lojas de alimentos importados nos EUA (Lawrence 1991; Madenjian *et al.* 1993). Recentemente, *Cis chinensis* foi encontrada também no Brasil (obs. pessoal).

Ciídeos também podem causar prejuízos a coleções científicas. *Hadreule blaisdelli* (Casey) é comumente encontrada em coleções de fungos da Europa e América do Norte. Essa espécie pode ter dezenas de gerações em um mesmo corpo-de-frutificação, sem adição de água ou de nenhum outro nutriente (Klopfestein & Graves 1987). Um descuido pode, portanto, levar à contaminação de toda uma coleção.

História Taxonômica

A primeira espécie de Ciidae foi descrita como *Dermestes boleti* Scopoli, com base em exemplares coletados em Carniola (província de Kranjska, Eslovênia) (Lawrence 1971). Hoje, sabe-se que essa espécie também ocorre no Cáucaso e até mesmo no Japão. Posteriormente, *Derm. boleti* foi transferida para um gênero novo, *Cis* Latreille. O vocábulo *Cis* vem do grego "κισ", substantivo masculino que designa "verme que escava madeira", possível alusão aos imaturos que pareceriam vermes; por causa deste nome, acreditou-se durante algum tempo que esses besouros podiam se alimentar diretamente de madeira.

A descrição de outras espécies com características similares e incluídas em *Cis* levou Leach (*in* Samouelle 1819) a delimitar uma família à parte para este gênero, chamada "Cisidae". Porém, a derivação "Cisidae" não está gramaticalmente correta, já que o "s" de *Cis* teria que ser suprimido para se adicionar o sufixo "-idae" (o sufixo deve ser adicionado ao radical; ICZN 1999, Art. 29.1). Uma variação do grego "κισ" é "κιοσ", o que poderia levar à derivação "Cioidae", que também foi utilizada por alguns autores da segunda metade do século XIX até o início do século XX (Gistel 1856; Gemminger & Harold 1869; Fåhraeus 1871; Kiesenwetter 1877; Reitter 1878, 1902; Gorham 1883; Casey 1898; Perkins 1900; Kraus 1908; Dalla Torre 1911; Dury 1917; Bréthes 1924; Lesne 1924). Contudo, o gênero nominotípico não foi descrito com base nesta variante. Outro nome que aparece na literatura é "Cissidae" (Wollaston 1854; Waterhouse 1860), que foi provavelmente um erro de grafia. Em muitos livros didáticos, na última listagem das espécies da família (Abdullah 1973), e em trabalhos faunísticos na Europa (*e.g.* Reibnitz 1999) imperou o uso do nome Cisidae. Apesar disso, por simplificação e coerência, o nome Ciidae será utilizado aqui: é o nome correto (Grensted 1940) e, adicionalmente, todos os taxônomos especialistas nessa família o adotam (*e.g.* Lawrence 1965; Kawanabe 1994a; Lawrence & Lopes-Andrade 2007).

A primeira revisão mundial de Ciidae foi feita por Mellié (1849), e incluía 106 espécies distribuídas em 7 gêneros (*Endecatomus* Mellié; *Xylographus* Mellié; *Ropalodontus* Mellié; *Cis* Latreille; *Ennearthron* Mellié; *Orophius* Redtenbacher; *Octotemnus* Mellié) e 1 subgênero de *Ennearthron* (*Ceracis* Mellié). Alguns desses gêneros já tinham sido descritos por Mellié (1847) em um pequeno trabalho, com base em espécies originalmente descritas no gênero *Cis*. Várias modificações importantes se sucederam depois da monografia de Mellié (1849): (i) *Endecatomus* foi retirado da família e transferido para Bostrichidae por LeConte (1861); (ii) *Orophius* foi rebaixado a subgênero de *Octotemnus* (Reitter 1878), *status* suprimido na revisão do gênero por Kawanabe (2002); (iii) *Ceracis* ganhou *status* de gênero (Lacordaire 1857). Os demais gêneros citados por Mellié (1849) são válidos até hoje. A única mudança drástica na caracterização dos gêneros deste trabalho (Mellié 1849) foi a transferência de diversas espécies de *Ennearthron* para *Ceracis*, na revisão dos *Ceracis* da América do Norte (Lawrence 1967b); mesmo assim, ainda há dúvida sobre o *status* da maioria dos *Ennearthron* (Lopes-Andrade & Zacaro 2003a; Kawanabe 1996b).

Os trabalhos subseqüentes ao de Mellié (1849) foram, em sua maioria, descrições de espécies nos gêneros preexistentes. Alguns gêneros de Ciidae foram transferidos para outras famílias, e outros foram sinonimizados: (i) o gênero *Rhipidandrus* LeConte foi transferido para Ciidae (LeConte & Horn 1883), mas retornou para Tenebrionidae; (ii) *Pterogenius* Candèze, por sua vez, foi para uma nova família (Pterogeniidae), juntamente com *Histanocerus* Motschulsky (Crowson 1955); (iii) *Sphindocis* Fall foi retirado de Ciidae (Lawrence 1971), retornando alguns anos depois (em Sphindociinae; Lawrence 1974b); (iv) diversos gêneros foram sinonimizados, principalmente com *Cis* (*e.g.*, *Eridaulus* Thomson, *Macrocis* Reitter, *Cisdygma* Reitter, *Xestocis* Casey).

Estudos de espécimes coletados em expedições científicas às ilhas do Pacífico e Índico (Perkins 1900; Scott 1926; Blair 1928; Zimmerman 1938) levaram à descoberta de diversos ciídeos, muitos dos quais foram descritos em gêneros novos: *Apterocis* Perkins; *Dimerapterocis* Scott; *Paratrichapus* Scott; *Polynesicis* Zimmerman; *Scolytocis* Blair; e *Tropicis* Scott. Estudos da fauna japonesa levaram à descrição de gêneros restritos a esse país: *Acanthocis* Miyatake (descrito originalmente como subgênero de *Cis*); *Anoplocis* Kawanabe; *Dichodontocis* Kawanabe; *Hyalocis* Kawanabe; *Lipopterocis* Miyatake; *Neoennearthron* Miyatake; *Nipponapterocis* Miyatake; *Nipponocis* Nobuchi & Wada; *Odontocis* Nakane & Nobuchi; *Paraxestocis* Miyatake; *Syncosmetus* Sharp; e *Xylographella* Miyatake. Atualmente, um dos focos de interesse da taxonomia supraspecífica de Ciidae é, justamente, comparar estes gêneros e questionar a validade dos mesmos. Algumas sinonímias, inclusive, serão propostas em breve (*e.g.*, *Nipponocis* como sinônimo de *Cis*, e *Wagaicis* como sinônimo de *Odontocis*; John F. Lawrence, com. pes.).

Grande parte dos gêneros tem ampla distribuição geográfica, sendo alguns holárticos (*Dolichocis* Dury; *Ennearthron*; *Hadreule* Thomson; *Octotemnus*; *Ropalodontus*; *Strigocis* Dury; *Sulcacis* Dury), paleárticos (*Cisarthron* Reitter), pantropicais (*Xylographus*), neotropicais (*Falsocis* Pic; *Malacocis* Gorham; *Porculus* Lawrence) ou cosmopolitas (*Cis*; *Orthocis* Casey). Poucos gêneros são endêmicos da região neártica (*Plesiocis* Casey; *Sphindocis* Fall), da Europa Oriental (*Diphyllocis* Reitter; *Wagaicis* Lohse), de ilhas do Oceano Atlântico (*Atlantocis* Israelson), do Oceano Índico (*Dimerapterocis* Scott, *Paratrichapus* Scott e *Tropicis* Scott) e do Pacífico (*Apterocis* Perkins, *Scolytocis* Blair).

Ciidae conta atualmente com cerca de 40 gêneros e 600 espécies descritas (Adbullah 1973; Lawrence & Lopes-Andrade 2007). Contudo, sabe-se que a diversidade dessa família é muito maior, principalmente nos trópicos. Até o momento, as faunas melhor estudadas foram a neártica (Casey 1884, 1898; Lawrence 1967b, 1971, 1974a,b, 1982), a paleártica (Miyatake 1954, 1955, 1959, 1982, 1985; Nakane & Nobuchi 1955, 1956; Nobuchi 1955a,b, 1959, 1960a,b; Nobuchi & Wada 1956; Chujô 1939, 1940a,b, 1941, 1966; Kawanabe 1993, 1994a,b, 1995a,b, 1996a,b, 1997a,b, 2002; Kawanabe & Miyatake 1996; Pope 1977; Reitter 1885, 1886, 1887, 1902a,b, 1911, 1913a,b, 1915; Thomson 1863; Abeille de Perrin 1874a,b, 1876; Królik 2002), e a fauna das ilhas do Pacífico (Blackburn & Sharp 1885; Blair 1927, 1928, 1932, 1935, 1940, 1941, 1944; Zimmerman 1938, 1939, 1941, 1942).

Os estudos taxonômicos sobre a fauna neotropical se restringiram a descrições esparsas até o momento. Com exceção do trabalho de

Mellié (1849), a quase totalidade das espécies neotropicais foi descrita por Bréthes (1922, 1923, 1924), Friedenreich (1881), Gorham (1883, 1886, 1898), Lawrence (1987), Lopes-Andrade (*in* Almeida & Lopes-Andrade 2004; Lopes-Andrade & Zacaro 2003a,b; Lopes-Andrade *et al.* 2003; Lopes-Andrade *et al.* 2002) e por Pic (1916a,b, 1922, 1923, 1930, 1940). Até 2004, havia muitos gêneros neotropicais ainda não descritos e somente uma chave taxonômica para as espécies do gênero *Porculus* (Lawrence 1987).

Muitos autores tentaram estabelecer uma classificação supragenérica para Ciidae. A grande maioria das divisões adotadas, porém, foram artificiais e injustificadas (*e.g.*, Cisinae & Octotemninae, *in* Winkler 1927). Lawrence (1971), em sua revisão dos Ciidae da América do Norte, adotou uma divisão simples de Ciidae em duas subfamílias: Orophiinae e Ciinae. A primeira incluía os gêneros *Octotemnus* Mellié, *Paratrichapus* Scott, *Ropalodontus* Mellié, *Scolytocis* Blair e *Xylographus* Mellié. Todos os outros gêneros conhecidos até então foram incluídos em Ciinae. Posteriormente, o próprio Lawrence (1974a) alterou essa classificação, mudando o *status* dessas subfamílias para tribos (Orophiini e Ciini) e, em um *addendum*, propôs o retorno de *Sphindocis denticollis* Fall para Ciidae, em uma subfamília própria (Sphindociinae). Lawrence (1974b) estudou em detalhes os imaturos de *Sphindocis* Fall, 1917 e, finalmente, delimitou a subfamília Sphindociinae com maior precisão. Posteriormente, Lawrence (1982, 1987) utilizou esta última classificação, que também foi adotada por autores japoneses (*e.g.*, Kawanabe 1993). Entretanto, um estudo mais detalhado do gênero japonês *Xylographella* levou à descrição de uma nova tribo de Ciinae (Kawanabe & Miyatake 1996), Xylographellini; segundo estes últimos autores, o gênero *Scolytocis* seria incluído, com ressalvas, nesta nova tribo.

Entretanto, em seu trabalho sobre os Coleoptera do mundo, Lawrence *et al.* (1999) abandonaram a divisão de Ciinae em tribos, dada a falta de homologias conhecidas para cada um desses *taxa.* Assim, não há um consenso sobre a classificação de Ciidae, e é necessário que se encontrem homologias para justificar uma classificação supragenérica da família. Muitos caracteres da morfologia externa de Ciidae são convergentes e, portanto, insatisfatórios para justificarem um agrupamento, mesmo que artificial, para os gêneros descritos. O estudo da morfologia de genitália de machos e fêmeas contorna esse problema, já que se presume que os escleritos genitais sofram pressões seletivas distintas daquelas dos escleritos externalizados.

Relações Filogenéticas

A família Ciidae pertence à superfamília Tenebrionoidea (antiga divisão Heteromera, *in pars*), da série Cucujiformia da subordem Polyphaga. Esta subordem é a mais diversificada dentro dos Coleoptera. Cucujiformia (Tenebrionoidea + Cucujoidea) é considerado um ramo monofilético (Lawrence & Newton 1995). Grande parte das espécies deste grupo possui algum grau de associação ou dependência por fungos (Lawrence *et al.* 1999). Dentro de Tenebrionoidea, Ciidae é considerado um ramo basal, estando próximo a Pterogeniidae (considerado como grupo irmão), Archecrypticidae, Prostomidae, Mycetophagidae e Melandryidae (Lawrence 1982). Porém, essas hipóteses de proximidade de Ciidae com outras famílias consideradas "basais" dentro de Tenebrionoidea são abordagens completamente empíricas, sem suporte filogenético real. Alguns autores modernos estão questionando, inclusive, o posicionamento de Ciidae dentro de Tenebrionoidea e propondo uma maior proximidade de Ciidae com famílias de Cucujoidea (pelo menos como hipótese alternativa; Klaus-Dieter Klass, comunicação pessoal).

Não há nenhuma filogenia de Ciidae publicada, nem mesmo para grupos de espécies ou gêneros dentro desta família. Todas as propostas de relações filogenéticas encontradas até o momento na literatura são completamente empíricas, e se restringiram à indicação de proximidade entre alguns gêneros. Há, porém, trabalhos sobre filogenia de Ciidae não publicados. Na dissertação de mestrado, apresentei uma análise filogenética da família (Lopes-Andrade 2004) baseada em caracteres morfológicos externos que, em sua maioria, se mostraram altamente homoplásicos. No mesmo estudo, porém, foram apresentados os primeiros dados comparativos de morfologia de genitália, que se mostraram consistentes para a classificação específica e genérica. A morfologia de genitália feminina apresentou caracteres interessantes para a classificação supragenérica da família, mas não havia dados suficientes, naquele momento, para se obter conclusões mais robustas sobre as relações filogenéticas dos grandes grupos de Ciidae. Por isso, considerei mais consistente trabalhar melhor os caracteres utilizados, ampliar a matriz com os grupos terminais faltantes, e re-analisar os dados. Isso deve ser feito após a conclusão do doutorado, e só então essa filogenia será publicada. Outro trabalho não publicado sobre filogenia de Ciidae foi feito recentemente pela equipe do Dr. Klaus-Dieter Klass (Alemanha) com base em análises moleculares de algumas espécies de Ciidae e de diversas famílias de Cucujiformia. Alguns dados desse trabalho corroboram a minha análise sobre dados morfológicos: monofilia de Ciidae, polifilia de *Cis* e *Sulcacis*, e maior proximidade de *Sulcacis* a gêneros de Orophiini. Mas os dados moleculares não permitiram uma resolução mais detalhada das relações dentro de Ciidae.

Citogenética e Morfologia Interna

A maior parte das espécies de Polyphaga (Coleoptera) descritas citogeneticamente apresenta o número diplóide 2n=20 cromossomos, e a meiofórmula 9 + Xy_p (Smith & Virkki 1978). Segundo estes autores (*op. cit.*), o cariótipo ancestral de Polyphaga teria este mesmo número diplóide; e o sistema de determinação de sexo Xy_p não poderia ser assumido como um caráter ancestral, mas sim como uma vantagem adaptativa comum em Coleoptera.

Há poucos dados sobre citogenética de Ciidae na literatura. O primeiro trabalho sobre a citogenética dessa família foi feito por Lawrence (1967a), que estudou duas espécies de Ciidae: *Cis fuscipes* Mellié; e *Cis impressus* Casey. Esta última espécie foi sinonimizada com a primeira no mesmo trabalho (*op. cit.*), com base nos argumentos de que não havia diferenças morfológicas entre elas e que possuíam o mesmo número diplóide (2n = 14). Este autor (*op. cit.*) verificou, também, que todos os indivíduos identificados anteriormente como *C. fuscipes* eram fêmeas e, finalmente, experimentos em laboratório sugeriram que essa espécie seria partenogenética.

Smith & Virkki (1978) citam dados não publicados sobre a meiofórmula de outras duas espécies: (i) *Sulcacis lengi* Dury, com 9 + Xy_p; e (ii) *Octemnus laevis* Casey, 10 + Xy_p. Estes mesmos autores (op. cit.) argumentam que preferem manter *C. fuscipes* e *C. impressus* como espécies separadas (sem apresentarem, contudo, nenhum argumento consistente). A única representação da morfologia cromossômica de Ciidae foi apresentada por Lopes-Andrade *et al.* (2003a) para *Cis leoi* Lopes-Andrade *et al.*, com meiofórmula 10II + Xyp.

Há pouca informação na literatura sobre a morfologia interna de Ciidae. Descrições histológicas da anatomia dos sistemas digestivo e reprodutivo de adultos de *Hadreule blaisdelli* Casey foram feitas por Klopfestein & Graves (1992). Segundo estes autores, as gônadas de *Had. blaisdelli* têm basicamente o mesmo o padrão descrito para outras espécies de Polyphaga: cada ovário é formado por três ovaríolos telotróficos, e cada testículo por três testíolos.

Morfologia de Genitália

Neste projeto, "genitália" se refere ao conjunto de partes esclerotizadas que compõe a "genitália externa" *sensu* Matsuda (1976). Em Ciidae, a genitália de machos é composta pelo 9° segmento (fusão do 9° esternito e do 9° tergito), peça basal (falobase) e *aedeagus* (conjunto do tégmen e lobo mediano). O *aedeagus* é geralmente simétrico; o tégmen é o resultado da fusão dos paramêros; e o lobo mediano (pênis) é o órgão copulatório propriamente dito. Até o momento, sabe-se que a genitália de fêmea pode ser composta por um par de paraproctos alongados, cada um sustentado por um báculo longitudinal, coxitos divididos transversalmente e com um báculo transversal sustentando a base (provavelmente homólogo ao gonângulo), estiletes (*styli*) bem desenvolvidos, inseridos nos ápices dos coxitos e espículo ventral (*spiculum ventrale*) geralmente longo.

A morfologia de genitália de machos tem sido extensivamente usada na caracterização de espécies de Ciidae (*e.g.* Lawrence 1971), mas uma ênfase maior sempre foi dada por autores japoneses (*e.g.* Kawanabe 1993; 1994a, b) e brasileiros (*e.g.* Almeida & Lopes-Andrade 2004; Lopes-Andrade *et al.* 2002; Lopes-Andrade *et al.* 2003; Lopes-Andrade & Zacaro 2003a, b). Devido ao diminuto comprimento da genitália, o mais comum em trabalhos taxonômicos é a representação da morfologia dessa estrutura por esquemas simplificados. Contudo, recentemente o uso de fotografias tem se mostrado mais efetivo e prático (*e.g.* Lopes-Andrade *et al.* 2003).

A morfologia de genitália de fêmea de Ciidae é pouco conhecida, há poucas citações na literatura (Thayer & Lawrence 2002) e nenhum esquema ou dado descritivo detalhado, muito menos fotografias. Thayer & Lawrence (2002) citam uma variação do comprimento do *spiculum ventrale* e do número de divisões transversais dos coxitos (gonocoxitos), que seria diferente em Ciini (quatro divisões) e Orophiini (duas divisões). Contudo, estes autores analisaram poucos gêneros, não apresentaram dados morfométricos, representações pictóricas, nem detalhes estruturais.

JUSTIFICATIVA

Com exceção da subfamília (monospecífica) Sphindociinae, não há nenhuma proposta consistente para a classificação supragenérica de Ciidae. A tribo Xylographellini não inclui todos os gêneros que possuem as características diagnósticas da tribo. A tribo Ciini inclui gêneros que são mais próximos a Xylographellini ou a Orophiini. A morfologia de genitália masculina e feminina proporciona caracteres consistentes para uma classificação supragenérica de Ciidae (Lopes-Andrade 2004). Contudo, não há nenhum estudo comparativo de genitália que forneça dados suficientes para o uso desses caracteres na classificação da família. Alguns caracteres de genitália masculina têm sido usados como diagnósticos em descrições de espécies, mas raramente foram considerados como caracteres decisórios na classificação genérica ou supragenérica. Não há dados descritivos detalhados sobre genitália de fêmea, nem mesmo para os gêneros mais comuns de Ciidae.

Pretendo, com o estudo comparativo apresentado aqui, apresentar características morfológicas de genitálias de macho e fêmea que possam ser usadas na diagnose de táxons genéricos e supragenéricos de Ciidae. Esses dados serão importantes na proposição de novos limites e *status* dos táxons já reconhecidos e na delimitação de tribos ou subtribos em cada um desses grupos.

OBJETIVO

O objetivo geral desta tese é propor um novo sistema de classificação para Ciidae (Coleoptera: Tenebrionoidea).

METODOLOGIA

Distribuição Geográfica dos Grupos Estudados

Este estudo abrange todas as áreas de ocorrência de espécies da família Ciidae, que possui distribuição mundial. Há espécies analisadas provenientes de todas as regiões biogeográficas, incluindo: (i) todos os gêneros descritos das Américas (Regiões Andina, Neotropical e Neártica) e Oceania; (ii) todos os gêneros (com exceção de *Cisarthron*) das partes continentais das Regiões Paleártica e Etiópica (Africana); (iii) os gêneros com mais de uma espécie descrita da Região Indo-Malaia (incluindo ilhas); (iv) representação das faunas insulares dos oceanos Atlântico (*e.g.*, *Atlantocis*), Pacífico (*e.g.*, *Apterocis*) e Índico (*e.g.*, *Tropicis*).

Coletas

Alguns colaboradores realizaram coletas esporádicas e esparsas nas regiões neotropical (Brasil, México), neártica (México, Canadá), paleártica (Alemanha, Escócia, Inglaterra, Japão, Polônia, Romênia) e etiópica (África do Sul). Realizei pessoalmente coletas no Brasil (Minas Gerais, São Paulo, Espírito Santo e Bahia) e no México (Veracruz e Yucatán). As coletas no México forneceram exemplares em abundância de gêneros raros em coleções (*e.g. Strigocis, Malacocis*), além de permitir contato com um especialista na família e troca de espécimes para estudos, essenciais para a finalização deste trabalho.

O modo mais fácil de encontrar ciídeos é coletando corpos-de-frutificação de fungos orelhas-de-pau que, geralmente, apresentam pequenos orifícios na sua camada externa quando colonizados por estes besouros. Esses fungos crescem em troncos de árvores em decomposição e, em alguns casos, em árvores ainda vivas de ambientes alterados ou áreas urbanas. Contudo, alguns ciídeos ápteros ou micrópteros são coletados em serrapilheira, mas não se sabe se eles só se dispersam pela serrapilheira ou se estariam associados a fungos de solos.

Criação de Ciídeos em Laboratório

Mantive algumas populações de ciídeos em laboratório pelas seguintes razões: (i) necessidade de obter grande número de indivíduos para facilitar a descrição das espécies novas; (ii) obter genitálias melhor preservadas; (iii) obter espécimes para troca com museus e colecionadores particulares. Para isso, mantive cada população isolada, em pote plástico com tampa perfurada (cada furo pequeno o suficiente para evitar a passagem do menor ciídeo). Quando necessário, coloquei um recipiente de vidro com algodão e água no pote para manter a umidade do(s) fungo(s). Recolhi constantemente alguns indivíduos adultos, mortos ou vivos, e os acondicionei em álcool absoluto.

Os ciídeos são fáceis de serem transportados do campo e criados em laboratório. Isso se deve principalmente a seu hábito de vida: o fungo é alimento em todas as fases, e também serve de abrigo. Várias gerações podem ser mantidas sem precisar de adição de mais corpos-de-frutificação e nem de cuidados na manutenção da temperatura e umidade. Exemplo disso é que algumas das populações foram mantidas por mais de quatro anos sem nem ao menos abrir o pote. Contudo, alguns gêneros de Ciidae não se aclimatam facilmente em laboratório, como é o caso de *Phellinocis.*

Empréstimos e Doações por Instituições e Coleções Particulares

Os Ciidae utilizados na presente tese se encontram temporariamente na coleção do Laboratório de Orthopterologia (DBG) da Universidade Federal de Viçosa. Organizei essa coleção, em grande parte, durante a dissertação de mestrado (no período de 2002 a 2004), e a incrementei durante o doutoramento. Além dos espécimes da coleção de referência, instituições nacionais e estrangeiras enviaram ciídeos como empréstimo ou doação. Os acrônimos de todas as coleções consultadas são listados a seguir (origem e/ou curadores entre parênteses):

ANIC—Australian National Insect Collection, CSIRO Entomology (Canberra, Austrália; Adam Slipinski & John F. Lawrence)
CMNC—Canadian Museum of Nature (Ottawa, Ontario, Canadá; Bob Anderson)
CNCI—Canadian National Collection of Insects (Ottawa, Ontario, Canadá; Pat Bouchard)
EMEC—Essig Museum of Entomology (Berkeley, California, EUA; Cheryl Barr)
FMNH—Field Museum of Natural History (Chicago, Illinois, EUA; Margaret Thayer)
GOPC—Glenda Orledge Private Collection (Bath, Reino Unido)
IEXA—Instituto de Ecología (Xalapa, VeraCruz, México; Leonardo Delgado)
KMMA—Koninklijk Museum voor Midden Afrika (Tervuren, Bélgica; Marc De Meyer)
LAPC—Cristiano Lopes-Andrade Private Collection (Viçosa, Minas Gerais, Brasil)
MCZ—Museum of Comparative Zoology, Harvard University (EUA; Phillip Perkins)
MHNG—Muséum d'Histoire Naturelle (Geneva, Switzerland; Giulio Cuccodoro)
MZLU—Museum of Zoology, Lund University (Lund, Suécia; Roy Danielsson)

RKPC— Roman Królik Private Collection (Polônia)
RRPC—Rafal Ruta Private Collection (Polônia)
SMTD— Staatliches Museum für Tierkunde (Dresden, Alemanha; Klaus-Dieter Klass)
UGZM— Entomología, Centro de Estudios en Zoología, Universidad de Guadalajara (Zapopan, Jalisco, México; José Luis Navarette-Heredia)

Todo esse material, em conjunto, representa cerca de 80% dos gêneros mundiais e 35% das espécies descritas para a família. Há, ainda, cerca de 400 espécies novas que, se fossem descritas, aumentariam em mais de 65% o número de espécies de Ciidae. Contudo, a descrição exaustiva de novos táxons não foi objetivo desta tese e não seria viável dentro do tempo previsto para a conclusão do doutorado (quatro anos).

Estudo da morfologia externa

Estudei a morfologia externa dos espécimes tanto por observação direta em lupa como pela análise de fotografias em Microscópio Eletrônico de Varredura convencional (MEV) ou de pressão variável (MEV–PV). O estudo da morfologia externa não teve caráter comparativo exaustivo. Só serviu de complemento aos trabalhos de descrição de gêneros, para a resolução de problemas de identificação de gêneros e espécies, e de delimitação de táxons genéricos e supragenéricos.

Observações e fotografia em estereomicroscópio

Observei os exemplares de museus e de coleções particulares diretamente sob estereomicroscópio (lupa). Dissequei os exemplares vivos ou fixados em álcool e, posteriormente, os montei em triângulo de papel em alfinete entomológico (nº 1 ou 2), utilizando cola hidrossolúvel. Registrei detalhes da morfologia externa por desenho sob câmara-clara ou por fotografia. No último caso, utilizei uma câmera digital Canon S70 acoplada a uma lupa MZ16.

Em uma fase mais avançada da tese (na descrição de *Neoapterocis*, no artigo sobre *Falsocis* Pic, e no artigo sobre Xylographellini) utilizei a técnica de automontagem para a resolução de problemas de profundidade de campo em fotografias de grande aumento. A automontagem consiste em construir uma imagem com base em fotografias seqüenciais em diferentes planos de foco. A imagem final é um mosaico desses planos, e permite a visualização de todo o objeto em grande resolução e riqueza de detalhes. Muitos *softwares* têm essa função de automontagem, mas dei preferência ao *freeware* COMBINE ZM (Hadley 2006). Inicialmente (descrição de *Neoapterocis*), obtive imagens a partir de cinco ou seis fotos. Nos artigos três e quatro da tese, o melhor domínio da técnica me permitiu fotografar planos de foco com distâncias de 0,015 a 0,020mm. Isso gera de 20 a 40 fotos (em objetos de 0,5mm de profundidade, como muitos ciídeos), permitindo a construção de imagens que mostram até pequenas variações da superfície cuticular desses insetos.

Análise em MEV e MEV–PV

Para a análise em MEV ou MEV–PV, foi utilizado o protocolo descrito abaixo:

a. desidratar em série alcoólica (70, 80 e 100%; somente para **MEV**);
b. passar no ponto crítico (somente para **MEV**);
c. montar em suporte de alumínio (**MEV** e **MEV–PV**);
d. cobrir com ouro (somente para **MEV**);
e. analisar o material.

Fiz os registros fotográficos em MEV e MEV-PV utilizando meio digital.

Análise da genitália

Para estudar a morfologia da genitália de machos e fêmeas, dissequei (**i**) espécimes vivos, (**ii**) fixados em álcool absoluto ou (**iii**) montados em alfinetes entomológicos. Os números em algarismos romanos indicam variações no protocolo de dissecção, quando pertinente, e a metodologia utilizada é descrita a seguir:

a. hidratar em água quente com detergente neutro (somente para **ii** e **iii**) por 15 minutos;
b. remover o abdômen em solução fisiológica para insetos (**i**) ou água (**ii** e **iii**);
c. amolecer e clarear com solução saturada de KOH por, no máximo, 30 minutos*;
d. remover a genitália do abdômen;
e. montar a genitália, entre lâmina e lamínula, utilizando como meio de inclusão gel de álcool polivinílico saturado em solução de lactofenol**;
f. secar a lâmina em estufa a 60°C por uma hora, ou naturalmente por três a sete dias;
g. etiquetar a lâmina, indicando: número seqüencial de registro; espécie; e localidade;
h. etiquetar o espécime montado em alfinete com o número de referência da lâmina de genitália, ou fixar com esmalte na própria lâminas, nos casos em que o espécime for preservado (principalmente no caso **iii**).

*Protocolo usado até 2005. De 2006 em diante, utilizei uma solução de KOH / Detergente / Água (1 : 1 : 20, aproximadamente) onde amoleci os espécimes a frio durante 4 a 12h. Esta nova solução se mostrou mais prática para preparação de grande quantidade de material em pouco tempo _ um ajuste metodológico necessário à conclusão da tese dentro do prazo. Vale salientar que o amolecimento nessa solução durante um tempo maior (2 dias ou mais) permite a obtenção de preparações melhores do que com solução de KOH puro saturado ou amolecimento a quente.

Gel de Downs (Downs 1943; Salmon 1947): Fazer uma solução **A saturada de álcool polivinílico em água a 60°C; fazer uma solução **B** de ácido fênico e ácido lático na proporção de 1:1; misturar essas duas soluções na proporção 14 **A** : 11 **B**. Conservar solução-estoque ao abrigo da luz. **Esta solução é tóxica e deve ser manuseada com cuidado!**

Observei e fotografei as lâminas contendo os escleritos genitais em microscópio binocular. Registrei cada estrutura com uma ou mais fotografias. No último caso, integrei digitalmente duas ou mais fotografias (de áreas diferentes da estrutura) para compor uma imagem final mostrando toda a estrutura. As fotografias originais foram sempre coloridas e amplas (entre 5 e 12 megapixels, 72dpi). Dessa forma, obtive melhores contraste e resolução nas pranchas finais, apresentadas em tons-de-cinza de alta resolução (300 dpi). Em casos de estruturas com focos em diferentes planos, utilizei fotografias em diferentes profundidades de campo para a confecção de uma imagem final mais informativa (processo de automontagem, explicado anteriormente).

As melhores preparações são aquelas obtidas por dissecção de espécimes vivos, melhores ainda nas espécies que apresentam alta esclerotização das estruturas de interesse. Contudo, grande parte do material acessível para estudo proveio de coleções secas, com espécimes coletados desde o início do século XIX. Portanto, nem sempre as estruturas de interesse (escleritos genitais e pré-genitais de machos e fêmeas) se preservaram, nem se mantiveram íntegras no processo de dissecção ou durante o tratamento químico. Quando havia mais espécimes disponíveis, fiz novas preparações. Em casos de espécimes únicos ou raros, apresento as melhores preparações que obtive, mesmo que muito aquém do almejado.

Outra variável que contribuiu na qualidade final das fotografias ou imagens foi o equipamento utilizado. Testei várias câmeras digitais (*e.g.* Sony T33; Nikon Coolpix 990, 995 e 4500; Cânon S70), mas o equipamento preferencial foi a câmera digital Canon S70 acoplada ao microscópio binocular (Olympus BX41 ou Leica DM2500) com um adaptador Leica. Esta última combinação não permitiu a melhor qualidade de imagem dentre todas, mas representou a melhor relação entre o tempo necessário para obter cada foto e a qualidade (quantidade de informação) _ fator extremamente importante em um estudo comparativo que utilizou mais de quatro mil fotografias e imagens digitais.

Depois de tratadas digitalmente, organizei parte das fotografias e imagens finais obtidas em pranchas, utilizando o software Corel Draw (do pacote Corel X3). Confeccionei as escalas das pranchas por comparação direta com fotos de lâmina de calibração em diversos aumentos (4x, 10x, 20x, 40x, 100x), de acordo com o microscópio binocular, câmera digital e configurações utilizadas em cada fotografia.

Descrição de espécies e gêneros

Descrevi parte dos gêneros novos (e respectivas espécies novas, quando pertinente) encontrados em coleções e em coletas em campo. Na presente tese, limito essas descrições a novos táxons com ampla distribuição geográfica e com importantes características morfológicas de genitália. Portanto, esta tese não é um estudo taxonômico exaustivo, nem apresenta descrições de todos os gêneros novos de Ciidae presentes em coleções.

A comprovação que um *taxon* é realmente novo para a ciência depende do estudo aprofundado da literatura disponível, e de comparação com tipos primários, parátipos ou paralectótipos. Há vários outros problemas que devem ser considerados: (i) alguns tipos estão perdidos (*e.g.* os tipos das duas espécies de *Trichapus*) ou mal preservados; (ii) muitas espécies são conhecidas somente pelos tipos e estes, em grande parte, estão em instituições fora do país. Esses exemplares têm que ser estudados *in loco*, já que a remessa de tipos primários pelo correio é arriscada; (iii) alguns museus, como o Museu de Zoologia de Londres (antigo Museu Britânico de História Natural: BMNH) têm restrições ao envio de espécimes ao Brasil; (iv) as descrições na literatura são, muitas vezes, incompletas ou insatisfatórias; (v) muitas espécies foram descritas somente com base em fêmeas; (vi) a literatura disponível está em diversas línguas, grande parte em latim, francês, alemão, inglês, polonês, romeno, russo e japonês. Descrevo nesta tese somente os táxons comprovadamente novos, quando todos os problemas supracitados foram adequadamente contornados. A delimitação de cada *taxon* nesta tese deve ser considerada como uma hipótese, passível de ser refutada em análises futuras.

A descrição de cada *taxon* seguiu o seguinte roteiro:

a. comprovar que o *taxon* é novo;
b. separar todos os indivíduos presentes na coleção pertencentes ao *taxon*;
c. dissecar alguns indivíduos para extração da genitália;
d. determinar e etiquetar o espécime que será o holótipo (macho), e os que serão parátipos (machos e fêmeas);
e. analisar em MEV ou MEV–PV (quando possível e extremamente necessário) ou fotografar em microscópio estereoscópico;
f. analisar a genitália em microscópio binocular;
g. medir 10 representantes de cada localidade, quando houver espécimes disponíveis, além do holótipo, seguindo os parâmetros morfométricos determinados por Lawrence (1987);
h. encontrar características diagnósticas para o *taxon*;
i. descrever a morfologia externa e a morfologia da genitália de machos e fêmeas, quando pertinente.

RESULTADOS

Como resultado do trabalho de comparação de genitálias de machos e fêmeas de diferentes gêneros, descrevo dois gêneros e 22 espécies de diversos países ou territórios, a saber: Brasil (SC, PR, RS, MG, ES, BA, PA); Chile; Colômbia; Costa Rica; Dominica; Equador; Guatemala; Fiji; Malásia; Mauritius; México; Nova Zelândia; Panamá; Porto Rico; República Dominicana; Reunião; e Venezuela. Além disso, redescrevo dois gêneros: *Phellinocis* Lopes-Andrade & Lawrence, e *Neoapterocis* Lopes-Andrade. Delimito duas tribos novas (Atlantociini e Ceraciini), duas subtribos novas (Syncosmetina e Xylographina). Também apresento novos limites para uma subfamília (Orophiinae), duas tribos (Orophiini e Xylographellini) e duas subtribos (Orophiina e

Xylographellina), já existentes. A nova classificação que apresento aqui é um agrupamento de quase a metade das espécies da família (boa parte em Orophiinae *sensu novo*).

Apresento os resultados desta tese em forma de artigos publicados em revista científica indexada (Artigos 1 a 3) e manuscritos completos (Artigos 4 e 5). Os manuscritos (Artigos 4 e 5) não devem ser considerados publicações válidas para fins de nomenclatura zoológica, em acordo com as normas do Código Internacional de Nomenclatura Zoológica de 1999 (Capítulo 3, Artigos 8.2 e 8.3). Abaixo, listo os artigos, cada um seguido de uma breve explanação:

ARTIGO 1: Lopes-Andrade, C., Lawrence, J.F. (2005) *Phellinocis*, a new genus of Neotropical Ciidae (Coleoptera: Tenebrionoidea). Zootaxa 1034: 43–60.

Neste artigo descrevo, em co-autoria com J. F. Lawrence, um gênero Neotropical com três espécies novas. Padronizamos a nomenclatura para a genitália de macho, e utilizamos a morfologia dessa estrutura como caráter diagnóstico. Uma das espécies descritas (*Phellinocis romualdoi* Lopes-Andrade & Lawrence) possui variação intra-específica do número de antenômeros e fêmea com "fóvea" abdominal _ primeiros registros desses casos em Ciidae. Não descrevemos a genitália de fêmea do gênero, já que preparações dessas estruturas só foram obtidas por mim quase dois anos depois da submissão do artigo. No quinto artigo da tese, este gênero é transferido de Ciini para a nova tribo Ceraciini (em Orophiinae *sensu novo*).

ARTIGO 2: Lopes-Andrade, C. (2007) *Neoapterocis*, a new apterous Ciidae (Coleoptera: Tenebrionoidea) genus from Mexico and Chile. Zootaxa 1481: 35–47.

Descrevo um gênero áptero com duas espécies novas (uma do Chile e a outra do México). Utilizo a morfologia de genitália para caracterizá-lo, já que a morfologia externa é insuficiente para posicioná-lo dentro da família. É o primeiro caso de um gênero áptero de Ciidae de terras continentais e a primeira representação gráfica da genitália de fêmea de Ciidae. O exame de espécimes do Chile, depois que publiquei este artigo, me levou a duvidar dos limites do gênero: possivelmente, há um gênero chileno e outro mexicano. Contudo, ainda não encontrei características que possam justificar a separação de *Neoapterocis* em dois gêneros _ isso depende da revisão dos gêneros de Ciidae compostos somente por espécies ápteras.

ARTIGO 3: Lopes-Andrade, C. (2007) Notes on *Falsocis* Pic (Coleoptera: Tenebrionoidea: Ciidae), with the description of an endangered Brazilian species. Zootaxa 1544: 41–58.

Neste artigo, redescrevo o gênero *Falsocis* Pic. Discuto o posicionamento de *Falsocis* dentro da família Ciidae com base, principalmente, em caracteres de genitália de macho e de fêmea. Descrevo uma espécie nova (*Falsocis brasiliensis* Lopes-Andrade), e argumento que esta espécie está ameaçada de extinção. *Falsocis* apresenta características externas convergentes com características de Orophiini. Mas apresento dados contundentes de morfologia de genitália de fêmea que justificam a permanência desse gênero na subfamília Ciinae.

