ESTUDO TAXONÔMICO DE IMATUROS DE RUTELINAE, COM ÊNFASE EM RUTELINI (COLEOPTERA: MELOLONTHIDAE)

por

TAMARA GOMES CARVALHO

(Sob Orientação do Professor Paschoal Grossi - UFRPE)

RESUMO

Rutelinae é a segunda maior subfamília de Melolonthidae (Coleoptera, Scarabaeoidea) em riqueza de espécies, com aproximadamente 4.197 espécies descritas para o mundo todo e a maior riqueza na Região Neotropical, com cerca de 1.337 espécies registradas. Sete tribos compõem Rutelinae atualmente: Adoretini, Alvarengiini, Anatistini, Anomalini, Anoplognathini, Geniatini e Rutelini; destas, apenas Adoretini não ocorre no Brasil. Imaturos de Rutelinae geralmente se desenvolvem em madeira podre e contribuem diretamente para a decomposição de matéria morta depositada nas florestas e ciclagem de nutrientes, embora os membros das tribos Anomalini e Geniatini desenvolvam-se principalmente no solo e muitos são pragas de culturas por consumir raízes. A biologia e taxonomia de imaturos de Rutelinae são pouco conhecidas, menos de 2% das espécies registradas possuem descrições de larvas ou pupas. Assim, esse estudo teve como objetivo contribuir com o conhecimento de imaturos da subfamília Rutelinae com a inclusão de novas descrições de larvas e pupas. Foram descritos imaturos de dez espécies de Rutelini, em que seis espécies são de Anticheirina: *Anticheira capucina* (Fabricius, 1787), *Anticheiroides brullei* (Castelnau, 1840), *Macraspis laevicollis* (Waterhouse, 1881), *M. variabilis* Ohaus, 1914, *Telaugis aenescens* Burmeister, 1844, e *Vayana bicolor* (Olivier, 1789), sendo as primeiras descrições de imaturos para os gêneros *Anticheira* Eschscholtz, 1818, *Anticheiroides* Soula, 1998, *Telaugis*

Burmeister, 1844, e *Vayana* Ohaus, 1915; e quatro espécies de *Pelidnota* MacLeay, 1819: *Pelidnota ancilla* Bates, 1904, *P. nitescens* (Vigors, 1825), *P. pulchella* (Kirby, 1819) e *P. rugulosa* Burmeister, 1844. Com esse estudo, 23 espécies com descrição de imaturos de Rutelini são agora conhecidas para o Brasil, totalizando 28 espécies de Rutelinae, o que corresponde a 5,9% das espécies de Rutelinae registradas para o país.

PALAVRAS-CHAVE: Coró, ciclo de vida, morfologia, Neotropical, Scarabaeoidea, taxonomia

TAXONOMIC STUDY OF THE IMMATURES OF RUTELINAE, WITH EMPHASIS ON RUTELINI (COLEOPTERA: MELOLONTHIDAE)

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## ABSTRACT

Rutelinae is the second-largest subfamily of Melolonthidae (Coleoptera, Scarabaeoidea) in species richness, with approximately 4,197 described species worldwide, and is most abundant in the Neotropics, with about 1,337 recorded species. Seven tribes currently compound Rutelinae: Adoretini, Alvarengiini, Anatistini, Anomalini, Anoplognathini, Geniatini, and Rutelini; these, only Adoretini does not occur in Brazil. Rutelinae immatures usually develop in rotting wood and contribute directly to the decomposition of dead matter deposited in forests and nutrient cycling, although members of the tribes Anomalini and Geniatini develop mainly in the soil and many are crop-pests by consuming roots. The biology and taxonomy of immatures of Rutelinae are poorly known, with less than 2% of recorded species having descriptions of larvae or pupae. Thus, this study aimed to contribute the knowledge of the immatures of the subfamily Rutelinae with the inclusion of new descriptions of larvae and pupae. Here, immature of ten species of Rutelini were described, six of the Anticheirina: *Anticheira capucina* (Fabricius, 1787), *Anticheiroides brullei* (Castelnau, 1840), *Macraspis laevicollis* (Waterhouse, 1881), *M. variabilis* Ohaus, 1914, *Telaugis aenescens* Burmeister, 1844, and *Vayana bicolor* (Olivier, 1789), with the first descriptions of immatures for the genera *Anticheira* Eschscholtz, 1818, *Anticheiroides* Soula, 1998, *Telaugis* Burmeister, 1844, and *Vayana* Ohaus, 1915; and four species of the genus *Pelidnota* MacLeay, 1819: *Pelidnota ancilla* Bates, 1904, *P. pulchella* (Kirby, 1819), *P. nitescens* (Vigors, 1825) and *P.*

*rugulosa* Burmeister, 1844. With this study, 23 species with immature described to Rutelini are now known for Brazil, totaling 28 species of Rutelinae, corresponding to 5,9% of all Rutelinae species recorded in the country.

KEYWORDS: Life cycle, morphology, Neotropical, Scarabaeoidea, taxonomy, white grubs

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Tese apresentada ao Programa de Pós-Graduação em Entomologia, da Universidade Federal Rural de Pernambuco, como parte dos requisitos para obtenção do grau de Doutor em Entomologia.

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TAMARA GOMES CARVALHO

**Comitê de Orientação:**

Paschoal Grossi – UFRPE

Juares Fuhrmann – MZUSP

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**Banca Examinadora:**
André da Silva Ferreira – UFRPE
Fábio Correia Costa – UFPE
Fernando Willyan Trevisan Leivas – UFPR
Paula Batista dos Santos – UNIVASF
Paschoal Coelho Grossi – UFRPE

| | |
|---|---|
| Tamara Gomes Carvalho<br>Doutora em Entomologia | Prof. Paschoal Grossi – UFRPE<br>Orientador |

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SUMÁRIO

# CAPÍTULO 1

# INTRODUÇÃO

## Ontogenia

O desenvolvimento pós-embrionário de todos os insetos é dividido em estágios, cada um deles apresentando um número diferente de mudas (Gullan & Cranston 2014). A forma do inseto no intervalo entre duas mudas é chamada de ínstar. A larva recém-emergida encontra-se no primeiro ínstar, quando a primeira muda acontece, ela passa para o segundo ínstar, assim por diante. O último ínstar é a imago (chamado assim por conta de o inseto exibir a "imagem" da forma adulta) ou o adulto, fase em que não ocorrem mais episódios de muda (Marques 2012).

O desenvolvimento dos besouros (Coleoptera), assim como de outros insetos holometábolos, é caracterizado por três fases bem definidas. A fase larval, representada por um número de ínstares variável segundo o táxon observado e onde ocorre o crescimento do animal, a fase de pupa, um ínstar quiescente onde ocorre a diferenciação para o estágio adulto, e, finalmente, a fase de imago ou adulto, marcando o estágio potencialmente reprodutivo. Tanto o estágio de larva quanto o de pupa são conjuntamente denominados de fase imatura ou pré-imaginal (Costa & Ide 2006a, 2006b).

Durante a fase de pupa ocorrem modificações profundas, as quais são responsáveis pela diferenciação da larva em adulto. Esse padrão de desenvolvimento é chamado de metamorfose. A metamorfose possivelmente está relacionada à perda de características adaptativas típicas da larva e o ganho das características dos adultos, e geralmente indicaria a distância ecológica entre o imaturo e o adulto (Marques 2012). Snodgrass (1954) definiu metamorfose como as mudanças

ocorridas entre o último instar larval e o adulto; já outros autores levam em consideração a somatória de todas as mudanças desde o ovo até o adulto (Chapman 2013).

As estruturas do adulto estão presentes no interior da larva na forma de células imaginais, que podem reunir-se em estruturas anatomicamente definidas, os discos imaginais. À medida que o disco cresce, a estrutura relacionada do adulto começa a ser formada no interior do disco. O crescimento prossegue até que a estrutura geral do apêndice em formação esteja externalizada durante a fase de pupa (Gullan & Cranston 2012).

Os insetos são divididos, quanto ao tipo de metamorfose, em três grupos: ametábolos, hemimetábolos e holometábolos. Na ametabolia, o inseto imaturo emerge do ovo assemelhando-se com um adulto em miniatura, com a diferença de o aparelho reprodutor ser pouco desenvolvido; os insetos ametábolos são representados por duas ordens ápteras. Em contraste, os Pterygota adultos e imaturos são dissimilares quanto ao desenvolvimento das asas. O desenvolvimento dos Pterygota pode ser dividido em hemimetabolia e holometabolia. Na hemimetabolia, o desenvolvimento das asas ocorre externamente ao corpo, através de mitoses progressivas dos brotos alares em cada muda. A ninfa, imaturo hemimetábolo, possui forma semelhante ao adulto, exceto pelo tamanho pequeno, ausência de asas e de genitália. Na holometabolia, as asas desenvolvem-se internamente no corpo da larva, através dos discos imaginais. As larvas são fundamentalmente diferentes dos adultos e entre os dois estágios encontra-se a pupa, que é a característica mais marcante nesse tipo de desenvolvimento (Marques 2012, Gullan & Cranston 2014).

Duas teorias explicam como as larvas evoluíram. Uma é que as larvas holometábolas e ninfas hemimetábolas são correspondentes e a pupa desenvolveu-se a partir de uma forma intermediária de larva que diferiu-se gradualmente dos adultos. A outra, mais aceita, é que a larva é uma extensão da proninfa hemimetábola, um estágio obscuro entre a eclosão e a ninfa de primeiro ínstar,

geralmente muito curto e em alguns grupos ocorre dentro do ovo (Hinton 1955, Truman & Riddiford 1999).

Uma explicação à origem da holometabolia é que esse tipo de desenvolvimento permite que adultos e imaturos possam ter dietas diferentes. De fato, as larvas da maioria dos holometábolos vivem particularmente em substratos líquidos ou úmidos, ou em plantas, podendo ser saprófagos, minadores de folhas ou broqueadores de madeira, e endoparasitóides, enquanto os adultos são de vida livre (Grimaldi & Engel 2005). A metamorfose completa reduz a competição entre imaturos e adultos por providenciar uma clara diferenciação ecológica entre estes estágios (Gullan & Cranston 2014). Alternativamente, as larvas simplesmente poderiam explorar recursos abundantes para o qual os adultos não foram idealmente adaptados, em vez de apenas tentar reduzir a competição dietética. Além disso, a separação física, não apenas alimentar, pouparia os imaturos mais vulneráveis dos mesmos predadores e parasitas que atacam os adultos (Grimaldi & Engel 2005). Pelo fato de os Endopterygota constituírem o grupo de insetos mais numeroso e mais diversificado, pode-se inferir que a presença de larvas e pupas em seu ciclo biológico teria sido favorável a esta diversificação (Costa *et al*. 1998).

Insetos da ordem Coleoptera são endopterigotos ou holometábolos, ou seja, suas asas desenvolvem-se internamente durante a metamorfose. A forma e estrutura das larvas dos besouros são adaptadas a tipos específicos de ambiente. Entre os coleópteros há grande diversidade de tipos larvais, dentre eles o escarabaeiforme, o qual possui corpo robusto, subcilíndrico, em forma de “C”, pernas bem desenvolvidas, e sem apêndices abdominais. Ocorre entre os Scarabaeoidea, Chrysomeloidea e Curculionoidea (Costa *et al*. 1998).

Larva do tipo escarabeiforme é uma das características que sustenta a monofilia de Scarabaeoidea, em conjunto com pernas anteriores fossoriais com tíbias achatadas e externamente denteadas, tipo especializado de dobra das asas posteriores e antenas lameladas (Scholtz 1990). As

larvas de Scarabaeoidea podem desenvolver-se em uma variedade de habitats. Em grupos como Lucanidae e Passalidae, as larvas são saprófitas de troncos podres. Larvas de Geotrupidae e Scarabaeidae se desenvolvem principalmente em esterco de mamíferos herbívoros onde também se alimentam de fungos (Ritcher 1966, Lawrence 1991). Larvas de Melolonthidae alimentam-se de troncos podres, raízes de plantas ou solo rico em material vegetal, neste grupo são encontradas algumas pragas de gramíneas, pastagens e hortaliças (Rodrigues *et al*. 2017a). A configuração larval em forma de "C" resulta em aumento da capacidade abdominal em relação a cabeça e o tórax, que está diretamente relacionada à propensão das larvas de Scarabaeoidea se alimentarem de grandes quantidades de alimento, afim de empupar em tamanho maior (McHugh & Liebherr 2009).

A pupa é um estágio que possui caracteres próprios, muitas vezes esses caracteres são considerados intermediários entre o último instar larval e ao adulto, mas esse tipo de reconhecimento se baseia-se apenas na aparência externa e superficial do caractere. A existência da pupa, uma forma quiescente, é o que permite a radical mudança de forma dos holometábolos. As estruturas do adulto são formadas na larva de último instar e são evertidas durante a muda larva-pupa. A classificação de formas pupais é feita de acordo com a situação dos apêndices locomotores e bucais (Marques 2012). Por ser um período de repouso, durante o qual o inseto não se alimenta e torna-se bastante vulnerável à predação, geralmente a pupa desenvolve-se dentro de um casulo ou de uma câmara pupal (Costa & Ide 2006a).

Todas as pupas de Coleoptera são adécticas – sem mandíbulas funcionais – e a maioria é exarata, com os apêndices livres não estando soldados nem secundariamente aderidos ao corpo. Outro caráter típico das pupas dos coleópteros são os órgãos dioneiformes, estruturas sempre desenvolvidas nas margens opostas de alguns dos tergitos abdominais. Estas estruturas são bastantes esclerotizadas e em algumas espécies são denteadas, funcionando como uma armadilha, podendo fechar-se pela contração dos músculos dorsais longitudinais dos respectivos segmentos.

Supõe-se que a função dessa estrutura seja proteção da pupa por conta do seu mecanismo de fechamento, que poderia eventualmente prender algum predador (Costa *et al*. 1998). Segundo Sousa *et al*. (2018), a ontogenia pupal envolve dois processos principais: a extroversão dos apêndices como clípeo, asas e pernas, e a contração do abdômen. A retração do segmento X e redução da parte posterior do segmento IX resulta em uma dobra posterolateral do tergito IX, característica típica de Cetoniidae, Dynastinae e Rutelinae.

Os insetos desenvolvem-se de ovos que variam muito em tamanho e forma segundo a espécie. Em algumas espécies de Scarabaeidae, os ovos absorvem água até duplicarem de peso, especialmente no início do desenvolvimento. O ovo dos insetos é formado por cório, camada serosa, membrana vitelina, citoplasma e núcleo (Costa & Vanin 2006). A microescultura do cório tem sido usada como característica de identificação em insetos; Sreedevi *et al.* (2015) caracterizaram a microescultura de ovos de cinco espécies de Rutelinae, sendo o primeiro trabalho que faz a caracterização de ovos para esta subfamília.

Apesar de Scarabaeoidea ser uma das superfamílias mais diversas dentro de Coleoptera, os estágios imaturos de apenas 10% de suas espécies foram descritos (Neita-Moreno & Morón 2017). Dentre os principais trabalhos publicados, destacam-se: Hayes (1929), com sua monografia de morfologia, taxonomia e biologia de Scarabaeoidea dos Estados Unidos; Böving (1936), que descreve termos aplicados à terminologia da epifaringe e raster; e Ritcher (1966), um dos mais importantes trabalhos taxonômicos sobre os imaturos de Scarabaeoidea, incluindo Rutelinae, com ênfase em Anomalini e Rutelini.

**Subfamília Rutelinae**

Rutelinae MacLeay, 1819 inclui uma variedade de besouros fitófagos de pequeno e médio tamanho, muitos dos quais são coloridos e com reflexos metálicos (Ritcher 1966). O nome comum

da subfamília, no inglês *shining leaf chafers*, se refere ao fato de possuírem padrões de coloração chamativos (Jameson 2002). Esta é a segunda maior subfamília de Melolonthidae (Coleoptera, Scarabaeoidea) em riqueza de espécies, são aproximadamente 4.197 espécies descritas para o mundo todo, e maior riqueza na Região Neotropical, com cerca de 1.337 espécies registradas (Ferreira *et al.* 2018). No Brasil, há o registro de 476 espécies, 103 subespécies e 58 gêneros de Rutelinae (Ferreira & Grossi 2023), cerca de um terço de todas as espécies registradas para a Região Neotropical.

Os adultos de Rutelinae se distinguem, morfologicamente, de outras subfamílias de Melolonthidae pelo seguinte conjunto de características: forma do corpo oval, em geral alongada; labro fracamente projetado através do ápice do clípeo; antenas com 8–10 antenômeros, clava da antena com três lamelas; placa escutelar exposta; garras tarsais de todas as pernas com mobilidade independente e, frequentemente, desiguais em comprimento ou tamanho, levemente divididas no ápice, sendo uma garra de cada par bem reduzida; pigídio exposto após o ápice dos élitros (Jameson 2002).