ARTIGO 4: The tribe Xylographellini (Coleoptera: Tenebrionoidea: Ciidae).

Utilizo a morfologia de genitália de macho e fêmea para discutir os limites da tribo Xylographellini e sua relação com outros grupos de Ciidae. Transfiro três gêneros para Xylographellini, nas subtribos Xylographellina (*Xylographella* e *Scolytocis*) e Syncosmetina **subtr. nov.** (*Syncosmetus* e *Tropicis*). Discuto os limites e/ou distribuição de 21 espécies de quatro gêneros. Dezesseis espécies são descritas (15 *Scolytocis* e 1 *Tropicis*), de ilhas dos oceanos Índico, Pacífico e Atlântico (Mar do Caribe), e de toda a Região Neotropical. Apresento, além da descrição das genitálias de macho e fêmea desses quatro gêneros, dados comparativos sobre a morfologia de antena, aparelho bucal, asas membranosas (quando presentes) e élitros.

ARTIGO 5: The subfamily Orophiinae *sensu novo* (Coleoptera: Tenebrionoidea: Ciidae).

Neste artigo, comparo a morfologia de genitália de fêmea e macho de cerca de 75% dos gêneros descritos de Ciidae. Apresento a morfologia de genitália de fêmea em detalhes e de forma comparativa pela primeira vez. De forma complementar, discuto dados gerais de morfologia externa _ resultado da comparação de mais de 220 espécies de Ciidae. Com isso, proponho uma nova classificação supragenérica de Ciidae, transferindo parte dos gêneros originalmente em Ciini para novas tribos e subtribos, ou tribos já existentes e incluídas em Orophiinae *sensu novo*. Sugiro que características de genitália de fêmea são homologias de Orophiinae. Essa nova classificação torna coerentes diversas informações sobre a biologia de ciídeos, abrindo um novo campo para estudos ecológicos e biogeográficos.

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ARTIGO I: *Phellinocis*, a new genus of Neotropical Ciidae (Coleoptera: Tenebrionoidea)

Cristiano Lopes-Andrade & John F. Lawrence, 2005
Zootaxa 1034: 43–60

ARTIGO II: *Neoapterocis*, a new genus of apterous Ciidae (Coleoptera: Tenebrionoidea) from Chile and Mexico

Cristiano Lopes-Andrade, 2007
Zootaxa 1481: 35–47

ARTIGO III: Notes on *Falsocis* Pic (Coleoptera: Tenebrionoidea: Ciidae), with the description of an endangered Brazilian species

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Notes on *Falsocis* Pic (Coleoptera: Tenebrionoidea: Ciidae), with the description of an endangered Brazilian species

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Abstract

The genus *Falsocis* Pic is redescribed based on *F. opacus* Pic and *F. brasiliensis* **sp. nov.** an endangered Brazilian species. A key to males of the species of *Falsocis* is provided, together with a description of the external morphology of adults and of the morphology of male genitalia of both species. In addition, the female genitalia of *F. brasiliensis* **sp. nov.** are described. *Falsocis* is included in the tribe Ciini, and its relationship with *Acanthocis* Miyatake and other Ciidae genera is discussed. *Falsocis brasiliensis* **sp. nov.** is known from only three Atlantic Forest remnants, all surrounded by urban areas, pastures or agriculture, and is probably one of the most endangered Brazilian ciids.

Key words: Beetle, Neotropical, Ciinae, Ciini, Atlantic Forest, Conservation Biology

Resumo

O gênero *Falsocis* Pic é redescrito com base em *F. opacus* Pic e *F. brasiliensis* **sp. nov.**, uma espécie brasileira ameaçada. Uma chave para machos das espécies de *Falsocis* é apresentada, juntamente com a descrição da morfologia externa de adultos e morfologia de genitália de macho de ambas as espécies, e genitália de fêmea de *F. brasiliensis* **sp. nov.** *Falsocis* é incluído na tribo Ciini, e sua relação com *Acanthocis* Miyatake e outros gêneros de Ciidae é discutida. *Falsocis brasiliensis* **sp. nov.** ocorre somente em três fragmentos de Mata Atlântica, todos circundados por áreas urbanas, pastos e agricultura, e é provavelmente um dos ciídeos mais ameaçados do Brasil.

Palavras-chave: Besouro, Neotropical, Ciinae, Ciini, Mata Atlântica, Biologia da Conservação

Resúmen

Se redescribe al género *Falsocis* Pic, con base en *F. opacus* Pic y *F. brasiliensis* **sp. nov.**, una especie amenazada de Brazil. Se presenta una clave para los machos de *Falsocis*, así como la descripcion de morfología externa de adultos y de genitalia masculina de ambas especies, y de la genitalia femenina de *F. brasiliensis* **sp. nov.** Se incluye a *Falsocis* en la tribu Ciini, y se discute a sus relaciones con *Acanthocis* Miyatake y otros géneros. *Falsocis brasiliensis* **sp. nov.** ocurre solamente en tres fragmentos de Bosque Atlántico, todos rodeados por area urbana, areas de pastizal y agrícolas, y es probablemente uno de los Ciidae más amenazados de Brasil.

Palabras-Clave: Coleóptero, Neotropical, Ciinae, Ciini, Bosque Atlántico, Conservación

Introduction

Falsocis Pic is a distinct genus, which seems to be restricted to the Neotropical Region. *Falsocis opacus* Pic and the subspecies *Falsocis opacus flavus* Pic were originally described from French Guiana (Pic 1916,

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1922), but the species also occurs in northern Brazil. Blackwelder (1945) and Abdullah (1973) referred to this genus as "*Falcocis*" and "*Falcosis*", respectively, and derived the specific and subspecific epithets as the genus name were feminine. According to the International Code of Zoological Nomenclature (International Commission on Zoological Nomenclature 1999), the correct original spelling of a name is to be preserved unaltered (Art. 32.3), except in the cases treated under Article 34. "*Falcocis*" and "*Falcosis*" are neither emendations nor mandatory changes, and should be considered incorrect subsequent spellings (Art. 33.3). In addition, *Falsocis* is a masculine noun, because it ends in the masculine Greek word "*cis*" (Art. 30.1.2). Since the works of Pic (1916, 1922), and the citations of Blackwelder (1945) and Abdullah (1973), few references to the genus are found in the literature. Lawrence (2001) informally cited the genus to Costa Rica. Lopes-Andrade (2002) cited the genus to Brazil and provided a photograph of a live male *Falsocis* (see Lopes-Andrade 2002, Fig. 3B), which is the specimen chosen as the holotype of the new species described here.

In this work, I redescribe *Falsocis* Pic and discuss the taxonomic limits of the genus. I also provide a brief diagnosis of *Falsocis opacus* Pic and describe *Falsocis brasiliensis* **sp. nov.**, an endangered Brazilian species.

Material and Methods

Permanent slide preparations followed the protocol described by Lopes-Andrade *et al.* (2003). Analysis and photography of slide preparations were made under an Olympus BX41 or BX61 transmitted light microscope. Measurements were taken under an MBS-9 stereomicroscope with a special scale ocular. Final comparisons and descriptions of general external morphology were made under a Leica MZ16. Digital photographs of slide preparations and whole specimens were taken with a Canon S70. Final images of dorsal, lateral, ventral and frontal views of the body were the result of joining 30 to 45 photographs in different focus using the software CombineZM (Hadley 2006). Scanning Electron Micrographs (SEMs) of *Falsocis brasiliensis* **sp. nov.** were obtained using a LEO 435VP under variable pressure (which does not require prior metal coating). Images were arranged and standardized using Corel Photo Paint and Corel Draw X3 software. The distribution map (Fig. 24) was made using the software ArcMap 9.0.

Terms for external morphology, male genitalia and pregenital segments of ciids are explained and discussed by Lopes-Andrade & Lawrence (2005). The terms mesoventrite and metaventrite (introduced by Lawrence 1999) have been used in place of the misapplied terms mesosternum and metasternum respectively (see Lopes-Andrade & Lawrence 2005; Lopes-Andrade 2007). Terms for female terminalia are briefly explained by Lopes-Andrade (2007).

The following symbols are used for measurements and ratios: TL = total length (including head measured from above); PL = pronotal length along midline; PW = greatest pronotal width; EL = elytral length (median length from base of scutellum to elytral apex); EW = greatest elytral width; GD = greatest depth. The range, mean and standard deviation are given for measurements and ratios of males and females (when available). The ratio GD/EW was taken as an indication of degree of convexity; TL/EW indicates degree of body elongation. The species description provided here is based on the holotype, which is a fully pigmented male, and differences among paratypes are given in the section on *Variation*. Description of male genitalia was based on the comparison of specimens from all known localities.

I could not examine the primary types of *Falsocis opacus* Pic and *Falsocis opacus flavus* Pic. Presumably, both types are in Maurice Pic Collection, which now belongs to the Muséum National d'Histoire Naturelle (MNHN, Paris, France). I could not afford to visit MNHN, and I preferred not to take the risk of receiving primary types by mail. Unfortunately, most of the primary types of Brazilian ciids are deposited in institutions outside of Brazil (mainly in European museums), and some are even lost (*e.g.* the types of *Trichapus* Friedenreich; see Lawrence 1987). The primary types of Brazilian species described by Lawrence (1987), and the ones described by my colleagues and I (Lopes-Andrade *et al.* 2002; Lopes-Andrade & Zacaro 2003a, b;

Lopes-Andrade *et al.* 2003; Almeida & Lopes-Andrade 2004; Lopes-Andrade & Lawrence 2005) are all deposited in MZSP (São Paulo, Brazil; see acronym below).

Specimens examined have been deposited in (or belong to) the following institutional and private collections (with acronyms used in this paper):

CMN	Canadian Museum of Nature (Ottawa, Ontario, Canada)
LAPC	Cristiano Lopes-Andrade Private Collection (Viçosa, Minas Gerais, Brazil)
MZSP	Museu de Zoologia da Universidade de São Paulo (São Paulo, Brazil)
SMTD	Staatliche Museum für Tierkunde (Dresden, Germany)

Falsocis **Pic, 1916 (Figs 1–24)**

Falcocis in Blackwelder 1945: 549 (incorrect subsequent spelling)
Falcosis in Abdullah 1973: 231 (incorrect subsequent spelling)

Type species

Falsocis opacus Pic, 1916, by monotypy

Included taxa

Falsocis opacus Pic, 1916
Falsocis opacus flavus Pic, 1922
Falsocis brasiliensis **sp. nov.**

Diagnosis

The genus may be distinguished from other ciid genera by the combination of an extremely convex body, dual vestiture of pronotum and elytra, triangular scutellum, fully developed hind wings, flat prosternum (slightly convex), laminate prosternal process, each protibia with outer margin expanded to form a single tooth, metaventrite disc small and with discrimen extending from posterior to anterior margin. Males have the frontoclypeal ridge curved upwards and bearing a pair of small tubercles on the anterior edge; lateral corners angulate, or produced upwards to form a pair of long curved horns; the anterior pronotal edge elevated and produced forwards; and a distinct setose patch in the first abdominal ventrite.

Redescription

Length 2.00–3.15mm. Body oval, oblong (between 1.48 and 1.97X as long as wide), extremely convex (GD/EW = 0.78–0.88), vestiture of pronotum and elytra dual, consisting of small, inconspicuous decumbent setae and stout, conspicuous suberect to erect setae, all yellowish. Head not visible (Fig. 1) or barely visible from above (Fig. 7); disc convex, subglabrous, with coarse and sparse punctation; interstice between punctures microreticulate. Frontoclypeal ridge in male curved upwards and bearing two small tubercles on the anterior edge (Figs 4, 10), lateral corners angulate (Fig. 4) or produced to form a pair of long horns (Fig. 10). Head, pronotum and elytra punctation single, coarse, irregularly distributed; each puncture bearing a seta (small and decumbent or stout and erect). Antennae (Figs 14, 17) inserted beyond eyes, with 10 antennomeres; funicle subglabrous; club with three antennomeres, transverse, loose, more setose than funicle; each antennomere of the club bearing four sensillifers formed by a group of indistinctly organized sensilla. Mouthparts (Fig. 18) with galea and lacinia subcircular; prementum longer than wide, with labial palpi inserted at its apex; labial palpi very small, basal palpomere reduced to a thin lamella and barely visible (even at magnifications of 200X), second palpomere broad and conspicuous, apical palpomere cylindrical. Eyes (Fig. 14) prominent, finely facetted, each eye usually with more than 70 ommatidia. Pronotal surface densely punctate;

punctation coarse; anterior edge elevated and produced; males with anterior edge strongly developed forwards to form a plate that narrows towards a straight anterior edge (Figs 1–3, 7–9); apical margin of the plate slightly sinuous (Figs 1, 7), sometimes with a patch of long setae on either side (Figs 7, 9–11); lateral pronotal carinae finely crenulate, invisible for their entire lengths from above (Figs 1, 7); antero-lateral pronotal corners broadly rounded or angulate, slightly to distinctly produced forwards. Scutellum triangular (Fig. 13). Elytra strongly convex; lateral to posterior margins bending ventrally (Figs 3, 9, 11, 16); humeri angulate; lateral carinae strong, forming epipleura below more large at base and tapering to basal third, then continuing as a narrow line (Fig. 9, 11, 16) or expanding again until the apex (Fig. 3). Hindwings present and fully developed (Fig. 19). Prosternum short, flat (slightly convex), without carina at midline (Fig. 15); prosternal process short, as long as the prosternum length at midline, laminate, slightly curved inwards. Procoxae subconical (Figs 3, 9, 11, 15), slightly projecting below the plane of the prosternal process. Procoxal cavities opened behind, each aperture width being almost half the length of the prosternal process. Each tibia without spines; outer apex of each protibia expanded to form a single tooth (Fig. 11, arrow). Each tarsus with four tarsomeres. Meso and metacoxae contiguous. Metaventrite almost as long as the first ventrite at midline; discrimen extending from anterior margin throughout the disc at midline, almost reaching the posterior margin. First abdominal ventrite longer than the following ventrite at midline, but smaller than the second and third abdominal ventrites together; males bearing a distinct setose patch at midline (Fig. 16, arrow). Male genitalia well sclerotized; ninth segment V-shaped; eighth sternite (Figs 5, 21) with anterior margin curved inwards, corners angulate and slightly produced; aedeagus (Figs 6, 20, 22) with tegmen twice to four times as wide as median lobe (penis); tegmen nearly as long as median lobe. Female genitalia as described for *Falsocis brasiliensis* **sp. nov.** (Fig. 23; see below).

Comments

Unfortunately, the description of *F. opacus flavus* by Pic (1922) is excessively brief, being only "Coloration flave. Guyane". It is not possible either to give this taxon separate species status, or to synonymize it with *F. opacus*, until the types of Pic are examined.

Lawrence & Lopes-Andrade (2005) mentioned 14 ciid genera with a combination of concave or biconcave prosternum and laminate prosternal process, including *Falsocis*. However, *Falsocis* does have a flat (slightly convex) prosternum, without distinct concavity.

Within the current classification of Ciidae, *Falsocis* Pic may be placed in the tribe Ciini of the subfamily Ciinae. It lacks the spinose outer tibial edges that characterize both Orophiini (Lawrence 1974a) and Xylographellini (Kawanabe & Miyatake 1996) and the distinctive type of antennal club, prementum and male genitalia found in the latter tribe.

Key to the males of *Falsocis* Pic

1 Frontoclypeal ridge with corners obtusely angulate (Fig. 3–4). Anterior pronotal plate completely concealing the head from above (Fig. 1), with anterior margin bearing a row of stout setae similar to those of lateral margins. Pronotal disc (Fig. 1) with dense punctation, punctures separate by a distance of one puncture width or less. Elytral apices explanate and broadly crenulate (Figs 1–3). Epipleura larger at base and tapering to basal third, then expanding again until the apex (Fig. 3). Aedeagus elongate, around four times as long as wide (Fig. 6). TL around 3mm. Amazon Forest (Fig. 24), in French Guiana and northern Brazil.. .... ***Falsocis opacus* Pic**

\- Frontoclypeal ridge with corners produced upwards to form a pair of long curved horns (Figs 8, 10). Head partially visible from above (Fig. 7). Apex of anterior pronotal plate bearing a patch of long setae on either side (Figs 7, 9–11). Pronotal disc with sparse punctation (Fig. 7), punctures separate by a distance

In the male genitalia, the eighth sternite (Fig. 5) has angulate and slightly produced corners. The basal piece (Fig. 6) is conspicuous, U-shaped, and half the length of aedeagus. The aedeagus (Fig. 6) is four times as long as wide, tegmen twice as wide as median lobe, and median lobe almost as long as tegmen.

The species is known only from the Amazon Forest (Fig. 24), and is one of the largest Neotropical Ciidae.

Specimen examined

Brazil: (CMN) labeled: /BRAZIL Pará Altamira 6.iv.1986 N. Degallier [printed]/Falsocis opacus Pic [handwritten] Det J. F. Lawrence [printed]/.

Variation

Just one specimen was examined, with measurements (in mm) and ratios as follows: TL 3.15; PL 1.25; PW 1.55; El 1.80; EW 1.60; GD 1.25; PL/PW 0.81; EL/EW 1.13; EL/PL 1.44; GD/EW 0.78; TL/EW 1.97.

Falsocis brasiliensis sp. nov. (Figs 7–24)

Falsocis sp. in Lopes-Andrade (2002).

Etymology

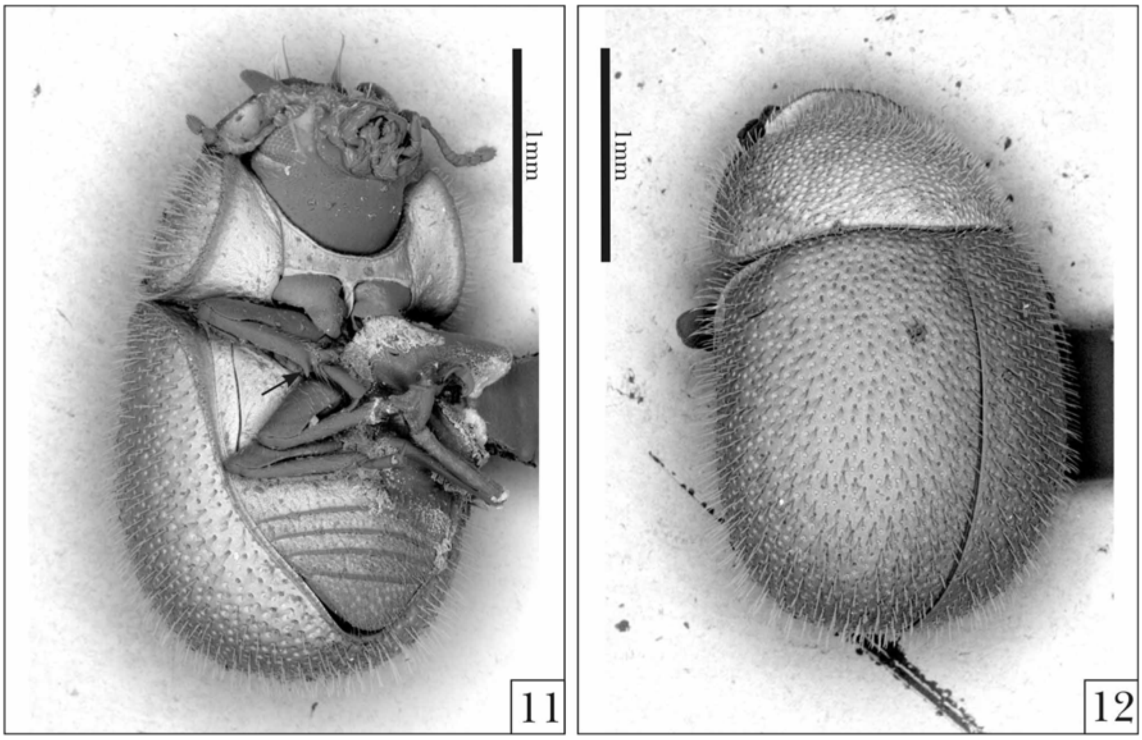
The specific epithet refers to Brazil, *terra typica* of this species.

Diagnosis

The species may be distinguished from *F. opacus* by the smaller body length (2.8mm or less), pronotal punctation sparse, and epipleura large at base and tapering to basal third, then continuing as a narrow line. Males have the corners of the frontoclypeal ridge produced upwards to form a pair of lateral horns (Fig. 10), and apex of the anterior pronotal plate bearing a patch of long setae on either side (Figs 7, 9–11).

Description

Holotype. , measurements in mm: TL 2.20; PL 0.90; PW 1.20; EL 1.30; EW 1.30; GD 1.15. Ratios: PL/PW 0.75; EL/EW 1.00; EL/PL 1.44; GD/EW 0.88; TL/EW 1.69. Body oblong, strongly convex, reddish brown. Head concave on dorsum, with disc slightly convex; frontoclypeal ridge produced upwards, with corners forming lateral long horns produced upwards and slightly curved backwards (Figs 8, 10) and bearing two small, inconspicuous tubercles between them (Fig. 10). Antennae (Figs. 14, 17) with length of the antennomeres (in mm) as follows: 0.080; 0.048; 0.036; 0.031; 0.027; 0.022; 0.019; 0.055; 0.054; 0.087. Pronotum strongly convex, dorsum with irregular, distinct, single punctation; punctures broad, uniform in size, separated by a distance of one to three puncture widths; each puncture bearing a small and decumbent or a stout and erect yellowish seta; interstices between punctures smooth; lateral corners angulate and produced forwards (Fig. 8); antero-lateral margins (beyond lateral angles) curved upwards and bearing a row of small setae; anterior edge strongly developed forwards to form a plate that narrows towards a straight anterior edge, this edge bearing a tuft of long setae on either side (Figs 7–9). Scutellum triangular (Fig. 13), with punctures bearing suberect setae. Elytra strongly convex, sides (seen from above) slightly diverging for the first three quarters of their lengths, then converging towards their apices; disc with distinct, irregular and single punctation; punctures and their setae similar to those on pronotum; interstices between punctures smooth; lateral and apical margins not visible from above (Fig. 7), curving downwards (Fig. 9); epipleura tapering to basal third, then continuing as a narrow line until apex (Figs 9, 11, 16). Hindwings fully developed (Fig. 19). First abdominal ventrite with a margined setose patch (Fig. 16).



FIGURES 11–12. *Falsocis brasiliensis* **sp. nov. 11.** SEM of the male holotype, ventral view; note the tooth at the outer apex of protibia (arrow). **12.** SEM of a female paratype, dorsal view.

Type series

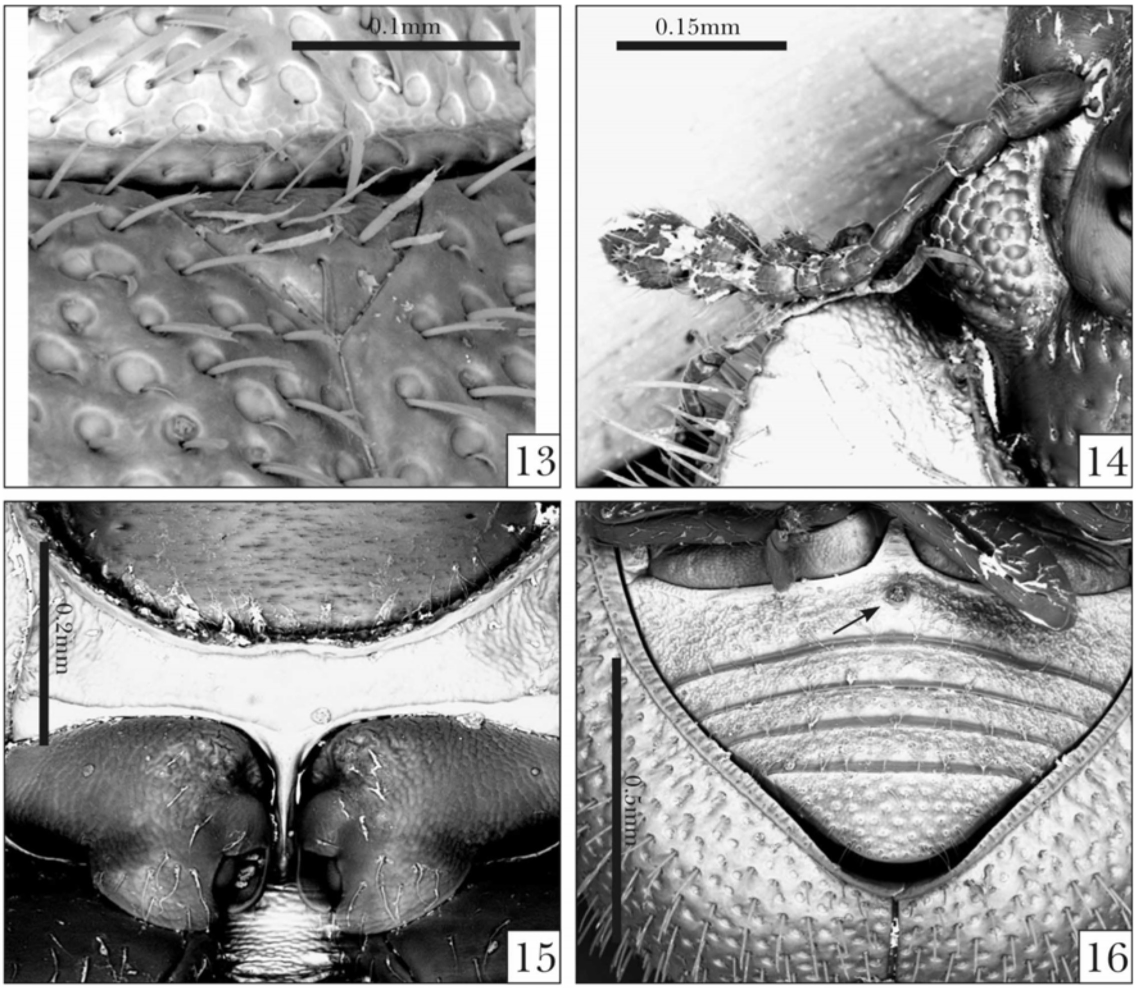
Holotype. (MZSP), **Brazil:** labeled /BRASIL: MG Viçosa x.2000 leg. C. Lopes-Andrade [printed]/*Falsocis brasiliensis* Lopes-Andrade HOLOTYPUS [printed in red paper]/. *Paratypes*. **Brazil:** 2 , 2 (LAPC), same data as holotype; 3 , 1 /BRASIL: MG Viçosa, Mata da Biologia 20.i.2002 leg C. Lopes-Andrade [printed]/; 3 , 1 (LAPC) /BRASIL: ES Venda Nova do Imigrante 31.v.2002 leg. R. Falqueto/; 3 , 3 (1 completely dissected, LAPC; 1 preserved for molecular analysis, SMTD; remaining specimens at LAPC) labeled /BRASIL: BA Jussari; “RPPN Serra do Teimoso”; 23.iii a 17.iv.2005 leg. K. S. Furieri/. All paratypes with a second label /*Falsocis brasiliensis* Lopes-Andrade PARATYPUS [printed in yellow paper]/.

Variation

Males (n = 10. including the holotype), measurements in mm: TL 2.00–2.80 (2.26 ± 0.22); PL 0.80–1.15 (0.89 ± 0.11); PW 1.10–1.45 (1.24 ± 0.10); EL 1.25–1.65 (1.36 ± 0.11); EW 1.25–1.55 (1.37 ± 0.09); GD 1.05–1.25 (1.13 ± 0.06). Ratios: PL/PW 0.65–0.79 (0.72 ± 0.04); EL/EW 0.93–1.04 (0.99 ± 0.04); EL/PL 1.42–1.69 (1.54 ± 0.10); GD/EW 0.78–0.88 (0.83 ± 0.04); TL/EW 1.54–1.81 (1.65 ± 0.07).

Females (n = 5), measurements in mm: TL 2.00–2.35 (2.15 ± 0.15); PL 0.75–0.95 (0.81 ± 0.08); PW 1.15–1.25 (1.20 ± 0.05); EL 1.25–1.45 (1.33 ± 0.09); EW 1.25–1.40 (1.34 ± 0.05); GD 1.05–1.20 (1.11 ± 0.05). Ratios: PL/PW 0.65–0.76 (0.67 ± 0.06); EL/EW 0.93–1.07 (0.99 ± 0.05); EL/PL 1.47–1.93 (1.65 ± 0.17); GD/EW 0.78–0.88 (0.83 ± 0.04); TL/EW 1.48–1.68 (1.60 ± 0.08).

Specimens from Jussari are darker than the ones from Viçosa and Venda Nova do Imigrante. Their male genitalia are slightly smaller, but their general morphology is not sufficiently different to suggest that they comprise a distinct species or subspecies. When carefully compared, the external morphology and the morphology of male genitalia from the three known localities varies little among specimens.

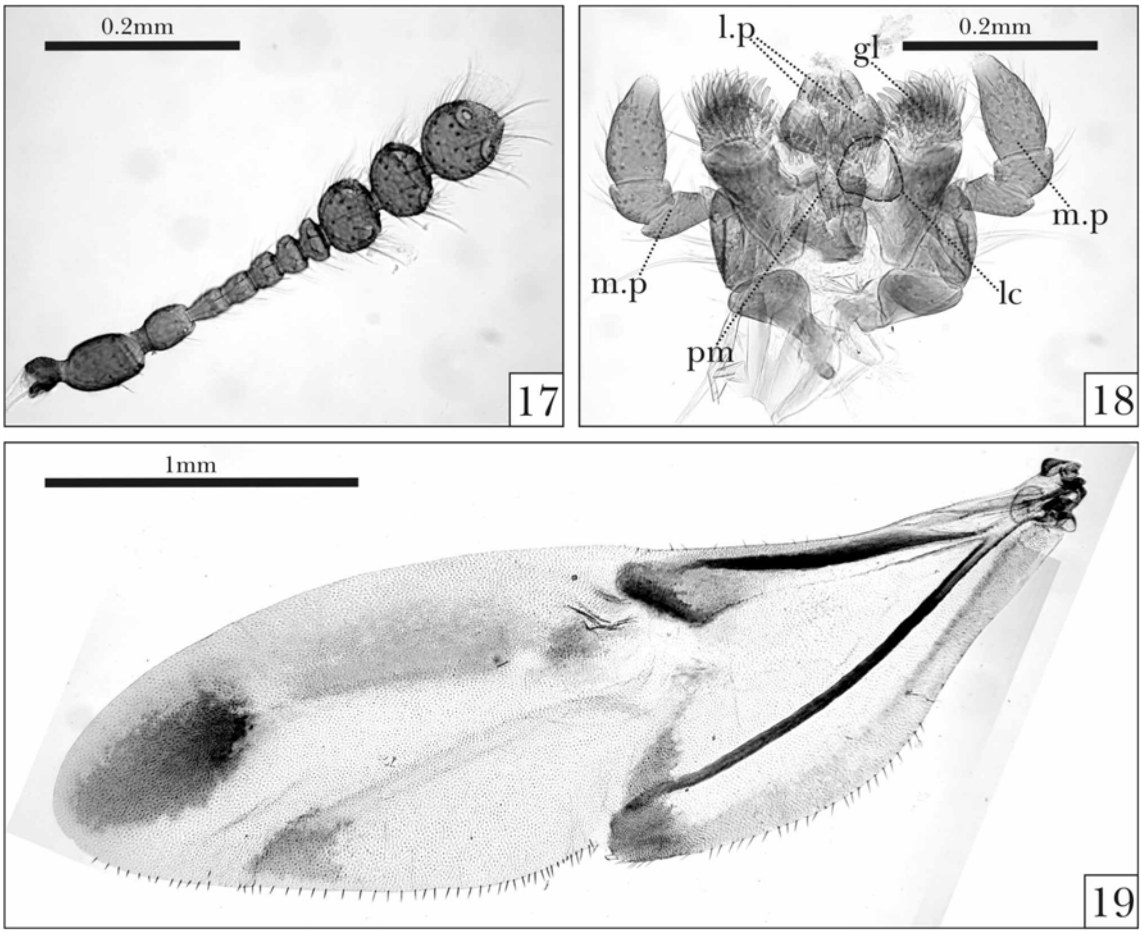


FIGURES 13–16. SEM of *Falsocis brasiliensis* **sp. nov.**; male holotype, unless otherwise specified. **13.** Female paratype, scutellum. **14.** Antenna. **15.** Prosternum, prosternal process and procoxae. **16.** Abdominal ventrites; note the setose patch in the midline of the first abdominal ventrite (arrow).

Biology and Distribution

All known specimens were collected in basidiocarps of an unidentified species of *Phellinus* Quél. (Hymenochaetaceae). Live specimens were observed feeding on the dorsum of the basidiocarp, making convex excavations on its surface (pers. obs.). Other Ciidae species usually explore the basidiocarp from the ventral to the dorsal surface.

Falsocis brasiliensis **sp. nov.** was found just in three small Atlantic Forest remnants (Fig. 24), as follows: (i) “Mata da Biologia” remnant (around 75ha), Viçosa county in the state of Minas Gerais (20º45’S, 42º52’W); (ii) valley of Lavrinhas, rural area of Venda Nova do Imigrante county in the state of Espírito Santo (20º20’S, 41º08’W); (iii) “RPPN Serra do Teimoso”, Jussari county in the state of Bahia (Cocoa Coast; 15º11'S, 39º29'W), a small private protected area (around 200ha). In Viçosa, just eleven specimens (nine included in the type series) were collected, as a result of considerable collection effort between 1999 and 2006. In Jussari, specimens collected were bred in laboratory from April 2005 to August 2006, when the last live female was found. Including the remains of dead specimens and the six specimens included in the type series, around three generations succeeded in each of two basidiocarps collected in Jussari. In this case, generations were estimated as the number of dead couples found sequentially in the fungi from April 2005 up to August 2006.



FIGURES 17–19. *Falsocis brasiliensis* **sp. nov. 17.** Antenna. **18.** Part of mouthparts showing the prementum (pm), labial palpi (l.p), lacinia (lc), galea (gl) and maxillary palpi (m.p). **19.** Hind wing.

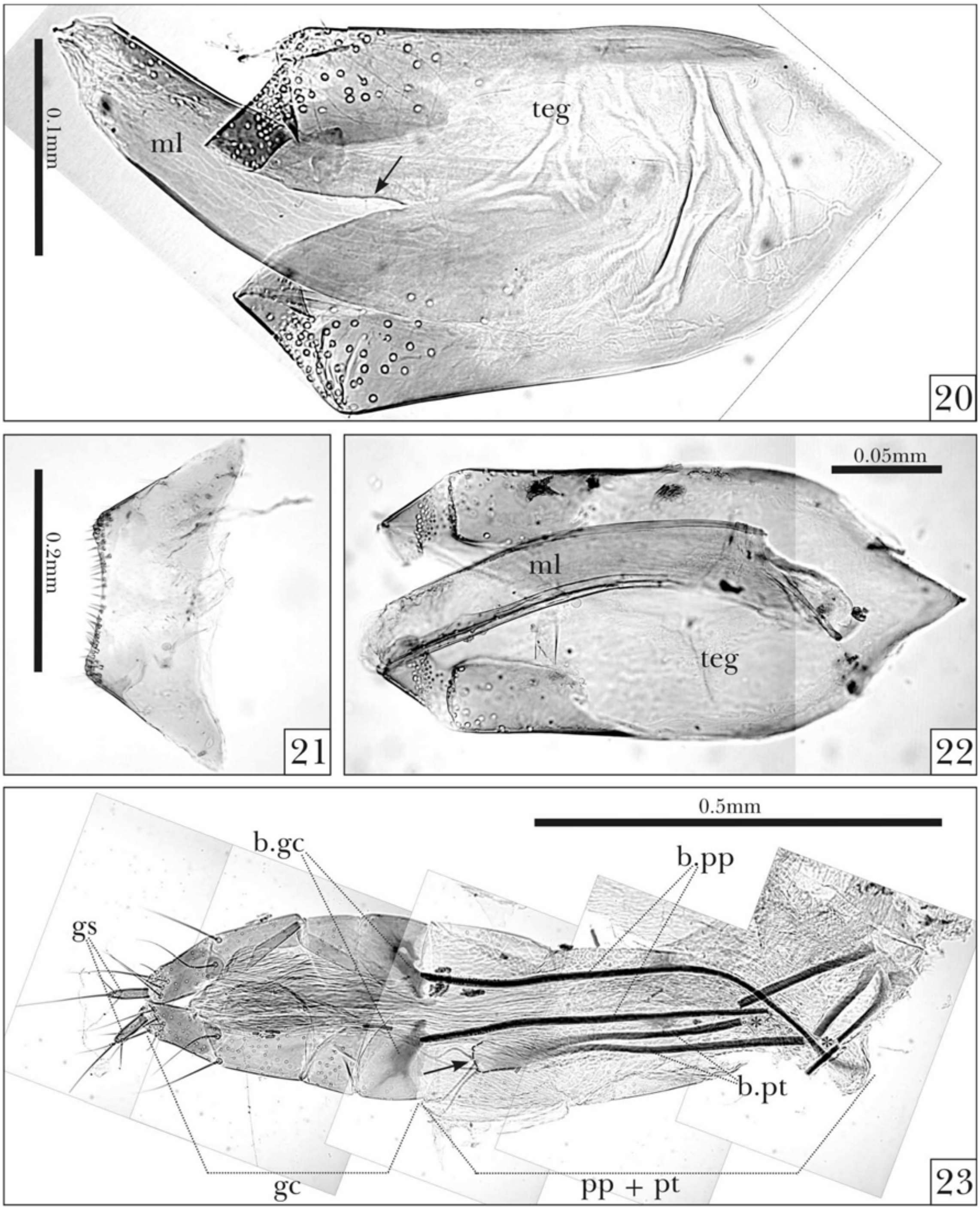
Discussion

Systematics

The reasons to place *Falsocis* in Ciini, as proposed here, deserve some explanation. The current suprageneric classification of Ciidae is based in traditional external morphological characters (*e.g.* number of antennomeres, secondary sexual characters, shape of protibiae). An exception is the tribe Xylographellini, which is defined by a combination of traditional characters (*e.g.* shape of the procoxae and the prosternal process) together with the morphology of male genitalia and mouthparts (Kawanabe & Miyatake 1996). Most of the ciids live in tunnels excavated inside basidiocarps, which imposes strong selective pressures over their body shape. Therefore, morphological convergences are expected, and such convergences have led to several incongruities in the classification of the family. In addition, characters such as number of antennomeres may vary within a genus, or even within a species (*e.g.* in *Phellinocis romualdoi* Lopes-Andrade & Lawrence). Suprageneric taxa should be defined by a unique combination of characters (autapomorphies, whenever possible), in order to support more stable taxonomic classifications. Xylographellini is a good example, as it is well defined by a combination of peculiar characters: labial palpi inserted at the middle of prementum; antennal club compact, with more than four sensillifers in each antennomere; ninth-segment (*spiculum gastrale*) of male Y-shaped. Considering these characters as autapomorphies, *Scolytocis* Blair and *Tropicis* Scott may also be included in Xylographellini, although *Tropicis* has an enlarged prosternal process and cylindrical procoxae similar to that found in several Ciini genera (*e.g. Cis* Latreille and *Ennearthron* Mellié). The shape of the prosternal process varies within Ciini (*e.g. Porculus* Lawrence has laminate prosternal process); therefore it cannot be used to define the tribe. Among the other suprageneric taxa of Ciidae, Sphindociinae is well defined by unique morphological characters of larva and adult (see Lawrence 1974b). However, no autapomorphy is known for either Orophiini or Ciini. While comparing the female genitalia of Ciidae for a forthcoming work, I observed that this structure is distinctly modified in Orophiini and Xylographellini (see Lopes-Andrade 2007 for a brief description), as well as in several genera currently included in Ciini (*e.g. Ceracis* Mellié; *Phellinocis* Lopes-Andrade & Lawrence; *Sulcacis* Dury). Morphology of female genitalia, together with characters of external morphology, may be good arguments to exclude these and other genera from the tribe Ciini. However, this situation is rather complex and will be treated in a separate work (Lopes-Andrade in preparation). For the discussion provided here, it is important to emphasize that *Falsocis* does not have such a modified female genitalia. Therefore, the maintenance of *Falsocis* in Ciini as proposed here is not arbitrary.