Sete tribos compõem Rutelinae atualmente: Adoretini, Alvarengiini, Anatistini, Anomalini, Anoplognathini, Geniatini e Rutelini (Bouchard *et al*. 2011). Adoretini é distribuída no Velho Mundo (Regiões Afrotropical e Paleártica) (Jameson 2002); Alvarengiini, na América do Sul (Frey 1975); a tribo Anatistini é encontrada apenas nas Américas Central e do Sul; a tribo Anomalini é amplamente distribuída no mundo todo e apresenta maior riqueza de espécies no Velho Mundo; Anoplognathini ocorre na Austrália e nas Américas Central e do Sul (Jameson 2002). A tribo Geniatini é distribuída do México, a 18º de latitude norte a América do Sul, a 40º de latitude sul e nas Pequenas Antilhas, no Caribe (Jameson & Hawkins, 2005). Rutelini é amplamente distribuída no mundo todo, com maior diversidade em número de espécies na Região Neotropical (Jameson 2002). Dentre estas tribos, Anomalini e Rutelini, respectivamente, apresentam a maior riqueza de espécies dentro da subfamília.

Rutelinae foi dividida em dois subgrupos por Ohaus (1918, 1934): Orthochilidae e Homalochidae, de acordo com as posições e características do labro. Orthochilidae corresponde às espécies que têm um labro projetado verticalmente quando comparado ao clípeo (tribos Adoretini, Alvarengiini, Anatistini, Anoplognathini e Geniatini); e Homalochidae corresponde às espécies em que o labro é projetado horizontalmente (tribos Anomalini e Rutelini). Vários agrupamentos subtribais foram propostos, mas sem definições e com diagnoses insuficientes para identificação e, devido à essas indefinições, surgiram conflitos sobre a classificação de grupos dentro das tribos e subtribos, como por exemplo, em Rutelina, Parastasiina, Pelidnotina e entre os limites com Dynastinae (Jameson 1998). Até o momento, indícios se acumulam a respeito da parafilia de Rutelinae com relação a Dynastinae (Jameson 1998, Smith *et al.* 2006, Ahrens 2011, 2014, McKenna *et al.* 2014, Gunter *et al.* 2016, Eberle *et al*. 2019), e o não monofiletismo de grupos amplia a imprecisão taxonômica para esses táxons. Moore *et al.* (2018) discorre mais afundo sobre as relações entre Cyclocephalini (Dynastinae) e Rutelinae, esclarecendo como a posição desta tribo ainda não está resolvida dentro das duas subfamílias. A falta de definições subtribais tem levado taxonomistas a transferir gêneros dentro de subtribos, e estas, como não possuem base filogenética, providenciam apenas uma estimativa superficial de grupos naturais e um estudo taxonômico filogenético de toda a subfamília em um contexto amplo faz-se necessário (Jameson 1998). Por questões práticas, grupos parafiléticos ainda são utilizados enquanto esses estudos encontram-se em construção.

Em termos ecológicos, adultos de Rutelinae são fitófagos e alimentam-se de folhas, flores ou partes de flores, e podem desempenhar um importante papel ecológico na polinização de algumas espécies de plantas, enquanto as larvas são saprofitófagas e contribuem diretamente para a decomposição de matéria orgânica e na ciclagem de nutrientes, alimentando-se de raízes vivas, composto ou material em decomposição, como troncos e raízes (Jameson 2002, Ferreira *et al.*

2018). Embora as larvas de muitas espécies sejam pragas, sua biologia e taxonomia são pouco conhecidas (Neita-Moreno & Morón 2017), menos de 2% das espécies registradas possuem descrições de larvas ou pupas (Fang *et al.* 2018). Um exemplo disso são os imaturos da espécie-tipo de Rutelinae – *Rutela lineola* Linnaeus, 1767 – que só foram descritos em 2011, 244 anos após a descrição original do adulto, mesmo este sendo um inseto comum (Calisto & Morelli 2011). No Brasil, apenas 3,8% das espécies de Rutelinae registradas para o país possuem descrição de imaturos (Tabela 1).

As referências mais antigas aos imaturos de Rutelinae remontam aos séculos XVIII e XIX, com trabalhos mais focados em descrever a biologia e ecologia do que a morfologia, as descrições eram pouco informativas para identificação: *Anomala dubia* (Scopoli, 1763) [publicada como *Anomala frischii* Fabr.], publicada por Frisch (1720); *Phyllopertha horticola* Linnaeus, 1758 por Bouché (1830) e *Pelidnota punctata* (Linnaeus, 1758) por Harris (1841). As primeiras ilustrações aparecem em Frisch (1720) e Chapuis & Candize (1853) das espécies, respectivamente, *A. frischii* e *P. punctata*. No século XX, surgiram muitos trabalhos faunísticos, com chaves e descrições de imaturos de Scarabeoidea, incluindo Rutelinae, destacando-se aqui Arrow (1917), Hayes (1929), Gardner (1935) e Jansens (1947). Ritcher (1966) forneceu um dos trabalhos pioneiros no estudo de imaturos de Rutelinae neotropicais, compilando descrições de trabalhos anteriores, inclusão de novas descrições, notas biológicas, ilustrações de caracteres diagnósticos e uma chave de identificação de larvas para as tribos de Rutelinae (excluindo Alvarengiini, Anatistini e Geniatini). Este trabalho é um norte no estudo de imaturos de Rutelinae e após a sua publicação diversos autores descreveram imaturos da subfamília (Tabela 2). Neita-Moreno & Morón (2017) atualizaram a chave de Ritcher (1966) incluindo Geniatini. Os imaturos de Anatistini e Alvarengiini até então são desconhecidos, ambas as tribos possuem três espécies, cada uma, registradas para o Brasil (Tabela 1). As larvas de Rutelini são relativamente bem conhecidas e um número limitado de gêneros e espécies de

Anomalini têm sido descritas (Neita-Moreno & Morón 2017). Uma chave de identificação para larvas de terceiro ínstar de Anomalini do Novo Mundo foi fornecida por Filippini *et al.* (2017) e Pardo-Locano *et al.* (2017). Jameson & Morón (2001) apresentaram uma chave de identificação para as larvas de Rutelini americanos e uma chave para as pupas da mesma tribo foi fornecida por Bento & Fonseca (2020). Rodrigues *et al.* (2017b) apresentaram uma chave para as larvas conhecidas de Rutelinae no Novo Mundo.

Morfologicamente, as larvas de Rutelinae podem ser diferenciadas das outras larvas de Melolonthidae pelo seguinte conjunto de características: mandíbulas com uma área estridulatória ventral oval formada por um conjunto de estrias transversais; maxilas com um conjunto de dentes estridulatórios; gálea e lacínia da maxila fusionadas em mala; lacínia com um, dois, ou três unci apicais; epifaringe com ou sem proplegmata, plegmata presente ou ausente, dois nesia usualmente presentes; tergitos IX e X nunca fusionados; raster com ou sem palidia; abertura anal transversa, levemente curvada; pretarsos com duas cerdas (Richter 1966, Lawrence 1991). Morón *et al*. (2016) caracterizou as pupas de Rutelinae e Dynastinae com a presença de órgãos dioneiformes e ausência de urogonfo e de projeções tergais, humerais e pronotais. As pupas de Anomalini possuem os espiráculos V–VIII com peritrema e o espiráculo I oculto sob as asas; tergitos VII e VIII separados (Morón 1993). Rutelini possui 4–5 orgãos dioneiformes; espiráculo I geralmente oculto, espiráculos V–VIII sem peritrema; tergitos VII e VIII separados (Morón 1993).

**Adoretini**

Adoretini possui aproximadamente 555 espécies (Krajcik 2007) e apenas duas espécies com imaturos descritos detalhadamente, *Adoretus sinicus* Burmeister, 1855 descrito por Habeck (1963), e *Adoretus tenuimaculatus* Waterhouse, 1875 descrito por Fang *et al.* (2018), embora o gênero *Adoretus* Dejean, 1833 tenha aproximadamente 460 espécies (Krajcik 2007) e algumas sejam

importante pragas de culturas (McQuate & Jameson 2011). Na literatura encontra-se referências mais antigas a Habeck (1963) com descrições de imaturos de outras espécies de *Adoretus*, como em Gardner (1935), porém pouco informativas a nível de identificação. As larvas de Adoretini se caracterizam por possuírem um par de estemas; antenômero IV com um ponto sensorial dorsal; epifaringe com plegmata, gymnoparia bem desenvolvida e epitorma distinta; palidia ausente (Neita-Moreno & Morón 2017, Fang *et al*. 2018).

**Anomalini**

Anomalini é composta por aproximadamente 2.000 espécies descritas no mundo todo, no qual se destaca o gênero *Anomala* Samouelle, 1819 com cerca de 1000 espécies (Micó *et al.* 2003). Embora muitas espécies sejam associadas a habitats florestais, pelo menos 24 foram apontadas como pragas agrícolas, razão principal pela descrição dos seus imaturos (Pardo-Locano *et al.* 2017). No Novo Mundo, 35 espécies de Anomalini possuem imaturos conhecidos (Tabela 2), enquanto no Brasil apenas três espécies de Anomalini, das 17 registradas para o país, possuem imaturos descritos (Tabela 1). As larvas de Anomalini podem ser distinguidas das outras tribos de Rutelinae pelo seguinte conjunto de características: lacínia da maxila com dois unci de tamanhos similares; área ventral da mandíbula direita sem cerdas dorsomolares; epifaringe com três (raramente dois ou quatro) heli proeminentes, zygum como *cross-bar*, haptomerum fracamente projetado, plegmata bem desenvolvida, proplegmata ausente, crepis geralmente presente, cone sensorial e placa esclerotizada distintas; antenômero IV com um ponto sensorial dorsal; raster com duas palidia (Ritcher 1966, Neita-Moreno & Morón 2017, Rodrigues *et al.* 2017b).

**Anoplognathini**

Anoplognathini possui oito espécies com imaturos descritos de um total de 150 espécies conhecidas (Paucar-Cabrera & Smith 2002, Cisternas & Carillo, 2012, Neita-Moreno & Morón 2017, Neita-Moreno *et al.* 2021). Hardy (1976) descreveu a larva de *Saulostomus villosus* Waterhouse, 1878 para a Tasmânia, Austrália. McQuillan (1985) redescreveu a larva de *S. villosus* e descreveu a de *Anoplognathus suturalis* Boisduval, 1835, também para a Tasmânia. Paucar-Cabrera & Smith (2002) descreveram as larvas de *Platycoelia gaujoni* Ohaus, 1904 e *P. lutescens* Blanchard, 1851, ambas encontradas no Equador, sendo as primeiras larvas de Anoplognathini descritas para a Região Neotropical. Cisternas & Carrillo (2012) descreveram *Hylamorphas elegans* (Burmeister, 1844) e *Aulacopalpus punctatus* (Fairmaire & Germain, 1860) para o Chile. Neita-Moreno & Morón (2017) descreveram *P. valida* Burmeister, 1844 para a Colômbia e, por último, Neita-Moreno *et al.* (2021) também descrevem *P. puncticollis* Ohaus, 1904 para a Colômbia. As larvas de Anoplognathini podem ser diferenciadas das demais tribos de Rutelinae pelas seguintes características: um ou mais de um ponto sensorial dorsal no antenômero IV; haptomerum da epifaringe sem heli, zygum em forma de bico, plegmata ausente; lacínia da maxila com três unci; raster geralmente com palidia ausente (Ritcher 1966, Neita-Moreno & Morón 2017, Paucar-Cabrera & Smith 2002, Rodrigues *et al.* 2017b).

**Geniatini**

Geniatini inclui 13 gêneros e 346 espécies e, destes, 11 gêneros e 209 espécies são registradas para o Brasil (Ferreira 2020, Ferreira & Grossi 2023), no entanto somente três espécies de Geniatini possuem imaturos descritos e apenas dois possuem registro no país. Pardo-Locano *et al*. (2006) descreveram os imaturos de *Leucothyreus femoratus* Burmeister, 1844, primeira larva descrita para Geniatini. Fuhrmann (2013) descreveu os imaturos de *Geniates barbatus* Kirby, 1819 e Rodrigues *et al*. (2017b) descreveram os imaturos de *G. borelli* Camerano, 1894. Larvas de *Leucothyreus*

MacLeay, 1819 foram reportadas como pragas de soja em Mato Grosso por Rodrigues & Pereira (2014), onde consomem as raízes da cultura. Larvas de Geniatini podem ser caracterizadas pelas seguintes características: presença de um ponto sensorial dorsal no antenômero IV; presença de estemas; epifaringe sem heli, crepis distinto, cone sensorial e placa esclerotizada distintos; raster com palidia presente (Fuhrmann 2013, Neita-Moreno & Morón 2017, Pardo-Locano *et al*. 2006, Rodrigues *et al.* 2017b).

**Rutelini**

Larvas de Rutelini são relativamente bem conhecidas quando comparada com outras tribos de Rutelinae (Neita-Moreno & Morón 2017), 21 gêneros e 44 espécies possuem larvas descritas, e apenas dez gêneros e 20 espécies possuem pupas descritas (Tabela 2), mas levando-se em consideração que existem aproximadamente 75 gêneros e 650 espécies de Rutelini descritas no mundo (Machatschke 1972), apenas imaturos de 28% dos gêneros e de 7% das espécies da tribo são conhecidas. No Brasil, esse padrão se repete com aproximadamente 5% das 243 espécies de Rutelini registradas para o país (Ferreira & Grossi 2023) que possuem descrição de imaturos (Tabela 1). A obra de Ritcher (1943, 1945, 1966) é uma das mais importantes dentre os trabalhos de imaturos de Rutelini neotropicais e foi seguida por vários autores (Tabela 02), destacando-se os trabalhos de Morón (1976a, 1976b, 1983, 1993, Morón & Paucar-Cabrera 2003, Morón & Nogueira 2000, Morón & Deloya 2001) e Jameson (1996, 1998, Jameson *et al.* 1994, Jameson & Morón 2001), principais referências em estudos de imaturos de Rutelini. As larvas de Rutelini podem ser caracterizadas pelo seguinte conjunto de características: estipes da maxila com 5–14 dentes estridulatórios e com um processo anterior; lacinia com um ou dois unci (reduzidos ou não); epifaringe com haptomerum proeminente, um ou dois nesia presentes; proplegmata ausente; plegmata presente ou ausente; último

segmento antenal com dois ou mais pontos sensoriais; raster com ou sem palidia (Jameson & Morón 2001).

**Justificativa e objetivos**

Rutelinae, apesar de sua relevância na ecologia de sistemas florestais e do grande número de espécies registradas em todo o mundo, possui conhecimento escasso quanto às descrições dos seus imaturos e ao conhecimento sobre a sua biologia. A descrição de larvas e pupas pode trazer novos conhecimentos sobre caracteres diagnósticos que podem ser úteis para corroborar hipóteses sobre a monofilia de tribos e subtribos, bem como de gêneros, ampliando a taxonomia desta subfamília. Além disso, estudos sobre a biologia e dados de distribuição destes besouros podem contribuir com a preservação de habitats ameaçados, dada a especificidade destes insetos, auxiliando o conhecimento sobre a biodiversidade da fauna brasileira e, consequentemente, a sua conservação. Com isso, o objetivo dessa tese é realizar novas descrições de larvas e pupas de espécies da fauna brasileira e, com isso, contribuir com o conhecimento de imaturos de Rutelinae neotropicais. Além disso, gerar novos dados taxonômicos que possam corroborar as propostas de classificação existentes para a subfamília e classificações inferiores, a partir de novas descrições e através da comparação morfológica de imaturos.

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*Referências que a autora não teve acesso.

**Tabelas:**

Tabela 1. Número de gêneros e espécies de Rutelinae (Coleoptera: Melolonthidae) com imaturos descritos em comparação com o número de espécies e gêneros registrados para o Brasil[1].

| | **Total de espécies registradas para o Brasil** | **Espécies que ocorrem no Brasil com descrição de imaturos** | **Total de gêneros registrados para o Brasil** | **Gêneros que ocorrem no Brasil com descrição de imaturos** |
|---|---|---|---|---|
| **Alvarengiini** | 3 | 0 | 2 | 0 |
| **Anatistini** | 3 | 0 | 1 | 0 |
| **Anomalini** | 17 | 3 | 3 | 2 |
| **Anoplognathini** | 1 | 0 | 1 | 1 |
| **Geniatini** | 209 | 2* | 11 | 2 |
| **Rutelini** | 243 | 13* | 40 | 7 |
| **Total** | 476 | 18 (3,8%) | 58 | 12 (20,7%) |

[1]Atualizado de acordo com o Catálogo Taxonômico da Fauna do Brasil (Ferreira & Grossi 2023).