Falsocis has subconical procoxae slightly extending ventrally below the plane of the prosternum, and laminate prosternal process, a character combination currently regarded as diagnostic of Orophiini and Xylographellini (Kawanabe & Miyatake 1996; Lawrence 1974a). However, *Falsocis* differs from the Orophiini and Xylographellini genera in a number of ways. In both of these tribes the female genitalia are reduced and modified (pers. obs.), the tibiae bear spines along the outer margin from the apical angle to at least the basal third, the antero-lateral angles of the pronotum are never produced forwards, and the anterior pronotal margin and frontoclypeal ridge are usually devoid of conspicuous secondary sexual characters. Within Ciini, *Falsocis* is quite distinct due to its combination of large body size, high convexity, distinct morphology of male pronotal margin and frontoclypeal ridge, and the above-mentioned procoxae and prosternal characters resembling Orophiini. The reduced first palpomere of labial palpi, in combination with the comparatively well-developed lacinia, seems also to be unique to *Falsocis*. The morphology of mouthparts deserves careful attention in Ciidae taxonomy, as it provides strong characters of phylogenetic importance (Kawanabe 2002; Lopes-Andrade pers. obs.). Information on mouthparts is briefly summarized by Lopes-Andrade (2007), but more extensive comparisons between genera are necessary before any conclusions can be drawn. The reduced metaventrite disc of *Falsocis* resembles that of apterous or micropterous genera (Lopes-Andrade 2007), but the hind wings are fully developed and functional. Among the Ciini, a similar case of a macropterous genus with reduced metaventrite is *Malacocis* Gorham, which also has a similar prosternum and prosternal process to that of *Falsocis*. However, *Malacocis* has reduced and modified female genitalia, and the protibial apices bear spines, characteristics that more closely resemble *Sulcacis* Dury and *Ceracis* Mellié than *Falsocis*.

Within the Ciini genera, *Falsocis* most closely resembles *Acanthocis* Miyatake by the combination of the following characters: vestiture of two sorts of setae; head almost or completely concealed from above by pronotum; frontoclypeal ridge in male produced upwards, with sides distinctly angulate or each produced to form a long horn; anterior pronotal edge forming an elevated plate, produced forwards more strongly in males than in females; antero-lateral pronotal angles produced forwards; laminate prosternal process; each protibia expanded near outer apex to form a single tooth; meso and metacoxae subcontiguous to contiguous. In *Acanthocis inonoti* Miyatake, the frontoclypeal ridge of males bears one conspicuous horn at each side and two small tubercles between them, as in *F. brasiliensis* **sp. nov.** However, *Acanthocis* Miyatake differs from *Falsocis* in having a longitudinal carina at the midline of the prosternum, and first abdominal ventrite of males devoid of a setose patch (Miyatake 1954; Nobuchi 1959). Although both *Acanthocis* and *Falsocis* may be confused with *Cis* in a dorsal view, they are easily distinguished from *Cis* by the combination of characters mentioned above.



FIGURES 20–23. *Falsocis brasiliensis* **sp. nov. 20.** Male genitalia, specimen from Venda Nova do Imigrante (in the state of Espírito Santo). Ventral view showing tegmen (teg), with its V-shaped emargination at apex (arrow), and median lobe (ml). **21.** Eighth sternite of male. **22.** Male genitalia, specimen from Jussari (in the state of Bahia). Dorsal view showing the tegmen (teg) and median lobe (ml). **23.** Female genitalia showing the gonostyli (gs), gonocoxites (gc), paraproct (pp), proctiger (pt), transverse baculi of basal gonocoxite (b.gc), baculi of paraproct (b.pp) and baculi of proctiger (b.pt). The dashed line (arrow) indicates the apex of proctiger, and asterisks the broken portions of baculi. Spiculum ventrale not shown.

FIGURE 24. Distribution map of *Falsocis* Pic. The circle and question mark represent the known localities of *Falsocis opacus* Pic. Triangles represent the known localities of *Falsocis brasiliensis* **sp. nov**

Host-use

Falsocis brasiliensis **sp. nov.**, so far found only in *Phellinus* fungi, may be placed in the *Phellinus* ciid host-use group (*sensu* Orledge & Reynolds 2005). This group comprises host fungi of the genera *Cryptoporus*, *Cyclomyces*, *Inonotus*, *Phaeolus* and *Phellinus* (Orledge & Reynolds 2005). The ciid *Acanthocis inonoti*, a Japanese species from an apparently close related genus, belongs to this same host-use group. *Acanthocis quadridentatus* Nobuchi & Wada, the other described species of the genus, was already found in *Phellinus* (Kawanabe 1995). These observations on *Acanthocis* and *Falsocis* support that closely related ciid taxa may use closely related fungi (or the same fungi) as host. Gumier-Costa *et al.* (2003) briefly discussed a similar case, in which the closely-related *Cer. monocerus* Lawrence and *Cer. cornifer* (Mellié) breed in the same host-fungi, *Pycnoporus sanguineus* (L. ex Fries). Several genera and species groups of Ciidae use a single host-fungi or are rarely found elsewhere, and the degree of host specificity may be greater in tropical forests than in temperate and subtropical regions (Lawrence 1973). This tendency for members of some ciid genera and species group to use similar host taxa was first formalized by Orledge & Reynolds (2005) in terms of ciid host-use groups.

In the Brazilian Atlantic Forest, there are a number of Ciidae species belonging to the *Phellinus* host-use group, such as *Phellinocis romualdoi* Lopes-Andrade & Lawrence, *Porculus piceus* (Mellié), *Ceracis limai* Lopes-Andrade *et al.*, and undescribed species of the *Cis bilamellatus* group, *Cis taurus* group and the genus *Xylographus* Mellié (pers. obs.). All of these species are less frequently collected than other Brazilian ciids, even when some preference is given for the collection of *Phellinus* basidiocarps (pers. obs.).

Conservation Status

Falsocis is extremely rare in museum collections and is seldom found in the field. *Falsocis opacus* occurs on the northeastern South America (Amazon Forest), and few field collection data are available for the species. Available data for *F. brasiliensis* **sp. nov.** suggest that the species is restricted to the southeastern Brazil (Atlantic Forest), does not occur in open areas and has an extremely low population density (in comparison to other Brazilian Ciidae). *Falsocis brasiliensis* **sp. nov.** was collected only in small forest remnants in the states of Minas Gerais (MG), Espírito Santo (ES) and Bahia (BA). In the last century, the landscape of Viçosa (MG) and its surroundings was deeply altered by human activity, mostly for pastures, agriculture (*e.g.* coffee plantations) and urbanization. The forest is now fragmented, with its remnants predominantly restricted to hilltops. The largest remnant is less than 300ha. Venda Nova do Imigrante (ES) is basically a rural area, where pastures and plantations surround small forest remnants. "RPPN Serra do Teimoso" (Jussari, BA) is the only known protected area where *F. brasiliensis* **sp. nov.** occurs. Considering the urban and rural expansion in Viçosa and Venda Nova do Imigrante, the "RPPN Serra do Teimoso" can be taken as the only known refuge of the species.

The saproxylic insects (insects associated with deadwood or with the fungi and microorganisms that decompose it, *sensu* Speight 1989) are one of the most threatened groups of forest animals due to their intrinsic dependence upon the availability of dead wood, a resource usually less available in managed than in unmanaged forests (Grove & Stork 1999). Among the saproxylic insects, obligatory fungivorous (as the ciids) may be the most threatened group, as they also depend upon the adequate development and quality of fungi inhabiting dead wood. The case of ciids is of particular interest, as they have a variable degree of host-use specificity, some species being restricted to just one or few species of fungi (Lawrence 1973; Orledge & Reynolds 2005). Such intrinsic dependence upon host fungi restricts the occurrence of most neotropical ciid species, and small changes in environmental factors (such as availability of deadwood and quality of fungi) may lead to the local extinction of various ciid species. In a conservation viewpoint, the Ciidae may be one of the first organisms to be affected by habitat fragmentation or reduced availability of resources (macrofungi and, indirectly, dead wood).

I have been collecting ciids for almost eight years, and also receiving large numbers of basidiocarps with ciids from various Brazilian biomes, representing nearly 300 localities from 15 states of Brazil. Surely, it is intriguing that so few *Falsocis* specimens were collected until now. And the fact that *F. brasiliensis* **sp. nov.** was found just in so small forest remnants is worth mentioning. Considering the IUCN Categories and Criteria (IUCN 2001), *F. brasiliensis* **sp. nov.** matches at least the qualitative criteria for considering it an endangered species (EN) because: (i) there is a continuous decline in the area of forested habitat of suitable quality due to human activity; (ii) only three currently occupied areas (subpopulations *sensu* IUCN 2001) are known; (iii) the sum of these areas is less than $10Km^2$; (iv) these subpopulations all occur in severely fragmented landscapes, and are surrounded by urban or rural (open) areas; (v) the species does not occur in urban or open areas; (vi) the known areas of occupancy are extremely isolated from each other and genetic exchange is not expected; (vii) considering the most well sampled locality (Viçosa), the frequency of collection suggests a low subpopulation density. Data available on *F. opacus* are not sufficient to evaluate its conservation status.

Falsocis species have singular morphological and biological characteristics, and there is no other Ciidae genus resembling it, except *Acanthocis* from Japan. *F. brasiliensis* **sp. nov.** is the first tropical Ciidae that matches at least the qualitative criteria of an endangered species (*sensu* IUCN 2001). Unfortunately, insects, particularly the saproxylic, are usually ignored in tropical forest management and conservation issues (Grove & Stork 1999). A direct consequence is that little financial support is available for conducting studies on saproxylic insects, and the lack of qualitative and quantitative data leave them out of the "red lists" of endangered and threatened species. However, being out of the "red lists" does not mean that saproxylic insect species are not threatened, a logical conclusion frequently neglected.

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F. opacus was arranged by Robert Anderson and François Génier (CMN), with the assistance of F. Z. Vaz-de-Mello. Rafal Ruta (Poland) copied and sent the works of Pic. Karina S. Furieri and Romualdo Falqueto collected specimens from Bahia and Espírito Santo States, respectively. Equipment facilities were provided by "Laboratório de Orthopterologia" and "Laboratório de Histologia e Embriologia" (both DBG/UFV). SEM photographs were made at NAP/MEPA (ESALQ/USP) with the assistance of Dr. Elliot W. Kitajima. CLA was granted by CNPq (processo número 140463/2004–6) for his doctorate degree; other financial support by CAPES, CNPq and FAPEMIG.

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ARTIGO IV: The tribe Xylographellini (Coleoptera: Tenebrionoidea: Ciidae)

Cristiano Lopes-Andrade, manuscrito original
Artigo apresentado no formato de submissão para a Zootaxa

Este manuscrito não deve ser considerado como publicação válida para fins de nomenclatura zoológica, em acordo com as normas do Código Internacional de Nomenclatura Zoológica de 1999 (Capítulo 3, Artigos 8.2 e 8.3)

The tribe Xylographellini (Coleoptera: Tenebrionoidea: Ciidae)

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Abstract

The tribe Xylographellini is redefined and three genera are formally transferred to it: *Scolytocis* Blair, to the subtribe Xylographellina; *Syncosmetus* Sharp and *Tropicis* Scott, to the subtribe Syncosmetina **subtr. nov**. The genus *Scolytocis* is redescribed and diagnoses are provided for the other genera of the tribe. Sixteen new species are described: *Scol. bouchardi* **sp. nov.**; *Scol. cariborum* **sp. nov.**; *Scol. danielssoni* **sp. nov.**; *Scol. difficillimus* **sp. nov.**; *Scol. fritzplaumanni* **sp. nov.**; *Scol. furieriae* **sp. nov.**; *Scol. howdeni* **sp. nov.**; *Scol. indecisus* **sp. nov.**; *Scol. kiskeyensis* **sp. nov.**; *Scol. lawrencei* **sp. nov.**; *Scol. malaysianus* **sp. nov.**; *Scol. neozelandensis* **sp. nov.**; *Scol. panamensis* **sp. nov.**; *Scol. paschoali* **sp. nov.**; *Scol. zimmermani* **sp. nov.**; and *Trop. cuccodoroi* **sp. nov.** A key to the subtribes and genera of Xylographellini is provided, as well as keys to the species of *Scolytocis*. The taxonomic limits and geographic distribution of the tribe, its subtribes and genera is discussed in light of the new data provided here. The morphological similarities between Xylographellini and Orophiini are briefly discussed.

Kew words: Minute fungus-beetles, Syncosmetina **subtr. nov.**, genitalia, systematics, geographic distribution

Resumo

A tribo Xylographellini é redefinida e três gêneros são formalmente transferidos para ela: *Scolytocis* Blair, para a subtribo Xylographellina; *Syncosmetus* Sharp e *Tropicis* Scott, para a subtribo Syncosmetina **subtr. nov**. O gênero *Scolytocis* é redescrito e diagnoses são fornecidas para os outros gêneros da tribo. Dezesseis espécies novas são descritas: *Scol. bouchardi* **sp. nov.**; *Scol. cariborum* **sp. nov.**; *Scol. danielssoni* **sp. nov.**; *Scol. difficillimus* **sp. nov.**; *Scol. fritzplaumanni* **sp. nov.**; *Scol. furieriae* **sp. nov.**; *Scol. howdeni* **sp. nov.**; *Scol. indecisus* **sp. nov.**; *Scol. kiskeyensis* **sp. nov.**; *Scol. lawrencei* **sp. nov.**; *Scol. malaysianus* **sp. nov.**; *Scol. neozelandensis* **sp. nov.**; *Scol. panamensis* **sp. nov.**; *Scol. paschoali* **sp. nov.**; *Scol. zimmermani* **sp. nov.**; e

Trop. cuccodoroi **sp. nov.** Uma chave para as subtribos e gêneros de Xylographellini é fornecida, assim como chaves para as espécies de *Scolytocis*. Os limites taxonômicos e distribuição geográfica da tribo, subtribos e gêneros são discutidos a partir dos novos dados apresentados aqui. As similaridades morfológicas entre Xylographellini e Orophiini são brevemente discuticas.

Palavras-chave: Ciídeos, Syncosmetina **subtr. nov.**, genitália, sistemática, distribuição geográfica

Introduction

The tribe Xylographellini (Ciidae: Ciinae) was established by Kawanabe & Miyatake (1996) for the genus *Xylographella* Miyatake, comprising only the type species from Japan. Along with Sphindociinae, Xylographellini is regarded as being monospecific and both are the unique suprageneric Ciidae taxa defined by robust morphological characters (Kawanabe & Miyatake 1996; Lopes-Andrade 2007a, b). However, while no other Sphindociinae species came to light in the last decades, many new Xylographellini species are known from museum and private collections. Moreover, other described Ciidae genera that possess the diagnostic characters of Xylographellini should be included in the tribe. One of these genera, the monospecific *Scolytocis* Blair was doubtly included in the tribe (Kawanabe & Miyatake 1996). Besides it, the genera *Syncosmetus* Sharp and *Tropicis* Scott also share some diagnostic characters with *Xylographella* and *Scolytocis*. In the description of *Scolytocis*, Blair (1928) cited that it resembles *Tropicis* in the "short antennae with broad compact club, and also in the denticulations of the outer edge of the tibiae". The drawings and descriptions of *Tropicis* by Scott (1926) and *Syncosmetus* Sharp by Miyatake (1954, as *Omogocis* Miyatake) provided important cues on the morphological similarities of both genera, and also on their relationship with *Scolytocis* and *Xylographella*.

In the last eight years, large series of new *Scolytocis* species were collected in Brazil, and other specimens were made available by private and institutional collections. A good amount of material was brought together, allowing comparative studies and giving some light on the generic and suprageneric relationships of Xylographellini. Specimens of this tribe continue to arrive from various sources, but it is necessary to accomplish this work, transferring to Xylographellini some taxa that certainly belong to the tribe and describing several new species. I did not intend to conduct an exhaustive taxonomic revision, but to provide important distributional and morphological information on this barely known group of Ciidae. Moreover, Cytogenetic and Ecology of some of these new species are being worked on by other researchers, so it is urgent to have them described.

In this work, I formally include *Scolytocis* in Xylographellini. I also transfer *Syncosmetus* and *Tropicis* to the tribe (in the new subtribe Syncosmetina **subtr. nov.**), redefine Xylographellini and provide identification keys for its genera and subtribes, and for the species of *Scolytocis*. Nineteen new species (18 of Xylographellina and one belonging to Syncosmetina **subtr. nov**.) are described, and six morphological species-groups are proposed for *Scolytocis*. The morphology, host-use and geographic distribution of Xylographellini are discussed in light of the new information provided here.

Material and Methods

Species boundaries

Besides other external morphological characters, I carefully compared the male genitalia, antennae, hind wings and tibiae of all the subsamples of the new species described here. The morphology of these structures showed to be consistent throughout the range of each species (in case of species known from more than one locality and/or field collection), accompanying the consistence in the morphology of other traditional characters normally used in Ciidae taxonomy. The comparison of subsamples of widely distributed species (mainly of the genus *Scolytocis*) allowed me to recognize characters that vary more interspecifically than intraspecifically in the Xylographellini genera. Therefore, I could better characterize species known from only one locality.

Species boundaries were judged only by morphological criteria, and the geographic distributions of the species were interpreted *a posteriori* (to avoid redundancy while discussing the distribution of the Xylographellini and its taxa). The limits between the species discussed here are hypothetical and can be tested and refuted by further works using molecular, cytogenetical, ecological or any other biological criteria. When there were doubts on the boundaries of two or more species, I preferred to treat and describe them as separate taxa. Further field collection, mainly in the known geographic gaps, would clarify these matters.

Morphological examinations

Permanent slide preparations followed the protocol described by Lopes-Andrade *et al.* (2003). In some cases, female genitalia were stained with Chlorazol Black E (Direct Black 38, C.I. No. 30235). Examination and photography of slide preparations were made under an Olympus BX41 or a Leica DM 2500 compound microscope.

Measurements of body length, pronotum and elytra were taken under an MBS-9 stereomicroscope with a special scale ocular. Measurements of antennae, wings and genitalia were taken under a Leica DM 2500 with a scale ocular. Final comparisons and descriptions of general external morphology were made under a Leica MZ16. Digital photographs of slide preparations and holotypes were taken with a Canon S70. Final images of dorsal, lateral and ventral surfaces of body were the result of joining 20 to 40 photographs in different focus using the auto-montage freeware CombineZM (Hadley 2006). Scanning Electron micrographs (SEM's) were obtained using a LEO 435VP under variable pressure (which does not require prior metal coating). Images were arranged and standardized using Corel Photo Paint and Corel Draw X3 software.

Terms for external morphology, male genitalia and pregenital segments of ciids are explained and discussed by Lopes-Andrade & Lawrence (2005). The terms mesoventrite and metaventrite (introduced by Lawrence 1999) have been used in place of the misapplied terms mesosternum and metasternum (see Lopes-Andrade & Lawrence 2005; Lopes-Andrade 2007a). Terms for female terminalia are briefly explained by Lopes-Andrade 2007a.

The sex ratio of *Scolytocis* species, based on observations during dissections, was near one male for five females. For *Tropicis*, this relationship was near 1:1. In some cases, the number of available specimens of each locality was low, and so I preferred not to dissect all specimens: they could be damaged during dissection and, even though, no males would be found. Among the 15 new species of *Scolytocis*, I found males of 12 species and describe their genitalia here. Males of four *Scolytocis* species are unknown (or were not dissected), as follows: *Scol. danielssoni* **sp. nov.**, *Scol. neozelandensis* **sp. nov.** and *Scol. zimmermani* **sp. nov.** All these three species are sufficiently different to allow recognition by external morphological features. Males of *Tropicis cuccodoroi* **sp. nov.** were dissected and their genitalia examined, and comparisons were made with the male genitalia of the other available species of the genus, *Trop. sexcarinatus* (Waterhouse). The male genitalia of *Syncosmetus japonicus* Sharp is also described, but females were not dissected (I had few specimens in hands and preferred not to dissected all). Unfortunately, I had only one female *Sync. reticulatus* Miyatake in hands, which was completely dissected, and no males for comparison. Two females and one male of *Xylographella punctata* Miyatake were dissected. Among all the Xylographellini species, I could not examine three species: *Scol. samoensis* Blair; *Trop. brevicarinatus* Scott; and *Trop. flexicarinatus* Scott. The holotypes of the new species described here were not dissected, so their gender could not be determined. All the photographs of antennae, mouthparts, hind wings, metatibiae, male and female genitalia are of paratypes.

A maximum of ten specimens from each locality were measured. For each species, the range, mean and standard deviation are given for measurements and ratios of a subsample or the whole type series (including the holotype). Measurements of antennomeres were taken only from the holotypes and are provided in each description. The following symbols are used for measurements and ratios: TL, total length (including head measured from above); PL, pronotal length along midline; PW, greatest pronotal width; EL, elytral length (median length from base of scutellum to elytral apex); EW, greatest elytral width; GD, greatest depth; FL, antennal funicle length; CL, antennal club length. The ratio GD/EW was taken as an indication of degree of convexity; TL/EW indicates degree of body elongation. Species descriptions are based on the holotype that, in each case, is a fully pigmented adult. All characters mentioned in description refer to the holotype, except characters of hind wing and genitalia that were all observed in dissected paratypes. Characters and measurements of tibiae and antennae are of holotypes, but the corresponding figures are of paratypes. Differences among paratypes, if any, are given in the sections on *Variation*, together with standard measurements and ratios of paratypes.

Pin label data: host-fungi and localities

Data of pin labels, given in the section on *Specimens examined*, are cited *ipsis litteris*. Data of each label is delimited by a forward slash. All labels are printed in white paper, unless otherwise specified. If a label is mixed printed and handwritten, or has a distinct color (yellow or red) the information is cited inside square brackets immediately following the label wording.

Information on host fungi from pin label data were updated following the database Species Fungorum (Index Fungorum Partnership 2007) available online, and are given in the sections on *Host-fungi*. Geographic coordinates were estimated for all the locality data available from the literature and from pin label data of the specimens examined. Two main data sources were consulted and confronted (Global Gazetteer 2007; Google Earth 2007), and the estimated geographic coordinates were plotted in distributional maps using the software ArcMap 9.0. Most of the terms used here for major biogeographic areas are those adopted by Olson *et al.* (2001). However, in the case of Latin America and the Caribbean Islands, I followed the biogeographic areas and transition zones discussed by Morrone (2006) based on analyses of the entomofauna. In both cases, my choices were arbitrary and are used here only to illustrate and discuss the major distributional patterns of Xylographellini. The term "Region" here is used as a synonym of "Ecozone" and "Realm".

Depositories

Specimens have been deposited in (or belong to) the following institutional and private collections, (with acronyms used in this paper):

ANIC—Australian National Insect Collection, CSIRO Entomology (Canberra, Australia)
BPBM—Bernice P. Bishop Museum (Honolulu, Hawaii, USA)
CAMB—Coleção Ayr de Moura Bello (Rio de Janeiro, RJ, Brazil)
CMNC— Canadian Museum of Nature (Ottawa, Ontario, Canada)
CNCI—Canadian National Collection of Insects (Ottawa, Ontario, Canada)
FMNH—Field Museum of Natural History (Chicago, Illinois, USA)
GOPC—Glenda Orledge Private Collection (Bath, UK)
KMMA—Koninklijk Museum voor Midden Afrika (Tervuren, Belgium)
LAPC—Cristiano Lopes-Andrade Private Collection (Viçosa, MG, Brazil)
MCNZ—Museu de Ciências Naturais da Fundaçao Zoobotânica (Porto Alegre, RS, Brazil)
MCZ—Museum of Comparative Zoology, Harvard University (Cambridge, Massachusetts, USA)
MHNG—Muséum d'Histoire Naturelle (Geneva, Switzerland)
MNNC—Museo Nacional de Historia Natural (Santiago, Chile)
MZLU—Museum of Zoology, Lund University (Lund, Sweden)
MZSP—Museu de Zoologia da Universidade de São Paulo (São Paulo, SP, Brazil)
RRPC—Rafal Ruta Private Collection (Poland)
SMTD—Staatliches Museum für Tierkunde (Dresden, Germany)
UFES—Coleção Entomológica da Universidade Federal do Espírito Santo (Vitória, ES, Brazil)

All the holotypes of new Brazilian species are deposited in MZSP. The holotypes of the remaining new *Scolytocis* are deposited in CNCI (*Scol. bouchardi* **sp. nov.**, *Scol. howdeni* **sp. nov.**) and in ANIC, and the holotype of *Tropicis cuccodoroi* **sp. nov.** in MHNG.

Tribe Xylographellini Kawanabe & Miyatake, 1996 (Figs 1–136)

Extant taxa

Xylographella Miyatake, 1985.

Included taxa

Scolytocis Blair, 1928
Syncosmetus Sharp, 1891
Tropicis Scott, 1926

Diagnosis and comments

Xylographellini may be distinguished from the other Ciidae by the following combination of characters: (i) each antenna with seven (antennomeres of club fused; Fig. 60C), or nine to ten antennomeres (club with three antennomeres; Figs 2, 17, 58–59, 60A, B, 89, 109, 119, 131); (ii) antennal club distinctly compact, at least 1.2X longer than the funicle; (iii) at least the apical antennomere bearing more than four sensillifers, usually more than seven, sometimes coalescent and difficult to be counted; (iv) insertion of labial palpi near the middle of prementum (Fig. 5); (v) prementum with a longitudinal sulcus in frontal view (Fig. 3); (vi) apical labial palpomere widened (Figs 5–8); (vii) prosternum short, being concave, biconcave, flat or slightly tumid; (viii) each tibia usually expanded near the middle or the apex, bearing spines on its outer margin (Figs 18, 61–63, 90, 110, 120, 132); (ix) ninth segment of male abdomen (pregenital segment) always Y-shaped (Figs 20, 64–68, 71, 73–74, 91–94, 111, 121, 133, 135); (x) male genitalia with tegmen and median lobe elongate, cylindrical, at least 4X longer than large; (xi) absence of conspicuous secondary sexual characters in male, but first abdominal ventrite of males sometimes bearing a indistinct setose patch; (xii) female genitalia (Figs 9–12) with gonocoxites divided in two parts, always longer than paraproct; (xiii) gonostyli present (Fig. 11) or absent (most Xylographellini; Figs 9–10, 12).

Characters iii to v and ix are restricted to Xylographellini and are interpreted here as autapomorphies of the tribe. Character ii also occurs in *Nipponapterocis* Miyatake, which is probably a Xylographellini (see Discussion for more details). Character viii occurs mostly in Xylographellini and Orophiini. Character ix occurs in the latter two tribes and also in some genera formally included in Ciini (*Ceracis* Mellié, *Phellinocis* Lopes-Andrade & Lawrence, *Sulcacis* Dury and related genera) and is probably an autapomorphy of Xylographellini, Orophiini and part of Ciini (a strong indication that Ciini is polyphyletic). The female genitalia of the genera related to *Cis*

Latreille (*Ennearthron* Mellié, *Strigocis* Dury, *Falsocis* Pic and so on) all have the basic morphology found in many Tenebrionoidea families (see Lopes-Andrade 2007a, b).

Identification key for the subtribes and genera of Xylographellini

1 Width of scutellum at base more than 0.10X the greatest elytral width (EW). Prosternal process laminate. Procoxae subconical, extending below the plane of the prosternal process. Tibiae (Figs 18, 61–63, 90, 110) with outer edge broadly rounded and/or tibiae distinctly expanded to apex; spines conspicuous…**2 (Xylographellina Kawanabe & Miyatake)**

- Width of scutellum at base less than 0.10X the greatest elytral width (EW). Prosternal process broad. Procoxae subcylindrical and at the same level of the prosternal process. Tibiae (Figs 120, 132) not conspicuously expanded to apex; outer edge of tibiae straight or slightly rounded; spines thin, small, indistinct …**3 (Syncosmetina Lopes-Andrade subtr. nov.)**

2 Antennal funicle with five antennomeres (Fig. 17). Lateral margins of pronotum crenulate. Japan…***Xylographella* Miyatake**

- Antennal funicle with four antennomeres (Figs 58–60, 89, 109). Lateral margins of pronotum smooth. Indo-Malaya, Australasia, Oceania and Neotropical Region…***Scolytocis* Blair**

3 Body subparallel-sided. Humeri angulate. Hind wings well developed. Western Indian Ocean (Seychelles and the Mascarene Islands)…***Tropicis* Scott**

- Body ovoid. Humeri rounded. Hind wings extremely reduced (almost absent). Japan and probably Vietnam…***Syncosmetus* Sharp**

Subtribe Xylographellina Kawanabe & Miyatake, 1996 (1–6, 9–10, 13–112, 136)

Included genera

Scolytocis Blair, 1928
Xylographella Miyatake, 1985 **(type genus)**

Diagnosis

This subtribe is characterized by the combination of the following characters: (i) elytra without longitudinal keels; (ii) scutellum conspicuous, its basal width more than 0.10X the greatest elytral width; (iii) prosternal process laminate; (iv) procoxae subconical, extending below the plane of the prosternal process; (v) apex of prementum acute.

Distribution

Xylographellina is the most widespread subtribe of Xylographellini, occurring throughout the Neotropical Region and in parts of the Palearctic (restricted to Japan), Oceania, Australasia (restricted to New Zealand) and Indo-Malayan Regions.

***Xylographella* Miyatake, 1985 (Figs 5, 9, 13–21)**

Included species

Xylographella punctata Miyatake, 1985 **(type species, by monotypy)**

Diagnosis

The genus *Xylographella* was well redescribed by Kawanabe & Miyatake (1996) in the work delimiting the tribe Xylographellini, and it is not necessary to provide a redescription here. The genus is closely related to *Scolytocis*, but differs mainly by the combination of the following features: (i) antennal funicle with five antennomeres; (ii) lateral margins of pronotum crenulate; (iii) pronotal and elytral punctation coalescent; (iv) male genitalia with tegmen bearing a longitudinal baculum at midline (Fig. 19).

Comments

Formally, the genus is monospecific and occurs only on Japan.

***Xylographella punctata* Miyatake, 1985 (Figs 5, 9, 13–21)**

Diagnosis

The genus is monospecific, and so the unique species may be easily recognized by the characters cited in the diagnosis of the genus (see above).

Host fungi

Fomes fomentarius (L.) J.J. Kickx (Polyporaceae) and *Elfvingia applanata* (Pers.) P. Karst. (Ganodermataceae) (Kawanabe & Miyatake 1996; Kawanabe 1998). Regarded as belonging to the *Ganoderma* host-use group (Orledge & Reynolds 2005).

Distribution

Japan, at the islands of Honshu and Shikoku (Fig. 21).

Specimens examined

Japan: 1m# labeled /Japan: Chu-Zenji 21.vii.09 E. Gallus [handwritten] / 604 [handwritten] / *Xylographella punctata* Miyatake, 1985 C. Lopes-Andrade det. [printed]/, 2f#f# labeled /Japan: Chu-Zenji 21.vii.09 E. Gallus [printed] / *Xylographella punctata* Miyatake, 1985 C. Lopes-Andrade det. [printed] /; 2 specimens / Japan, Nara Pref. Mt. Obako-dake, 1300m near Nosegawa-mura vill. 25 iii 2006, leg. P. Jaloszynski [printed] / *Xylographella punctata* det. Rafal Ruta 2005 [sic] [printed] /.

Scolytocis **Blair, 1928 (Figs 22–112)**

Included species

Scolytocis bouchardi Lopes-Andrade **sp. nov.**
Scolytocis cariborum Lopes-Andrade **sp. nov.**
Scolytocis danielssoni Lopes-Andrade **sp. nov.**
Scolytocis difficillimus Lopes-Andrade **sp. nov.**
Scolytocis fritzplaumanni Lopes-Andrade **sp. nov.**
Scolytocis furieriae Lopes-Andrade **sp. nov.**
Scolytocis howdeni Lopes-Andrade **sp. nov.**
Scolytocis indecisus Lopes-Andrade **sp. nov.**
Scolytocis kiskeyensis Lopes-Andrade **sp. nov.**
Scolytocis lawrencei Lopes-Andrade **sp. nov.**
Scolytocis malaysianus Lopes-Andrade **sp. nov.**
Scolytocis neozelandensis Lopes-Andrade **sp. nov.**
Scolytocis panamensis Lopes-Andrade **sp. nov.**
Scolytocis paschoali Lopes-Andrade **sp. nov.**
Scolytocis samoensis Blair, 1928 **(type species, by monotypy)**
Scolytocis zimmermani Lopes-Andrade **sp. nov.**

Diagnosis

Scolytocis may be distinguished from the other Ciidae by the combination of the diagnostic characters of Xylographellini, mainly the compact antennal club in which each antennomere bears more than four sensillifers, and the fended prementum with labial palpi inserted at its middle. *Scolytocis* differs from the other Xylographellini genera by the combination of following characters: (i) antennal funicle with four antennomeres; (ii) lateral pronotal margins smooth; (iii) prosternal process laminate; (iv) procoxae subconical. Characters i and ii separate *Scolytocis* from *Xylographella*.

Characters iii and iv separate *Scolytocis* from *Syncosmetus* and *Tropicis* (Syncosmetina **subtr. nov.**).

Redescription

Measurements in mm (n = 145, including holotypes and part of the specimens from all localities; excepting *Scol. samoensis* Blair): TL 1.00–2.00; PL 0.32–0.79; PW0.42–0.89; EL 0.58–1.26; EW 0.42–0.95; GD 0.42–0.89. Body light brown to black, shiny to dull on dorsum, subglabrous, vestiture consisting of minute, incospicuous fine setae, sometimes with moderately long setae on the ventral surface. Head strongly declined, barely visible from above. Frontoclypeal region simple in both genders. Labium (Figs 3, 6) with prementum elongate, subpentagonal, apex subacute, fended at middle in the external surface, produced forwards, with labial palpi inserted at its middle and apical palpomere widely expanded. Antennae inserted in front of eye (Fig. 1); fossa deep; funicle always bearing four antennomeres; club compact (with three antennomeres; Figs 2, 58–59, 60A–B, 89, 109) or with the antennomeres completely fused to each (so that it appears to be one large antennomeres; 60C); apical antennomere of the club bearing at least five sensillifers (Fig. 2, arrows) formed by a group of short and cylindrical sensilla. Pronotum with anterior edge simple in both sexes, broadly rounded, anterolateral angles obtuse, not produced; anterolateral margins straight or slightly arched inwards; posterolateral angles broadly rounded or angulate; lateral pronotal carinae smooth, not visible for their entire lengths from above; posterior margin sometimes bearing a rugose border along it. Scutellum conspicuous, triangular, glabrous, punctate or not; basal width more than 0.10X the EW. Elytra subquadrate to suboval; apex truncate or acute, convex or slightly concave, sometimes bearing small cuticular globules (each globule always bearing a small fine setae); posterolateral corners bending dorsally, lateral margins usually not visible from above; suture margined or not, but never deflexed at apex; punctation single, seriate to confuse. Hind wings always fully developed, sometimes extremely membranous; radial cell present and conspicuous; apical area always longer than basal area, without pigmented patches or with one to two pigmented lines/patches (complete or incomplete; distinct or vague). Metaventrite suture (discrimen) present, but usually restricted to the basal region (Fig. 4). Prosternum very short; concave, biconcave or triconcave; with or without longitudinal carina at midline; prosternal process laminate and slightly curved. All tibiae expanded to middle or to apex, outer margin bearing a row of several spines (Figs 61–63, 90, 110). Outer face of protibiae setose along the inner margin; inner face of meso and metatibiae with a setose region near the inner margin, restricted to apical third or extending to base. Femorae subglabrous on internal and external surfaces. Each tarsus formed by four tarsomeres. Male without abdominal setose patch or with a very small, incospicuous setose patch in the midline of the first abdominal ventrite, barely visible even in high magnifications (around 100X) or in slide preparations. *Male genitalia.* Ninth segment Y-shaped (Figs 64–68, 71, 73–74, 91–92, 93–94, 111). Tegmen and median lobe elongate, cylindrical (64–65, 67–70, 72–74, 91–95, 111). Tegmen with sclerotized apex and membranous basal portion; median lobe as long as tegmen or longer, membranous to barely esclerotized. *Female genitalia.* (Fig. 10) Eighth sternite broadly rounded or slightly arched inwards at apex. Spiculum ventrale slightly longer to twice as long as ovipositor. Gonostyli of ovipositor always absent.

Distribution

Scolytocis is found on all the regions where the subtribe Xylographellina occurs, except on Japan. However, its most diversified fauna is the Neotropical, with 12 known species (all these species being described here).

Comments

Six morphological species groups are recognizable, and are arbitrarily named here as follows: (i) the *bouchardi* group, comprising the species with triconcave prosternum, and including *Scol. bouchardi* **sp. nov.** and *Scol. difficillimus* **sp. nov.**; (ii) the *lawrencei* group, comprising the small species with tumid prosternum and small hind wings, and including *Scol. cariborum* **sp. nov.**, *Scol. kiskeyensis* **sp. nov.**, *Scol. lawrencei* **sp. nov.**, *Scol. malaysianus* **sp. nov.** and probably *Scol. samoensis* Blair**;** (iii) the *danielssoni* group, comprising the large Central-American species with a conspicuous rugose border along the posterior pronotal margin and a biconcave prosternum bearing a narrow longitudinal carina at midline, including *Scol. danielssoni* **sp. nov.**, *Scol. howdeni* **sp. nov.**, *Scol. indecisus* **sp. nov.** and *Scol. panamensis* **sp. nov.**; (iv) *fritzplaumanni* group, comprising the species with smooth posterior pronotal border and a biconcave prosternum that lacks longitudinal carina, and including the Brazilian *Scol. fritzplaumanni* **sp. nov.**, *Scol. furieriae* **sp. nov.**, and *Scol. paschoali* **sp. nov.**; (v) the *neozelandensis* group, including only *Scol. neozelandensis* **sp. nov.**; (vi) the *zimmermani* group, including only *Scol. zimmermani* **sp. nov.** The species-groups of some Ciidae genera are just taxonomic tools, and they cannot be considered *a priori* to be monophyletic taxa (Lopes-Andrade *et al.* 2003).

Identification key to the Northern Neotropical species of *Scolytocis* Blair

1 Posterior margin of pronotum bearing a rugose border along it. Prosternum conspicuously biconcave and with a narrow longitudinal carina at midline…6

- Posterior margin of pronotum without a rugose border. Prosternum without longitudinal carina at midline…2

2 Prosternum concave to slightly tumid at midline …4

- Disc of prosternum in a different plane from the sides, so that the prosternum appears to be triconcave…3

3 Scutellum less than 0.18X the EW. Known from Guatemala and Mexico (Fig. 75)…***Scol. bouchardi*** **sp. nov.**

- Scutellum more than 0.18X the EW…Known from Ecuardor (Fig. 75)…***Scol. difficillimus*** **sp. nov.**

4 Elytral apex almost glabrous…5

- Elytral apex with concavity bearing several setae (best seen in lateral view). Known from Dominica, in the insular Northern Neotropical Region (Fig. 76)… ***Scol. cariborum*** **sp. nov.**

5 Metaventrite and abdominal ventrites glabrous. Known from the Dominican Republic and Puerto Rico, in the insular Northern Neotropical Region (Fig. 76)…***Scol. kiskeyensis*** **sp. nov.**

- Metaventrite and abdominal ventrites bearing several setae (best seen in lateral view). Known from the continental Northern Neotropical Region (Fig. 75)…***Scol. lawrencei*** **sp. nov.**

6 Pronotum punctation fine; punctures usually separated by a distance of two puncture widths or more…8

- Pronotum punctation coarse; punctures very close to each other, usually separated by a distance of less than two puncture widths…7

7 Pronotal punctures separated by a distance of one puncture width or less. Known from Chiapas, Mexico (Fig. 75)…***Scol. howdeni*** **sp. nov.**

- Pronotal punctures separated by a distance of one to two puncture widths. Known from Mexico (Hidalgo) and Guatemala (Fig. 75)…***Scol. indecisus*** **sp. nov.**

8 Antennomeres of the antennal club completely fused to each other (Fig. 60C). Interstice between punctures finely microreticulate. Scutellum more than 0.13X the EW. Known from Panama (Fig. 75)…***Scol. panamensis*** **sp. nov.**

- Antennomeres of the antennal club distinct from each other (Fig. 58C). Interstice between punctures smooth, without microreticulation. Scutellum less than 0.13X the EW. Known from Costa Rica (Fig. xxx)…***Scol. danielssoni*** **sp. nov.**

Identification key to the Southern Neotropical species of *Scolytocis* Blair

1 Pronotal punctation fine and sparse; punctures separated by one to three puncture widths…2

- Pronotal punctation coarse and dense; punctures separated by a distance of one puncture width of less. South Region of Brazil (Fig. 96)…***Scol. fritzplaumanni* sp. nov.**

2 Antennal club less than 1.6X the funicle length. TL usually less than 1.5mm…***Scol. furieriae* sp. nov.**

- Antennal club at least 2X longer than the funicle. TL usually more than 1.5mm…***Scol. paschoali* sp. nov.**

Identification key to the Indo-Malayan, Australasian and Oceanic species of *Scolytocis* Blair *

1 Last antennomere shorter than the two preceding antennomeres together. Basal width of the scutellum less than 0.2X the greatest elytral width (EW). Each metatibia expanded to apex; spines of the outer edge separated by at least one spine width. TL less than 1.3mm…2

- Last antennomere twice as long as the two preceding antennomeres together. Basal width of the scutellum around 0.2X the EW. Each metatibia broadly rounded, large at middle; spines of the outer edge very close to each other at apical half. TL more than 1.40mm. Known from Fiji (Pacific Ocean; Fig. 112)…***Scol. zimmermani* sp. nov.**

2 Antennal club at least 1.8X longer than the funicle. Apical declivity of elytra weakly concave. Known from Malaysia (Southeastern Asia; Fig. 112)…***Scol. malaysianus* sp. nov.**

- Antennal club near 1.6X as long as the funicle. Apical declivity of elytra distinctly concave. Known from Northern New Zealand (Fig. 112)…***Scol. neozelandensis* sp. nov.**

* *Scolytocis samoensis* Blair not included

Northern Neotropical species of *Scolytocis* Blair

Scolytocis bouchardi Lopes-Andrade sp. nov. (Figs 22–24, 49, 58A, 61A, 64, 75)

Etymology

The species is named after Dr. Patrice Bouchard, curator of the Coleoptera collection of CNCI. Among the specimens loaned by CNCI (around 800), I found the only known specimens of two new *Scolytocis* species described here. The study of the remaining specimens will certainly enhance the current knowledge on the Ciidae taxonomy, mainly of the Neotropical species.

Diagnosis

The species belongs to the *bouchardi* species-group, due to the smooth posterior margin of pronotum and the triconcave prosternum. It differs from *Scol. difficillimus* **sp. nov.** by combination of the following characters: (i) width of eye usually more than 1.2X the basal width of scutellum; (ii) basal width of scutellum near 0.17X the EW; (iii) Metatibiae less than 4X as long as broad.

Description

Holotype. (Figs 22–24) Measurements in mm: TL 1.42; PL 0.47; PW 0.58; EL 0.89; EW 0.63; GD 0.58. Ratios: PL/PW 0.81; EL/EW 1.41; EL/PL 1.89; GD/EW 0.92; TL/EW 2.25. Body dark brown; head and pronotum darker than elytra, almost black; antennae, mouthparts and legs light yellowish brown. Head sparsely punctate, finely and inconspicuously microreticulate. Each antenna (Fig. X; paratype) with nine antennomeres (FL 0.098mm; CL 0.170mm; CL/FL 1.74); length of the antennomeres (in mm) as follows: 0.088; 0.043; 0.048; 0.018; 0.015; 0.018; 0.045; 0.045; 0.080. Eyes with greatest width 1.28X the basal width of scutellum. Pronotum sparsely punctate; puncture fine, shallow, separated by a distance of two to four puncture widths; interstice between punctures inconspicuously, finely microreticulate; anterolateral margins slightly arched inwards; posterolateral angles broadly rounded; posterior margin without rugose border. Scutellum bearing small punctures near the anterior margin; basal width 0.17X the EW. Elytral punctation subseriate; puncture coarser, shallower and more irregular than those of pronotum; interstice between punctures shiny, rugose, but not microreticulate; elytral apex subacute, with some sparse and small cuticular globules; apical region bearing a concavity. Each hind wing (Fig. 49; paratype) with apical area bearing one vague, incomplete pigmented line near the anterior margin. Prosternum triconcave, without longitudinal carina at midline. Metaventrite and abdominal ventrites bearing small setae. Each metatibia (Fig. 61A, paratype) broadly rounded, near 3.5X as long as broad; outer edge with spines (around 20) regularly distributed at basal two thirds and then getting sparser. *Male genitalia (in a paratype).* (Fig. 64, paratype from

Oaxaca, Mexico) Apex of tegmen (sclerotized apical two-thirds) subtriangular; median lobe extremely membranous, elongate, near 1.5X longer than tegmen.

Type series

Holotype. (CNCI) **Guatemala:** /GUAT. Isabal [sic], 2Km N Las Escobas 300m, 15.XI.1986 M. Sharkey / *Scolytocis bouchardi* Lopes-Andrade HOLOTYPUS [printed in red paper]/. *Paratypes.* **Guatemala:** 4 specimens (2 CNCI, 2 LAPC), same data as holotype but distinguished labeled /*Scolytocis bouchardi* Lopes-Andrade PARATYPUS [printed in yellow paper]/. **Mexico:** 2 specimens /6mi.S Valle Nac. 2000' Oaxaca MEX. July 30, 1971 A. Newton, coll. / Rigidoporus sp. / J. F. Lawrence Lot [printed] 3312 [handwritten]/.

Variation

Measurements in mm (n = 4, including the holotype): TL 1.37–1.58 (1.46 ± 0.09); PL 0.47–0.53 (0.49 ± 0.03); PW 0.58–0.63 (0.59 ± 0.03); EL 0.84–0.95 (0.88 ± 0.05); EW 0.63–0.68 (0.64 ± 0.03); GD 0.58–0.63 (0.59 ± 0.03). Ratios: PL/PW 0.81–0.84 (0.82 ± 0.02); EL/EW 1.33–1.41 (1.37 ± 0.04); EL/PL 1.79–1.89 (1.82 ± 0.05); GD/EW 0.85–1.00 (0.92 ± 0.06); TL/EW 2.17–2.33 (2.27 ± 0.07).

Distribution

Known only from Guatemala and Mexico (Fig. 75).

Host fungi

Rigidoporus sp. (Meripilaceae).

Comments

The "triconcave" prosternum of *Scol. bouchardi* **sp. nov.** and *Scol. difficillimus* **sp. nov.** is unique among the Xylographellini, although that is a character not easy to observe (the prosternum itself is very short in the *Scolytocis* spp.). The "triconcave" prosternum is here defined as the prosternum with a slightly concave disc, with either lateral side concave but in different plane than the disc, appearing triconcave in frontal view. *Scol. bouchardi* **sp. nov.** is closely related, and probably conspecific to *Scol. difficillimus* **sp. nov.** (from Ecuador). However, I have no male of *Scol. bouchardi* **sp. nov.** from the type locality in hands, and only one male from Oaxaca (Mexico; Fig. 64, genitalia). The male genitalia of the unique male *Scol. difficillimus* **sp. nov.** examined is incomplete (see Fig. 66). The specimens from Guatemala and Mexico have some morphological differences in comparison to the specimens from Ecuador. Therefore, I prefer to describe them as separate species now.

Scolytocis cariborum **Lopes-Andrade sp. nov. (Figs 25–27, 50, 58B, 61B, 65, 76)**

Etymology

The specific epithet refers to the Caribs, native habitants of the island of Dominica.

Diagnosis

The species belongs to the *lawrencei* species-group, and so is distinguishable from the other *Scolytocis* by the smooth posterior margin of pronotum and the concave prosternum. It differs from the other species in the group by the elytral apex with concavity bearing several setae (best seen in lateral view) and distinct morphology of male genitalia.

Description

Holotype. (Figs 25–27) Measurements in mm: TL 1.21; PL 0.42; PW 0.53; EL 0.74; EW 0.58; GD 0.47. Ratios: PL/PW 0.80; EL/EW 1.27; EL/PL 1.75; GD/EW 0.82; TL/EW 2.09. Body brown; basal antennomeres, mouthparts and legs yellowish brown. Head with shallow, coarse and sparse punctation; interstice between punctures smooth, shiny, barely microreticulate near margins. Each antenna (Fig. 58B, paratype) with nine antennomeres (FL 0.075mm; CL 0.140mm; CL/FL 1.87); length of the antennomeres (in mm) as follows: 0.068; 0.035; 0.038; 0.013; 0.013; 0.013; 0.043; 0.035; 0.063. Eyes with greatest width 1.33X the basal width of scutellum. Pronotum sparsely punctate; punctures shallow, irregular, separated by a distance of two to four puncture widths; interstice between punctures finely, inconspicuously microreticulate; anterolateral margins slightly arched inwards; posterolateral angles broadly rounded; posterior margin without rugose border. Scutellum unpunctate, surface smooth; basal width 0.17X the EW. Elytra with coarse, shallow, subseriate punctation, confuse near apex; border of punctures somewhat indistinct from surrounding surface; interstice between punctures irregular, but not microreticulate; elytral apex subacute; apical region with concavity, which bears several setae (best seen in lateral view); cuticular globules very small, inconspicuous. Each hind wing (Fig. 50, paratype) with apical area bearing one vague, incomplete pigmented line near the anterior margin. Prosternum concave. Metaventrite glabrous. Abdominal ventrites bearing some sparse setae. Each metatibia (Fig. 61B, paratype) just slightly expanded near apex, more than 4X as long as broad;

outer apical and outer lateral edges forming an obtuse rounded angle; spines (around 15) sparse. *Male genitalia (in a paratype).* (Fig. 65) Apex of tegmen (sclerotized three-fourths) subtriangular; median lobe around 1.5X longer than tegmen, with a conspicuous globular apex.

Type series

Holotype. (ANIC) **Dominica:** /New Florida Estate 2000’ SW slope of Morne Anglais, DOMINICA VI-11-73 / Cary P. Sheldon Collector / *Rigidoporus* sp**.** / J. F. Lawrence Lot [printed] 3451 [handwritten]**/** *Scolytocis cariborum* Lopes-Andrade HOLOTYPUS [printed in red paper]/. *Paratypes.* **Dominica:** 4 specimens, same data as holotype but distinguished labeled /*Scolytocis cariborum* Lopes-Andrade PARATYPUS [printed in yellow paper]/.

Variation

Measurements in mm (n = 4, including the holotype): TL 1.11–1.21 (1.17 ± 0.05); PL 0.37–0.42 (0.41 ± 0.03); PW 0.47–0.53 (0.49 ± 0.03); EL 0.68–0.79 (0.72 ± 0.05); EW 0.53–0.58 (0.54 ± 0.03); GD 0.47–0.47 (0.47 ± 0.0). Ratios: PL/PW 0.78–0.89 (0.84 ± 0.06); EL/EW 1.27–1.50 (1.34 ± 0.11); EL/PL 1.63–1.88 (1.78 ± 0.12); GD/EW 0.82–0.90 (0.88 ± 0.04); TL/EW 2.09–2.30 (2.17 ± 0.10).

Distribution

Known only from Dominica Island in the Lesser Antilles province (*sensu* Morrone 2006).

Host fungi

Rigidoporus sp. (Meripilaceae).

Comments

Scol. cariborum **sp. nov.** most resembles *Scol. kiskeyensis* **sp. nov.**, and both comprise a subgroup of the *lawrencei* species-group due to the distinctly sclerotized median lobe that is globose (at least at apex). Both species are confined to the insular Northern Neotropical Region.

***Scolytocis danielssoni* Lopes-Andrade sp. nov. (Figs 28–30, 51, 58C, 61C, 75)**

Etymology

The species is named after Dr. Roy Danielsson, curator of the Entomological Collection of MZLU. The loan of a large amount of ciids of MZLU has been very important to conclude a series of works on the Ciidae systematics, and two specimens of this new species were found among the specimens he sent me.

Diagnosis

The species belongs to the *danielssoni* species-group, and so it is distinguishable from the other *Scolytocis* species by the biconcave prosternum with a narrow longitudinal carina at midline, the rugose border along the posterior pronotal margin and the comparatively large tibiae. It differs from *Scol. howdeni* **sp. nov.** and *Scol. indecisus* **sp. nov.** by the fine and sparse pronotal punctation, and the lack of microreticulation at the interstice between punctures. It differs from *Scol. panamensis* **sp. nov.** by the distinct separation of the three antennomeres of the club.

Description

Holotype. (Figs. 28–30) Measurements in mm: TL 1.68; PL 0.58; PW 0.74; EL 1.00; EW 0.79; GD 0.68. Ratios: PL/PW 0.78; EL/EW 1.27; EL/PL 1.72; GD/EW 0.86; TL/EW 2.13. Body shiny black; upper and ventral surfaces subglabrous. Head with dorsum smooth, shiny, sparsely punctate. Each antenna (Fig. 58C, paratype) with nine antennomeres (FL 0.143mm; CL 0.175mm; CL/FL 1.23); length of the antennomeres (in mm) as follows: 0.06; 0.050; 0.063; 0.028; 0.025; 0.028; 0.048; 0.050; 0.078. Eyes with greatest width 1.5X the basal width of scutellum. Pronotum punctate; punctures sparse, small, deep, uniform in size, separated by a distance of two to three puncture widths; interstice between punctures smooth, shiny; anterolateral margins straight; posterolateral angles angulate (Fig. x, arrow); posterior margin with a conspicuous, narrow rugose border along it. Scutellum glabrous, unpunctate, shiny; basal width 0.11X the EW. Elytral punctures slightly coarser than those of pronotum; interstices between punctures smooth and shiny; elytral apex truncate, bearing a distinct concavity when seen from above; cuticular globules very small, inconspicuous. Each hind wing (Fig. 51) with apical area bearing two distinct pigmented lines, one near the anterior margin and the other almost reaching the posterior margin. Prosternum biconcave, with a narrow longitudinal carina at midline. Metaventrite glabrous. Abdominal ventrites bearing some small and sparse setae. Each metatibia (Fig. 61C, paratype) slender, more than 4X as long as broad; outer apical and outer lateral edges forming an obtuse rounded angle; outer edge with spines (around 20) regularly distributed at apical two-thirds and then getting sparser. *Male genitalia.* Unknown.

Type series

Holotype. (MZLU) **Costa Rica:** /Costa Rica, San Jose, Cerro de la Muerte 3200m, 20.III.1986 leg. M. Sörensson / *Scolytocis danielssoni* Lopes-Andrade HOLOTYPUS [printed in red paper]/. *Paratypes.* **Costa Rica:** 1 specimen (LAPC), sama data as the holotype; 3 specimens (2 ANIC, 1 LAPC) labeled /2.5mi.S.W. Rincon Puntarenas, Costa Rica Mar. 1-7, '67 / Robin Andrews Coll. / Phellinus sp. / J. F. Lawrence Lot [printed] 2185 [handwritten]/. All the paratypes with an additional label /*Scolytocis danielssoni* Lopes-Andrade PARATYPUS [printed in yellow paper]/.

Variation

Measurements in mm (n = 4, including the holotype): TL 1.53–1.79 (1.67 ± 0.11); PL 0.53–0.63 (0.58 ± 0.04); PW 0.63–0.74 (0.71 ± 0.05); EL 0.89–1.11 (1.01 ± 0.09); EW 0.74–0.84 (0.80 ± 0.05); GD 0.63–0.79 (0.71 ± 0.07). Ratios: PL/PW 0.78–0.86 (0.82 ± 0.04); EL/EW 1.20–1.31 (1.26 ± 0.05); EL/PL 1.67–1.91 (1.74 ± 0.11); GD/EW 0.85–0.94 (0.88 ± 0.04); TL/EW 2.00–2.13 (2.08 ± 0.06).

Distribution

Known only from Costa Rica (Fig. 75).

Host fungi

Phellinus sp. (Hymenochaetaceae).

Comments

Among the *Scolytocis* examined, this new species occurs at the highest known altitude (type locality, Cerro de la Muerte, 3200m over the sea).

Scolytocis difficillimus **Lopes-Andrade sp. nov. (Figs 31–33, 52, 59A, 62A, 66, 75)**

Etymology

The specific epithet is a reference to the difficulty in recognizing the species, mainly in distinguishing it from *Scol. bouchardi* **sp. nov.**

Diagnosis

The species belongs to the *bouchardi* species-group, so it differs from the other *Scolytocis* mainly by the triconcave prosternum. It differs from *Scol. bouchardi* **sp.**

nov., the closest related species, by the comparatively smaller body (TL less than 1.3mm) and small eyes (1.0X the basal width of scutellum).

Description

Holotype. (Figs. 31–33) Measurements in mm: TL 1.16; PL 0.42; PW 0.53; EL 0.74; EW 0.53; GD 0.53. Ratios: PL/PW 0.80; EL/EW 1.40; EL/PL 1.75; GD/EW 1.00; TL/EW 2.20. Body dark brown; antennae, mouthparts and legs yellowish brown. Head with shallow, sparse, inconspicuous punctation; interstice between punctures finely microreticulate. Each antenna (Fig. 59A, paratype) with nine antennomeres (FL 0.078mm; CL 0.150mm; CL/FL 1.94); length of the antennomeres (in mm) as follows: 0.088; 0.040; 0.040; 0.013; 0.013; 0.013; 0.040; 0.038; 0.073. Eyes with greatest width 1.0X the basal width of scutellum. Pronotal punctation coarse, sparse, shallow; punctures separated by a distance of two to four punctures widths; interstice microreticulate; anterolateral margins slightly arched inwards; posterolateral angles broadly rounded; posterior margin without rugose border. Scutellum with some fine, sparse punctures; basal width 0.21X the EW. Elytral punctation confuse at base and subseriate at disc; punctures coarse, shallow, irregular; punctures without conspicuous border.; interstice between punctures finely rugose; elytral apex subacute, declivity with weak concavity; cuticular globules very small, inconspicuous; elytral suture weakly margined at apical third. Each hind wing (Fig. 52) with apical area bearing one vague, incomplete pigmented line near the anterior margin. Prosternum triconcave, without longitudinal carina. Metaventrite and abdominal ventrites bearing slender, small setae. Each metatibiae (Fig. 62A) broadly rounded, near 3.5X as long as broad; outer edge with spines (around 20) regularly distributed at apical two thirds and then getting sparser. *Male genitalia (in a paratype).* (Fig. 66) Apex of tegmen (sclerotized apical two-thirds) subtriangular; median lobe not observed, probably extremelly membranous.

Type series

Holotype. (ANIC) **Ecuador:** /ECUAD: Pichincha Rio Palenque, 47Km.S Sto Domingo JULY 20-30, 1975 / S. & J. Peck Collectors / *Rigidoporus* sp. / *Scolytocis difficillimus* Lopes-Andrade HOLOTYPUS [printed in red paper]/. *Paratypes.* **Ecuador:** 4 specimens, same data as holotype. All the paratypes with an additional label /*Scolytocis difficillimus* Lopes-Andrade PARATYPUS [printed in yellow paper]/.

Variation

Measurements in mm (n = 2, including the holotype): TL 1.16–1.26 (1.21 ± 0.07); PL 0.42–0.42 (0.42 ± 0.00); PW 0.53–0.53 (0.53 ± 0.00); EL 0.74–0.84 (0.79 ± 0.07); EW 0.53–0.58 (0.55 ± 0.04); GD 0.53–0.53 (0.53 ± 0.00). Ratios: PL/PW 0.80–0.80 (0.80 ± 0.00); EL/EW 1.40–1.45 (1.43 ± 0.04); EL/PL 1.75–2.00 (1.88 ± 0.18); GD/EW 0.91–1.00 (0.95 ± 0.06); TL/EW 2.18–2.20 (2.19 ± 0.01).

Distribution

Known only from the type locality in Ecuador (Fig. 75).

Host fungi

Rigidoporus sp. (Meripilaceae).

Comments

I was a little bit reluctant in describing this species, due to its similarities to *Scol. bouchardi* **sp. nov.** However, after a careful comparison of morphological features, I concluded that some specimens from Ecuador, from a single field collection, are quite distinct and cannot be adequately included in any of the new Northern Neotropical species described here. After delimiting *Scol. difficillimus* **sp. nov.**, I found out that it was very similar to *Scol. bouchardi* sp. nov. in the morphology of hind wings, tibiae, and prosternum (“triconcave”), which led me to define a morphological group for both species (the *bouchardi* species-group).

I examined one more specimen from Ecuador, belonging to CNCI: /ECU. Limoncocha Napo Prov. 250m 22.VI.76, Ber. 356, S&J Peck/. However, the specimen lacks the antennae and it resembles more the *Scol. lawrencei* **sp. nov.** than *Scol. difficillimus* **sp. nov.**, although it does not adequately fit in any of these species.

Scolytocis howdeni **Lopes-Andrade sp. nov. (Figs 34–36, 53, 59B, 62B, 67, 75)**

Etymology

The species is named after Henry F. Howden, who collected the six specimens of the type series.

Diagnosis

The species belongs to the *danielssoni* species-group, and so it is distinguishable from the other *Scolytocis* species by the biconcave prosternum with a narrow longitudinal carina at midline, the rugose border along the posterior pronotal margin and the comparatively large tibiae. It differs from the other species in the group mainly by the close pronotal punctation, with punctures separated by a distance of one puncture width or less.

Description

Holotype. (Figs 34–36) Measurements in mm: TL 2.00; PL 0.79; PW 0.89; EL 1.21; EW 0.95; GD 0.89. Ratios: PL/PW 0.88; EL/EW 1.28; EL/PL 1.53; GD/EW 0.94; TL/EW 2.11. Body dark brown, head and pronotum slightly darker than elytra; basal antennomeres, mouthparts and tarsi yellowish brown; dorsal and ventral surfaces almost entirely glabrous. Head with dorsum coarsely punctate; punctures irregular, with interstice finely microreticulate. Each antenna (Fig. 59B, paratype) with nine antennomeres (FL 0.098mm; CL 0.160mm; CL/FL 1.64); length of the antennomeres (in mm) as follows: 0.118; 0.055; 0.053; 0.015; 0.015; 0.015; 0.050; 0.045; 0.065. Eyes with greatest width 1.33X the basal width of scutellum. Pronotum coarsely punctate; punctures irregular, limits distinct, usually separate by a distance of one puncture width or less, but not coalescent; interstice between punctures finely microreticulate; anterolateral margins straight; posterolateral angles broadly rounded; posterior margin with a conspicuous rugose border along it. Scutellum rugose, basal width 0.13X the EW. Elytra with punctation slightly coarser, denser and more irregular than that of pronotum; interstice between punctures smooth; elytral apex truncate, with a small concavity when seen from above; cuticular globules absent. Each hind wing (Fig. 53) with apical area bearing one vague, incomplete pigmented line near the anterior margin. Prosternum biconcave, with a narrow longitudinal carina at midline. Metaventrite and abdominal ventrites almost glabrous. Each metatibia (Fig. 62B) near 3.0X as long as broad; outer apical and outer lateral edges forming an obtuse angle that is broadly rounded; outer edge with spines (around 20) regularly distributed and more close to each other at apical third (outer apical edge), then getting sparser. *Male genitalia (in a paratype).* (Fig. 67) Apex of tegmen (sclerotized apical half) subtriangular, base membranous; median lobe membranous, elongate, near 1.2X longer than tegmen.

Type series

Holotype. (CNCI) **Mexico:** /3 mi. N.W. San Cristobal L.C., Chis. Mex. V. 29 1969 H.F. Howden / *Scolytocis howdeni* Lopes-Andrade HOLOTYPUS [printed in red paper]/. *Paratypes.* **Mexico:** 5 specimens, same data as holotype. All the paratypes with an additional label /*Scolytocis howdeni* Lopes-Andrade PARATYPUS [printed in yellow paper]/

Variation

Measurements in mm (n = 5, including the holotype): TL 1.84–2.00 (1.94 ± 0.07); PL 0.68–0.79 (0.71 ± 0.05); PW 0.84–0.89 (0.86 ± 0.03); EL 1.16–1.26 (1.21 ± 0.04); EW 0.89–0.95 (0.94 ± 0.02); GD 0.84–0.89 (0.86 ± 0.03). Ratios: PL/PW 0.76–0.88 (0.82 ± 0.04); EL/EW 1.22–1.35 (1.29 ± 0.05); EL/PL 1.53–1.85 (1.72 ± 0.12); GD/EW 0.89–0.94 (0.92 ± 0.03); TL/EW 1.94–2.12 (2.07 ± 0.07).

Distribution

Known only from the type locality in Chiapas, Mexico (Fig. 75).

Host fungi

Unknown.

Comments

It resembles *Scol. indecisus* **sp. nov.** in the coarse and dense punctation of elytra and pronotal, but is easily distinguished by the features mentioned in the diagnosis.

Scolytocis indecisus **Lopes-Andrade sp. nov. (Figs 37–39, 54, 59C, 62C, 68, 75)**

Etymology

The specific epithet refers to my indecision in choosing the name of this new species.

Diagnosis

The species belongs to the *danielssoni* species-group, and so it is distinguishable from the other *Scolytocis* species by the biconcave prosternum with a narrow longitudinal carina at midline, the rugose border along the posterior pronotal margin and the comparatively large tibiae. *Scol. danielssoni* **sp. nov.** has finer pronotal punctation and intertices of punctures shiny, *Scol. panamensis* **sp. nov.** has a distinct antennal club (with only one broad antennomere) and *Scol. howdeni* **sp. nov.** has closer pronotal punctation.

Description

Holotype. (Figs 37–39) Measurements in mm: TL 1.42; PL 0.47; PW 0.58; EL 0.89; EW 0.68; GD 0.63. Ratios: PL/PW 0.82; EL/EW 1.31; EL/PL 1.89; GD/EW 0.92; TL/EW 2.08. Body shiny dark-brown, with head and pronotum darker than elytra; antennae, monthparts and legs yellowish brown. Head punctate, with interstice between punctures microreticulate. Each antenna (Fig. 59C, paratype) with nine antennomeres (FL 0.095mm; CL 0.145mm; CL/FL 1.53); length of the antennomeres (in mm) as follows: 0.068; 0.038; 0.050; 0.015; 0.015; 0.015; 0.038; 0.040; 0.068. Eyes with greatest width 1.0X the basal width of scutellum; ommatidia with irregular surface. Pronotum with deep and coarse punctation; punctures separated by a distance of one to two puncture widths, some areas of the disc with sparser punctation; interstice between punctures inconspicuously microreticulate, shiny; anterolateral margins straight [conf]; posterolateral angles broadly rounded; posterior margin with a rugose border along it. Scutellum glabrous, unpunctate, shiny, basal width 0.13X the EW. Elytra with confuse punctation, slightly coarser than that of pronotum; punctures deep, with interstice smooth and shiny; elytral apex truncate, slightly concave when seen from above, bearing small, inconspicuous cuticular globules. Each hind wing (Fig.54) extremely membranous, probably not or barely functional for flight; apical area without conspicuous pigmented lines. Prosternum biconcave, with a narrow longitudinal carina at midline. Metaventrite and abdominal ventrites subglabrous (bearing indistinct small and sparse setae). Each metatibia (Fig. 62C, paratype) near 3.2X as long as broad; outer apical and outer lateral edges forming an obtuse angle that is broadly rounded; outer edge with spines (around 20) regularly distributed and more close to each other at apical two-thirds, then getting sparser. *Male genitalia (in a paratype).* (Fig. 68) Tegmen with apex (sclerotized apical half) subpentagonal, basal half extremelly membranous; median lobe as long as tegmen.

Type series

Holotype. (ANIC) **Mexico:** /Tenango de Doria Hidalgo, MEXICO July 24, 1969 / S. & J. Peck Collectors / Phellinus sp. / J. F. Lawrence Lot [printed] 3075 [handwritten]/ *Scolytocis indecisus* Lopes-Andrade HOLOTYPUS [printed in red paper]/. *Paratypes.* **Mexico:** 8 specimens, same data as holotype; 2 specimens /Tenango de Doria Hidalgo, MEXICO July 24, 1969 / S. & J. Peck Collectors / Ganoderma sp. / J. F. Lawrence Lot [printed] 3074 [handwritten]/; 1 specimen /6.4mi. S. Tenango de Doria Hidalgo MEX.July 24, 1969 / S. & J. Peck Collectors / Ganoderma sp. / J. F. Lawrence Lot [printed] 3079 [handwritten]/; 3 specimens /7mi. SW Tenango de Doria Hidalgo, MEX. VII-2-71 A. Newton / Phellinus sp. / J. F. Lawrence Lot [printed] 3258 [handwritten]/. **Guatemala:** 1 specimen /GUAT.: QUEZALTEN.[ANGO] 12Km.S.E. Zunil, N.W. face Cerro Zunil, Fuentes Georginas, 2700m 17.VI.1993, R. Anderson hardwood for.litter, 93-2C [sic]/; 9 specimens / Sierra de las Minas / Montana Piamont – 9000ft. / Dept. Progresso Guat. [printed] II:7:42 [handwritten] / Col. By A.E. Vatter, Jr.

/ F. Mus. Bot. Exp. to Guat. / Fungus # 436-6 [handwritten]/; 75 specimens / Sierra de las Minas; Montana Piamont – 9000ft.; Dept. Progresso Guat. II:7:42; Col. By A.E. Vatter, Jr. / F. Mus. Bot. Exp. to Guat.; Fungus # 436-6/. All the paratypes with an additional label /*Scolytocis indecisus* Lopes-Andrade PARATYPUS [printed in yellow paper]/.

Variation

Measurements in mm (n = 11, including the holotype): TL 1.26–1.84 (1.45 ± 0.16); PL 0.42–0.68 (0.51 ± 0.08); PW 0.53–0.79 (0.61 ± 0.07); EL 0.79–1.16 (0.90 ± 0.10); EW 0.63–0.84 (0.70 ± 0.07); GD 0.58–0.84 (0.64 ± 0.08). Ratios: PL/PW 0.73–0.92 (0.83 ± 0.05); EL/EW 1.13–1.42 (1.29 ± 0.08); EL/PL 1.42–2.00 (1.77 ± 0.16); GD/EW 0.85–1.00 (0.92 ± 0.04); TL/EW 1.92–2.25 (2.07 ± 0.09).

Distribution

Known from Mexico and Guatemala (Fig. 75).

Host fungi

Ganoderma sp. (Ganodermataceae) and *Phellinus* sp. (Hymenochaetaceae).

Comments

The specimens dissected have extremelly membranous hind wings (see Fig. 54). This, together with the ommatidia with irregular surface (common in apterous or micropterous ciids), suggests that the species is undergoing loss of flight capability.

***Scolytocis kiskeyensis* Lopes-Andrade sp. nov. (Figs 40–42, 55, 60A, 63A, 69–71, 76)**

Etymology

The specific epithet refers to Kiskeya (also Quisqueya), an indigenous name for the island of Hispaniola (Haiti and Dominican Republic), *terra typica* of this species.

Diagnosis

The species belongs to the *lawrencei* species-group, and so is distinguishable from the other *Scolytocis* by the smooth posterior margin of pronotum and the concave prosternum. *Scol. cariborum* **sp. nov.** has several setae at the elytral apex, and *Scol. lawrencei* **sp. nov.** has setae at the metaventrite and abdominal ventrites.

Description

Holotype. (Figs 40–42) Measurements in mm: TL 1.00; PL 0.37; PW 0.42; EL 0.63; EW 0.47; GD 0.42. Ratios: PL/PW 0.88; EL/EW 1.33; EL/PL 1.71; GD/EW 0.89; TL/EW 2.11. Body reddish brown; antennae, mouthparts and legs slightly lighter than body. Head shiny, sparsely punctate; punctures fine, interstice smooth. Each antenna (Fig. 60A) with nine antennomeres (FL 0.073mm; CL 0.108mm; CL/FL 1.48); length of the antennomeres (in mm) as follows: 0.060; 0.035; 0.035; 0.013; 0.013; 0.013; 0.025; 0.033; 0.050. Eyes with greatest width 1.0X the basal width of scutellum. Pronotum sparsely, finely punctate; puncture deep, separated by a distance of three to five puncture widths; interstice between punctures microreticulate; anterolateral margins straight; posterolateral angles broadly rounded; posterior margin without rugose border. Scutellum shiny, rugose but not microreticulate, bearing one distinct puncture; basal width 0.16X the EW. Elytra with coarse, shallow, subseriate punctation; limits of punctures not well distinct (when seen from above), interstice between punctures dull [conf.]; elytral apex rounded, slightly concave, bearing very small, indistinct cuticular globules (best seen in lateral view). Each hind wings (Fig. 55) with apical area without conspicuous pigmented lines. Prosternum concave, without longitudinal carina. Metaventrite and abdominal ventrites glabrous. Each metatibiae (Fig. 63A) near 3X as long as broad; outer apical and outer lateral edges forming an almost perpendicular angle that is rounded; outer edge with spines (around 15) regularly distributed at apical two-thirds. *Male genitalia (in paratypes).* (Fig. 69–71) Both tegmen and median lobe completely and equally sclerotized, elongate but somewhat globose; median lobe broadly rounded, only 4X as long as broad and larger at middle.

Type series

Holotype. (ANIC) **Dominican Republic:** /DOM. REP.: Polo, 690m July, 1974 P. Hertz / Fomes sclerodermeus / J. F. Lawrence Lot No. [printed] 3659 [handwritten]/ *Scolytocis kiskeyensis* Lopes-Andrade HOLOTYPUS [printed in red paper]/. *Paratypes.* **Dominican Republic:** 2 specimens, same data as holotype. **Puerto Rico:** 2 specimens labeled /Cerro Dona Juana Ponce, P.R. Dec. 28, 1966 / S. Peck Collector / Ganoderma sp. / J. F. Lawrence Lot. [printed] 1929 [handwritten]/; 1 specimen /Luquillo Exp. For. Humacao, P.R. Dec. 23, 1966 / S. Peck Collector / ex Fomes sclerodermeus / J. F. Lawrence Lot. [printed] 1926 [handwritten]/. All the paratypes with an additional label /*Scolytocis kiskeyensis* Lopes-Andrade PARATYPUS [printed in yellow paper]/.

Variation

Measurements in mm (n = 3, including the holotype): TL 1.00–1.16 (1.07 ± 0.08); PL 0.32–0.42 (0.37 ± 0.05); PW 0.42–0.47 (0.44 ± 0.03); EL 0.63–0.74 (0.68 ± 0.05); EW 0.47–0.53 (0.49 ± 0.03); GD 0.42–0.47 (0.44 ± 0.03). Ratios: PL/PW 0.75–0.89 (0.84 ± 0.08); EL/EW 1.33–1.44 (1.39 ± 0.06); EL/PL 1.71–2.17 (1.88 ± 0.25); GD/EW 0.89–0.90 (0.89 ± 0.01); TL/EW 2.11–2.22 (2.18 ± 0.06).

Distribution

Known from the Greater Antilles, from Puerto Rico and the Dominican Republic (Fig. 76).

Host fungi

Fomes fasciatus (Sw.) Cooke (Polyporaceae) and *Ganoderma* sp. (Ganodermataceae).

Comments

The morphology of the male genitalia in this species is unique among all the known *Scolytocis*. The genitalia of *Scol. cariborum* **sp. nov.** has a median lobe with a globose apex, somewhat resembling the one of *Scol. kiskeyensis* **sp. nov.**, which may be a tendency in the insular Neotropical species of *Scolytocis*.

***Scolytocis lawrencei* Lopes-Andrade sp. nov. (Figs 43–45, 56, 60B, 63B, 72–73, 75)**

Etymology

The species is named after John F. Lawrence, great coleopterist (and ciidologist) who first recognized this species, and who also arranged and organized most of the Xylographellini described in this work.

Diagnosis

The species belongs to the *lawrencei* species-group, and so is distinguishable from the other *Scolytocis* by the smooth posterior margin of pronotum and the concave prosternum. It differs from the other Neotropical species in the group mainly by the glabrous elytral apex and the slightly setose metaventrite and abdominal ventrites.

Description

Holotype. (Figs 43–45) Measurements in mm: TL 1.16; PL 0.42; PW 0.53; EL 0.74; EW 0.58; GD 0.53. Ratios: PL/PW 0.80; EL/EW 1.27; EL/PL 1.75; GD/EW 0.91;

TL/EW 2.00. Body brown; basal antennomeres, mouthparts and legs light yellowish brown. Head finely and sparsely punctate; interstice between puncture inconspicuously microreticulate. Each antenna (Fig. 60B, paratype) with nine antennomeres (FL 0.073mm; CL 0.130mm; CL/FL 1.79); length of the antennomeres (in mm) as follows: 0.073; 0.033; 0.035; 0.013; 0.013; 0.013; 0.038; 0.030; 0.063. Eyes with greatest width 1.0X the basal width of scutellum. Pronotum with shallow, coarse, sparse punctation; punctures separate by a distance of two to three puncture widths, interstice microreticulate; anterolateral margins slighted arched inwards; posterolateral angles broadly rounded; posterior margin without rugose border. Scutellum unpunctate, microreticulate; basal width 0.19X the EW. Elytra with subseriate punctation; punctures coarser and shallower than those of pronotum, border indistinct from elytral surface (at least when seen from above); interstice between punctures rugose, but without microreticulation; elytral apex subacute, declivity without conspicuous concavity but bearing some small, inconspicuous cuticular globules. Each hind wing (Fig. 56) with apical area bearing one vague, incomplete pigmented line near the anterior margin. Prosternum concave, without longitudinal carina at midline. Metaventrite and abdominal ventrites bearing setae, best seen in lateral view. Each metatibia (Fig. 63B) just slightly expanded near apex, around 4X as long as broad; outer edge broadly rounded, bearing spines (around 20) regularly distributed at apical two thirds and then getting sparser. *Male genitalia (in paratypes).* (Figs 72–73) Tegmen and median lobe barely sclerotized; tegmen with apex (apical three-fourths) subtriangular; median lobe extremelly elongate, more than 10X longer than broad.