* Em Geniatini Rodrigues *et al*. (2017) descreveram a larva e a pupa de *Geniates borelli* coletadas no Brasil, apesar de esta espécie não estar oficialmente incluída no Catálogo Taxonômico da Fauna do Brasil (Ferreira & Grossi 2023) seu registro é contabilizado aqui. Assim como *Pelidnota fulva* e *P. granulata* também são contabilizadas aqui, pois Rodrigues *et al*. (2012) e Bento & Fonseca (2020), respectivamente, registraram a coleta dessas espécies no Brasil.

Tabela 2. Espécies de Rutelinae (Coleoptera: Melolonthidae) do Novo Mundo com imaturos descritos (Atualizado de Albertoni *et al.* 2014 [em Rutelini] e Neita-Moreno *et al.* 2021 [em Anoplognathini]):

| **Espécies** | **Imaturos publicados como** | **Larva** | **Pupa** | **Referência** |
|---|---|---|---|---|
| **Anoplognathini** | | | | |
| *Aulacopalpus punctatus* (Fairmaire & Germain, 1860) | igual | x | | Cisternas & Carrillo 2012 |
| *Anoplognathus suturalis* Boisduval, 1835 | igual | x | | McQuillan 1985 |
| *Hylamorphas elegans* (Burmeister, 1844) | igual | x | | Cisternas & Carrillo 2012 |
| *Platycoelia gaujoni* Ohaus, 1904 | igual | x | | Paucar-Cabrera & Smith 2002 |
| *Platycoelia lutescens* Blanchard, 1850 | igual | x | | Paucar-Cabrera & Smith 2002 |
| *Platycoelia puncticollis* Ohaus, 1904 | igual | x | x | Neita-Moreno *et al*. 2021 |
| *Platycoelia valida* Burmeister, 1844 | igual | x | x | Neita-Moreno & Morón 2017 |
| *Saulostomus villosus* Waterhouse, 1878 | igual | x | | Hardy 1976, McQuillan 1985 |
| **Anomalini** | | | | |
| *Anomala balzapambae* Ohaus, 1897 | igual | x | | Filippini *et al*. 2017 |
| *Anomala binotata* Gyllenha, 1817 | igual | x | | Ritcher 1943, 1966 |
| *Anomala cincta* Say, 1835 | igual | x | x | Micó *et al*. 2003 |
| *Anomala cupricollis* (Chevrolat, 1834) | *Callisthetus cupricollis* (Chevrolat, 1834) | x | | Micó et al. 2003 |
| *Anomala denticollis* Bates, 1888 | *Paranomala denticollis* (Bates, 1888) | x | | Ramirez-Salinas *et al*. 2011 |
| *Anomala discoidallis* Bates, 1888 | igual | x | | Micó *et al*. 2003 |
| *Anomala discoidallis* Bates, 1888 | igual | | x | Filippini *et al*. 2017 |
| *Anomala flavila* Bates, 1888 | *Paranomala flavila* (Bates, 1888) | x | | Mozo *et al*. 2014 |
| *Anomala flavipennis* Burmeister, 1844 | igual | x | | Ritcher 1943, 1966 |
| *Anomala foraminosa* (Bates, 1888) | *Paranomala foraminosa* (Bates, 1888) | x | | Mozo *et al.* 2014b |
| *Anomala forreri* Bates, 1888 | igual | x | | Micó *et al*. 2003 |
| *Anomala hoepfneri* Bates, 1888 | igual | x | | García *et al.* 2009 |
| *Anomala hoepfneri* Bates, 1888 | *Paranomala hoepfneri* (Bates, 1888) | x | | Mozo *et al*. 2014 |
| *Anomala inconstans* Burmeister, 1844 | igual | x | | Ramirez-Salinas *et al.* 2004 |
| *Anomala innuba* (Fabricius, 1787) | igual | x | | Ritcher 1943,1966 |

Tabela 2. Continuação:

| **Espécie** | **Imaturos publicados como** | **Larva** | **Pupa** | **Referência** |
|---|---|---|---|---|
| *Anomala kansana* Hayes & McColloch, 1924 | igual | x | | Ritcher 1943, 1966 |
| *Anomala lucicola* (Fabricius, 1798) | igual | x | | Ritcher 1943, 1966 |
| *Anomala ludoviciana* Schaeffer, 1906 | igual | x | | Ritcher 1943, 1966 |
| *Anomala marginata* (Fabricius, 1973) | igual | x | | Ritcher 1943, 1966 |
| *Anomala minuta* Burmeister, 1844 | igual | x | | Ritcher 1943, 1966 |
| *Anomala nigropicta* Casey, 1915 | igual | x | | Ritcher 1943, 1966 |
| *Anomala oblivia* Horn, 1884 | igual | x | | Ritcher 1943, 1966 |
| *Anomala orientalis* (Waterhouse, 1875) | igual | x | | Ritcher 1943, 1966 |
| *Anomala popayana* Ohaus, 1897 | igual | x | x | Filippini *et al*. 2017 |
| *Anomala sticticoptera* Blanchard, 1851 | igual | x | | Micó *et al*. 2003 |
| *Anomala testaceipennis* Blanchard, 1856 | igual | x | x | Rodrigues *et al*. 2017b |
| *Anomala trapezifera* Bates, 1888 | *Paranomala trapezifera* (Bates, 1888) | x | | Ramirez-Salinas *et al*. 2011 |
| *Anomala undulata* Melsheimer, 1844 | igual | x | | Pardo-Locano *et al*. 2017 |
| *Anomala valida* Burmeister, 1844 | igual | x | | Filippini *et al*. 2017 |
| *Callistethus buchwaldianus* (Ohaus, 1908) | igual | x | | Filippini *et al*. 2017 |
| *Callistethus levii* (Blanchard, 1851) | igual | x | x | Filippini *et al*. 2017 |
| *Pachystethus vidua* (Newman, 1838) | *Callisthetus vidua* (Newman, 1838) | x | | Micó et al. 2003 |
| *Popillia japonica* (Newman, 1838) | igual | x | | Ritcher 1943, 1966 |
| *Strigoderma arboricola* (Fabricius, 1792) | igual | x | | Ritcher 1943, 1966 |
| *Strigoderma costulipennis* Bates, 1888 | igual | x | | Mozo *et al*. 2014 |
| *Strigoderma pygmaea* (Fabricius, 1798) | igual | x | | Ritcher 1945, 1966 |
| *Strigoderma sulcipennis* Burmeister, 1844 | igual | x | | Pardo-Locano *et al*. 2017 |
| **Geniatini** | | | | |
| *Geniates barbatus* Kirby, 1819 | igual | x | x | Fuhrmann 2013 |
| *Geniates borelli* Camerano, 1894 | igual | x | x | Rodrigues *et al*. 2017b |
| *Leucothyreus femoratus* Burmeister, 1844 | igual | x | x | Pardo-Locano *et al*. 2006 |

Tabela 2: Continuação:

| Espécie | Imaturos publicados como | Larva | Pupa | Referência |
|---|---|---|---|---|
| **Rutelini** | | | | |
| *Calomacraspis concina* (Blanchard, 1850) | igual | x | | Jameson *et al.* 1994 |
| *Chlorota cincticollis* Blanchard, 1850 | igual | x | x | Jameson & Morón 2001 |
| *Chlorota paulistana* Ohaus, 1912 | igual | x | x | Carvalho *et al*. 2019 |
| *Chrysina adelaida* (Hope, 1840) | *Plusiotis adelaida* Hope, 1840 | x | | Morón 1976a |
| *Chrysina macropus* (Francillon, 1795) | igual | x | | Morón 1976a |
| *Chrysina woodi* (Horn, 1885) | *Plusiotis woodi* Horn, 1885 | x | | Ritcher 1948, 1966 |
| *Chrysophora chrysochlora* (Latreille, 1811) | igual | x | x | Pardo-Locano & Morón 2007 |
| *Cnemida intermedia* Bates, 1888 | igual | x | | Jameson 1996 |
| *Cnemida retusa* (Fabricius, 1801) | igual | | x | Bento *et al*. 2018 |
| *Cotalpa lanigera* (Linnaeus, 1758) | igual | x | | Ritcher 1945, 1966 |
| *Heterosternus buprestoides* Dupont, 1832 | igual | x | | Morón 1983 |
| *Homonyx chalceus* Blanchard, 1850 | igual | x | x | Morelli 1996 |
| *Lagochile collaris* (Blanchard, 1850) | *Chasmodia collaris* (Blanchard, 1850) | x | | Jameson & Morón 2001 |
| *Lagochile emarginata* (Gyllenhal, 1817) | igual | x | x | Albertoni *et al*. 2014 |
| *Macraspis aterrima* Waterhouse, 1881 | igual | x | x | Morón & Paucar-Cabrera 2003 |
| *Macraspis chrysis* (Linnaeus, 1764) | igual | x | x | Morón & Paucar-Cabrera 2003 |
| *Macraspis chrysis* (Linnaeus, 1764) | *Macraspis rufonitida* Burmeister, 1844 | x | | Morón 1976b |
| *Macraspis cincta* (Drury, 1782) | igual | x | x | Vanin & Costa 1980 |
| *Macraspis clavata* Olivier, 1789 | igual | x | | Medeiros *et al*. 2019 |
| *Macraspis dichroa cribata* Waterhouse, 1881 | igual | x | | Monné 1969 |
| *Macraspis festiva* Burmeister, 1844 | igual | x | x | Morón & Paucar-Cabrera 2003 |
| *Macraspis morio* (Burmeister, 1844) | igual | x | x | Begha & Santos 2020 |
| *Macraspis pseudochrysis* Landin, 1956 | igual | x | x | Morón & Paucar-Cabrera 2003 |
| *Macraspis rufonitida* Burmeister, 1844 | igual | x | x | Morón & Paucar-Cabrera 2003 |
| *Macropoides crassipes* (Horn, 1866) | igual | x | | Morón 1983 |
| *Macropoides nietoi* Guérin, 1844 | igual | x | | Morón 1983 |