Type series

Holotype. (ANIC) **Costa Rica:** /C. RICA: Heredia Finca la Selva 1974 [printed] July [handwritten]/ J. F. Lawrence Lot [printed] 3643 [handwritten]/ S. Klein-Feldt [handwritten]/ Rigidoporus sp./ 636 [handwritten]/ *Scolytocis lawrencei* Lopes-Andrade HOLOTYPUS [printed in red paper]/. *Paratypes.* **Costa Rica:** 7 specimens, same data as holotype; 1 specimen /Puerto Viejo Costa Rica VIII-4-65 / A. Raske Collector / ex Polyporus zonalis / J. F. Lawrence Lot [printed] 1613 [handwritten]/; 1 specimen /Turrialba Costa Rica VIII-31-66/ Robin Andrews Collector / Fomes (Rigidoporus) auberianus ? / J. F. Lawrence Lot [printed] 1848 [handwritten]/; 1 specimen "COSTA RICA: Punt.[arenas] S. Vito, Las Cruces July 1982 B. Gill 1200m/. **Panama:** 11 specimens labeled /Canal Zone: Is. Barro Colorado II.19-III.9-75 Lawrence, Erwin / Rigidoporus sp. /, 5 distinguished labeled /J. F. Lawrence Lot [printed] 3777 [handwritten]/ and 6 /J. F. Lawrence Lot [printed] 3811 [handwritten]/; 4 specimens

/Barro Colorado Is. Canal Zone Feb. 15,1968 / J. F. Lawrence Lot [printed] 2419 [handwritten]/, 3 specimens distinguished labeled /Polyporus lignosus/ and 1 /Trametes corrugata/; 3 specimens /Barro Colorado Is. Canal Zone Panama, IV-3-67 / ex Polyporus lignosus / J. F. Lawrence Lot [printed] 2100 [handwritten]/; 2 specimens /Panama: Canal Zone Barro Colorado Is. February 6 1976 A. Newton / litter under rotting logs /; 4 specimens /Barro Colorado Is. Canal Zone July 11 1969 / J. F. Lawrence Lot [printed] 2847 [handwritten]/; 2 specimens /Barro Colorado Is. Canal Zone July 11 1969 / Rigidoporus sp. / J. F. Lawrence Lot [printed] 2838 [handwritten]/; 2 specimens /Barro Colorado Is. Canal Zone Aug. 13 1969 / Rigidoporus sp. / J. F. Lawrence Lot [printed] 3042 [handwritten]/. **Mexico:** 1 specimen /MEX: Veracruz, 33Km N. Catemaco, Los Tuxtlas Biology Stn. 8-15.VI.1984 D. H. Lindeman / Scolytocis sp. [handwritten] Det. J. F. Lawrence [printed]/; 1 specimen (CNCI) /MEX. Chis., Palenque 2-30.VII.1983, rain forest, S&J Peck & R. Anderson, 100m/. **Colombia:** 1 specimen /3000', Rio Jamundi, 10mi.S. Cali, Valle, Colombia, II.16.1970 Henry F. Howden/. All the paratypes with an additional label /*Scolytocis lawrencei* Lopes-Andrade PARATYPUS [printed in yellow paper]/.

Variation

Measurements in mm (n = 21, including the holotype): TL 1.00–1.32 (1.16 ± 0.08); PL 0.37–0.42 (0.40 ± 0.03); PW 0.42–0.58 (0.49 ± 0.04); EL 0.58–0.89 (0.73 ± 0.08); EW 0.47–0.63 (0.54 ± 0.05); GD 0.42–0.58 (0.48 ± 0.04). Ratios: PL/PW 0.72–0.89 (0.83 ± 0.05); EL/EW 1.10–1.67 (1.35 ± 0.11); EL/PL 1.38–2.14 (1.82 ± 0.19); GD/EW 0.82–1.00 (0.90 ± 0.05); TL/EW 2.00–2.44 (2.15 ± 0.10).

Distribution

Known from Mexico, Costa Rica, Panama and Colombia (Fig. 75).

Host fungi

Rigidoporus sp., *Rigidoporus lineatus* (Pers.) Ryvarden and *Rigidoporus microsporus* (Sw.) Overeem (Meripilaceae); *Earliella scabrosa* (Pers.) Gilb. & Ryvarden (Polyporaceae).

Comments

A common and widespread continental mesoamerican *Scolytocis*. It co-occurs with *Scol. panamensis* **sp. nov.** in Panama, and large specimens of *Scol. lawrencei* **sp. nov.** may be confounded with it in dorsal view. However, *Scol. panamensis* **sp. nov.**

belongs to the *danielssoni* species-group, and is unique among the *Scolytocis* in the fused antennomeres of the club.

I included the specimen from Colombia in the type series with some doubt: it fits the species-boundaries as stated here, but only one specimen is known from this country.

Scolytocis panamensis **Lopes-Andrade sp. nov. (Figs 46–48, 57, 60C, 63C, 74, 75)**

Etymology

The specific epithet refers to Panama, *terra typica* of this new species.

Diagnosis

The species belong to the *danielssoni* species-group, and so it is distinguishable from the other *Scolytocis* species by the biconcave prosternum with a narrow longitudinal carina at midline, the rugose border along the posterior pronotal margin and the comparatively large metatibia (Fig. 63C). The species is easily distinguished from all the other Central American *Scolytocis* by fused antennomeres of the club, which appear as a one large antennomere even in slide preparations (Fig. 60C).

Description

Holotype. (Figs 46–48) Measurements in mm: TL 1.53; PL 0.53; PW 0.68; EL 0.95; EW 0.74; GD 0.68. Ratios: PL/PW 0.77; EL/EW 1.29; EL/PL 1.80; GD/EW 0.93; TL/EW 2.07. Body black; basal antennomeres, mouthparts and legs light yellowish brown. Head sparsely and finely punctate; interstice between puncture smooth, shiny. Each antenna (Fig. 60C) with seven antennomeres (FL 0.098mm; CL 0.145mm; CL/FL 1.49); funicle with four antennomeres and club with only one distinguishable large antennomere; length of the antennomeres (in mm) as follows: 0.085; 0.045; 0.050; 0.018; 0.015; 0.015; 0.145 (= fused antennomeres of the club). Eyes with greatest width 1.28X the basal width of scutellum. Pronotum with fine, shallow, sparse punctation; punctures separate by a distance of three to five punctures, interstice microreticulate; anterolateral marings of pronotum slightly arched inwards; posterolateral angles broadly rounded; posterior margin bearing a rugose border along it. Scutellum punctate, rugose; basal width 0.15X the EW. Elytra with confuse punctation; punctures coarser and shallower than that of pronotum; punctures without conspicuous limits (at least when seen from above), separated by a distance of one to two puncture widths, interstice smooth, shiny; elytral apex truncate; apical declivity concave, bearing small cuticular globules. Each hind wing (Fig. 57) with apical area bearing one vague, incomplete pigmented line near the anterior margin. Prosternum biconcave, with a narrow longitudinal carina at midline. Metaventrite and abdominal ventrites glabrous. Each metatibia (Fig. 63C) broadly rounded, near 3X as long as broad; outer apical and outer lateral edges forming an obtuse rounded angle; spines (less than 20) close to each other at the outer apical edge, then getting sparser. *Male genitalia (in a paratype).* (Fig. 74) Genitalia very small (around 0.25mm, including the ninth segment), barely sclerotized. Apical portion of tegmen (apical four-fifths) triangular, apex conspicuously acute; median lobe extremelly membranous, indistinct, as long as tegmen.

Type series

Holotype. **Panama:** /Barro Colorado Is. Canal Zone July 14 1969 Phellinus sp. / J. F. Lawrence Lot [printed] 2889 [handwritten]/ *Scolytocis panamensis* Lopes-Andrade HOLOTYPUS [printed in red paper]/. *Paratypes.* **Panama:** 2 specimens, same data as holotype; 4 specimens /Barro Colorado Is. Canal Zone Feb. 5, 1968 / Fomes pseudosenex / J. F. Lawrence Lot [printed] 2310 [handwritten]/; 1 specimen /Barro Colorado Is. Canal Zone July 6 1969 / Phellinus sp. / J. F. Lawrence Lot [printed] 2787 [handwritten]/. All the paratypes with an additional label /*Scolytocis panamensis* Lopes-Andrade PARATYPUS [printed in yellow paper]/.

Variation

Measurements in mm (n = 5, including the holotype): TL 1.53–1.63 (1.56 ± 0.05); PL 0.53–0.58 (0.56 ± 0.03); PW 0.63–0.68 (0.67 ± 0.02); EL 0.89–1.00 (0.95 ± 0.04); EW 0.68–0.79 (0.74 ± 0.04); GD 0.63–0.68 (0.66 ± 0.03). Ratios: PL/PW 0.77–0.92 (0.83 ± 0.06); EL/EW 1.20–1.36 (1.29 ± 0.06); EL/PL 1.55–1.90 (1.70 ± 0.14); GD/EW 0.86–0.93 (0.90 ± 0.04); TL/EW 2.07–2.23 (2.12 ± 0.07).

Distribution

Known only from Panama (Fig. 75).

Host fungi

Phellinus sp. (Hymenochaetaceae) and *Fomes pseudosenex* (Murrill) Sacc. & Trotter (Polyporaceae).

Comments

This species is unique among all the other Ciidae due to its fused antennomeres of the antennal club (so each antenna has seven antennomeres). Besides the fused club, the gross antennal morphology of *Scol. panamensis* **sp. nov.** is similar to that of other species in the *danielssoni* group.

Southern Neotropical species of *Scolytocis*

Scolytocis fritzplaumanni Lopes-Andrade sp. nov. (Figs 77–79, 86, 89A, 90A, 91–92, 96)

Etymology

The specific epithet refers to the great entomologist Fritz Plaumann, who first collected the species.

Diagnosis

The species belongs to the *fritzplaumanni* species-group and so it is distinguishable from the other *Scolytocis* by the biconcave prosternum without longitudinal carina at midline, and the smooth border of the posterior pronotal margin. It differs from the other species in the group by the coarse and dense pronotal punctation, with punctures separated by a distance of one puncture width of less.

Description

Holotype. (Figs 77–79) Measurements in mm: TL 1.74; PL 0.68; PW 0.79; EL 0.95; EW 0.84; GD 0.79. Ratios: PL/PW 0.86; EL/EW 1.13; EL/PL 1.40; GD/EW 0.94; TL/EW 2.07. Body dark brown, including antennae, mouthparts and legs; tarsi a little bit lighter than legs. Head with dorsum punctate; puncture coarse, with interstices finely microreticulate. Each antenna (Fig. 89A) with nine antennomeres (FL 0.095mm; CL 0.148mm; CL/FL 1.55); length of the antennomeres (in mm) as follows: 0.095; 0.038; 0.053; 0.015; 0.015; 0.013; 0.038; 0.043; 0.068. Eyes with greatest width 1.22X the basal width of scutellum. Pronotum coarsely and densely punctate; punctures irregular, shallow, with limits well-distinct, separate by a distance of one puncture width or less; interstices between punctures finely microreticulate; anterolateral margins straight; posterolateral angles broadly rounded; posterior margin without a rugose border. Scutellum smooth, shiny, with sparse punctures, basal width 0.15X the EW. Elytra with coarse and confused punctation; punctures irregular, deeper than those of pronotum, sometimes without distinct limits; interstice between punctures smooth; elytral apex truncate, slightly concave when seen from above, bearing sparse but conspicuous cuticular globules. Each hind wing (Fig. 86) with apical area bearing two distinct pigmented lines, one near the anterior margin and the other almost reaching the posterior margin. Prosternum biconcave, but without a longitudinal carina at midline. Metaventrite and abdominal ventrites almost glabrous. Each metatibia (Fig. 90A) broadly rounded, less than 3X as long as broad; outer edge with spines (around 25) closer to each other at apical one-fourth, then getting sparser. *Male genitalia (in paratypes).* (Figs 91–92) Genitalia elongate, equally sclerotized; apex of tegmen subtriangular; median lobe around 1.25X longer than tegmen.

Type series

Holotype. (MZSP) **Brazil:** /Nova Teutonia Santa Catarina Brazil Fritz Plaumann [printed] XI-64 [handwritten]/ *Scolytocis fritzplaumanni* Lopes-Andrade HOLOTYPUS [printed in red paper]/. *Paratypes.* **Brazil:** 24 specimens labeled /Nova Teutonia Santa Catarina BRAZIL March F. Plaumann/; 3 specimens /Brasilien Nova Teutonia 27º11' B 52º23' L Fritz Plaumann 300-500m v. 1960/; 3 specimens /Serra do Mar, 1200m 25' 46, 49' 06 BRAZIL May, 1964 Plaumann/; 1 specimen /Serra do Mar Brazil 1000m May, 1964 [handwritten]/ Fritz Plaumann Collector [printed]/; 4 specimens /Nova Teutonia Santa Catarina BRAZIL Fritz Plaumann [printed] June 1972 [handwritten]/; 2 specimens /Boqueirão, 29'16, 52' 32 Rio Grande do Sul Brazil ix.66 / Fritz Plaumann Collector/; 2 specimens /Boqueirão 29'16 52' 32 600m / F. Plaumann Sept. 1960/; 121 specimens (10 CNCI; 2 KMMA; 10 LUND; 2 MCZ; 6 MHNG; 4 RRPC; 10 SMTD) /BRASIL: PR Guaratuba; “Pontal do Rio Itararé”; 900m iii.2005 leg. P. Coelho Grossi / *Ganoderma* sp./; 85 specimens (2 LUND; 4 MHNG) /BRASIL: RS São Francisco de Paula "FLONA SFP"; 2006 leg. L.V. Graf/. All the paratypes with an additional label /*Scolytocis fritzplaumanni* Lopes-Andrade PARATYPUS [printed in yellow paper]/.

Variation

Measurements in mm (n = 25): TL 1.58–2.00 (1.75 ± 0.11); PL 0.63–0.79 (0.68 ± 0.05); PW 0.68–0.89 (0.79 ± 0.04); EL 0.89–1.21 (1.03 ± 0.09); EW 0.74–0.95 (0.85 ± 0.05); GD 0.74–0.89 (0.79 ± 0.04). Ratios: PL/PW 0.8–0.94 (0.86 ± 0.05); EL/EW 1.07–1.44 (1.2 ± 0.08); EL/PL 1.28–1.92 (1.51 ± 0.14); GD/EW 0.88–1 (0.92 ± 0.04); TL/EW 1.89–2.19 (2.05 ± 0.08).

Distribution

Known from the South Region of Brazil, from various localities in the states of Paraná, Santa Catarina and Rio Grande do Sul (Fig. 96).

Host fungi

Ganodermataceae, in *Ganoderma* sp. (specimens from Guaratuba), and *Ganoderma australe* (Fr.) Pat. (specimens from São Francisco de Paula; L.V. Graf pers. comm.).

Comments

This is a common *Scolytocis* from the South Region of Brazil, being easily collected.

***Scolytocis furieriae* Lopes-Andrade sp. nov. (Figs 10, 80–82, 87, 89B, 90B, 93–94, 96)**

Etymology

The species is named after the ecologist, entomologist and great collector of Ciidae, Karina Schimdt Furieri.

Diagnosis

The species belongs to the *fritzplaumanni* species-group and so it is distinguishable from the other *Scolytocis* by the biconcave prosternum without longitudinal carina at midline, and the smooth border of the posterior pronotal margin. It differs from *Scol. fritzplaumanni* **sp. nov.** by the fine and sparse pronotal punctation, and from *Scol. paschoali* **sp. nov.** by the smaller body (usually less than 1.5mm) and smaller antennal-club (around 1.6X longer than funicle).

Description

Holotype. (Figs80–82) Measurements in mm: TL 1.32; PL 0.53; PW 0.63; EL 0.74; EW 0.68; GD 0.63. Ratios: PL/PW 0.84; EL/EW 1.09; EL/PL 1.40; GD/EW 0.93; TL/EW 1.94. Body dark brown; antennae, mouthparts and legs dark yellowish brown. Dorsum of head with small, shallow and sparse punctures; interstice between punctures distinctly microreticulate. Each antenna (Fig. 89B) with nine antennomeres (FL 0.088mm; CL 0.125mm; CL/FL 1.43); length of the antennomeres (in mm) as follows: 0.080; 0.035; 0.043; 0.015; 0.015; 0.015; 0.035; 0.035; 0.055. Eyes with greatest width 1.25X the basal width of scutellum. Pronotum finely and sparsely punctate; puncture small, shallow, separate by a distance of two to three puncture widths; anterolateral margins straight; posterolateral angles broadly rounded; posterior margin without a rugose border. Scutellum slightly rugose, basal width 0.17X the EW. Elytra with punctation confused, coarser and denser than that of pronotum; punctures irregular, deep, coalescent near the margin; interstice between punctures smooth to finely rugose;

elytral apex truncate, bearing sparse and small cuticular globules, with weak concavity when seen from above. Each hind wing (Fig. 87) with apical area bearing two distinct pigmented lines, one near the anterior margin and the other almost reaching the posterior margin. Prosternum biconcave, without longitudinal carina at midline. Metaventrite and abdominal ventrites almost glabrous. Each metatibia (Fig. 90B) broadly rounded, around 3X as long as broad; outer apical and outer lateral edges forming an obtuse rounded angle; outer edge with spines (around 20) closer to each other at apical one-fourth, then getting sparser. *Male genitalia (in paratypes).* (Figs 93–94) Apical portion of tegmen subpentagonal; median lobe around 1.3X longer than tegmen.

Type series

Holotype. (MZSP) **Brazil:** /BRASIL: BA Jussari; “RPPN Serra do Teimoso” 23.iii a 17.iv.2005 leg. K. S. Furieri / *Scolytocis furieriae* Lopes-Andrade HOLOTYPUS [printed in red paper]/. *Paratypes.* **Brazil:** 7 specimens (LAPC), same data as holotype; 70 specimens (6 CNCI; 2 KMMA; 5 LUND; 3 MHNG; 5 SMTD) /BRASIL: BA Eunápolis xi.2004 JNC Louzada leg./; 63 specimens (6 CNCI; 2 MCZ; 5 LUND; 3 MHNG; 5 SMTD) /BRASIL: ES Linhares 11-21.x.2004 P. C. Grossi leg./; 12 specimens (LAPC) /BRASIL: PA Marabá; “Reserva Biológica de Tapirapé; Amazônia Legal” 19.xi.2003 leg. F. Gumier-Costa/; 1 specimen (LAPC) /BRASIL: PA Marabá 03.xii.2003 leg. F. Gumier-Costa/. All the paratypes with an additional label /*Scolytocis furieriae* Lopes-Andrade PARATYPUS [printed in yellow paper]/.

Variation

Measurements in mm (n = 38, including the holotype): TL 1.16–1.58 (1.39 ± 0.09); PL 0.47–0.58 (0.55 ± 0.04); PW 0.53–0.68 (0.62 ± 0.04); EL 0.68–1.00 (0.80 ± 0.07); EW 0.58–0.74 (0.67 ± 0.04); GD 0.53–0.68 (0.62 ± 0.04). Ratios: PL/PW 0.75–1.00 (0.88 ± 0.06); EL/EW 1.00–1.35 (1.19 ± 0.09); EL/PL 1.25–1.89 (1.48 ± 0.16); GD/EW 0.78–1.00 (0.92 ± 0.04); TL/EW 1.78–2.25 (2.07 ± 0.10).

Distribution

Known from various localities in the states of Pará (North Region), Bahia (Northeast Region), and Espírito Santo (Southeast Region) (Fig. 96).

Host fungi

Unkown.

Comments

Scol. furieriae **sp. nov.** was first collected by Gumier-Costa (2004), who found it only on a primary forest of the Amazon Basin. The type locality is Serra do Teimoso (Jussari, BA), a small forest remnant (around 200ha) maintained as a “Reserva Particular do Patrimônio Natural” (RPPN, Private Reserve of Natural Patrimony), being sympatric to *Falsocis brasiliensis* Lopes-Andrade (an endangered ciid species; Lopes-Andrade 2007b).

Scolytocis paschoali **Lopes-Andrade sp. nov. (Figs 1–4, 83–85, 89C, 90C, 95, 96)**

Etymology

The species is named after Paschoal Coelho Grossi, entomologist, good friend, and great collector of ciids.

Diagnosis

The species belongs to the *fritzplaumanni* species-group and so it is distinguishable from the other *Scolytocis* by the biconcave prosternum without longitudinal carina at midline, and the smooth border of the posterior pronotal margin. It differs from the other species in the group by the by the combination of a fine and sparse pronotal punctation and a large antennal club (2X longer than funicle).

Description

Holotype. (Figs 83–85) Measurements in mm: TL 1.70; PL 0.60; PW 0.75; EL 1.10; EW 0.85; GD 0.75. Ratios: PL/PW 0.80; EL/EW 1.29; EL/PL 1.83; GD/EW 0.88; TL/EW 2.00. Body black, almost entirely glabrous; legs brown; antennae, mouthparts and tarsi yellowish brown. Head coarsely punctate; punctures small, with interstice microreticulate. Each antenna (Fig. 89C) with nine antennomeres (FL 0.093mm; CL 0.190mm; CL/FL 2.05); length of the antennomeres (in mm) as follows: 0.105; 0.045; 0.050; 0.013; 0.015; 0.015; 0.053; 0.053; 0.085. Eyes with greatest width 1.5X the basal width of scutellum. Pronotal punctation sparse; punctures shallow and narrow, separated by a distance of one to three puncture widths; interstice between punctures finely and conspicuously microreticulate; anterolateral margins straight; posterolateral angles broadly rounded; posterior margin without a rugose border. Scutellum unpunctate, but microreticulate; basal width 0.14X the EW. Elytra with confuse punctation, coarser and denser than that of pronotum; punctures deep, usually separated by a distance of two puncture widths or less; interstice between punctures smooth, shiny; elytral apex truncate, apical border slightly concave when seen from above, bearing small, sparse cuticular globules. Each hind wing (Fig. 88) with apical area bearing two distinct pigmented lines, one near the anterior margin and the other almost reaching the posterior margin. Prosternum biconcave, without longitudinal carina at midline. Metaventrite and abdominal ventrites glabrous. Each metatibia (Fig. 90C) broadly rounded, around 3X as long as broad; outer apical and outer lateral edges forming an obtuse rounded angle; outer edge with spines (around 20) close to each other at the apex and getting sparser untill its base. *Male genitalia (in paratypes).* (Fig. 95) Apical portion of tegmen with sides subparallel; median lobe slightly longer than tegmen.

Type series

Holotype. (MZSP) **Brazil:** /BRASIL: RJ Macaé de Cima 03.xi.2003 leg. P.C. Grossi / *Scolytocis paschoali* Lopes-Andrade HOLOTYPUS [printed in red paper]/. *Paratypes.* **Brazil:** 41 specimens, same data as holotype (2 CNCI; 2 LUND; 2 MHNG; 4 RRPC; 2 SMTD); 1f# (LAPC) /Brasil: Venda Nova do Imigrante, ES 13-16.xi.1999 leg. F. Z. Vaz-de-Mello/. All the paratypes with an additional label /*Scolytocis paschoali* Lopes-Andrade PARATYPUS [printed in yellow paper]/.

Variation

Measurements in mm (n = 11, including the holotype): TL 1.53–1.74 (1.66 ± 0.09); PL 0.58–0.68 (0.62 ± 0.04); PW 0.68–0.79 (0.72 ± 0.04); EL 0.89–1.10 (0.99 ± 0.07); EW 0.74–0.85 (0.80 ± 0.04); GD 0.68–0.79 (0.72 ± 0.04). Ratios: PL/PW 0.80–0.92 (0.85 ± 0.04); EL/EW 1.13–1.33 (1.24 ± 0.06); EL/PL 1.47–1.83 (1.60 ± 0.13); GD/EW 0.86–0.94 (0.90 ± 0.03); TL/EW 1.94–2.20 (2.09 ± 0.08).

Distribution

Known from the type locality in Nova Friburgo (in the state of Rio de Janeiro) and Venda Nova do Imigrante (in the state of Espírito Santo), both in the Southeast Region of Brazil (Fig. 96).

Host fungi

Unknown.

Comments

The species seems to be closest related to *Scol. furieriae* **sp. nov.**

Indo-Malayan, Australasian and Oceanic species

Scolytocis malaysianus Lopes-Andrade sp. nov. (Figs 97–99, 106, 109A, 110A, 111, 112)

Etymology

The specific epithet refers to Malaysia, *terra typica* of this species.

Diagnosis

The species belongs to the lawrencei species-group, and so is distinguishable from the other *Scolytocis* by the smooth posterior margin of pronotum and the concave prosternum. It differs from all the other species in this group by the surfaces of the prosternum, metaventrite and abdominal ventrites, which have a distinct microreticulation in high relief.

Description

Holotype. (Fig. 97–99) Measurements in mm: TL 1.05; PL 0.42; PW 0.42; EL 0.63; EW 0.47; GD 0.47. Ratios: PL/PW 1.00; EL/EW 1.33; EL/PL 1.50; GD/EW 1.00; TL/EW 2.22. Body black; antennae, mouthparts and legs dark yellowish brown. Head sparsely punctate; punctures shallow, interstice finely microreticulate. Each antenna (Fig. 109A) with nine antennomeres (FL 0.068mm; CL 0.125mm; CL/FL 1.85); length of the antennomeres (in mm) as follows: 0.060; 0.028; 0.030; 0.013; 0.013; 0.013; 0.033; 0.038; 0.055. Eyes with greatest width 1.2X the basal width of scutellum. Pronotum with coarse, sparse, shallow punctation; puncture irregular, separated by a distance of two to three puncture widths, interstice conspicuously microreticulate; anterolateral margins straight; posterolateral angles broadly rounded; posterior margin without a rugose border. Scutellum unpunctate; basal width 0.16X the EW. Elytra with subseriate punctation; punctures coarser and shallower than those of pronotum; border of punctures indistinct, interstice slightly rugose; elytral apex rounded, glabrous, its declivity with a weak concavity, cuticular globules absent. Each hind wing (Fig. 106) with apical area without conspicuous pigmented lines. Prosternum concave, without longitudinal carina; surface with distinct microreticulation in high relief. Metaventrite and abdominal ventrites glabrous, microreticulation similar to that of prosternum. Each metatibia (Fig. 110A) near 3X as long as broad; outer apical and outer lateral edges forming an almost perpendicular angle that is rounded; outer edge with spines (around 15) regularly distributed at apical two-thirds, then getting sparser. *Male genitalia (in a* *paratype).* (Fig. 111) Genitalia barely sclerotized; apex of tegmen acute; median lobe extremelly membranous and elongate, around 1.8X longer than tegmen.

Type series

Holotype. (ANIC) **Malaysia:** /Malaysia, Pahang Temerloh Distr. Krau Game Res. Feb. 18, 1975 J. Fleagle, coll. / Ganoderma sp./ J. F. Lawrence Lot [printed] 3911 [handwritten]/ *Scolytocis malaysianus* Lopes-Andrade HOLOTYPUS [printed in red paper]/. *Paratypes.* **Malaysia:** 2 specimens, same locality data as holotype; 2 specimens, /Malaysia, Pahang Temerloh Distr. Krau Game Res. Feb. 18, 1975 J. Fleagle, coll. / Phellinus sp. / J. F. Lawrence Lot [printed] 3906 [handwritten]/; 2 specimens /Malaysia: Perak N. slopes Gunong Bubu, K. Kangsar Dist. Feb. 2, 1975 J. Fleagle, coll. / Phellinus sp./, one additionally labeled /J. F. Lawrence Lot [printed] 3765 [handwritten]/, and the other /J. F. Lawrence Lot [printed] 3768 [handwritten]/. All the paratypes with an additional label /*Scolytocis malaysianus* Lopes-Andrade PARATYPUS [printed in yellow paper]/.

Variation

Measurements in mm (n = 5, including the holotype): TL 1.00–1.16 (1.08 ± 0.06); PL 0.37–0.42 (0.40 ± 0.03); PW 0.42–0.47 (0.43 ± 0.02); EL 0.63–0.74 (0.66 ± 0.05); EW 0.42–0.53 (0.47 ± 0.04); GD 0.42–0.47 (0.44 ± 0.03). Ratios: PL/PW 0.88–1.00 (0.93 ± 0.07); EL/EW 1.20–1.56 (1.41 ± 0.14); EL/PL 1.50–1.86 (1.66 ± 0.16); GD/EW 0.89–1.00 (0.94 ± 0.06); TL/EW 2.10–2.44 (2.30 ± 0.14).

Distribution

Known only from Malaysia.

Host fungi

Ganoderma sp. (Ganodermataceae), *Phellinus* sp. (Hymenochaetaceae).

Comments

The placement of this species in the *lawrencei* species-group is justifiable, since it resembles other species of the group not only by external morphological features but also by the morphology of male genitalia (compare Figs 73 and 111).

Scolytocis neozelandensis Lopes-Andrade sp. nov. (Figs 100–102, 107, 109B, 110B, 112)

Etymology

The specific epithet refers to New Zealand, *terra typica* of this species.

Diagnosis

This new species is the unique *Scolytocis* that has the combination of a rugose border along the posterior pronotal margin and a concave prosternum. The other *Scolytocis* with such rugose border all have a biconcave prosternum with a narrow longitudinal carina (the *danielssoni* group).

Description

Holotype. (Figs 100–102) Measurements in mm: TL 1.21; PL 0.42; PW 0.53; EL 0.74; EW 0.58; GD 0.53. Ratios: PL/PW 0.80; EL/EW 1.27; EL/PL 1.75; GD/EW 0.91; TL/EW 2.09. Body dark brown; antennae and mouthparts yellowish brown; legs reddish brown. Head with coarse, sparse, shallow punctation; interstice between punctures inconspicuously microreticulate, shiny. Each antenna (Fig. 109B) with nine antennomeres (FL 0.083mm; CL 0.133mm; CL/FL 1.61); length of the antennomeres (in mm) as follows: 0.088; 0.038; 0.038; 0.015; 0.015; 0.015; 0.038; 0.038; 0.058. Eyes with greatest width 1.0X the basal width of scutellum. Pronotum with coarse, shallow, confuse punctation; punctures irregular, separated by a distance of one to three puncture widths; interstice between punctures microreticulate, being much more conspicuous near the lateral margin; anterolateral margins slightly arched inwards; posterolateral angles broadly rounded; posterior margin bearing a conspicuous rugose border along it. Scutellum unpunctate, rugose; basal width 0.16X the EW. Elytra with confuse punctation, coarser and denser than that of pronotum; interstice between puncture finely microreticulate near the anterior margin, then getting rugose posteriorly; elytral apex truncate, declivity conspicuously convave and bearing very small cuticular globules. Each hind wing (Fig. 107) with apical area without conspicuous pigmented lines. Prosternum concave, without longitudinal carina at midline. Prosternum, metasternum and abdominal ventrites conspicuously and regularly microreticulate, somewhat rugose. Each metatibia (Fig. 110B) near 3.25X as long as broad; outer apical and outer lateral edges forming an obtuse angle that is broadly rounded; outer edge with spines (around 15) regularly distributed at apical two-thirds. *Male genitalia.* Unknown.

Type series

Holotype. (ANIC) **New Zealand:** /New Zealand: ND: Waipoua SF, Wairau Summit 387m 11-14 iv.1980 podocarp-mixed broadleaf A. Newton, M. Thayer/

Ganoderma sp. / *Scolytocis neozelandensis* Lopes-Andrade HOLOTYPUS [printed in red paper]/. *Paratypes.* **New Zealand:** 1 specimen, same data as holotype; 1 specimen /New Zealand, CL Kirikiri Saddle, 835m Coromandel Range 1 Feb. 1986 J. F. Lawrence / J. F. Lawrence Lot Ganoderma sp./. The paratypes with an additional label /*Scolytocis neozelandensis* Lopes-Andrade PARATYPUS [printed in yellow paper]/.

Variation

Measurements in mm (n = 3, including the holotype): TL 1.16–1.26 (1.21 ± 0.05); PL 0.42–0.47 (0.44 ± 0.03); PW 0.47–0.58 (0.53 ± 0.05); EL 0.68–0.79 (0.74 ± 0.05); EW 0.53–0.63 (0.58 ± 0.05); GD 0.47–0.58 (0.53 ± 0.05). Ratios: PL/PW 0.80–0.89 (0.84 ± 0.05); EL/EW 1.25–1.30 (1.27 ± 0.03); EL/PL 1.63–1.75 (1.68 ± 0.06); GD/EW 0.90–0.92 (0.91 ± 0.01); TL/EW 2.00–2.20 (2.10 ± 0.10).

Distribution

Known only from New Zealand (Fig. 112).

Host fungi

Ganoderma sp. (Ganodermataceae).

Comments

This species was cited by Leschen *et al.* (2003) as *Scolytocis* sp.

Scolytocis samoensis Blair, 1928

Diagnosis and comments

Scol. samoensis, was described based in just one specimen, probably a female, deposited in BPBM (Hawaii, USA). Blair (1928) mentioned that the holotype is very defective. Though, I prefer not to take the risk and didn't ask for the loan of it. From the description provided by Blair (1928), *Scol. samoensis* may be distinguished from the other *Scolytocis* described here by the completely rounded humeri and the first abdominal ventrite longer than the next two ventrites together. In the other *Scolytocis* the first abdominal is as long as or shorter than the next two ventrites together, and the humeri is always angulate.

As mentioned by Blair, the tarsi of *Scol. samoensis* appear to have three tarsomeres. The basal tarsomere of all *Scolytocis* examined in this study is extremely small and barely visible, even in high magnifications (over 100X under stereomicroscope). However, in slide preparations, I could evaluate that all species have four tarsomeres in each tarsus. The same is probably true for *Scol. samoensis*. A small discussion on the hypothetical presence of three tarsomeres (rather than four) in each tarsus of some ciid species is provided b y Lopes-Andrade (2007a).

Due to its small length, the seriate elytral punctation, and the antennal club that is almost twice as long as the funicle, *Scol. samoensis* may be included in the *lawrencei* species-group.

Distribution

Known only from the type locality: Tutuila, Pago Pago, Samoa (Polynesia; Fig. 112).

Scolytocis zimmermani **Lopes-Andrade sp. nov. (Figs 103–105, 108, 109C, 110C, 112)**

Etymology

The species is named after the great entomologist E. C. Zimmerman, who collected many already described and remaining undescribed species of Ciidae from Pacific Islands.

Diagnosis

The species is the unique *Scolytocis* with the tibia conspicuously expanded to middle (Fig. 110C), and in which the spines are very close to each other (separated by less than a spine width).

Description

Holotype. (Figs 103–105) Measurements in mm: TL 1.58; PL 0.63; PW 0.68; EL 0.89; EW 0.68; GD 0.68. Ratios: PL/PW 0.93; EL/EW 1.31; EL/PL 1.41; GD/EW 1.00; TL/EW 2.32. Body with dorsum dark brown, ventral surface reddish brown; basal antennomeres, mouthparts and tarsi yellowish brown. Head finely and sparsely punctate on dorsum; interstice between punctures smooth, shiny, rugose near the anterior margin. Each antenna (Fig. 109C) with nine antennomeres (FL 0.113mm; CL 0.195mm; CL/FL 1.73); length of the antennomeres (in mm) as follows: 0.100; 0.043; 0.065; 0.020; 0.015; 0.013; 0.045; 0.050; 0.100. Eyes with greatest width 1.11X the basal width of scutellum. Pronotum with shallow punctation; punctures fine at disc, separated by a distance of two to three puncture widths; near the lateral margins, the punctures are coarse and somewhat elongate, separated by one puncture width or less, but not coalescent; interstice between punctures finely and inconspicuously microreticulate;

anterolateral margins straight; posterolateral angles broadly rounded; posterior margin without a rugose border. Scutellum unpunctate, shiny; basal width 0.21X the EW. Elytra with confuse punctation, which is shallower, denser and coarser than that of pronotum; interstice between punctures smooth, shiny; elytral apex truncate; apical declivity concave, with inconspicuous cuticular globules. Each hind wing (Fig. 108) with apical area bearing two distinct pigmented lines, one near the anterior margin and the other almost reaching the posterior margin. Prosternum concave, without longitudinal carina at midline. Metaventrite and abdominal ventrites glabrous. Each metatibia (Fig. 110C) conspicuously expanded at middle; outer margin equally spinulose from apex to middle, with spines very close to each other and then getting spaced to the base. *Male genitalia.* Unknown.

Type series

Holotype. (ANIC) **Fiji:** **/**Wainiloka Ovalau, Fiji [printed] VII-II-38 [handwritten]/ Shelf Fungi / ECZimmerman Collector / *Scolytocis zimmermani* Lopes-Andrade HOLOTYPUS [printed in red paper]/. *Paratypes.* **Fiji:** 2 specimens, same data as holotype (1 ANIC, 1 LAPC). The paratypes with an additional label /*Scolytocis zimmermani* Lopes-Andrade PARATYPUS [printed in yellow paper]/.

Variation

Measurements in mm (n = 3): TL 1.42–1.58 (1.53 ± 0.09); PL 0.58–0.63 (0.60 ± 0.03); PW 0.63–0.68 (0.66 ± 0.03); EL 0.79–0.95 (0.88 ± 0.08); EW 0.63–0.68 (0.66 ± 0.03); GD 0.63–0.68 (0.65 ± 0.03). Ratios: PL/PW 0.85–0.93 (0.90 ± 0.04); EL/EW 1.25–1.40 (1.32 ± 0.08); EL/PL 1.36–1.64 (1.47 ± 0.15); GD/EW 0.93–1.00 (0.98 ± 0.04); TL/EW 2.25–2.32 (2.30 ± 0.04).

Distribution

Known only from the type locality in Ovalau, Fiji (Melanesia; Fig. 112).

Host fungi

Unknown.

Comments

Morphology of male genitalia is not provided for this species: only three specimens are known, one was dissected (unfortunately a female) and I preferred to maintain the integrity of the other two specimens.

Syncosmetina Lopes-Andrade subtr. nov. (Figs 7–8, 11–12, 113–121, 136)

Included genus

Syncosmetus Sharp, 1891 **(type genus)**

Tropicis Scott, 1926

Diagnosis

This new subtribe is characterized by the combination of the following characters: (i) lateral pronotal carina always crenulate; (ii) pronotal and elytral punctation very coarse and dense, punctures coalescent in some portions; (iii) scutellum inconspicuous, its basal width less than 0.10X the greatest elytral width; (iv) elytra bearing longitudinal keels in most species; (v) prosternal process broad; (vi) procoxae cylindrical, at the same level of the prosternal process; (vii) apex of prementum rounded.

Distribution

Syncosmetina **subtrib. nov.** occurs in parts of the Afrotropical (restricted to the western Indian Ocean; *Tropicis*) and Palearctic (restricted to Japan; *Syncosmetus*) Regions. However, a new *Syncosmetus* is known from the Indo-Malayan Region (Vietnam; Rafal Ruta pers. comm.).

***Syncosmetus* Sharp, 1891 (Figs 11, 113–122)**

***Omogocis* Miyatake, 1954**

Included species

Syncosmetus japonicus Sharp, 1891 **(type species)**

Syncosmetus reticulatus Miyatake, 1985

Diagnosis and comments

Syncosmetus is distinguishable from *Tropicis* by the combination of the following features: (i) body suboval to oval; (ii) humeri rounded; (iii) hind wings rudimentary. The genus has two described species, both from Japan.

***Syncosmetus japonicus* Sharp, 1891 (Figs 113–115, 119A, 120A, 121, 122)**

=*Omogocis tuberculifrons* Miyatake, 1954

Diagnosis and comments

The species differs form *Syn. reticulatus* by the more convex and oval body (Figs 113–115), with more marked keels and larger punctation on elytra. The male genitalia (Fig. 121) is well sclerotized, and it is morphologically distinct from the other male genitalia of Xylographellini.

Specimen examined

Japan. Three specimens labeled /JAPAN, Shikoku Ishizuchi Mt. N.P. M. Tsutsujo, 1600m 14.VIII.80, S. Peck / Betula-Fagus logs, stump & moss litter/; one specimen /JAPAN, Shikoku Ishizuchi Mt. N.P. Omogo Valley 18-25.VIII.1980 S. Peck, 700m / fungi on logs & moss, mixed warm temp for/. All specimens with an identification label /*Syncosmetus japonicus* Sharp, 1891 C. Lopes-Andrade det. 2007/.

Host-fungi

Pleurotus sp. (Pleurotaceae) (Kawanabe 1995b, doubtful report), *Trametes versicolor* (L.) Lloyd (Polyporaceae) (cited as *Coriolus versicolor* in Kawanabe 1996, as a doubtful report); *Fomes fomentarius* (L.) J.J. Kickx (Polyporaceae), *Pyrrhoderma sendaiense* (Yasuda) Imazeki (Hymenochaetaceae) and *Elfvingia applanata* (Pers.) P. Karst. (Ganodermataceae) (Kawanabe 1998); *Inonotus mikadoi* (Lloyd) Gilb. & Ryvarden (Hymenochaetaceae) (Kawanabe 1999).

Distribution

Known from Japan (Fig. 122).

***Syncosmetus reticulatus* Miyatake, 1985 (Figs 11, 116–118, 119B, 120B, 122)**

Diagnosis and comments

The species differs from *Syn. japonicus* by the more parallel-sided body (Figs116–118) and less marked keels on elytra. No males were examined, so it was not possible to evaluate whether some of the distinct characters of the male genitalia of *Syn. japonicus* are restricted to the species or diagnostic to the genus.

Specimen examined

Japan: One f# labeled / JAPAN NARA Pref. Mt. Obako-dake, 1300m near Nosegawa-mura vill. 25 III 2006, leg. P. Jaloszynski [printed] / Syncosmetus reticulatus [handwritten] det. Rafal RUTA 2005 [sic] [printed]/

Host-fungi

Fomes fomentarius (L.) J.J. Kickx (Polyporaceae) and *Elfvingia applanata* (Pers.) P. Karst. (Ganodermataceae) (Kawanabe 1998). Regarded as belonging to the *Ganoderma* host-use group (Orledge & Reynolds 2005).

Distribution

Known from Japan (Fig. 122).

Tropicis **Scott, 1926 (8, 12, 123–135)**

Included species

Tropicis brevicarinatus Scott, 1926
Tropicis cuccodoroi Lopes-Andrade **sp. nov.**
Tropicis flexicarinatus Scott, 1926
Tropicis sexcarinatus (Waterhouse, 1876) **(type species)**

Diagnosis and comments

Very similar to *Syncosmetus*, but all the known species are macropterous. Consequently, the body of *Tropicis* is subparallel-sided (rather than suboval to oval) and the humeri angulate (rather than rounded). Scott (1926) provided a key for the three species he included at the genus that time. The species described here, *Trop. cuccodoroi* **sp. nov.**, falls in *Trop. brevicarinatus* in the identification key of Scott, differing in the lack of longitudinal keels near the elytral apex. I will not provide a new identification key for *Tropicis*: I cannot make much addition to it, since I have not examined the two species from Seychelles (*Trop. brevicarinatus* and *Trop. flexicarinatus*).

Tropicis brevicarinatus **Scott, 1926**

Diagnosis and comments

As mentioned by Scott (1926), it differs from the other *Tropicis* mainly by the short elytral keels. In *Trop. cuccodoroi* **sp. nov** the elytral keels are almost indistinct.

Specimen examined

No specimen examined.

Host-fungi

Unknown.

Distribution

Western Indian Ocean, Seychelles (Fig. 135).

Tropicis cuccodoroi **Lopes-Andrade sp. nov. (Figs. 123–125, 129, 131A, 132A, 133, 135)**

Etymology

This species is named after Giulio Cuccodoro, who kindly authorized the loan of the *Tropicis* from the collection of MHNG.

Diagnosis

The species close resembles *Trop. brevicarinatus* Scott, and it differs from it and the other described *Tropicis* by the indistinct elytral keels.

Description

Holotype. (Fig. 123–125) Measurements in mm: TL 1.32; PL 0.42; PW 0.53; EL 0.79; EW 0.58; GD 0.53. Ratios: PL/PW 0.80; EL/EW 1.36; EL/PL 1.88; GD/EW 0.91; TL/EW 2.27. Body dark brown; head and pronotum darker than elytra; basal antennomeres, mouthparts and legs yellowish brown; abdominal ventrite brown. Head conspicuously punctate; puncture deep, large, twice the width of an ommatidia [conf.]; interstice between punctures smooth, shiny. Each antenna (Fig. 131A) with ten antennomeres (FL 0.103mm; CL 0.135mm; CL/FL 1.32); length of the antennomeres (in mm) as follows: 0.07; 0.038; 0.035; 0.025; 0.013; 0.015; 0.015; 0.035; 0.038; 0.063. Eyes with greatest width 1.67X the basal width of scutellum. Pronotum deeply and coarsely punctate; punctures separated by a distance of one puncture width or less; interstice between punctures smooth, shiny; anterolateral margins straight; posterolateral angles broadly rounded; posterior margin without rugose border. Scutellum very small, unpunctate, glabrous, shiny; basal width 0.075X the EW. Elytral punctation and interstice similar to that of pronotum; elytral apex rounded, without longitudinal keels; apical declivity with very weak concavity, cuticular globules inconspicuous; elytral suture margined at apical third. Each hind wing (Fig.129) with apical area bearing two distinct pigmented lines, one near the anterior margin and the other almost reaching the posterior margin. Prosternum with fine, regular, circular microreticulation in high relief. Metaventrite and abdominal ventrites glabrous, bearing microreticulation similar to that of Prosternum. Each metatibia (Fig. 132A) slender, subtriangular, just slightly expanded to apex; outer lateral edge straight, bearing around

5 sparse spines; outer apical edge bearing around 10 spines, close to each other. *Male genitalia (in paratypes).* (Fig. 133) Genitalia elongate, subcylindrical, sclerotized; median lobe near 1.3X longer than tegmen, around 15X as long as wide.

Type series

Holotype. (MHNG) **Réunion:** /La Réunion Y. Gomy [printed] Pl. des Chicots 21.4.73 - 1860m Tamisage [handwritten]/ *Tropicis cuccodoroi* Lopes-Andrade HOLOTYPUS [printed in red paper]. *Paratypes.* **Réunion:** Total of 26 specimens (7 LAPC; 19 MHNG). 7 specimens /La Réunion Y. Gomy [printed] Cilaos Grand Matarum 1.xi.69 tamisage [handwritten]/; 1 specimen /La Réunion J. David [printed] Foret Bebour Aout 1973 [handwritten]/; 3 specimens /La Réunion Y. Gomy [printed] Brûlé de Mare Longue 23.2.72 tamisage tronc [handwritten]"; 3 specimens /La Réunion Y. Gomy [printed] Takamaka 26.i.72 chemin du barrage Tamisage souche très humide [handwritten]/; 1 specimen /La Réunion Y. Gomy [printed] Plaine des Makes 1500m-19.xi.70 s/ ecorces tamarin [handwritten]/; 1 specimen /La Réunion Y. Gomy [printed] Piste Forestier de la Pl. des Affouches 19.11.67 P.K5 [sic] [handwritten]/; 1 specimen /La Réunion Y. Gomy [printed] Pl. des Makes 14km - 15.xi.70 tamisage troncset humus [handwritten]/; 4 specimens /La Réunion Y. Gomy [printed] Pl. d'Affouches 1200m-1.xi.71 tamisage souche et humus Gite [handwritten]/; 1 specimen /La Réunion Y. Gomy [printed] ND de la Paix 31.xii.70-1500m tamisage [handwritten]/; 2 specimens /La Réunion P. Schauenberg [printed] Forêt endémique Ravine Grand Chaloupe -590m 11.i.75 [handwritten]/; 1 specimen /La Réunion Y. Gomy [printed] Plaine des Cafres ND de la Paix 9.i.72 tamisage [handwritten]/; 1 specimen /La Réunion Y. Gomy [printed] Gite Forestiere de Bebour 22.4.72 tamisage humus [handwritten]/. **Mauritius:** Total of 76 specimens (19 LAPC; 57 MHNG). 11 specimens labeled /Ile Maurice Y. Gomy [printed] Macabe Forest 13.i.70 tronc mort [handwritten]/; 5 specimens /Ile Maurice Y. Gomy [printed] Macabe 11.4.70 [handwritten]/; 6 specimens /Ile Maurice Y. Gomy [printed] Magenta 11.4.70 [handwritten]/; 50 specimens /Ile Maurice Y. Gomy [printed] Mont Cocotte 600m 28.i.71 tamisage [handwritten]/; 1 specimen /Ile Maurice Y. Gomy [printed] Mare Longue 19.i.71 tamisage tronc [handwritten]/; 1 specimen /Ile Maurice Y. Gomy [printed] Mont Cocotte 19.i.1970 tronc mort [handwritten]/; 1 specimen /Ile Maurice Y. Gomy [printed] Riviere Patate 19.i.71 tamisage tronc [handwritten]/. All the paratypes with an additional label / *Tropicis cuccodoroi* Lopes-Andrade PARATYPUS [printed in yellow paper]/.

Variation

Measurements in mm (n = 20, including the holotype): TL 0.95–1.58 (1.19 ± 0.15); PL 0.32–0.53 (0.39 ± 0.05); PW 0.42–0.68 (0.51 ± 0.06); EL 0.63–0.95 (0.74 ± 0.08); EW 0.47–0.74 (0.55 ± 0.07); GD 0.42–0.58 (0.50 ± 0.04). Ratios: PL/PW 0.70–0.89 (0.77 ± 0.04); EL/EW 1.18–1.50 (1.35 ± 0.09); EL/PL 1.63–2.14 (1.90 ± 0.14); GD/EW 0.77–1.00 (0.90 ± 0.06); TL/EW 1.91–2.30 (2.15 ± 0.10).

Distribution

Mascarene Islands (La Reunion, Mauritius; Fig. 135).

Host-fungi

Unknown.

Comments

This species resembles *Trop. brevicarinatus* Scott from Seychelles, but differs in lacking longitudinal keels at the elytral apex.

***Tropicis flexicarinatus* Scott, 1926**

Diagnosis and comments

As mentioned by Scott (1926), it differs from *Tropicis sexcarinatus* mainly by the sinuous elytral keels.

Specimen examined

No specimen examined.

Host-fungi

Unknown.

Distribution

Western Indian Ocean, Seychelles (Fig. 135).

***Tropicis sexcarinatus* (Waterhouse, 1876) (Figs 8, 12, 126–128, 130, 131B, 132B, 134, 135)**

Diagnosis and comments

It differs from the other *Tropicis* by the six longitudinal keels at elytra, most conspicuous at the apical half, and the coarse pronotal punctation with coalescent punctures. It most resembles *Trop. flexicarinatus*, but do not co-occur with it (see Fig.

135). The species is variable morphologically and may be a complex of close related species.

Specimens examined

Mauritius: Total of 40 specimens (5 LAPC; 35 MHNG). 12 specimens labeled /Ile Maurice Y. Gomy [printed] Macabe Forest 13.i.70 tronc mort [handwritten]/; 7 specimens /Ile Maurice Y. Gomy [printed] Macabe Forest 22.i.66 Champignon [handwritten]/; 12 specimens labeled /Ile Maurice Y. Gomy [printed] Maré Lonque 19.i.71 tamisage tronc [handwritten]/; 9 specimens /Ile Maurice Y. Gomy [printed] Macabe Forest 19.i.71 tamisage tronc [handwritten]/. **Rodrigues:** 1 specimen (MHNG) labeled /Ile Rodrigue Y. Gomy [printed] Mont Limon 396m-8.5.72 tamisage dans hampe d'Alôes [handwritten]/. **Réunion:** Total of 48 specimens (5 LAPC; 43 MHNG). 9 specimens labeled /La Réunion Y. Gomy [printed] Cilaos Grand Matarum tamisage i.xi.69 [handwritten]/; 12 specimens /La Réunion Y. Gomy [printed] Bras de la Plaine 22.8.65 dans champignon [handwritten]/; 1 specimen /La Réunion Y. Gomy [printed] Roche Ecrite 8.10.65 – 2200m au fauchoir [handwritten]/; 2 specimens /Cilaos Grand Matarum 6.8.67 dans champignon Y. Gomy [handwritten]/; 1 specimen /La Réunion Y. Gomy [printed] Hell Bourq 6.11.65 s. ecorces [handwritten]/; 1 specimen /La Réunion Y. Gomy [printed] Cirque de Salazie Piton Marmite 1800m 14.i.72 tamisage tronc pourri [handwritten]/; 2 specimens /La Réunion J. David [printed] Foret Bebour aout 1973 [handwritten]/; 3 specimens /La Réunion Y. Gomy [printed] La Petite Plaine 20.3.66 champignon arborie [handwritten]/; 1 specimen /La Réunion Y. Gomy [printed] La Petite Plaine Pl. des Palmistes 25.v.69-1300m [handwritten]/; 1 specimen /La Réunion Y. Gomy [printed] Ste Philippe-Alt.100m 15.2.71 tamisage souche [handwritten]; 3 specimens /La Réunion Y. Gomy [printed] Plaine des Chicots 1730m-10.10.66 Champignon [handwritten]/; 1 specimen /La Réunion Y. Gomy [printed] Cilaos Grand Matarum 7.xi.69 tamisage [handwritten]/; 5 specimens /La Réunion Y. Gomy [printed] Pl. des Chicots Gite 1850m-19.4.73 tamisage terreau [handwritten]/; 1 specimen /La Réunion Y. Gomy [printed] Pl. des Chicots Gite 21.4.73 1800m fauchoir [handwritten]/; 1 specimen /La Réunion Y. Gomy [printed] Pl. des Chicots 21.4.73-1800m fauchage [handwritten]/; 1 specimen /La Réunion Y. Gomy [printed] Pl. des Chicots Gite 1800m-21.4.73 s. calumets mort [handwritten]/; 1 specimen /La Réunion Y. Gomy [printed] Hts. de Sta. Rose 25.10.70 tamisage [handwritten]/; 1 specimen /La Réunion Y. Gomy [printed] Pl. des Makes 15.xi.70 tamisage troncset humus [handwritten]/.

Host-fungi

Unknown.

Distribution

Mascarene Islands (La Réunion, Mauritius and Rodrigues; Fig. 135).

Discussion

Morphological affinities

Among Ciidae species, head and pronotum sculpture, pattern of coloration, pilosity, rugosity, punctation and so on are extremely variable. However, there are some tendencies (or patterns) that are detectable: *Ceracis* and *Xylographus* are usually glabrous; Orophiini usually has weak or no secondary sexual characters; Ciini usually has broad prosternal process; Orophiini genera usually have spinose outer apical edge of protibiae. However, there are exceptions for all these cases: some Neotropical *Xylographus* are extremely pilose; some male Orophiini (*Octotemnus*) have modified mandibula; some Ciini (*Falsocis*, as mentioned above) have laminate prosternal process; and the protibial spines of *Paratrichapus* (Orophiini) are restricted to their apices. Other characters do not present such exceptions. Examples are the morphology of mouthparts, male pregenital segments, and female genitalia.

The shape of the prosternal process is a useful character in Ciidae taxonomy, but should be considered with care. The genera previously included in Orophiini (*Octotemnus*, *Paratrichapus*, *Xylographus*, *Ropalodontus*, *Hyalocis*) and Xylographellini (*Scolytocis* and *Xylographella*) are all characterized by a laminate prosternal process. But there are exceptions. For instance, *Octotemnus omogensis* Miyatake has a slightly broader prosternal process, but there is no doubt it is a true *Octotemnus* as it fits the combination of the other diagnostic character of the genus. In the other hand, a laminate prosternal process occurs in genera not related to Orophiini or Xylographellini. The latter is the case of *Falsocis* Pic, which possesses all the characters of a true Ciini except a broader prosternal process and cylindrical subcoxae (Lopes-Andrade 2007b). Therefore, the possession of a broader prosternal process and the configuration of procoxae alone are weak arguments to impede the inclusion of *Syncosmetus* and *Tropicis* in Xylographellini. The combination of other important features (*e.g.* configuration of antennae, mouthparts, female and male genitalia) can be considered “stronger” characters: some are clear autapomorphies of Xylographellini, as the labial palpi inserted at the middle of prementum and the singular compact antennal club; and other characters are shared by Xylographellini and the true Orophiini genera, as the simplified female genitalia (see also Lopes-Andrade 2007a, b).

Unsolved issues

The genera *Paraxestocis* Miyatake and *Nipponapterocis* Miyatake resemble Xylographellini in the compact antennal club, following the information cited in their original descriptions. However, *Paraxestocis* has conspicuous secondary sexual characters in the male head and pronotum, and most resembles the species of Orophiini in general features. In the other hand, *Nipponapterocis* shares many external morphological characters with *Syncosmetus*: (i) antenna with ten antennomeres and a compact club; (ii) the coarse punctation of dorsal and ventral surfaces; (iii) scutellum inconspicuous; (iv) hind wings rudimentary (v) prosternum longitudinally carinate at midline; (vi) prosternal process broad. Moreover, the genus is described as lacking sensillifers in the antennal club (Miyatake 1954; Kawanabe 1995a), a situation resembling some *Syncosmetus* and *Tropicis* species in which the sensillifers are confluent and inconspicuous (e.g., in *Syn. reticulatus* and *Trop. cuccodoroi* **sp. nov.**). In the drawings of Miyatake (1954, compare Figs C and D of plate 5), *Nipponapterocis* and *Syncosmetus* look very similar to each other. However, *Nipponapterocis* lacks the distinct longitudinal keels on elytra, presented in *Syncosmetus* and *Tropicis*, the frontoclypeal ridge bears a small conical projection in either side (at least in *Nip. brevis* Miyatake and *Nip. hirsutus* Kawanabe) and the vestiture consists of short but conspicuous fine hairs.

Following the descriptions provided by Miyatake (1954) and Kawanabe (1995a), *Paraxestocis* may be regarded as an Orophiini and *Nipponapterocis* as a Xylographellini. Unfortunately, neither authors accurately described the mouthparts, male or female genitalia of these genera. Due to the possession of incongruent characters, and as far as I haven’t examined either genera, I prefer to consider them as *incertae sedis*.

Host-use

The pin label data of specimens examined allowed the recognition of four main host fungi of *Scolytocis*: *Ganoderma* (Ganodermataceae), *Rigidoporus* (Meripilaceae), *Fomes* (Polyporaceae) and *Phellinus* (Hymenochaetaceae). Besides these host fungi genera, there is only one report of *Scol. lawrencei* **sp. nov.** collected in *Earliella* (Polyporaceae). *Ganoderma*, *Rigidoporus*, *Fomes*, *Earliella* are host fungi genera grouped under the *Ganoderma* host-use group (*sensu* Orledge & Reynolds

2005). Only three species were found in *Phellinus* fungi: *Scol. hidalgensis* **sp. nov.**; *Scol. malaysianus* **sp. nov.**; and *Scol. montanus* **sp. nov.** However, for all these three species there are other specimens collected in fungi of the *Ganoderma* host-use group. Orledge & Reynolds (2005) placed other Xylographellini (*Syn. reticulatus* and *Xyl. punctata*) in the *Ganoderma* host-use group. Therefore, the use of fungi of the *Phellinus* host-use group by Xylographellini ciids may be incidental or alternative.

Biogeography

There are two major groups in the tribe Xylographellini, formally treated here as separate subtribes (Fig. 136): (i) the Xylographellina, occurring in the Southeastern Asia (Malaysia, one species), Japan (one species), New Zealand (one species), Polynesia (Samoa, one species), Melanesia (Fiji, one species) and throughout the Neotropical Region (twelve species); (ii) the Syncosmetina **subtr. nov.**, with two species from Japan (genus *Syncosmetus*) and four species from the Western Indian Ocean (in the Seychelles and Mascarene Islands; genus *Tropicis*). Therefore, both subtribes are distributed through distinct areas and overlap only on Japan (Figs 21, 122, 136).

Xylographellini does not occur on the Nearctic Region, Europe and Northern Asia, with well-known Ciidae faunas. The tribe is known neither from the Andean Region nor the South American transition zone (*sensu* Morrone 2006), but both have barely studied Ciidae faunas. The subtribes of Xylographellini occur on Japan, being represented by only three species (one Xylographellina and two Syncosmetina **subtrib. nov.**). Since the tribe is unknown from the continental palearctics, it can be hypothesized that the Japanese Xylographellini are probably related to the Indo-Malayan fauna. Indeed, the occurrence of the tribe throughout the Indo-malayan Region is plausible, but yet confirmed only in Southeastern Asia (*Scol. malaysianus* **sp. nov.**, Xylographellina) and Vietnam (one undescribed *Syncosmetus*; Rafal Ruta pers. com.). The case of the Afrotropical Region is also of great interest. The islands where *Tropicis* (Syncosmetina **subtr. nov.**) occur are all in the western Indian Ocean (Seychelles and the Mascaren Islands), and most *Tropicis* species seem to be quite common there. Other ciids described from these islands (or close related species) are already known from the African continent (Ferrer 1997; Lopes-Andrade pers. obs.), showing that there may be some affinities between the continental African and the western Indian Ocean Ciidae faunas. Therefore, there might be a true Afrotropical Ciidae fauna and it is quite expected that Syncosmetina **subtr. nov.** occurs on the continental sub-saharan Africa.

The subtribe Xylographellina is most diversified in the Neotropical Region, being well represented by the genus *Scolytocis*. The Neotropical fauna of *Scolytocis* has three basic components: (i) a Northern continental fauna, comprising species of three morphological species-groups (*bouchardi*, *danielssoni* and *lawrencei* groups); (ii) an Insular fauna (Greater and Lesser Antilles), with one species-group (*lawrencei* group); (iii) a Southern fauna, including only one morphological species-group (*fritzplaumanni* group). The continental Northern and Southern *Scolytocis* faunas seem to be well separated by the South American transition zone (*sensu* Morrone 2006). The species from Antilles, although included in the *lawrencei* species-group, share some morphological features in the male genitalia that is not found in any other *Scolytocis*.

Based on the discussion provided above, the following biogeographical hypotheses can be proposed: (i) a Gondwanan origin of Xylographellini; (ii) an origin of Xylographellina on the western Gondwana; (iii) an origin of Syncosmetina **subtr. nov.** on the eastern Gondwana; (iv) a subsequent expansion of the South-American Xylographellina fauna, explaining the current occurrence of Xylographellina on the Australasian, Oceanic and Indo-Malayan Regions; (v) isolation of the western Indian-Ocean and the Indo-Malayan faunas of Syncosmetina **subtr. nov.**, seen today as two distinct genera (*Tropicis* and *Syncosmetus*, respectively). In such a scenario, the occurrence of Syncosmetina **subtr. nov.** and Xylographellina in Japan would be very recent in evolutive time. Most of these hypotheses (i, ii, iii and v), based on Gondwanan vicariance, can be tested estimating the time of speciation and confronting these data with the information on the break-up of Gondwana. If refuted, alternative explanations would be recent events of oceanic dispersion, and/or higher persistence of species (lower extinction rate) in islands than in continental lands. Indeed, molecular dating analyses have supported oceanic dispersal over tectonic vicariance for many taxa (De Queiroz 2005). However, it should be emphasized here that vicariance and dispersal hypotheses are not mutually exclusive, as they may explain the geographic expansion of Xylographellini in different evolutive times. The study of the insular Xylographellini fauna will certainly provide key-evidences on the evolution and biogeography of the tribe.

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Captions

FIGURES 1–4. *Scolytocis paschoali* **sp. nov. 1.** Part of the head, frontal view showing the eye. **2.** Antennal club, showing the sensillifers (arrows). **3.** Head, ventral view showing the mouthparts. Note the longitudinal sulcus of prementum (arrow). **4.** Ventral view showing the metaventrite.

FIGURES 5–8. Prementum with labial palpi. **5.** *Xylographella punctata* Miyatake, lateral view. **6.** *Scolytocis paschoali* **sp. nov. 7.** *Syncosmetus reticulatus* Miyatake. **8.** *Tropicis sexcarinatus* (Waterhouse).

FIGURES 9–12. Female terminalia. **9.** *Xylographella punctata* Miyatake. **10.** *Scolytocis furieriae* **sp. nov. 11.** *Syncosmetus reticulatus* Miyatake. **12.** *Tropicis sexcarinatus* (Waterhouse).

FIGURES 13–15. *Xylographella punctata* Miyatake. **13.** Dorsal view. **14.** Lateral view. **15.** Ventral view.

FIGURES 16–18. *Xylographella punctata* Miyatake. **16.** Hind wing. **17.** Antena. **18.** Metatibia.

FIGURES 19–20. *Xylographella punctata* Miyatake, male genitalia. **19.** Tegmen (teg) and median lobe (ml). **20.** Y-Shaped ninth segment (broken, see asterisks).

FIGURE 21. Distribution map of *Xylographella punctata* Miyatake (triangles) in Japan.

FIGURES 22–24. *Scolytocis bouchardi* **sp. nov. 22.** Dorsal view. **23.** Lateral view. **24.** Ventral view.

FIGURES 25–27. *Scolytocis cariborum* **sp. nov. 25.** Dorsal view. **26.** Lateral view. **27.** Ventral view.

FIGURES 28–30. *Scolytocis danielssoni* **sp. nov. 28.** Dorsal view. **29.** Lateral view. **30.** Ventral view.

FIGURES 31–33. *Scolytocis difficillimus* **sp. nov**, holotype. **31.** Dorsal view. **32.** Lateral view. **33.** Ventral view.

FIGURES 34–36. *Scolytocis howdeni* **sp. nov. 34.** Dorsal view. **35.** Lateral view. **36.** Ventral view.

FIGURES 37–39. *Scolytocis indecisus* **sp. nov. 37.** Dorsal view. **38.** Lateral view. **39.** Ventral view.

FIGURES 40–42. *Scolytocis kiskeyensis* **sp. nov**, holotype. **40.** Dorsal view. **41.** Lateral view. **42.** Ventral view.

FIGURES 43–45. *Scolytocis lawrencei* **sp. nov**, holotype. **43.** Dorsal view. **44.** Lateral view. **45.** Ventral view.

FIGURES 46–48. *Scolytocis panamensis* **sp. nov. 46.** Dorsal view. **47.** Lateral view. **48.** Ventral view.

FIGURES 49–51. Hind wings of Northern Neotropical *Scolytocis* Blair. **49.** *Scol. bouchardi* **sp. nov. 50.** *Scol. cariborum* **sp. nov. 51.** *Scol. danielssoni* **sp. nov.**

FIGURES 52–54. Hind wings of Northern Neotropical *Scolytocis* Blair. **52.** *Scol. difficillimus* **sp. nov. 53.** *Scol. howdeni* **sp. nov. 54.** *Scol. indecisus* **sp. nov.**

FIGURES 55–57. Hind wings of Northern Neotropical *Scolytocis* Blair. **55.** *Scol. kiskeyensis* **sp. nov. 56.** *Scol. lawrencei* **sp. nov. 57.** *Scol. panamensis* **sp. nov.**

FIGURES 58–60. Antennae of the Northern Neotropical *Scolytocis* Blair. **58.** *Scol. bouchardi* **sp. nov.** (A), *Scol. cariborum* **sp. nov.** (B), *Scol. danielssoni* **sp. nov.** (C). **59.** *Scol. difficillimus* **sp. nov.** (A), *Scol. howdeni* **sp. nov.** (B), *Scol. indecisus* **sp. nov.** (C). **60.** *Scol. kiskeyensis* **sp. nov.** (A), *Scol. lawrencei* **sp. nov.** (B), *Scol. panamensis* **sp. nov.** (C).

FIGURES 61–63. Metatibiae of the Northern Neotropical *Scolytocis* Blair. **61.** *Scol. bouchardi* **sp. nov.** (A), *Scol. cariborum* **sp. nov.** (B), *Scol. danielssoni* **sp. nov.** (C). **62.** *Scol. difficillimus* **sp. nov.** (A), *Scol. howdeni* **sp. nov.** (B), *Scol. indecisus* **sp. nov.** (C).

63. *Scol. kiskeyensis* **sp. nov.** (A), *Scol. lawrencei* **sp. nov.** (B), *Scol. panamensis* **sp. nov.** (C).

FIGURES 64–66. Male genitalia of *Scolytocis* Blair. **64.** *Scol. bouchardi* **sp. nov.** 65. *Scol. cariborum* **sp. nov. 66.** *Scol. difficillimus* **sp. nov.**

FIGURES 67–68. Male genitalia of *Scolytocis* Blair. **67.** *Scol. howdeni* **sp. nov. 68.** *Scol. indecisus* **sp. nov.**

FIGURES 69–71. Male genitalia of *Scolytocis kiskeyensis* **sp. nov. 69.** Tegmen and median lobe. Specimen from the Dominican Republic. **70.** Tegmen and median lobe. Specimen from Puerto Rico. **71.** Ninth segment (pregenital segment). Specimen from Puerto Rico.

FIGURES 72–74. Male genitalia of *Scolytocis* Blair. **72.** *Scol. lawrencei* **sp. nov.** Specimen from Costa Rica. **73.** *Scol. lawrencei* **sp. nov.** Specimen from Panama. **74.** *Scol. panamensis* **sp. nov.**

FIGURE 75. Distribution map of the continental Northern Neotropical species of *Scolytocis* Blair, showing the known distributions of *Scol. bouchardi* **sp. nov.** (stars), *Scol. danielssoni* **sp. nov.** (plus symbols), *Scol. difficillimus* **sp. nov.** (square), *Scol. howdeni* **sp. nov.** (lozenge), *Scol. indecisus* **sp. nov.** (fulfilled circles), *Scol. lawrencei* **sp. nov.** (triangles), *Scol. panamensis* **sp. nov.** (open circle).

FIGURE 76. Distribution map of the insular Northern Neotropical species of *Scolytocis* Blair, showing the known distributions of *Scol. cariborum* **sp. nov.** (plus symbol) and *Scolytocis kiskeyensis* **sp. nov.** (stars).

FIGURES 77–79. *Scolytocis fritzplaumanni* **sp. nov**, holotype. **77.** Dorsal view. **78.** Lateral view. **79.** Ventral view.

FIGURES 80–82. *Scolytocis furieriae* **sp. nov**, holotype. **80.** Dorsal view. **81.** Lateral view. **82.** Ventral view.

FIGURES 83–85. *Scolytocis paschoali* **sp. nov**, holotype. **83.** Dorsal view. **84.** Lateral view. **85.** Ventral view.

FIGURES 86–88. Hind wings of the Southern Neotropical *Scolytocis* Blair. **86.** *Scol. fritzplaumanni* **sp. nov. 87.** *Scol. furieriae* **sp. nov. 88.** *Scol. paschoali* **sp. nov.**

FIGURES 89–90. Southern Neotropical *Scolytocis* Blair. **89.** Antennae of *Scol. fritzplaumanni* **sp. nov.** (**A**), *Scol. furieriae* **sp. nov.** (**B**) and *Scol. paschoali* **sp. nov.** (**C**). **90.** Metatibiae of *Scol. fritzplaumanni* **sp. nov.** (**A**), *Scol. furieriae* **sp. nov.** (**B**) and *Scol. paschoali* **sp. nov.** (**C**).

FIGURES 91–92. Male genitalia of *Scolytocis fritzplaumanni* **sp. nov.**, from Brazil. **91.** Specimen from the type locality (Nova Teutônia, Santa Catarina). **92.** Specimen from Guaratuba, Rio Grande do Sul.

FIGURES 93–95. Male genitalia of *Scolytocis* Blair from Brazil. **93.** *Scol. furieriae* sp. nov. from the type locality (Jussari, Bahia). **94.** *Scol. paschoali* **sp. nov.**, dorsal-ventral view. **95.** *Scol. paschoali* **sp. nov.**, lateral view.

FIGURE 96. Distribution map, Southern Neotropical Region (part). *Scolytocis fritzplaumanni* **sp. nov.** (circles), *Scol. furieriae* **sp. nov.** (triangles), *Scol. paschoali* **sp. nov.** (squares).

FIGURES 97–99. *Scolytocis malaysianus* **sp. nov**, holotype. **97.** Dorsal view. **98.** Lateral view. **99.** Ventral view.

FIGURES 100–102. *Scolytocis neozelandensis* **sp. nov**, holotype. **100.** Dorsal view. **101.** Lateral view. **102.** Ventral view.

FIGURES 103–105. *Scolytocis zimmermani* **sp. nov**, holotype. **103.** Dorsal view. **104.** Lateral view. **105.** Ventral view.

FIGURES 106–108. Hind wings of the new Indo-Malayan, Australasian and Oceanic *Scolytocis* Blair. **106.** *Scol. malaysianus* **sp. nov. 107.** *Scol. neozelandensis* **sp. nov. 108.** *Scol. zimmermani* **sp. nov.**

FIGURES 109–111. Indo-Malayan, Australasian and Oceanic *Scolytocis* Blair. **109.** Antennae of *Scol. malaysianus* **sp. nov.** (**A**), *Scol. neozelandensis* **sp. nov.** (**B**) and *Scol.*

zimmermani **sp. nov.** (**C**). **110.** Metatibiae of *Scol. malaysianus* **sp. nov.** (**A**), *Scol. neozelandensis* **sp. nov.** (**B**) and *Scol. zimmermani* **sp. nov.** (**C**). 111. Male genitalia of *Scol. malaysianus* **sp. nov.**

FIGURE 112. Distributinal map of the Indo-Malayan, Australasian and Oceanic *Scolytocis* Blair, showing the distribution of *Scol. malaysianus* **sp. nov.** (circles), *Scol. neozelandensis* **sp. nov.** (triangles), *Scol. samoensis* Blair (plus symbol) and *Scol. zimmermani* **sp. nov.** (square).

FIGURES 113–115. *Syncosmetus japonicus* Sharp. **113.** Dorsal view. **114.** Lateral view. **115.** Ventral view.

FIGURES 116–118. *Syncosmetus reticulatus* Miyatake. **116.** Dorsal view. **117.** Lateral view. **118.** Ventral view.

FIGURES 119–121. *Syncosmetus* Sharp. **119.** Antennae of *Sync. japonicus* Sharp (**A**) and *Sync. reticulatus* Miyatake (**B**). **120.** Metatibiae of *Sync. japonicus* Sharp (**A**) and *Sync. reticulatus* Miyatake (**B**). **121.** Male genitalia of *Sync. japonicus* Sharp.

FIGURE 122. Distribution map of *Syncosmetus* Sharp Japan, showing the known distributions of *Sync. japonicus* Sharp (triangles) and *Sync. reticulatus* Miyatake (hexagon).

FIGURES 123–125. *Tropicis cuccodoroi* **sp. nov.**, holotype. **123.** Dorsal view. **124.** Lateral view. **125.** Ventral view.

FIGURES 126–128. *Tropicis sexcarinatus* (Waterhouse). **126.** Dorsal view. **127.** Lateral view. **128.** Ventral view.

FIGURES 129–130. Hind wings of two species of *Tropicis* Scott. **129.** *Trop. cuccodoroi* **sp. nov.** **130.** *Trop. sexcarinatus* (Waterhouse).

FIGURES 131–134. *Tropicis* Scott. **131.** Antennae of *Trop. cuccodoroi* **sp. nov.** (**A**) and *Trop. sexcarinatus* (**B**). **132.** Metatibiae of *Trop. cuccodoroi* **sp. nov.** (**A**) and *Trop. sexcarinatus* (**B**). **133.** Male genitalia of *Trop. cuccodoroi* **sp. nov.** showing the ninth segment, tegmen and median lobe. **134.** Male genitalia of *Trop. sexcarinatus* (Waterhouse) showing the tegmen and median lobe (**A**) and the ninth segment (**B**).

FIGURE 135. Distribution map of *Tropicis* Scott in the Western Indian Ocean, , showing the known distributions of *Tropicis brevicarinatus* Scott (double circles), *Trop. cuccodoroi* **sp. nov.** (open stars), *Trop. flexicarinatus* Scott ("X" symbols), *Trop. sexcarinatus* (Waterhouse) (plus symbol).

FIGURE 136. Distribution map of Xylographellini, showing the known distributions of the subtribes Xylographellina Kawanabe & Miyatake (stars) and Syncosmetina **subtrib. nov.** (triangles).

ARTIGO V: The subfamily Orophiinae *sensu novo* (Coleoptera: Tenebrionoidea: Ciidae)

Cristiano Lopes-Andrade, 2007
Artigo apresentado no formato de submissão para a Zootaxa

Este manuscrito não deve ser considerado como publicação válida para fins de nomenclatura zoológica, em acordo com as normas do Código Internacional de Nomenclatura Zoológica de 1999 (Capítulo 3, Artigos 8.2 e 8.3)

The subfamily Orophiinae *sensu novo* (Coleoptera: Tenebrionoidea: Ciidae)

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Abstract

The subfamily Orophiinae (Coleoptera: Tenebrionoidea: Ciidae) is redefined on the basis of morphology of female genitalia and external morphological features. Several genera formerly placed in Ciinae are transferred to Orophiinae sensu novo into two new tribes: Atlantociini **trib. nov.**, for the sole genus *Atlantocis* Israelson; and Ceraciini **trib. nov.**, for *Ceracis* Mellié, *Malacocis* Gorham, *Phellinocis* Lopes-Andrade & Lawrence, *Sulcacis* Dury, *Odontocis* Nakane & Nobuchi, and *Wagaicis* Lohse (although the last two genera are included with some doubt). The tribe Xylographellini is included in Orophiinae, and the new subtribe Xylographina **subtr. nov.** (Orophiini) is delimited to group the genera *Xylographus* Mellié and *Paratrichapus* Scott. A key to major Ciidae taxa is provided, together with discussion on major distribution patterns of Orophiinae and the future challenges on the Ciidae suprageneric classification.

Kew words: Female genitalia, Atlantociini **trib. nov.**, Ceraciini **trib. nov.**, Xylographina **subtrib. nov.**

Resumo

A subfamília Orophiinae (Coleoptera: Tenebrionoidea: Ciidae) é redefinida com base na morfologia de genitália de fêmeas e características morfológicas externas. Muitos gêneros anteriormente colocados em Ciinae são transferidos para Orophiinae sensu novo em duas novas tribos: Atlantociini **trib. nov.**, para o único gênero *Atlantocis* Israelson; e Ceraciini **trib. nov.**, para *Ceracis* Mellié, *Malacocis* Gorham, *Phellinocis* Lopes-Andrade & Lawrence, *Sulcacis* Dury, *Odontocis* Nakane & Nobuchi, e *Wagaicis* Lohse (apesar dos últimos dois gêneros serem incluídos com alguma dúvida). A tribo Xylographellini é incluída em Orophiinae, e a nova subtribo Xylographina **subtr. nov.** (Orophiini) é delimitada para agrupar os gêneros *Xylographus* Mellié e *Paratrichapus* Scott. Uma chave para os principais grupos de Ciidae é apresentada, juntamente com discussão sobre os principais padrões de distribuição de Orophiinae e desafios futuros sobre a classificação supragenérica de Ciidae.

Palavras-chave: Genitália de fêmea, Atlantociini **trib. nov.**, Ceraciini **trib. nov.**, Xylographina **subtrib. nov.**

Introduction

The Ciidae is a cosmopolitan family of mycetobiont beetles containing almost 600 named species in about 40 genera, with hundreds of species and some genera known in collections but still undescribed. The suprageneric classification of the family has been controversial. Besides the delimitation of Sphindociinae (Lawrence 1974) and Xylographellini (Kawanabe & Miyatake 1996; Lopes-Andrade 2007c-*manuscript*), the subfamilies and tribes proposed until now were mostly artificial, since they were not defined by any exclusive combination of characters. The diagnostic characters cited for such groups are usually variable even within a genus (*e.g.* number of antennomeres) or are characters more prone to be homoplasic. Indeed, some authors have even defined suprageneric groups without citing any diagnostic character.

In the unique world revision of the family, Mellié (1849) has not adopted any higher classification for Ciidae. Dalla Torre (1911) considered the subfamilies Hendecatominae (sic!) (for *Endecatomus* Mellié), Orophiinae (for *Octotemnus* Mellié, *Trichapus* Friedenreich and *Pterogenius* Candèze) and Cisinae (for the remaining genera). This position was maintained by subsequent authors, with the difference that some referred to “Orophiinae” as “Octotemninae” (*e.g.* Winkler 1927; Portevin 1931). Some authors even tried to implement subdivisions. That was the case of Portevin (1931), who divided “Cisinae” in “Cisini” and “Rhopalodontini”. Lesne (1935) formally transferred *Endecatomus* to Bostrichidae, and Crowson (1955) transferred *Pterogenius* to a new family (Pterogeniidae). After the exclusion of *Endecatomus* from Ciidae, some authors continued to adopt the traditional division into Ciinae and Orophiinae, however there was no homogeneity even in the spelling of the name applied to both taxa. The first problem was the name of the family, differentially spelled “Ciidae”, “Cisidae” or “Cioidae” by authors. I consider the name Ciidae as the correct, following Lawrence (1971). The second problem is that several authors (*e.g.* Chûjô 1939, 1966; Miyatake 1959) adopted the name “Octotemninae” for the group containing *Octotemnus*. However, the first formal name for the taxa was “Orophiina” of Thomson (1863), based in the genus *Orophius* Redtenbacher. *Orophius* was already taken as a subgenus of *Octotemnnus*, but it is currently a junior synonym (Kawanabe 2002). Thus, according to the International Code of Zoological Nomenclature (International Commission on Zoological Nomenclature 1999), the name Orophiinae is to be maintained. Another suprageneric taxon adopted by some japanese authors (Chûjô 1939, 1966; Miyatake 1959) was Ennearthroninae, for the sole genus *Ennearthron* Mellié, but the use of this name was discontinued in the literature.