Tabela 2: Continuação:

| **Espécie** | **Imaturos publicados como** | **Larva** | **Pupa** | **Referência** |
|---|---|---|---|---|
| *Microrutella viridiaurata* (Bates, 1888) | igual | x | | Jameson 1998 |
| *Paracotalpa ursina* (Horn, 1867) | igual | x | | Ritcher 1948, 1966 |
| *Paraheterosternus luedeckei* (Becker, 1907) | igual | x | x | Morón & Nogueira 2000 |
| *Parastasia brevipes* (LeConte, 1856) | igual | x | | Ritcher 1945, 1966 |
| *Parisolea pallida* (Candéze, 1869) | igual | x | | Morón 1983 |
| *Pelidnota fulva* Blanchard, 1850 | igual | x | | Rodrigues *et al*. 2012 |
| *Pelidnota granulata* (Gory, 1834) | igual | | x | Bento & Fonseca 2020 |
| *Pelidnota lugubris* (LeConte, 1874) | igual | x | x | Lugo-García *et al.* 2019 |
| *Pelidnota prolixa* Sharp, 1877 | igual | x | x | Barria *et al*. 2021 |
| *Pelidnota punctata* (Linnaeus, 1785) | igual | x | | Ritcher 1945, 1966 |
| *Pelidnota virescens* Burmeister, 1844 | igual | x | | Morón 1976a |
| *Platyrutela arenicola* Sólis & Morón, 1998 | igual | x | | Sólis & Morón 1998 |
| *Platyrutela cribata* Bates, 1888 | igual | x | | Sólis & Morón 1998 |
| *Pseudocotalpa sonoria* Hardy, 1974 | igual | x | | Dam & Dam 2006 |
| *Rutela dorcyi* (Olivier, 1789) | igual | x | x | Jameson 1998 |
| *Rutela formosa* Burmeister, 1844 | igual | x | | Ritcher 1966 |
| *Rutela lineola* (Linnaeus, 1767) | igual | x | | Calisto & Morelli 2011 |
| *Rutela sanguinolenta sanguinolenta* Waterhouse, 1874 | igual | x | x | Barria & Emmen 2020 |
| *Rutelisca durangoana* Ohaus, 1905 | igual | x | x | Morón & Deloya 1991 |

CAPÍTULO 2

# DESCRIPTION OF THE IMMATURES OF SIX SPECIES OF ANTICHEIRINA (COLEOPTERA: MELOLONTHIDAE: RUTELINAE: RUTELINI) [1]

TAMARA G. CARVALHO[2], JUARES FUHRMANN[3], PASCHOAL C. GROSSI[2]

[2]Universidade Federal Rural de Pernambuco, Programa de Pós-Graduação em Entomologia, Recife, PE - Brazil

[3]Universidade de São Paulo, Museu de Zoologia, São Paulo, SP - Brazil

[1]Carvalho, T.G, J. Fuhrmann[3] & P.C. Grossi. Description of the immatures of six species of Anticheirina (Coleoptera: Melolonthidae: Rutelinae: Rutelini). For submission in European Journal of Taxonomy.

ABSTRACT - The first immature description for the genera *Anticheira* Eschscholtz, 1818, *Anticheiroides* Soula, 1998, *Telaugis* Burmeister, 1844, and *Vayana* Ohaus, 1915 (Melolonthidae: Rutelinae) is presented. Here, we describe the female pupa of *Anticheira capucina* (Fabricius, 1787), the male pupa of *Anticheiroides brullei* (Castelnau, 1840), the last larval instar and pupa of *Macraspis laevicollis* (Waterhouse, 1881) and *M. variabilis* Ohaus, 1914, the female pupa of *Telaugis aenescens* Burmeister, 1844, and the last larval instar and female pupa of *Vayana bicolor* (Olivier, 1789). Illustrations and diagnostic characters are presented for all the species. The key to larvae of *Macraspis* and the key to Rutelini pupae are updated. With this study, immatures of six species of Anticheirina scarabs are firstly described and their diagnostic characters and differences are discussed for the first time.

KEYWORDS: Neotropical**,** Scarabaeoidea, taxonomy, white grubs

DESCRIÇÃO DOS IMATUROS DE SEIS ESPÉCIES DE ANTICHEIRINA (COLEOPTERA: MELOLONTHIDAE: RUTELINAE: RUTELINI)

RESUMO – É apresentada aqui a primeira descrição de imaturos para os gêneros *Anticheira* Eschscholtz, 1818, *Anticheiroides* Soula, 1998, *Telaugis* Burmeister, 1844, e *Vayana* Ohaus, 1915 (Melolonthidae: Rutelinae). Neste trabalho, são descritas: a pupa fêmea de *Anticheira capucina* (Fabricius, 1787), a pupa macho de *Anticheiroides brullei* (Castelnau, 1840), o último ínstar larval e pupa de *Macraspis laevicollis* (Waterhouse, 1881) e *M. variabilis* Ohaus, 1914, a pupa fêmea de *Telaugis aenescens* Burmeister, 1844, o último ínstar larval e pupa fêmea de *Vayana bicolor* (Olivier, 1789). São apresentadas ilustrações e caracteres diagnósticos para todas as espécies. A chave para larvas de *Macraspis* e a chave de pupas de Rutelini são atualizadas. Com esse estudo, imaturos de seis espécies de Anticheirina são descritas pela primeira vez, e seus caracteres diagnósticos e diferenças são aqui discutidas.

**PALAVRAS-CHAVE:** Coró, Neotropical**,** Scarabaeoidea, taxonomia

## Introduction

Anticheirina scarabs *sensu* Soula (1998, 2002a, 2002b, 2003, 2005) are composed of 44 genera, 550 species and subspecies, being the richest group of Rutelinae in the Neotropical region (Moore *et al*. 2014). Previously, Anticheirina was considered a subtribe of Rutelini, however, Jameson (1997) due to lack of phylogenetic support propose Anticheirina as a synonym of Rutelina (Rutelini) (Bouchard *et al*. 2011). Apparently, many genera are not monophyletic and the group as a whole lacks a complete taxonomic and phylogenetic study to clarify its limits (Clavijo-Bustos *et al*. 2022). However, the rarity of the specimens in collections, difficult access to types, and intraspecific variation make this taxonomic work difficult (Moore *et al*. 2014). The immatures of Few species of Anticheirina are known, totaling 21 species and nine genera: *Anticheira* Eschscholtz, 1818, *Anticheiroides* Soula, 1998, *Calomacraspis* Bates, 1888, *Chlorota* Burmeister, 1844, *Lagochile* Hoffmannsegg, 1817, *Macraspis* MacLeay, 1819, *Platyrutela* Bates, 1888, *Telaugis* Burmeister, 1844, and *Vayana* Ohaus, 1915 (Jameson & Morón 2001, Albertoni *et al.* 2014, Carvalho *et al.* 2019, Medeiros *et al.* 2019, Begha & Santos *et al*. 2020, present study). Anticheirina immatures are saproxylophagous and found in rotten wood (Moron & Paucar-Cabrera 2003). Adult specimens can be collected with fermented fruit traps and were observed in the forest canopy, feeding on floral parts (Moore *et al*. 2014, Puker *et al*. 2020).