Most of these divisions were based in number of antennomeres or even their length. In such cases, the diagnosis of higher taxa varied greatly between authors, and will not be discussed here. However, it is important to emphasize that number or length of antennomeres alone is not a good character for grouping Ciidae genera, as it may be variable even within a species (*e.g. Phellinocis romualdoi* Lopes-Andrade & Lawrence, which has 8 or 9 antennomeres).

In the absence of a good suprageneric classification, some authors abandoned any division (*e.g.* Abdullah 1973). Others continued to use the traditional division in Ciinae and Orophiinae, but justified by a combination of characters (*e.g.* Lawrence 1971). This scenario remained somewhat stable, except by the proposition of the new subfamily Sphindociinae by Lawrence (1974a, b) for the monospecific genus *Sphindocis* Fall. As a matter of hierarchy, the earlier subfamilies Ciinae and Orophiinae gained status of tribes (Ciini and Orophiini) inside Ciinae (Lawrence 1982). Afterwards, Kawanabe & Miyatake (1996) erected the tribe Xylographellini for the genus *Xylographella* Miyatake and included it in the subfamily Ciinae.

Currently, Ciidae comprises two subfamilies, Sphindociinae and Ciinae (Lawrence 1974a, b; Lawrence *et al.* 1999; Thayer & Lawrence 2002). The former contains only *Sphindocis denticollis* Fall, which is restricted to coastal northern and central California. Ciinae currently comprises the tribes Ciini, Orophiini and Xylographellini. The tribal division of Ciinae is being avoided by some authors

(Lawrence *et al.* 1999; Thayer & Lawrence 2002) or rearranged in light of new morphological data (Lopes-Andrade 2007a, b, c-*manuscript*). Recently, the tribe Xylographellini was redefined (Lopes-Andrade 2007c-*manuscript*) to encompass genera formerly in Ciini or Orophiini. The tribe Ciini has been used in a *stritco sensu* (Lopes-Andrade 2007a, b), since it is known that some of its genera are closely related to Orophiini.

The aim of this work is to provide some necessary changes to the suprageneric classification of Ciidae based mainly (but not only) in the morphology of female genitalia. Emphasis is given to the subfamily Orophiinae sensu novo, for which there are more consistent morphological evidence for delimiting new taxa. Two new tribes of Orophiinae are proposed, Atlantociini **trib. nov.** and Ceraciini **trib. nov.** Xylographina **subtr. nov.** is proposed to group *Xylographus* Mellié and *Paratrichapus* Scott within Orophiini. An identification key to the major Ciidae taxa is provided.

Material and Methods

Specimens examined

I examined and compared around 200 described species belonging to 31 described genera of Ciidae (Table 1). Other 30 undescribed species are listed under Table 1, because they were very important for the conclusions taken here. However, at least other 300 hundred undescribed or undetermined species, from all the biogeographic regions, were available for comparison. Three new Neotropical genera were examined, and they will be adequately described in forthcoming works. I dissected at least one species of each of the available genera, and in most cases males and females were available. For the most speciose genera, or genera with the highest number of available species, I dissected species until I concluded that the morphology of genitalia did not have any drastic intrageneric variation. Note that it is a conclusion limited by the species I had in hands, and further works may refute it. I requested all the currently described Ciidae genera (with the exception of *Trichapus* Friedenreich, of which the types are lost; Lawrence 1987) for museums and private collectors. Exceptions are the cases in which only type material was available. In such cases, I preferred not to take the risk of receiving primary types by mail, and did not request them. In other cases, loan requests were not approved, and so I tried to evaluate the status of these genera from data available on literature (see Tables 2 and 3). However, I could not place some of these genera based only on literature data. Such genera are considered here as *incertae sedis*.

I compared the gross morphology of the Ciidae genitalia to the ones of the families Archeocrypticidae, Mycetophagidae, Prostomidae and Pterogeniidae (Table 1). These families are supposed to be closely related to Ciidae (Lawrence 1999).

Genera not examined

Eleven Ciidae genera were not examined for this work (with number of described species inside parentheses): *Anoplocis* Kawanabe (2); *Dichodontocis* Kawanabe (1); *Hyalocis* Kawanabe (1); *Lipopterocis* Miyatake (1); *Nipponapterocis* Miyatake (3); *Odontocis* Nakane & Nobuchi (1); *Paraxestocis* Miyatake (1); *Trichapus* Friedenreich (2); *Cisarthron* Reitter (1); *Paratrichapus* Scott (1); and *Polynesicis* Zimmerman (1). The former seven genera occur in Japan, *Trichapus* is from Southern Brazil, *Cisarthron* is palearctic, *Paratrichapus* occurs in the Seychelles (Indian Ocean) and *Polynesicis* is restricted to the Austral Islands (French Polynesia). All these genera together represents around 2.5% of the described species of Ciidae, and some of them shall be synonymized or may include described species currently placed in other genera. *Anoplocis* may probably include palearctic species currently placed in *Ennearthron*, and there is little doubt that it is close related to *Orthocis* (as proposed by Kawanabe 1996). *Nipponapterocis* Miyatake may belong to Syncosmetina (Xylographellini) due to compact antennal club and other external morphological features (see Lopes-Andrade 2007c-*manuscript* for a more complete discussion), a combination of characters resembling *Syncosmetus* Miyatake. *Wagaicis* may be a synonym of *Odontocis* (J.F. Lawrence pers. comm.) and *Paratrichapus* a synonym of *Xylographus* (Lopes-Andrade 2007b). *Trichapus* is a problematic genus, as the types of both described species are lost (Lawrence 1987; Lopes-Andrade 2007a).

External morphology

I examined the specimens and studied their external morphology mainly under a Leica MZ16 or a MBS-9 stereomicroscope. I also consulted literature and used the available drawings and photographs to evaluate the presence or absence of major external morphological features. An archive of nearly 600 SEM photographs of around 80 Ciidae species, all made by me or colleagues from 2001 up to 2005, was also used to compare details of the smallest structures, such as mouthparts and sensillifers of the antennal club. Due to the amount of acquired data, I will not provide it here in details. All these results have been published separately in recent works (Lopes-Andrade & Lawrence 2005; Lopes-Andrade 2007a, b) or will be provided in forthcoming articles (Lopes-Andrade 2007c-*manuscript*).

Dissection and examination of genitalia

Direct observations of Ciidae genitalia under stereomicroscope are uninformative due to their small size. Slide preparations are necessary, but some traditional mounting media (*e.g.*, preparations in Canadian Balsam) are not advisable, as the very fragile structures of Ciidae genitalia may be damaged during the mounting process. Moreover, mounting in such media may take much time and not necessarily give the best results. I chose a harmless mounting media, called polyvinyl lacto-phenol or just "Downs Medium". I briefly described it in Lopes-Andrade *et al.* (2003), but detailed information on its preparation and use are provided by Downs (1943) and Salmon (1947). Such slide preparations are stable, and I have not observed the beginning of crystallisation or any kind of deterioration process up to now, even in slides almost 10 years old. However, deterioration of such mounting media was already observed in older slide preparations (Brown 1997). I took some cares to maximize the preservation of such slide preparations: I stocked Downs's Gel in dark vessels, for no more than five years; clean slides and cover slips before mounting specimens, with water and detergent, then alcohol 95% and finally absolute alcohol; carefully wash specimens in water after treatment with KOH, to avoid undesirable chemical reactions with the mounting medium; invert the slide and put it over the cover slip, to avoid formation of air bubbles; keep slide preparations in closed boxes, avoiding unnecessary exposure to light. Some female genitalia were extremely membranous and colourless, and so they were stained with Chlorazol Black E (=Direct Black 38, C.I. 30235) to obtain better contrast.

I examined slide preparations under an Olympus (BX41 or BX61) or a Leica DM 2500 compound microscope, and made digital photographs with a Canon S70 or a CCD camera. Some images were the result of joining 3 to 6 photographs in different focus using the software CombineZM (Hadley 2006). I arranged and standardized images using Corel Photo Paint and Corel Draw X3 software.

Interpretation of the morphology of genitalia

The genitalia of Ciidae may vary even between closely related species, especially male genitalia. However, most of the taxonomic works do not give sufficient emphasis to it. Usually, just brief descriptions are provided, and they are not enoughly informative for comparative purposes. In some works, drawings are provided (*e.g.* Lawrence 1971; Kawanabe 2002). I tried to use drawing techniques for male genitalia (see Lopes-Andrade *et al.* 2002), but it has proved to be time consuming when dealing with hundreds of species. Therefore, I decided to photograph slide preparations and provide more realistic representations of genitalia. I also used photography in the first descriptions of female genitalia (Lopes-Andrade 2007a, b), and I maintain its use here because photographs: (i) show most of what is seen while observing a slide preparation; (ii) are easy to obtain, mostly after the advance of digital photography; (iii) provide more details than drawings; (iv) can be reinterpreted by other authors, which is very important in case of comparative studies.

Comparisons of genitalia and hypotheses of homology provided here should be considered with much care. The interpretation of “absence” and “presence” of structures depends on: (i) degree of sclerotization; (ii) degree of miniaturization; (iii) preservation during dissection and slide preparation; (iv) physical limitations of optical equipments; and (v) my own limitations in interpreting homologies. For instance, very small or unsclerotized structures may be interpreted as “absent”, but other techniques may reveal their presence (*e.g.*, the bacula of paraproct in the female genitalia of *Phellinocis*).

Here, the term “absent” refers primarily to the evolutive loss of a structure, but may also indicate that I could not observe a structure under the available conditions. The term “present” indicates that I clearly observed a structure. However, it is difficult in some cases to tell apart the artifacts of preparation or observation and the true presence or absence of structures. For instance, it is difficult to distinguish effect of light reflection through lateral membranes and true presence of the bacula of proctiger in reduced female genitalia.

I tried to circumvent these problems by carefully comparing genitalia and determine: (i) structures less modified (in comparison to other tenebrionoid families); (ii) position of less modified structures; (iii) absence or presence of modified structures in relation to the determined less-modified condition. Some comparative plates are provided to best explain these interpretations, and descriptive plates are provided to show the consistency of such interpretations throughout the major taxa treated here. I am not providing photos of all examined genitalia (near 500 photos of 300 slide preparations), since they would extend this article without improvement of information.

Terminology

The nomenclature for the female genitalia varies considerably in the literature. Here, I keep using the nomenclature I adopted while describing the female genitalia of *Neoapterocis* Lopes-Andrade and *Falsocis* Pic (Lopes-Andrade 2007a, b). The terms “paraproct” (=ninth hemitergite or ninth laterotergite) and “proctiger” (=tenth tergite) follows Tanner (1927), but the terms “gonocoxite” and “gonostylus” are used in place of “coxite” and “stylus”. The terms “proximal” and “distal gonocoxites” follows Burmeister (1980). The term “baculum” (plural “bacula”) is used for the longitudinal supporting struts of proctiger, for the strut of each paraproct and also for the transverse to oblique strut of each proximal gonocoxite. Abbreviations for female genitalia and pregenital segments are as follows:

Pregenital segments of female

viii-st—Eighth Sternite
sv—Spiculum Ventrale
st—Spermatheca

Ventral side of ovipositor

v—Vagina or vulva
b.v—Baculum of vagina (=ninth sternite)
gs—Gonostylus (=stylus)
gc—Gonocoxite (=coxite)
p.gc—Proximal gonocoxite(s)
d.gc—Distal gonocoxite(s)
b.gc—Baculum of proximal gonocoxite
pp—Paraproct
b.pp—Baculum of paraproct

Dorsal side of ovipositor

pt—Proctiger
b.pt—Baculum of proctiger

Delimitation of suprageneric taxa

The morphology of female genitalia was the strongest (but not the unique) decisory character I use here for grouping major taxa. I use morphology of male genitalia and general external morphology of adults to best delimit tribes and subtribes. Lawrence (1974a, b) and Lopes-Andrade (2007c-*manuscript*) provided most complete characterisations of Sphindociinae and Xylographellini (and its included taxa), respectively. For both taxa, I provide additions concerning the morphology of the female genitalia and the most evident diagnostic characters. The external morphology of immature Ciidae is not sufficiently known to permit a comparison between the major groups. Therefore, I will not discuss it here.

I found or confirmed incongruities in the limits of several genera (*e.g. Ennearthron* Mellié), and synonymies and new genera will surely arise in the future. However, my aim is to provide a broad comparison of the major groups of Ciidae and propose changes to the suprageneric classification. I do not intend to make changes to the generic classification here.

Results

The Bauplan *of the female genitalia of Ciidae*

The female genitalia of *Sphindocis* and some Ciini (*sensu stricto*; see Lopes-Andrade 2007a, b) genera is of the same type as in some other tenebrionoid families: the gonostyli are usually present (absent in *Sphindocis* and *Porculus*); gonocoxites are transversely divided in three or four parts; each proximal gonocoxite bears an obliquely transverse baculum; the bacula of paraproct and proctiger are straight; and paraprocts are usually longer than the gonocoxites together. The unique conspicuous difference is that the spermatheca is not sclerotized in Ciidae, but it is usually sclerotized in some other basal families of tenebrionoids (Fig. 1, for an example). This morphology can be considered the *bauplan* of the female genitalia in Ciidae, and I observed in *Apterocis* Perkins (Fig. 3), *Cis* Latreille (Fig. 2), *Diphyllocis* Reitter, *Dolichocis* Dury, *Ennearthron* Mellié, *Euxestocis* Miyatake, *Falsocis* Pic (Fig. 7), *Hadreule* Thomson, *Neoapterocis* Lopes-Andrade (Lopes-Andrade 2007a), *Neoennearthron* Miyatake, *Nipponocis* Nobuchi & Wada, *Orthocis* Casey, *Porculus* Lawrence (Figs 2–3) and *Strigocis* Dury. Differences between these genera concern the length of the *spiculum ventrale*, the relative lengths of paraprocts and gonocoxites, and the presence of gonostyli (absent in *Sphindocis* (Fig. 1) and *Porculus* (Figs 2–3)). *Porculus* (Figs 2–3) has the whole ovipositor extremely sclerotized, but most of the structure of its female genitalia is the same as observed at the abovementioned genera. The female genitalia showing this basic morphology is conspicuous, easily observable during dissection, slightly longer or much longer than the male genitalia (usually around 0.4mm to 1.0mm long).

However, other genera have a simplified and reduced female genitalia: the gonostyli are usually absent or reduced; gonocoxites are transversely divided in no more than two parts (the proximal and distal gonocoxites); the bacula of paraproct and proctiger are curved (usually fused and difficult to tell apart); and paraprocts are usually as long as or smaller than the gonocoxites together. I called it “simplified” due to the loss and/or fusion of structures, and “reduced” because it is much smaller (usually 0.2mm to 0.25mm) than in the basic type of female genitalia in Ciidae. The reduced type of female genitalia is found in *Atlantocis* Israelson (Fig. 5), *Ceracis* Mellié (Fig. 5–6), *Malacocis* Gorham, *Octotemnus* Mellié, *Phellinocis* Lopes-Andrade & Lawrence, *Ropalodontus* Mellié, *Scolytocis* Blair (Fig. 4), *Sulcacis* Dury (Fig. 4), *Syncosmetus* Sharp, *Tropicis* Scott, *Xylographella* Miyatake and *Xylographus* Mellié. Part of these genera (*Atlantocis*, *Ceracis*, *Malacocis*, *Phellinocis* and *Sulcacis*) is currently in Ciini *sensu lato*. The other genera belong to Orophiini or Xylographellini (*sensu* Lopes-Andrade 2007c-*manuscript*; also for figures of female genitalia). The features of such modified (reduced and simplified) female genitalia are here being assumed as exclusive to the Orophiinae (see below).

The male genitalia

There is no new important data on the morphology of male genitalia, and so it will not be extensively discussed here. Among the dissected species (see Table 1), I observed a tendency in the simplification of male genitalia in the Orophiinae genera, and a tendency of elongation in some of its groups (mainly in Xylographellini *sensu* Lopes-Andrade 2007c-*manuscript*). I provide detailes on the morphology of male genitalia of Xylographellini in Lopes-Andrade (2007c-*manuscript*). The male genitalia of *Atlantocis* is exactly as described by Israelson (1985). The Y-shaped ninth-segment (pregenital segment) is unique to Xylographellini (*sensu* Lopes-Andrade *op. cit.*), and the other genera have Y or U-shaped ninth-segment (including *Sphindocis*). A sclerotized “basal piece” with a true basal position in relation to the tegmen is exclusive to *Sphindocis*. In the other Ciinae and Orophiinae, the basal piece is partially or completely positioned ventrally to the tegmen.

Suprageneric Classification of Ciidae Revisited

After comparing the morphology of the female of Ciidae and some “outgroups” (few species of few tenebrionoid families) (see Table 1), I am making the following changes to the suprageneric classification of Ciidae:

1. The tribes Orophiini and Xylographellini are excluded from Ciinae;
2. The tribe Orophiini (as used by Lawrence 1982) regains the status of subfamily, but in a new sense;
3. Some genera are exluded from Ciini and transferred to Orophiinae;
4. Atlantociini **trib. nov.** is erected for the sole apterous genus *Atlantocis* Israelson;
5. Ceraciini **trib. nov.** is erected for genera excluded from Ciini, and now transferred to Orophiinae due to shared morphological features of female genitalia;

6. The tribe Orophiini is divided into the subtribes Orophiina Thomson and Xylographina **subtrib. nov.**

A key to the suprageneric taxa of Ciidae is provided below. Afterwards, the new classification is detailed and justified, with diagnoses and comments for each suprageneric taxon. Tables 2 and 3 summarise this new classification.

Key to the suprageneric taxa of Ciidae Leach in Samouelle

1 Antennal funicle with six antennomeres; antennomeres of the club devoid of sensillifers. First two abdominal ventrites connate. Aedeagus with basal piece conspicuous and in a true basal position in relation to the tegmen...**Sphindociinae Lawrence**

- Antennal funicle with three to five antennomeres; each antennomere of the club bearing **at least** four distinct sensillifers. Fist two abdominal ventrites free. Aedeagus with basal piece usually incospicuous, positioned partially or completely below the tegmen...**2**

2 Each tibia without spines; if present, spines restricted to the apex of tibia, not reaching either the outer apical angle or the outer edge, **and** sensillifers of the antennal club **not** sunk. Female genitalia with gonostyli present (Fig. 2A); if absent, then female genitalia extremelly sclerotized (Fig. 2B); gonocoxites transversally divided in **at least** three distinct parts (Figs 1B, 2, 7A,C); baculi of paraproct and proctiger straight, their apices being distinctly separated...**Ciinae Leach in Samouelle (suprageneric classification not proposed here)**

- Each tibia (**at least** the meso and metatibiae) bearing spines **at least** at the outer apical angle (spines extending throughout the outer edge in some species or groups); if spines restricted to the tibial apex, then antennal sensillifers sunk. Female genitalia with gonostyli very reduced (indistinct) or absent; gonocoxites transversally divided in no more than two parts (Figs 4–6); at each side, the baculum of paraproct and proctiger are contiguous apically, somewhat fused or with indistinct separation, and broadly curved...**3 (Orophiinae Thomson, *sensu novo*)**

3 Spines of the meso and metatibiae restricted to the outer apical angle...**4**

- Spines of meso and metatibiae conspicuous and distributed at least through the apical two-thirds of the outer edge; if spines inconspicuous or restricted to the apices of tibiae, then antennal club compact and prementum with longitudinal sulcus at midline **or** antennal sensillifers sunk...**5**

4 Scutellum very reduced, less than 0.10X the greatest elytral width. Hind wings absent (apterous, micropterous). Female genitalia with each apical gonocoxite conspicuously separated (Fig. 5A); gonostyli always absent. Male genitalia with median lobe near half the length (or less) of tegmen...**Atlantociini trib. nov.**

- Scutellum visible, more than 0.10X the greatest elytral width. Hind wings always present (macropterous). Female genitalia with apical gonocoxites close to each other (Figs 4, 5B); gonostyli present (but small) or absent. Male genitalia with median lobe always more than 0.5X as long as tegmen, usually as long as tegmen or longer...**Ceraciini trib. nov.**

5 Antennal club loose, with each antennomere bearing exactly four sensillifers. Labial palpi inserted at the apex of prementum. Male genitalia with the ninth-segment U or V-shaped, never Y-shaped...**6 (Orophiini Thomson)**

- Antennal club compact, with each antennomere bearing five or more sensillifers (sometimes indistinc and/or coalescent). Labial palpi inserted near the middle of prementum. Male genitalia with the ninth-segment always Y-shaped...**7 (Xylographellini Kawanabe & Miyatake)**

6 Antennal sensillifers formed by a group of well-organized but distinctly superficial sensillae...**Orophiina Thomson**

- Antennal sensillifers sunk, with sensillae organized in at least two concentric rows...**Xylographina subtrib. nov.**

7 Prosternal process laminate. Procoxae subconical, extending below the plane of the prosternal process...**Xylographellina Kawanabe & Miyatake**

- Prosternal process broad. Procoxae subcylindrical and at the same level of the prosternal process…**Syncosmetina Lopes-Andrade**

Ciidae Leach in Samouelle, 1819

Sphindociinae Lawrence, 1974

Type genus

Sphindocis denticollis Fall, 1917

Comments

This subfamily is maintained as it stands, and is described and justified by Lawrence (1974b).

Ciinae Leach in Samouelle, 1819 *(sensu novo)*

Type genus

Cis Latreille, 1796

Extant genera

Acanthocis Miyatake, 1954
Anoplocis Kawanabe, 1996
Apterocis Perkins, 1900
Cis Latreille, 1796
Dimerapterocis Scott, 1926
Diphyllocis Reitter, 1885
Dolichocis Dury, 1919
Ennearthron Mellié, 1847
Euxestocis Miyatake, 1954
Falsocis Pic, 1916
Hadreule Thomson, 1863
Neoapterocis Lopes-Andrade, 2007
Neoennearthron Miyatake, 1954
Nipponapterocis Miyatake, 1954
Nipponocis Nobuchi & Wada, 1955
Orthocis Casey, 1898
Plesiocis Casey, 1898
Porculus Lawrence, 1987
Strigocis Dury, 1917

Doubtfully retained genera (genera not examined)

Cisarthron Reitter, 1885
Lipopterocis Miyatake, 1954
Polynesicis Zimmerman, 1926

Excluded genera

Atlantocis Israelson, 1985
Ceracis Mellié, 1849
Dichodontocis Kawanabe, 1994
Malacocis Gorham, 1886
Odontocis Nakane & Nobuchi, 1955
Paraxestocis Miyatake, 1954

Phellinocis Lopes-Andrade & Lawrence, 2005
Sulcacis Dury, 1917
Wagaicis Lohse, 1964

Diagnosis

This subfamily is now characterized by the combination of the following features: (i) each antennae with nine or ten antennomeres; (ii) antennal funicle with four or five antennomeres; (iii) antennal club loose, either with three distinct or two distinct and one small antennomere; (iv) each antennomere of the club bearing four sensillifers; (v) labial palpi always inserted near the apex of prementum; (vi) coxae usually cylindrical and not produced below the plane of the intercoxal process (except in *Acanthocis* and *Falsocis*); (vi) intercoxal process of prosternum usually broad (except in *Acanthocis*, *Falsocis* and *Porculus*); (vii) male genitalia with pregenital segment (ninth-segment) always U or V-shaped; (viii) median lobe slightly smaller to longer than tegmen; (ix) median lobe rarely elongate, usually not more than 4X as long as large; (x) female terminalia of the basic tenebrionoid type.

Comments

The limits of this subfamily are narrowed due to the exclusion of *Atlantocis* Israelson, *Ceracis* Mellié, *Dichodontocis* Kawanabe, *Malacocis* Gorham, *Odontocis* Nakane & Nobuchi, *Paraxestocis* Miyatake, *Phellinocis* Lopes-Andrade & Lawrence, *Sulcacis* Dury and *Wagaicis* Lohse. It’s still early to establish tribes or subtribes inside Ciinae *sensu novo*, a situation that will just be circumvented by a phylogenetic analysis or a more exhaustive comparative study of genitalia or other structures. *Falsocis* is maintained in Ciini due to shared characters of female genitalia, although it has some external morphological features resembling Orophiini (see Lopes-Andrade 2007b for a detailed explanation). The morphology of female genitalia of *Porculus*, together with some external morphological features, may be used to erect a new tribe to this sole genus. However, the focus of this work is on Orophiinae, and I will not erect any new suprageneric taxon of Ciinae here. I am regarding Orophiinae as being a monophyletic clade; but I cannot say the same about Ciinae.

Orophiinae Thomson, 1863 *(sensu novo)*

Type genus

Orophius Redtenbacher, junior synonym of *Octotemnus* Mellié

Included taxa

Orophiini (Orophiina Thomson plus Xylographina **subtr. nov.**), Xylographellini (Xylographellina + Syncosmetina, *sensu* Lopes-Andrade 2007c-*manuscript*), plus Atlantociini **trib. nov.** and Ceraciini **trib. nov.**

Diagnosis

This subfamily, in the new sense provided here, is defined by the combination of the following characters: (i) antennal funicle with three to five antennomeres; (ii) club compact (Xylographellini) or loose (remaining tribes); (iii) each antennomere of the club bearing at least 4 sensillifers (when more than four, some sensillifers may be coalescent and the club is always compact); (iv) labial palpi inserted near the middle (Xylographellini) or the apex (remaining tribes) of prementum; (v) prosternum concave to biconcave, always short; (vi) each meso and metatibiae bearing spines at least at the outer apical angle (Atlantociini **trib. nov.** and Ceraciini **trib. nov.**) or spines extending to the apical two-thirds (Orophiini and Xylographellini); (vii) male genitalia simple, with low intrageneric variability, subquadrate to distinctly elongate, usually without emarginations; (viii) female genitalia of the reduced and simplified type, being much smaller than the male genitalia and barely sclerotized

Comments

Thomson (1863) erected “Orophiina” mostly to encompass the genera *Ropalodontus* Mellié and the earlier *Orophius* Redtenbacher. Originally, he included only four species in the group: *Ropalodontus perforatus* Mellié, *Octotemnus glabriculus* (Gyllenhal) and *Octotemnus mandibularis* (Gyllenhal) (as the genus *Orophius* Redtenbacher, currently a junior synonym of *Octotemnus*), and *Cis lineatocribratus* Mellié (as an *Orophius*; sic). His concept of this suprageneric taxon already includes the configuration of procoxae (subconical), the distribution of spines at the outer edge of tibiae and the short prosternum. The concept provided here is extended to include genera with spines restricted to the outer apical angle of meso and metatibiae, and the taxon in its new sense is corroborated by data on the morphology of female genitalia. The reduced and simplified genitalia, with gonocoxites transversaly divided into two parts, are assumed as autapomorphies of the taxon.

Atlantociini *trib. nov.*

Type genus

Atlantocis Israelson, 1985

Included genus

Atlantocis Israelson, 1985

Diagnosis

This new tribe is recognisable by the combination of the following characters: (i) scutellum inconspicuous, less than 0.10X the greatest elytral width; (ii) hind wings absent; (iii) antennal club loose, and each antennomere bearing four sensillifers; (iv) labial palpi inserted at the apex of prementum; (v) prosternal process thin, but not lamillate; (vi) procoxae globular; (vi) spines restricted to the outer apical angle of tibiae; (vii) males usually with weak secondary sexual modifications on frontoclypeal region and anterior pronotal edge; (viii) female genitalia with the apices of the distal gonocoxites conspicuously separated; (ix) gonostyli always absent; (x) male genitalia with median lobe near half the length (or less) of tegmen, extremelly membranous and difficult to observe; (xi) ninth-segment of male genitalia U-shaped.

Comments

This tribe comprises only one genus (*Atlantocis*) with three described species, all occurring in the Macaronesian islands (Northern Atlantic Ocean, near Europe and Africa). I examined the three described species, and dissected two (Table 1). This new tribe may prove to be a subgroup of Ceraciini **trib. nov.**, but based on the available data I prefer to retain it as a separate tribe. Moreover, the internal relationship of the Ceraciini **trib. nov.** genera need further clarification, mainly concerning the relationship of the *Malacocis–Sulcacis* to the *Ceracis–Phellinocis* assemblages.

Atlantocis does not have close affinity with any continental Ciidae genera, and there is no close group occurring either in Europe or in northern Africa. It probably occurs at Cabo Verde _ the Macaronesian archipelago with the most unknown ciid fauna.

Ceraciini *trib. nov.*

Type genus

Ceracis Mellié

Included genera

Ceracis Mellié
Malacocis Gorham
Phellinocis Lopes-Andrade & Lawrence, 2005
Sulcacis Dury

Doubtfully included genera

Odontocis Nakane & Nobuchi
Wagaicis Lohse

Diagnosis

This new tribe is recognisable by the combination of the following characters: (i) hind wings ever present; (ii) antennal club always loose, and each antennomere bearing four sensillifers; (iii) labial palpi inserted at the apex of prementum; (iv) prosternal process laminate; (v) procoxae globular; (vi) tibiae, at least the meso and metatibiae, spinose apically; (vii) males usually with conspicuous secondary sexual modifications on frontoclypeal region and anterior pronotal edge; (viii) gonostyli of female genitalia, if present, very small and inconspicuous; (ix) ninth-segment of male genitalia V or U-shaped, never Y-shaped; (x) female genitalia with distal gonocoxites almost contiguous.

Comments

The genera included with doubt almost all belong to the japanese fauna (besides some undescribed forms from the Oriental and Australian Regions) and couldn't be examined, excepting the European genus *Wagaicis*. I have one available male of *Wagaicis*, and it does resemble a Ceraciini **trib. nov.** in many aspects. *Ceracis* is distributed and diversified mainly in the Neotropical and Nearctic Regions, with some australasian outliers. *Phellinocis* is Neotropical, and *Malacocis* is restricted to the northern neotropics, with one species occurring in the eastern United States. *Sulcacis* is holarctic.

Orophiini Thomson, 1863

Type genus

Orophius Redtenbacher, 1847, junior synonym of *Octotemnus* Mellié, 1847

Included taxa

Orophiina Thomson and Xylographina **subtr. nov.**

Diagnosis

This new tribe is recognisable by the combination of the following characters: (i) hind wings ever present; (ii) outer edge of each tibia bearing spines at least at the apical two-thirds; (iii) procoxae subconical, distinctly projecting below the plane of the prosternal process; (iv) prosternal process laminate; (v) antennal club always loose, and each antennomere bearing four sensillifers; (vi) labial palpi inserted near the apex of prementum; (vii) ninth-segment of male genitalia V or U-shaped, never Y-shaped; (viii) female genitalia with distal gonocoxites almost contiguous.

Comments

This taxa, originally erected for *Ropalodontus* and the earlier genus *Orophius* (= *Octotemnus*), remains without much change. Thomson (1863) already mentioned the conical procoxae, expanded protibiae with spinose outer edge, and the short prosternum, all retained here as diagnostic characters. This combination of characters also occurs in Xylographellini, but both tribes are easily separated by the distinct conformation of the antennal club, mouthparts and male genitalia.

Orophiina Thomson, 1863

Type genus

Orophius Redtenbacher, 1847, junior synonym of *Octotemnus* Mellié, 1847

Extant genera

Octotemnus Mellié, 1847

Ropalodontus Mellié, 1847

Doubtfully retained genus

Hyalocis Kawanabe, 1993

Excluded genera

Paratrichapus Scott, 1926
Xylographus Mellié, 1847

Diagnosis

This subtribe is recognisable by the combination of the following characters: (i) setose patch of first ventrite absent (barely visible? *Hyalocis*) or with a flap cover (*Ropalodontus* and *Octotemnus*); (ii) sensilla of the sensillifers of the antennal club not sunk;

Comments

The genera *Paratrichapus* and *Xylographus* are excluded, as they have morphological features not found in other Orophiini and deserve a new subtribe (see below). *Paraxestocis* is not included in this subtribe, although it has laminate prosternal process and spinose outer edge of tibiae. Its positioning is doubtfull since its habitus, from the drawing provided in the original description (Miyatake 1954), resembles that of *Odontocis* and *Wagaicis* (both included here in Ceraciini **trib. nov.**).

Xylographina ***subtrib. nov.***

Type genus

Xylographus Mellié, 1847

Included genus

Paratrichapus Scott, 1926
Xylographus Mellié, 1847

Diagnosis

This new subtribe is recognisable by the combination of the following characters: (i) sensillifers of the antennal club sunk; (ii) setose patch of first ventrite absent, barely visible or quite distinguishable, margined or not; never with a flap cover.

Comments

Paratrichapus may be a synonym of *Xylographus* (Lopes-Andrade 2007b). The unique difference of both is that the spines are restricted to the apex of each tibia in *Paratrichapus,* while in *Xylographus* they extend through at least the apical third. Indeed, some Neotropical *Xylographus*, which bear long and slender hair on the dorsum of pronotum and elytra, resemble very much *Paratrichapus sechellarum* Scott.

Xylographellini Kawanabe & Miyatake, 1996

Type genus

Xylographella Miyatake, 1985

Included taxa

Xylographellina Kawanabe & Miyatake (comprising *Xylographella* Miyatake and *Scolytocis* Blair)

Syncosmetina Lopes-Andrade (comprising *Syncosmetus* Sharp and *Tropicis* Scott)

Diagnosis and comments

Here, this tribe and its subtribes remain as defined by Lopes-Andrade (2007c, *in press*). The tribe is easily recognizable by the combination of the following characters: (i) antennal club large and compact; (ii) each antennomere of the club bearing more than five sensillifers; (iii) prementum subpentagonal, with labial palpi inserted near its middle; (iv) prementum with a longitudinal sulcus in frontal view; (v) terminal labial palpomere widened; (vi) outer edge of all tibiae bearing spines; (vii) ninth segment (pregenital segment) of male Y-shaped; (viii) tegmen of male genitalia elongate, at least 4X as long as large; (ix) median lobe elongate, the same length or longer than tegmen, barely sclerotized to membranous in most species; (x) female genitalia with distal gonocoxites almost contiguous.

The subtribes Xylographellina and Syncosmetina are easily distinguished by the characters cited in the identification key.

Discussion

Suprageneric classification

In the suprageneric classification proposed here, some homoplasic characters appear as homologies of major groups. That is the case for the prosternal process. A laminate (or tapering) prosternal process is found in *Ceracis* and other genera formerly in Ciini, but was also observed in Orophiini and Xylographellini. The transference of *Ceracis* and its close related genera to a new tribe inside Orophiinae (due to shared characters of female genitalia) leaves the laminate prosternal process as a homology of all the Orophiinae genera (except for the genera in Syncosmetina, in which it can be treated as a reversion). Only three genera with a tapering or laminate prosternal process remains in Ciinae *sensu novo*: *Acanthocis*, *Falsocis* and *Porculus*. *Porculus* may deserve a separate tribe, due to its distinctly sclerotized female genitalia devoid of gonostyli, but this matter needs a broader examination and comparison of the Ciinae genera. The subfamily Orophiinae and its included taxa are sustained by strong homologies, but Ciinae remains a pout-pourri of genera mostly joined by characters not exclusive to the group.

The subfamily Ciinae remains the biggest problem of the family Ciidae. Some evidence arose from the comparison of available species (Table 1), and external morphological features indicate that some genera may constitute natural groups. These groups may be formalized in suprageneric taxa after the solution of some incongruities. The limits of the genus *Cis* Latreille are a matter of great debate. *Cis*, as it currently stands, includes over 300 species, of a great variety of forms and distributed in all biogeographic regions. These species are joined in *Cis* on the basis of the antenna bearing 10-antennomeres, rounded or angulate to dentate protibial apex without spines at the outer angle, prosternal process never laminate, apex of elytral suture simple, and secondary sexual modifications usually present in male head and pronotum (Lawrence 1971; 1974a). However, number of antennomeres is not a stable character in the family, and some genera, as *Ennearthron*, have nothing different from *Cis* besides a reduced number of antennomeres. The apterous genera are another problem, as many external morphological characters used in their diagnosis seem to be homoplasies, which may have arosen as a consequence of loosing flight capability. Examples of such characters are the reduced eyes, the first abdominal ventrite longer than the following two ventrites together, the strongly convex body and rounded elytral humeri (the last common in most flightless Coleoptera). Most of the apterous Ciinae genera resemble very much some species of *Cis* and could be synonymies (even the recently described *Neoapterocis* Lopes-Andrade) or they may even constitute a distinct natural group in which the lost of flight capability might have occurred in the ancestor. This is another issue depending on a broad and careful comparison of the *Cis* species.

Other Ciinae genera seem to form natural groups. This is the case of *Porculus*, with a distinct female genitalia (hardly sclerotized) and a unique combination of external features. Also, *Acanthocis* and *Falsocis* share characters not found in any other Ciinae (Lopes-Andrade 2007b). These three genera are the unique Ciinae with laminate prosternal process, and both "groups" formed by them may deserve separate tribes. *Orthocis*, *Anoplocis* and other forms (now currently in *Ennearthron*) may also arise as a natural group. A tentative suprageneric classification of Ciinae may be accomplished by a careful comparison of external morphological characters for grouping genera, but I think a phylogenetic analysis (already being conducted by me and colleagues) will be most effective.

Oviposition

Modifications in the *bauplan* of the female genitalia indicate the evolution of alternate modes of oviposition. In the case of ciids, species without gonostyli are probably most generalist, and the simplification and reduction of the ovipositor may be linked to an increased number and reduced size of eggs. Degree of sclerotization may be related to the hardness or softness of substrates where ciids oviposite. Therefore, in the case of *Porculus*, which has an extremely sclerotized female genitalia, the species may oviposite in hard substrates.

The basic tenebrinoid number of ovarioles per ovary (three) was already observed in several major groups of Orophiinae: in *Ceracis* (Ceraciini **trib. nov.**); in *Xylographus* (Orophiini: Xylographina); and in *Scolytocis* (Xylographellini: Xylographellina). However, in some Orophiinae, besides the simplification and reduction of the ovipositor, a reduction in the number of ovarioles is also observed. That is the case of *Phellinocis romualdoi* and many species of *Ceracis* (C. Lopes-Andrade, pers. obs; A.A. Zacaro, pers. comm). Such reductions are usually accompanied by the reduction of number of testioles in males, but the number of ovarioles and testioles are not necessarily the same in each species. In Ciinae, reduction in the number of ovarioles is rarer than in Orophiinae, and it was observed only in *Cis chinensis* Lawrence and *Ennearthron victori* Lopes-Andrade & Zacaro (C. Lopes-Andrade, pers. obs; A.A. Zacaro, pers. comm). This reduction of number of ovarioles may also interfere in the amount and time of egg production.

Geographic distribution of Orophiinae

The subfamily Orophiinae is most diversified in tropical and subtropical regions. Orophiina is most diversified in the Indo-Malayan Region and eastern palearctics, with outliers in North America and Europe. Xylographina is pantropical, with outliers in the Indo-Malayan and Palearctic Regions (*e.g. Xyl. bostrichoides* (Dufour) and *Xyl. scheerpeltzi* Nobuchi & Wada). The highest species richness of Xylographina is found at the Neotropical and African Regions, considering described and undescribed forms.

Xylographellini occurs in the western Indian Ocean (Seychelles and Mascarene Islands), Japan, and in the Indo-Malayan, Oceanic and Neotropical Regions. However, its subtribes have quite distinct distributions: Xylographellina is basically Neotropical and Oceanic; while Syncosmetina occurs at the Indian Ocean and Japan. As far as it is known, the distribution of both subtribes overlaps only in Japan, where *Xylographella punctata* Miyatake and the *Syncosmetus* species co-exist (Lopes-Andrade 2007c, *manuscript*). There is no outlier of Xylographellini in either the Nearctic or the continental Palearctic Regions, but the tribe may occur in the sub-saharan Africa. The African continent and the islands where *Tropicis* (Syncosmetina) occurs share many species or species-groups of Ciidae. More field collections in Africa are necessary to evaluate this hypothesis. Atlantociini **trib. nov.** occurs only in the Macaronesian islands, and no allied continental group is known. Ceraciini **trib. nov.** is worldwidely distributed, but most diversified in the Neotropical, Australasian and Oceanic Regions. The genus *Ceracis* also occurs on the Nearctic Region, and is relatively speciose there (see Lawrence 1967).

The main taxonomist working with Ciidae until the 20th century lived on Europe, North America and Japan, and gave more emphasis to the faunas of the Holarctic Region. These faunas are dominated mainly by the Ciinae, the taxa comprising the most problematic genera (lacking sinapomorphies to define suprageneric and most generic taxa). That may explain why the suprageneric (and even generic) Ciidae classification remained so unresolved up to now. The emphasis on the tropical and pantropical fauna, mainly the Neotropical (dominated by the Orophiinae) permitted the rearrangement and grouping of half of the described genera of Ciidae, including almost 30% of the described species of the family. However, the Orophiinae is the group with the greatest number of genera and species remained to be described, mainly from the neotropics and sub-saharan regions.

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Captions

FIGURE 1. Comparative plate of female terminalia. **A.** *Histanocerus pubescens* Motschulsky (Pterogeniidae). **B.** *Sphindocis denticollis* Fall (Ciidae: Sphindociinae). Note that a sclerotized spermatheca (st) is present in **A**, but absent in **B** and all other Ciidae. See text for other abbreviations.

FIGURE 2. Comparative plate of female terminalia. **A.** *Cis boleti* (Scopoli). **B.** *Porculus grossus* Lawrence. Note that the whole genitalia of **B** is extremely sclerotized and lacks gonostyli (gs in **A**), but all the other components have a correspondent (homologous) in **A**. Dashed lines delimit the distal portion of proctiger (pt). See text for other abbreviations.

FIGURE 3. Comparative plate of female terminalia. **A.** *Apterocis variabilis* Perkins. **B.** *Porculus grossus* Lawrence. Note the homologous sclerotization between the distal gonocoxites (gc1 and gc2; connected circles). See text for other abbreviations.

FIGURE 4. Comparative plate of female terminalia. **A.** *Sulcacis bidentulus* (Rosenhauer). **B.** *Scolytocis furieriae* Lopes-Andrade (*i.l.*). Angles between the margins of first (gc1) and second (gc2) gonocoxites are acute in **A** and obtuse in **B** (arrows). Second gonocoxites have a lateral subtriangular sclerotization (connected circles), with conspicuous basal baculi (b.gc) in **A** but not in **B**. Note that small gonostyli (gs, dashed circles) are present in **A**. See text for other abbreviations.

FIGURE 5. Comparative plate of female terminalia. **A.** *Atlantocis canariensis* Israelson. **B.** *Ceracis cucullatus* (Mellié). Note that the apices of the bacula of paraproct are connected to the proctiger (connected circles). In **A** there are vestiges of the bacula of proctiger (arrows), not seen in **B**. Asterisk indicates a broken baculum. Small gonostyli (gs) are present in **B**. See text for other abbreviations.

FIGURES 6–7. Female terminalia stained with Chlorazol Black. **6.** *Ceracis cornifer* (Mellié). Note that the whole terminalia is much smaller than the terminalia of *Falsocis brasiliensis* (see below). **7.** *Falsocis brasiliensis* Lopes-Andrade, showing the whole terminalia (**A**), the apex of the proctiger (**B**) and the apical portion of the terminalia (**C**). In **B**, note that the apices of proctiger are confluent and do not separate from each other in the slide preparation (compare with Fig. 6, above, in which the either apex of the proctiger are placed laterally, separate from each other). In **C**, Note the three transversal divisions of the coxites (arrows), leading to four gonocoxites in each side. See text for other abbreviations.

Tables

TABLE 1. Species examined for this study. Genera in alphabetical order. "NA" stands for "Not Available", referring to the cases in which male or female specimens were not available. The "-" indicates the cases in which one or both genders were available but not dissected.

	Male	**Female**
ARCHEOCRYPTICIDAE		
Enneboeus Waterhouse		
Enneboeus caseyi Kaszab	x	x
MYCETOPHAGIDAE		
Mycetophagus		
Mycetophagus flexuosus Say	x	-
PROSTOMIDAE		
Prostomis		
Prostomis mandibularis (Fabricius)	x	-
PTEROGENIIDAE		
Histanocerus Motschulsky		
Histanocerus pubescens Motschulsky	x	x
CIIDAE		
Acanthocis Miyatake		
Acanthocis inonoti Miyatake	-	-
Apterocis Perkins		
Apterocis ephistemoides (Sharp)	x	-
Apterocis hawaiiensis Perkins	-	-
Apterocis hystrix Perkins	-	-
Apterocis impunctatus Perkins	x	x
Apterocis montanus Perkins	-	-
Apterocis rufonotatus Perkins	-	-
Apterocis vagepunctatus (Sharp)	x	-
Apterocis variabilis Perkins	x	x
Apterocis variegatus Perkins	-	-
Apterocis sp. 1 (aff. *rufonotatus*)	-	-
Apterocis sp. 2 (aff. *vagepunctatus*)	-	-
Atlantocis Israelson		
Atlantocis canariensis Israelson	x	x
Atlantocis gillerforsi Israelson	-	-
Atlantocis lauri (Wollaston)	x	x
Ceracis Mellié		

Ceracis bicornis (Mellié)	-	-
Ceracis castaneipennis Mellié	-	-
Ceracis cornifer (Mellié)	**x**	**x**
Ceracis cucullatus (Mellié)	**x**	**x**
Ceracis furcifer Mellié	**x**	**x**
Ceracis limai Lopes-Andrade *et al.*	**x**	**x**
Ceracis minutissimus (Mellié)	-	-
Ceracis nigropunctatus Lawrence	-	-
Ceracis pullulus (Casey)	-	-
Ceracis quadricornis Gorham	-	-
Ceracis punctulatus Casey	**x**	**x**
Ceracis sallei Mellié	-	-
Ceracis similis Horn	**x**	**x**
Ceracis simplicicornis (Pic)	-	-
Ceracis singularis (Dury)	-	-
Ceracis thoracicornis (Ziegler)	-	-
Ceracis variabilis (Mellié)	**x**	**x**
Ceracis sp.1 (BRASIL: PA; Carajás)	**x**	-
Ceracis sp.2 (BRASIL: BA; Caravelas)	**x**	-
Cis Latreille		
Cis sp. (*aff. bubalus*)	-	-
Cis americanus Mannerheim	-	-
Cis angustus Hatch	-	-
Cis biarmatus Mannerheim	-	-
Cis bicolor Sharp	-	-
Cis bidentatus (Olivier)	-	-
Cis bilamellatus Wood	**x**	-
Cis biramosus Steinheil	-	-
Cis bison (Reitter)	-	-
Cis boettgeri (Reitter)	-	-
Cis boleti (Scopoli)	**x**	**x**
Cis bubalus Reitter	-	-
Cis capensis Mellié	**x**	**x**
Cis castaneus Mellié	-	-
Cis cervus Blair	-	-
Cis chilensis Germain	-	-
Cis comptus Gyllenhal	**x**	-
Cis congestus Casey	-	-
Cis cognatissimus Perkins	-	-
Cis corticinus Gorham	-	-
Cis creberrimus Mellié	-	-
Cis crinitus Lawrence	-	-
Cis cucullatus Wollaston	-	-
Cis dentatus Mellié	-	-
Cis espinosai Brèthes	-	-

Cis evanescens Sharp	-	-
Cis fagi Waltl	-	-
Cis fasciatus Gorham	-	-
Cis festivus (Panzer)	-	-
Cis fissicornis Mellié	-	-
Cis fiuzai Almeida & Lopes-Andrade	**x**	**x**
Cis fuscipes Mellié	**x**	-
Cis glabratus Mellié	-	-
Cis graecus Schilsky in Küster	-	-
Cis gumiercostai Almeida & Lopes-Andrade	**x**	**x**
Cis hanseni Strand	-	-
Cis hieroglyphicus Reitter	-	-
Cis hispidus (Paykul)	-	-
Cis horridulus Casey	-	-
Cis hystriculus Casey	-	-
Cis krausi Dalla Torre	-	-
Cis jacquemarti Mellié	-	-
Cis japonicus Nobuchi	-	-
Cis leoi Lopes-Andrade *et al.*	**x**	**x**
Cis levettei Casey	-	-
Cis lineatocribratus Mellié	-	-
Cis micans (Fabricius)	-	-
Cis nipponicus Chûjô	-	-
Cis nitidus (Fabricius)	**x**	**x**
Cis pacificus Sharp	-	-
Cis pallidus Mellié	**x**	**x**
Cis pilosus Gorham	-	-
Cis pistoria Casey	-	-
Cis porcatus Sharp	-	-
Cis puncticollis Wollaston	-	-
Cis punctulatus Gyllenhal	-	-
Cis pygmaeus Marsham	-	-
Cis quadridens Mellié	-	-
Cis rotundulus Lawrence	-	-
Cis rugulosus Mellié	-	-
Cis seriatopilosus Motshulsky	-	-
Cis setarius Sharp	**x**	-
Cis setifer (Gorham)	**x**	-
Cis subtilis Mellié	-	-
Cis villosulus (Marsham)	-	-
Cis signatus Sharp	**x**	-
Cis testaceus Fahraeus	-	-
Cis tristis Mellié	-	-
Cis multidentatus (Pic)	**x**	**x**
Cis striolatus Casey	**x**	-

Cis subrobustus Miyatake	**-**	**-**
Cis tabidus Sharp	**-**	**-**
Cis taiwanus Chûjô	**-**	**-**
Cis tauriensis Królik	**x**	**-**
Cis taurus (Reitter)	**x**	**NA**
Cis tetracentrum Gorham	**-**	**-**
Cis tomentosus Mellié	**-**	**-**
Cis tricornis (Gorham)	**x**	**x**
Cis versicolor Casey	**x**	**-**
Cis sp.1 (signatus gp.)	**-**	**-**
Cis sp.2 (signatus gp.)	**-**	**-**
Cis sp.3 (setarius gp.)	**-**	**-**
Cis sp.4 (*comptus* gp. VIÇOSA)	**x**	**-**
Cis sp.5 (*taurus* gp. ES, VNI)	**x**	**x**
Cis sp.6 (*taurus* gp. BA, JUSSARI)	**x**	**x**
Cis sp.7 (CIPÓ)	**x**	**x**
Cis sp.8 (VIÇOSA)	**x**	**-**
Cis sp.9 (NOVA FRIBURGO)	**x**	**-**
Dimerapterocis Scott		
Dimerapterocis sp. Scott	**-**	**NA**
Diphyllocis Reitter		
Diphyllocis opaculus (Reitter)	**x**	**x**
Dolichocis Dury		
Dolichocis laricinus (Mellié)	**x**	**x**
Dolichocis manitoba (Dury)	**x**	**x**
Ennearthron Mellié		
Ennearthron cornutum (Gyllenhal)	**x**	**x**
Ennearthron filum (Abeille de Perrin)		
Ennearthron palmi Lohse	**x**	**x**
Ennearthron pruinosulus (Perris)	**x**	**x**
Ennearthron victori Lopes-Andrade & Zacaro	**x**	**x**
Euxestocis Miyatake		
Euxestocis bicornutus Miyatake	**x**	**x**
Falsocis Pic		
Falsocis opacus Pic	**x**	**NA**
Falsocis brasiliensis Lopes-Andrade	**x**	**x**
Falsocis sp.	**x**	**x**
Hadreule Thomson		
Hadreule blaisdelli (Casey)	**x**	**x**
Hadreule elongatula (Gyllenhal)	**x**	**x**
Hadreule sp.		
Malacocis Gorham		
Malacocis brevicollis (Casey)	**x**	**x**
Malacocis championi (Gorham)	**-**	**-**
Malacocis sp.	**-**	**-**

Neoapterocis Lopes-Andrade		
Neoapterocis chilensis Lopes-Andrade	**x**	**NA**
Neoapterocis mexicanus Lopes-Andrade	**x**	**x**
Neoapterocis sp.1 (MEXICO)	**x**	**-**
Neoapterocis sp.2 (CHILE)	**-**	**-**
Neoapterocis sp.3 (CHILE)	**-**	**-**
Neoennearthron Miyatake		
Neoennearthron bicarinatum Miyatake	**x**	**x**
Nipponocis Nobuchi & Wada		
Nipponocis longisetosus Nobuchi	**x**	**x**
Octotemnus Mellié		
Octotemnus dilutipes (Blackburn)	**x**	**-**
Octotemnus glabriculus Gyllenhal	**x**	**x**
Octotemnus laevis Casey	**x**	**-**
Octotemnus laminifrons (Motschulsky)	**-**	**-**
Octotemnus mandibularis (Gyllenhal)	**-**	**-**
Octotemnus opacus Mellié	**x**	**x**
Octotemnus palawanus Chûjô	**-**	**-**
Octotemnus robustus Kawanabe	**x**	**-**
Orthocis Casey		
Orthocis pseudolinearis (Lohse)	**-**	**-**
Orthocis reflexicollis (Abeille de Perrin)	**-**	**-**
Orthocis nigrosplendidus (Nobuchi)	**-**	**-**
Orthocis alni (Gyllenhal)	**x**	**x**
Orthocis perrisi Abeille de Perrin	**x**	**x**
Orthocis punctatus (Mellié)	**x**	**-**
Orthocis wollastonii (Mellié)	**x**	**-**
Orthocis sp. (BRASIL: MG; Ubá)	**x**	**x**
Phellinocis Lopes-Andrade & Lawrence		
Phellinocis erwini Lopes-Andrade & Lawrence	**x**	**-**
Phellinocis romualdoi Lopes-Andrade & Lawrence	**x**	**x**
Phellinocis thayerae Lopes-Andrade & Lawrence	**x**	**-**
Plesiocis Casey		
Plesiocis cribrum Casey	**x**	**NA**
Porculus Lawrence		
Porculus grossus Lawrence	**x**	**x**
Porculus piceus (Mellié)	**x**	**NA**
Porculus vianai(Pic)	**x**	**x**
Ropalodontus Mellié		
Ropalodontus americanus Lawrence	**x**	**-**
Ropalodontus baudueri (Abeille de Perrin)	**-**	**-**
Ropalodontus lawrencei Ruta	**-**	**-**
Ropalodontus novorossicus Reitter	**-**	**-**
Ropalodontus perforatus (Gyllenhal)	**x**	**x**
Ropalodontus perrini Reitter in Schneider & Leder	**-**	**-**

Ropalodontus strandi (Lohse)	x	x
Scolytocis Blair		
Scolytocis bouchardi i.l.	x	x
Scolytocis cariborum i.l.	x	x
Scolytocis danielssoni i.l.	-	x
Scolytocis difficillimus i.l.	x	x
Scolytocis fritzplaumanni i.l.	x	x
Scolytocis furieriae i.l.	x	x
Scolytocis howdeni i.l.	x	-
Scolytocis indecisus i.l.	x	x
Scolytocis kiskeyensis i.l.	x	x
Scolytocis lawrencei i.l.	x	x
Scolytocis malaysianus i.l.	x	x
Scolytocis neozelandensis i.l.	-	x
Scolytocis panamensis i.l.	x	x
Scolytocis paschoali i.l.	x	x
Scolytocis zimmermani i.l.	-	x
Sphindocis Fall		
Sphindocis denticollis Fall	x	x
Strigocis Dury		
Strigocis bicornis (Mellié)	-	-
Strigocis bilimeki (Reitter)	x	x
Strigocis opacicollis Dury	x	x
Strigocis opalescens (Casey)	x	x
Strigocis sp. 1 (BRASIL)	x	-
Strigocis sp. 2 (BRASIL)	x	-
Strigocis sp. 3 (BRASIL)	x	-
Strigocis sp. 4 (BRASIL)	-	-
Strigocis sp. 5 (BRASIL)	-	-
Strigocis sp. 5 (aff. *bilimeki*) (MEXICO)	-	-
Strigocis sp. 6 (MEXICO)	-	-
Strigocis sp. 7 (MEXICO)	-	-
Sulcacis Dury		
Sulcacis affinis (Gyllenhal)	x	x
Sulcacis bidentulus (Rosenhauer)	x	x
Sulcacis curtulus (Casey)	x	x
Sulcacis fronticornis (Panzer)	x	x
Sulcacis lengi Dury	x	x
Syncosmetus Sharp		
Syncosmetus japonicus Sharp	x	-
Syncosmetus reticulatus Miyatake	-	x
Tropicis Scott		
Tropicis sexcarinatus (Waterhouse)	x	x
Tropicis cuccodoroi i.l.	x	x
Xylographella Miyatake		

Xylographella punctata Miyatake	**x**	**x**
Xylographus Mellié		
Xylographus bostrichoides (Dufour)	**x**	**x**
Xylographus brasiliensis Pic	**-**	**-**
Xylographus contractus Mellié	**x**	**x**
Xylographus corpulentus Mellié	**-**	**-**
Xylographus gibbus Mellié	**x**	**x**
Xylographus hypocritus Mellié	**-**	**-**
Xylographus lemoulti Pic	**x**	**x**
Xylographus lucasi Lopes-Andrade & Zacaro	**x**	**x**
Xylographus madagascariensis Mellié	**-**	**-**
Xylographus sp. 1 (aff. *dentatus* Pic)	**-**	**-**
Xylographus sp. 2 (aff. *rufipennis* Pic)	**-**	**-**
Xylographus sp. 3	**-**	**-**
Xylographus sp. 4	**-**	**-**
Wagaicis Lohse		
Wagaicis wagae (Wankowicz)	**-**	**NA**

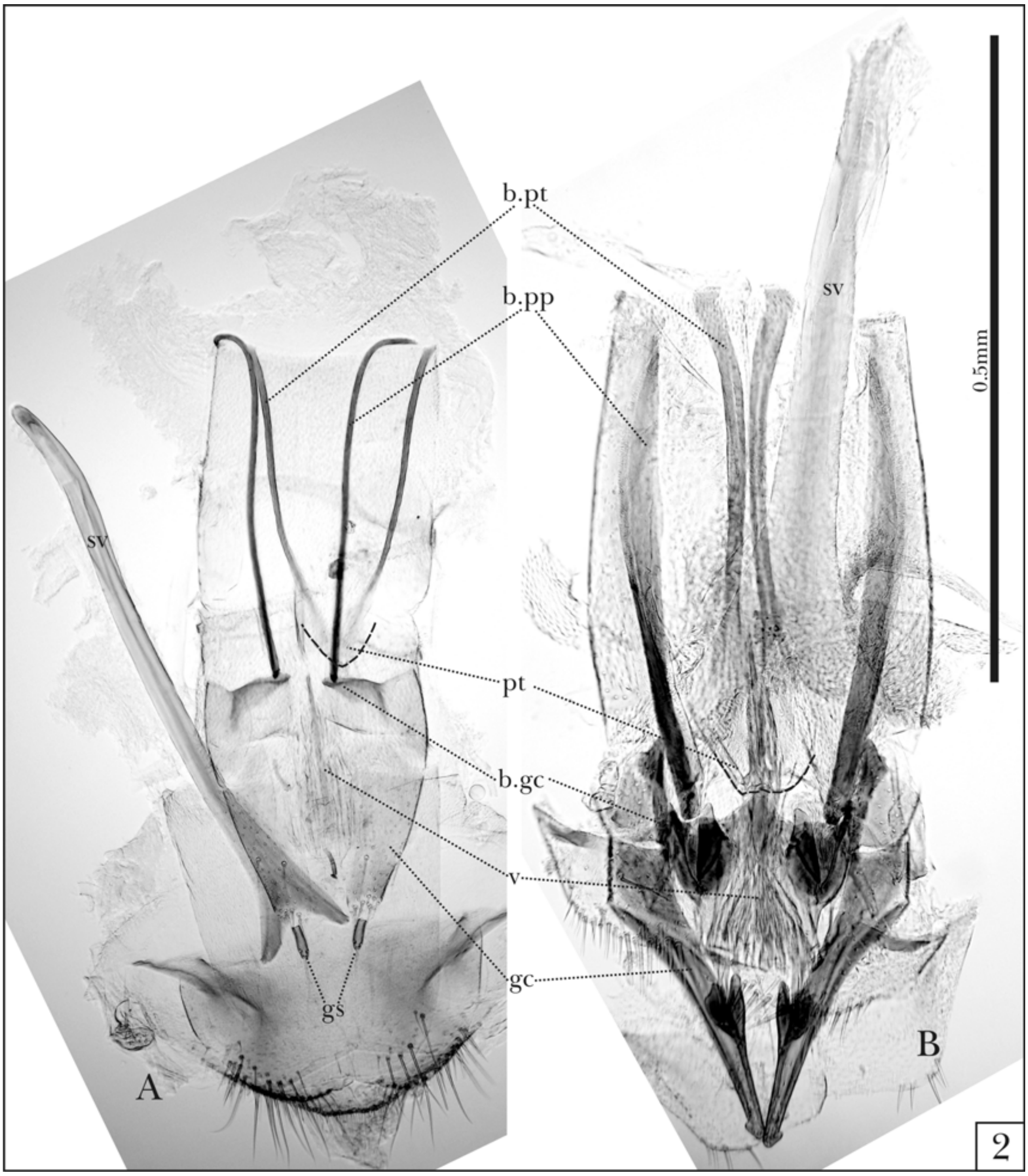
TABLE 2. The new suprageneric classification of Ciidae, with the described and valid Ciidae genera and their respective synonyms, if any. Part 1: Sphindociinae and Ciinae. Asterisks indicate the genera not examined and included in higher taxon based on characters mentioned in their original descriptions and subsequent taxonomic works, if available.

Ciidae Leach in Samouelle, 1819

- **1. Sphindociinae Lawrence, 1974**
    - *Sphindocis* Fall, 1917
- **2. Ciinae Leach in Samouelle, 1819**
    - *Acanthocis* Miyatake, 1954
    - * *Anoplocis* Kawanabe, 1996
    - *Apterocis* Perkins, 1900
    - *Cis* Latreille, 1796
        - *Cisdygma* Reitter, 1885; *Eridaulus* Thomson, 1863; *Macrocis* Reitter, 1878; *Xestocis* Casey, 1898; *Dimerocis* Peyerimhoff, 1918
    - * *Cisarthron* Reitter, 1885
    - *Dimerapterocis* Scott, 1926
    - *Diphyllocis* Reitter, 1885
    - *Dolichocis* Dury, 1919
    - *Ennearthron* Mellié, 1847
    - *Euxestocis* Miyatake, 1954
    - *Falsocis* Pic, 1916
    - *Hadreule* Thomson, 1863
        - *Maphoca* Casey, 1900; *Mapheae* Dalla Torre, 1911; *Pityocis* Peyerimhoff, 1918; *Ennearthon* (*Knablia*) Roubal, 1936
    - *Neoapterocis* Lopes-Andrade, 2007
    - *Neoennearthron* Miyatake, 1954
    - *Nipponocis* Nobuchi & Wada, 1955
    - *Orthocis* Casey, 1898
        - *Cis* (*Mellieicis*) Lohse, 1964
    - *Plesiocis* Casey, 1898
    - * *Polynesicis* Zimmerman, 1938
    - *Porculus* Lawrence, 1987
    - *Strigocis* Dury, 1917

TABLE 3. The new suprageneric classification of Ciidae, with the described and valid Ciidae genera and their respective synonyms, if any. Part 2: Orophiinae and *insertae sedis*. Asterisks indicate the genera not examined and included in higher taxon based on characters mentioned in their original descriptions and subsequent taxonomic works, if available.

- **Ciidae Leach in Samouelle, 1819**
  - **3. Orophiinae Thomson, 1863**
    - **3.1. Atlantociini Lopes-Andrade trib. nov.**
      - *Atlantocis* Israelson, 1985
    - **3.2. Ceraciini Lopes-Andrade trib. nov.**
      - *Ceracis* Mellié, 1848
      - *Malacocis* Gorham, 1886
        - *Brachycis* Casey, 1898
      - * *Odontocis* Nakane & Nobuchi, 1955
      - *Phellinocis* Lopes-Andrade & Lawrence
      - *Sulcacis* Dury, 1917
        - *Entypus* Redtenbacher, 1847; *Entypocis* Lohse, 1964
      - *Wagaicis* Lohse, 1964
    - **3.3. Orophiini Thomson, 1863**
      - **3.3.1. Orophiina Thomson, 1863**
      - * *Hyalocis* Kawanabe, 1993
      - *Octotemnus* Mellié, 1847
        - *Orophius* Redtenbacher, 1847; *Orophyus* Kiesenwetter, 1877; *Orophinus* Marschall, 1873
      - *Ropalodontus* Mellié, 1847
      - **3.3.2. Xylographina Lopes-Andrade subtrib. nov.**
      - * *Paratrichapus* Scott, 1926
      - *Xylographus* Mellié, 1847
    - **3.4. Xylographellini Kawanabe et Miyatake, 1996**
      - **3.4.1. Xylographellina Kawanabe et Miyatake, 1996**
      - *Scolytocis* Blair, 1928
      - *Xylographella* Miyatake, 1985
      - **3.4.2. Syncosmetina Lopes-Andrade i.l.**
      - *Syncosmetus* Sharp, 1891
        - *Omogocis* Miyatake, 1954
      - *Tropicis* Scott, 1926
- ***Incertae sedis***
  - * *Dichodontocis* Kawanabe, 1994
  - * *Lipopterocis* Miyatake, 1954
  - * *Nipponapterocis* Miyatake, 1954
  - * *Paraxestocis* Miyatake, 1954
  - * *Trichapus* Friedenreich, 1881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CONCLUSÃO GERAL

A principal alteração na classificação de Ciidae, pelos resultados desta tese, é a revalidação de Orophiinae como subfamília e a consolidação da tribo Xylographellini, com novos limites propostos para esses táxons. Nesta tese, foram apresentadas propostas para táxons supragenéricos, com justificativas morfológicas consistentes, agrupando quase 50% das espécies descritas da família. Esse grupo, Orophiinae *sensu novo*, é mais diverso em regiões tropicais e subtropicais, e de forte interesse para estudos em Ecologia e Biogeografia. A tribo Xylographellini, antes monospecífica e restrita ao Japão, agora é reconhecida como um grupo taxonômico de ampla ocorrência geográfica.

As conclusões teóricas apresentadas nesta tese advêm, em muito, de avanços técnicos na preparação de genitálias e fotografia digital. Esses avanços seguem uma tendência moderna de uso de fotografia digital como complemento (e não como substituto) de representações gráficas simples (desenhos) em trabalhos de taxonomia. Desenhos e esquemas são relativamente fáceis de serem feitos para organismos maiores do que 5mm, mas são difíceis no caso de Ciidae. Além disso, seriam pouco informativos: os detalhes necessários para se estudar as relações morfológicas dos grupos de Ciidae são de estruturas que, em geral, têm menos de 0,2mm. Desenhos e esquemas de estruturas tão pequenas seriam uma interpretação pouco detalhada da realidade, e a comparação de desenhos poderia levar a interpretações errôneas.

Esta tese apresenta produtos relevantes à sistemática da família Ciidae: (i) coleção de referência de Ciidae mantida em território brasileiro; (ii) laminário (com cerca de 450 lâminas) com genitálias extraídas de machos e fêmeas, além de outras estruturas internas ou externas; (iii) banco de dados com parte da bibliografia de Ciidae digitalizada; (iv) 22 espécies novas e dois gêneros novos descritos; (v) dois gêneros redescritos (*Falsocis* Pic, *Scolytocis* Blair); (vi) uma subfamília revalidada (Orophiinae), com a descrição de tribos e subtribos novas; (vii) redefinição de uma tribo já existente (Xylographellini); (viii) três artigos publicados; (ix) dois manuscritos já formatados para submissão; (x) incremento do conhecimento sobre a distribuição geográfica dos grandes grupos de Ciidae; (xi) reformulação de parte da classificação supragenérica de Ciidae a partir da comparação da morfologia de genitália masculina e feminina, complementares a outros dados morfológicos.

Como avanços técnicos, vale citar: (i) homogeneização dos caracteres utilizados em descrições de espécies, incluindo descrições mais detalhadas de morfologia de genitália masculina e feminina, asas e aparelho bucal; (ii) refinamento das técnicas de montagem de genitálias de Ciidae em lâmina (permitindo uma interpretação bidimensional, mais simplificada); (iii) utilização de fotografia digital de média resolução (3 a 7 megapixels) para representação de antenas, peças bucais, pernas e estruturas genitais; (iv) aplicação da técnica de automontagem para confeccionar imagens de média resolução dos holótipos e exemplares examinados, permitindo uma comparação detalhada dos espécimes sem a necessidade de consulta constante de material depositado em museu.

A seguir, alguns desses produtos e avanços técnicos são explicados mais detalhadamente.

Coleção de Referência

Um grande problema no estudo sistemático da família Ciidae no Brasil era a falta de uma coleção de referência que contivesse espécies de todas as regiões biogeográficas, condição imprescindível a estudos comparativos. Esse problema tinha duas causas principais: (i) o fato de muitos autores se dedicarem à fauna de seus próprios países ou de regiões biogeográficas específicas, organizando e incrementando coleções regionais; (ii) o fato de alguns museus restringirem o acesso às coleções, impedindo que a fauna de duas ou mais regiões pudessem ser comparadas. O primeiro fato é plenamente justificável: estudar a fauna local ou regional já é difícil, quanto mais comparar um vasto material procedente de faunas distantes. Quanto ao segundo fato, há explicações, mas não justificativas suficientes. Não há nenhuma coleção de Ciidae que possa ser considerada completa (com todos os gêneros e representantes de todos os grupos de espécies). Contudo, há coleções que podem ser chamadas de complementares, caso das coleções do Museu de História Natural de Londres (BMNH), Museu Nacional de História Natural de Paris (MNHN), Museu de História Natural de Genebra (MHNG), coleção do Laboratório de Entomologia da Universidade de Ehime (Japão), Coleção Nacional de Insetos Australianos (ANIC), Museu Berenice Bishop (BPBM, Havaí) e Museu de Zoologia Comparada de Harvard (MCZ). A razão da importância dessas coleções é simples: é nelas que se encontra depositada a maior parte dos tipos primários de Ciidae, e algumas delas guardam material de estudos faunísticos importantes (como de expedições às ilhas dos oceanos Índico e Pacífico). O caso da coleção do MNHN (Paris) é especial: ela abriga grande parte dos ciídeos descritos por Maurice Pic. O Sr. Pic baseava suas breves descrições em poucos exemplares, algumas vezes com base em uma única fêmea. Por representar quase 15% de todas as espécies descritas da família, e por ser quase totalmente composta de material-tipo, achei coerente não pedir o envio desses espécimes por correio. O estudo dessa coleção deve ser feito *in loco*. Das demais coleções, quase todas são acessíveis, e seus respectivos curadores autorizaram empréstimos sem grandes restrições. Há, porém, duas exceções: a coleção do BMNH (Inglaterra) e a de Ehime (Japão). A primeira abriga uma importante coleção de Ciidae, com material-tipo e espécimes identificados por quase todos os grandes especialistas na família. A segunda é a única que contém material quase completo sobre a fauna japonesa de Ciidae, país com antiga tradição na taxonomia do grupo. O curador do BMNH argumentou que a coleção só poderia ser consultada *in loco*, e que havia restrições a envio de material a brasileiros (mesmo de material não identificado ou de material não-tipo). A segunda, a de Ehime, nunca respondeu a nenhuma tentativa de contato.

Não posso fazer nada para mudar a mentalidade dos curadores dessas coleções. Só posso lastimar a perda absurda de informação que isso representa: ambas as coleções não estão sendo estudadas a fundo por nenhum especialista. A especialista britânica em Ciidae só trabalha com a fauna do Reino Unido e nunca descreveu nenhuma espécie. O especialista japonês trabalhou praticamente só com a fauna de seu país.

Críticas extensas ou tentativas repetitivas de contato com essas instituições não resolveriam o problema. Uma solução prática seria organizar uma coleção de referência sediada no Brasil. E esse é, provavelmente, o produto mais importante desta tese. A coleção de Ciidae, filiada temporariamente ao Laboratório de Orthopterologia da UFV (Viçosa, Minas Gerais), começou em de Setembro de 1999, com a coleta de alguns ciídeos na 'Mata da Biologia' (Campus da UFV, Viçosa, MG) e a doação de bibliografia por Fernando Z. Vaz de Mello. Em 8 anos, esta já é a maior coleção no mundo de ciídeos neotropicais. Mas considerando número de gêneros descritos, número de exemplares identificados e organização do material, é atualmente a maior coleção de Ciidae do mundo. O objetivo é incrementar esta coleção a tal ponto que torne desnecessária a consulta de coleções européias ou japonesas para a identificação de espécimes, ou condução de trabalhos faunísticos ou sistemáticos sobre Ciidae. Isto é viável, desde que o trabalho sobre a coleção continue nos próximos anos, e desde que haja financiamento adequado.

Fotografia digital e automontagem

Um problema que enfrentei durante a dissertação de mestrado e o início dos trabalhos para esta tese foi o alto custo (em dinheiro e tempo) para a obtenção de fotografias mais informativas de ciídeos. A técnica utilizada inicialmente foi a de Microscopia Eletrônica de Varredura (MEV). Porém, esta técnica não pode ser aplicada a exemplares únicos, holótipos ou material de museus, pelo alto risco de dano aos exemplares. Na descrição de *Phellinocis* (primeiro artigo), os exemplares fotografados em MEV não correspondem aos exemplares-tipo. Para *Falsocis* (terceiro artigo), foi utilizado a técnica de pressão variável, que não exige cobertura dos espécimes com metal pesado.

Porém, esta técnica apresenta um maior risco de dano, e não pode ser aplicada a espécimes mais delicados.

Uma saída foi encontrada durante a confecção do segundo capítulo (descrição de *Neoapterocis*). Para apresentar fotos dos exemplares-tipo, sem utilizar técnicas que poderiam ser danosas, e para diminuir os custos da descrição de novos táxons de Ciidae, utilizei a técnica de automontagem. Como explicado na introdução, ela consiste em unir fotografias em diferentes focos para confeccionar uma imagem final mais informativa (com maior riqueza de detalhes). Contudo, só alcancei um melhor domínio da técnica no artigo sobre *Falsocis*. O quarto artigo só foi viabilizado a partir daí, já que as espécies de Xylographellini (principalmente de *Scolytocis*) são muito parecidas externamente. Com as fotos apresentadas no quarto artigo, a identificação futura dessas espécies será, com certeza, mais fácil.

Avanços na classificação supragenérica de Ciidae

A classificação supragenérica de Ciidae era, até o início desta tese, em grande parte inconsistente e arbitrária. Sempre há certo grau de arbitrariedade em qualquer tentativa de hierarquização da diversidade biológica, mas no caso de Ciidae isso realmente chegou ao extremo. Na definição de táxons supra-específicos, principalmente dos supragenéricos, eram utilizadas características morfológicas externas com alto grau de convergência. Convergência morfológica em Ciidae é muito comum _ resultado direto do modo de vida desses insetos.

Alguns autores modernos (*e.g.* Lawrence *et al.* 1999) chegaram a abandonar a divisão clássica da família em tribos (Ciinae: Orophiini + Ciini + Xylographellini) por reconhecerem que não havia nenhuma característica exclusiva, nem mesmo uma combinação única de características, que pudesse definir esses grupos. Até mesmo a tribo Xylographellini apresentava problemas graves: apesar de ser bem definida (justamente por considerar dados de morfologia de genitália, aparelho bucal e antena), era incompleta, já que não incluía todos os táxons que apresentavam a combinação de características que originalmente definiam esta tribo. Isto era conseqüência da falta de um estudo comparativo da morfologia de genitália (considerando toda a família Ciidae, e não uma fauna restrita), mas também da insistência de alguns autores em dar um peso maior a características homoplásicas mesmo tendo outros dados morfológicos que eram claramente mais consistentes. Este foi o caso do gênero *Syncosmetus* Sharp, do Japão, mantido fora da tribo Xylographellini pelos próprios autores japoneses: o processo prosternal largo (caráter externo com certo grau de convergência em alguns grupos) foi argumento para manter o gênero em Ciini, apesar dele apresentar todas as outras características citadas na descrição original como restritas à tribo Xylographellini.

Os resultados mais fortes e consistentes apresentados aqui se referem à subfamília Orophiinae. Muitos gêneros mantidos em Ciini, que não deveriam estar na tribo (mesmo considerando a morfologia externa tradicional) foram transferidos para Orophiinae com base na morfologia de genitália feminina e na congruência de características morfológicas externas. Além de redefinida, Orophiinae foi reorganizada em novas tribos e subtribos, para comportar todos esses gêneros.

Perspectivas de estudo

Esta tese não resolve a classificação supragenérica da subfamília Ciinae. Mas, para os gêneros que permanecem na subfamília, já há alguma perspectiva de solução na classificação. Este é o caso do gênero *Porculus* Lawrence, que provavelmente representa uma nova tribo; *Falsocis* Pic e *Acanthoci*s Miyatake, que também devem formar um grupo independente; *Strigocis* Dury, *Orthocis* Casey e correlatos (como *Anoplocis* Kawanabe), que também podem ser tratados como um grupo à parte. Mas o grande problema de Ciinae reside na definição da subfamília com base em caracteres que não são exclusivos desse táxon. O meu estudo sobre a classificação de Ciidae será direcionado, a partir de agora, para a resolução desta questão. Um caminho viável para a resolução da classificação de Ciinae seria mesclar o trabalho de filogenia que desenvolvi no mestrado com os resultados apresentados no quinto capítulo desta tese. Isso será decidido após a publicação do quarto capítulo.

Espero que, a partir dos resultados apresentados aqui e dos produtos oriundos desta tese (como a coleção de referência), outros projetos importantes sobre Ciidae possam ser conduzidos. A confecção de uma chave taxonômica pictórica para os gêneros de ciídeos neotropicais é imprescindível e já está em andamento, e pode ficar pronta em poucos meses. Esta chave deverá ser publicada em português e inglês. A chave para os gêneros do mundo já é viável, mas acredito que demore dois ou até três anos para ser concluída. Com isso, espero que uma parte dos espécimes presentes em museus ou coleções particulares do mundo seja identificada até gênero, incentivando a troca de material ou, até mesmo, a formação de novos especialistas. Pretendo empregar a técnica de automontagem para fotografar espécimes-tipo e exemplares das espécies presentes na coleção de referência. No futuro, essas imagens poderiam ser disponibilizadas *on-line*, juntamente com a bibliografia digitalizada. Contudo, isso depende de financiamentos adequados e apoio de outros pesquisadores.

Fora à sistemática, agora há um campo aberto no Brasil para a utilização de Ciidae em outras áreas de pesquisa (como Ecologia, Etologia, Biogeografia e Citogenética). Ciidae é um grupo diverso, distribuído mundialmente, e em que a maioria das espécies apresenta uma alta dependência por um recurso limitado (em quantidade e existência temporal) e com distribuição agregada: corpos-de-frutificação de macrofungos coriáceos. A cooperação entre os especialistas em fungos e em insetos micetócolos ainda é muito tênue no Brasil, e tal cooperação é condição *sine qua non* à elaboração de trabalhos científicos de maior impacto sobre a relação inseto-fungo.