*Macraspis* is a Neotropical genus recorded from Mexico to Argentina, with great variation in size and coloration (Soula 1998). This genus includes 71 species and 19 subspecies (Bento *et al*. 2022), whose greatest diversity is found Brazil, with 34 species (Vaz-de-Mello & Grossi 2022) representing about 48% of the genus species richness. Of those, only 11 have immatures described: *Macraspis cribata* Waterhouse, 1881 by Monné (1969); *M. cincta* (Drury, 1782) by Vanin & Costa (1980); *M. aterrima* Waterhouse, 1881, *M. crhysis* (Linnaeus, 1764), *M. festiva* Burmeister, 1844, *M. pseudochrysis* Landin, 1956, and *M. rufonitida* Burmeister, 1844 by Morón & Paucar-Cabrera

(2003); *M. clavata* (Olivier, 1789) by Medeiros *et al.* (2019); *M. morio* Burmeister, 1844 by Begha & Santos (2020); *M. laevicollis* (Waterhouse, 1881) and *M. variabilis* Burmeister, 1844 (present study). Of these, only *M. aterrima* and *M. rufonitida* are not reported for Brazil. Larvae of *Macraspis* are saproxylophagous and immature stages are usually found in rotten trunks of various species, humid wood, or soil, feeding on decaying plant matter, and can be found associated with pupae and teneral adults (Morón & Paucar-Cabrera 2003, Medeiros *et al.* 2019, Begha & Santos 2020). Medeiros *et al*. (2019) report that adults of *M. clavata* were collected feeding on flowers of *Tibouchina* spp. (Melastomataceae), *Inga striata* (Mimosoideae), and Myrtaceae. Whereas Morón & Paucar-Cabrera (2003) recorded collection of adults of *M. chrysis* in flowers of *Manguifera indica* (Anacardiaceae) and *M. pseudochrysis* in leaves of mangrove, Lima & Castro (2020) reported *Macraspis sp.* in *Abelmoschus esculentus* (Malvaceae).

Until the present moment, the immatures of *Anticheira*, *Anticheiroides*, *Telaugis,* and *Vayana* were not known, and little is known about the natural history of these genera. *Anticheira* contains six valid species and subspecies (Moore *et al.* 2014), with two recorded for Brazil (Vaz-de-Mello & Grossi 2022), *Anticheira capucina* (Fabricius, 1787) has distribution in Brazil, the Amazon region, and Guyana (Soula 1998). *Anticheiroides* is formed by nine species (Soula 1998, Soula 2003, Moore *et al.* 2014) of which six are recorded for Brazil (Vaz-de-Mello & Grossi 2022), *Anticheiroides brullei* (Castelnau, 1840) occurs on the humid slopes of South and Southeast Brazil and probably has nocturnal habits (Soula 1998). *Telaugis* is a monotypic genus recorded for South America, including Brazil (Soula 1998, 2002a). *Vayana* comprises three species and just *V. melzeri* Ohaus, 1928 is recorded for Brazil (Soula 1998, 2002b, Vaz-de-Mello & Grossi 2022), *Vayana bicolor* (Olivier, 1789) is reported for French Guyana and Soula (1998) suggests that this specie distributes in the Brazillian Amazon, here its occurrence is confirmed for Brazil for the first time.

The present study aims to contribute to the taxonomic knowledge of the immature stages of Anticheirina. Third-instar larvae and pupae of *Macraspis laevicollis* (Waterhouse, 1881) and *M. variabilis* Burmeister, 1844 are described and compared. An updated key to the larvae is also provided. Additionally, we give the first description of the pupae of *Anticheira capucina* (Fabricius, 1787), *Anticheiroides brullei* (Castelnau, 1840), *Telaugis aenescens* Burmeister, 1844, and third-instar larva and pupa of *Vayana bicolor* (Olivier, 1789).

## Methodology

Descriptions of the immatures of *Macraspis laevicollis* were made based on two third instar larvae, and one female pupa, collected in Pico da Caledônia (1800m), Nova Friburgo, Rio de Janeiro, Brazil, on 12 April 2001, by Paschoal Grossi. For descriptions of the immatures of *Macraspis variabilis*, we used one third instar larva and one pupa, collected in October 2005, in Piraquara municipality, Paraná, Brazil, by Grossi. One male pupa *Anticheiroides brullei* was collected in November 2009, in Jaguariaíva, Paraná, Brazil, also by Grossi. All specimens were deposited in CERPE (Coleção Entomológica da Universidade Federal Rural de Pernambuco, Recife, Brazil – Paschoal Grossi curator). One last larval instar and one female pupa of *Vayana bicolor* collected in Tarumã, Manaus, Amazonas, Brazil, in December 2020, by M. Bento, is described. For the description of *Telaugis aenescens*, we used one female pupa from Museu da Amazônia (MUSA), Manaus, Amazonas, Brazil, collected on 12 June 2020 by Bento, Lima & Deballos. And is described one female pupa of *Anticheira capucina* from the same locality and collected in March 2020, by M. Bento. [Manaus, Amazonas, Brazil; Museu da Amazônia (MUSA); iii. 2020; M. Bento collector] is described. All these later specimens are housed in the Invertebrate Collection of Instituto Nacional de Pesquisas da Amazônia (INPA), Manaus, Brazil – Dr. Márcio Luiz de Oliveira curator.

The terminology of larvae follows Böving (1936) and Lawrence (1991), and head chaetotaxy and pupa terminology follows Sousa *et al*. (2018). Family-level classification follows Cherman & Morón (2014).

For the morphological study, the specimens were dissected and stored in containers containing 80% ethanol. The head, mouthparts, and spiracles were mounted on temporary laminas and, after being analyzed, stored. Structure analysis, comparison, and description of the larvae and pupae were performed with the assistance of ZEISS STEMI 508 stereoscope and OLYMPUS BX41 optical microscope. Drawings were made with the assistance of OLYMPUS SZX12 stereoscopic microscope with an attached clear camera. Photographs were taken with a NIKON D5300 camera attached to a ZEISS STEMI 508 stereo microscope. Image editing was done using the GIMP®.

## Results and Discussion

***Macraspis laevicollis* (Waterhouse, 1881)**

**Specimens examined:** Two larvae of 3º instar, and one female pupa: 12. iv. 2001, Pico da Caledônia (1800m), Nova Friburgo, Rio de Janeiro, Brazil, P. Grossi (collector) (CERPE).

**Third larval instar** (Figs. 1-2)

Description. *Total Length:* 41.70 mm. Surface smooth pubescent. *Colour:* yellowish white; head, pretarsus, spiracles, and pubescence reddish brown (Fig. 1A). **Head** (Fig. 1B) *Length:* 6.50 mm, *width:* 5.60 mm. Epicranial suture present, each side with 3–4 dorsoepicranial setae (*des*), 2–5 posteroepicranial setae (*pes*), 1–2 anteroepicranial setae (*aes*), 2–7 externoepicranial setae (*ees*), 4–5 posterofrontal setae (*pfs*), 1 externofrontal seta (*efs*), 1–2 anterofrontal angle setae (*aas*), 2–3 anterofrontal setae (*afs*). Stemmata present. Clypeus subtrapezoidal, sparsely punctate, each side with 2–3 externoclypeal setae (*ecs*), one minute anteroclypeal seta (*acs*). Labrum rounded,

rugopunctate, each side with 2–3 posterolabral setae (*pls*), 2–3 laterolabral setae (*lls*), one mediolabral seta (*mls*), and a group of 13 anterolabral setae (*als*). **Epipharynx** (Fig. 2I) wider than long. *Corypha* with a row of seven setae, epizygum and clythra absent. *Haptomerum* prominent with 17 tooth-like setae and 10 sensilla, zygum crossbar-like, heli absent. *Paria*, each side of acroparia with five setae, each acanthoparia with 7–8 spine-like setae; right chaetoparia with 50 setae and seven sensilla, left chaetoparia with 29 setae and 11 sensilla; gymnoparia distinct, phoba, plegmatia, and proplegmatia absent. *Pedium* asymmetric, without sensilla, phoba absent. *Haptolachus* with right side with four setae and four sensilla, left side with four setae and two sensilla; crepis indistinct; sensorial cone prominent with three sensilla; sclerotized plate indistinct; dexiotorma slightly sinuous; apotorma indistinct, laeotorma slightly curved, pternotorma rounded, epitorma as a depressed line. **Mandibles.** Right mandible (Figs. 2C-D) with 12 dorsomolar setae in a row, and seven ventromolar setae in a tuft; brustia with four setae; scrobe with seven setae; dorsolateral furrow with three setae; ventral process subquadrangular. Right incisor with two teeth, a right molar with three lobes: m1 and m2 rounded, m3 acute, calx subrectangular. Left mandible (Figs. 2A-B) with eight dorsomolar setae in a row, and seven minutes ventromolar setae in a tuft; brustia with 15 setae; scrobe with eight setae; dorsolateral furrow with two setae; ventral process prominent, subtriangular. Left incisor with three teeth; molar with m1 prominent and truncate, m2 acute; acia indistinct. **Maxilla** (Figs. 2E-F) symmetrical, galea and lacinia fused in a mala, mala setose, uncus of galea prominent and long, lacinia with two unci (Fig. 2G); palpus 4-segmented, palpomere III with two long setae, palpomere IV fusiform; stipe with stridulatory area bearing a row of 5–6 teeth and an obsolete truncate process. **Labium.** Prementum with five anteromedial setae, 3–4 anterolateral setae, two posteromedial setae, and two anteromedial sensilla; each side of mentum with one seta, right side with one sensillum; each side of submentum with 1–2 anterolateral setae, 1–2 posterolateral setae; ligula with five anteromedial setae, each side with 17–19 setae and a total of 22 sensilla, without phoba and heli.

**Hypopharynx** (Fig. 2H) with scleroma asymmetrical, transversal; right lobe with eight setae in the anterior margin; left lobe with 12 setae in the anterior margin, and a row of 12 setae; hypopharyngeal tubercle with transversal apex; right posterior preoral area (*ppa*) without setae and sensilla, left *ppa* with six setae and one sensillum. **Antenna** 4-segmented; antennomeres I with similar length than II, II longer than III, and III longer than IV; antennomere III with ventral tubercle; antennomere IV with five dorsal sensorial spots and eight ventral sensorial spots (Figs. 1F-G). **Thorax.** Prothorax with a distinct dorsal lobe and a lateral sclerite, tergal lobe covered by 16 setae, spiracle lobe with 15–18 setae, pleural lobe with 7–9 setae, ventral lobe with 31 setae. Meso- and metathorax with three distinct dorsal lobes, anterior tergal lobe with 12 setae, medial tergal lobe with 42–44 setae, posterior tergal lobe with 9–13 setae, and lateral tergal lobe with 15–20 setae; anterior pleural lobe with 1–9 setae, posterior pleural lobe with 7–9 setae; anteromedial ventral lobe with 29–37 setae, posterior ventral lobe with up to two setae. Thoracic spiracle: c-shaped, dorsoventral axis about 0.8x longer than dorsoventral axis of abdominal spiracles, dorsoventral diameter of bulla twice longer than the distance between respiratory plate arms. **Legs.** All legs with similar size and shape, femur with size crescent from anterior to posterior, pro- and mesopretarsus falciform with two lateral setae, metapretarsus shorter than pro- and mesopretarsus (Figs. 1C-E). **Abdomen** with 10 segments; segment I with two dorsal lobes; segments II–VI with three dorsal lobes each; segment VII with three slightly distinct dorsal lobes; segments VIII–X without dorsal divisions. Segment I with tergal anterior lobe (*tal*) covered by 24 setae, tergal posteromedial lobe with 64 setae, tergal lateral lobe (*tll*) with 4–6 setae; pleural anterior lobe (*pal*) without setae, pleural posterior lobe (*ppl*) with 12–13 setae, spiracle lobe (*esl*) with 5–7 setae; ventral anterior lobe (*val*) with 18 setae, ventral medial lobe (*vml*) with two setae, and ventral posterior lobe (*vpl*) without seta. Segments II–VI with *tal* covered by 75–116 setae, tergal medial lobe (*tml*) with 54–108 setae, *tll* with 5–9 setae, tergal posterior lobe (*tpl*) with 112–134 setae; *pal* with 0–4 setae, *ppl* with 9–19 setae, *esl* with 8–14 setae; *val* with 5–15

setae, *vml* with 4–5 setae, and *vpl* without setae. Segment VII with *tal* covered by 90 setae, *tml* with 51 setae, without *tll*, *tpl* with 12 setae; *pal*, *ppl*, and *esl* with similar setation as segment II–VI; *val* with one seta, *vml* with 09 setae, and *vpl* without setae. Segments VIII–IX with a tergal anterior row of 9–16 setae, and a tergal posterior row of 13–15 setae; pleural lobe with 13–20 setae, *esl* of the segment VIII with similar setation as segment II–VII; ventral lobe with 9–10 setae. Segment X dorsally covered by approximately 307 minutes setae. Raster (Fig. 1H) with palidium barely distinct, each palidium with about 15–17 pali. Each tegillum with 114–132 setae, and 29 of them pre-septula. Campus visible, and barbula indistinct. Anal opening transverse. Spiracles c-shaped with dorsoventral diameter of bulla subequal the distance between respiratory plate arms, and dorsoventral axis about 0.6x larger than anteroposterior axis.

**Remarks:** Third instar larvae of *Macraspis laevicollis* can be differentiated from others in *Macraspis* species by: lacinia of maxilla with 2 unci; each side of frons with 4–5 posterofrontal setae; labrum with 2–3 posterolabral setae each side; stridulatory area of maxilla with 5–6 teeth; antennomere IV with 5 dorsal sensorial spots.

**Female pupa** (Figs. 3A-B)

Description. *Total length:* 23.00 mm, *width*: 13.20 mm. The general aspect of body: oval shape, color yellowish, surface macroscopically glabrous, tergite IX posteriorly pubescent. **Head.** Vertex visible from dorsal view, epistomal suture sinuous and medially indistinct. Eyes partially covered by angles of pronotum. Canthus small, rounded, slightly prominent. Frons with six longitudinal grooves, parallel to each other. Clypeus transverse, subrectangular, each side with a lateromedial concavity. Labrum transverse, anterior margin rounded. The inner half of mandible, acuminate; out half, rounded. Maxillary palpi 0.5x the length of the antenna. Labium hidden in ventral view by the pterothoracic ventrite process. Antenna triangular, inner margin slightly sinuous, outer margin sinuous, posterior margin rounded. **Thorax.** Pronotum wider than long, suboctagonal, anterior

margin sinuous, anterolateral margin oblique, posterolateral margin straight, posterior margin sinuous. Ecdysial line visible in pronotum and mesonotum. Prosternum hidden by pterothoracic ventrite process. Mesonotum posteriorly projected, almost 0.5x longer-longer than pronotum. Metanotum with lobe posteromedial dividing completely tergite abdominal I. Pterothoracic ventrite process extended between pro- and mesocoxae. Mesothoracic spiracle present in a cavity between the anterior and media legs, pronotum, and elytral theca. Elytral theca with 3–4 striae. In ventral view, anterior legs superimposed on medial legs, medial legs superimposed on elytral theca, and metathoracic legs partially covered by forewing theca. Coxae separated from each other in the anterior and medial legs; metacoxae subcontiguous. Protibia spurs indistinct, mesotibia with one short inner spur, and metatibia with two prominent inner spurs. Articulations between mesofemur and mesotibia, metafemur and metatibia, visible in dorsal view. Legs in increasing order of size, from anterior to posterior legs. **Abdomen**. Four pairs of dioneiform organs present between tergites II–III, III–IV, IV–V, V–IV. Tergites I–II with transversal carina slightly distinct; III–VI with transversal carina evident, VII posteriorly expanded. Sternites II–X visible in ventral view, VII and VIII posteriorly expanded, IX with genital ampulla like two small tubercles. Abdominal spiracles I–IV with conspicuous peritreme, I covered by alar thecae, V–VIII like cuticular invagination.

**Remarks**: Pupae of *M. laevicollis* can be identified by frontoclypeal suture sinuous and medially indistinct; protibia with apical spur indistinct; and fold of abdominal tergite IX with light yellow short setae. The male pupa is unknown.

***Macraspis variabilis* Burmeister, 1844**

**Specimens examined:** One larva of 3º instar, and one pupa: x. 2005, Piraquara municipality, Paraná, Brazil, P. Grossi (collector) (CERPE).

**Third larval instar** (Figs. 4-5)

Description. *Total length:* 26.45 mm. *Colour:* Body yellowish white; clypeus, labrum, and mandible dark brown; frons, pretarsus reddish-brown; cranium yellowish brown. Surface weakly setose, minute setae (Fig. 4A). **Head** (Fig. 4B). *Length*: 5.50 mm, *width:* 5.00 mm. Epicranial suture present, each side with two dorsoepicranial setae (*des*), 1–2 posteroepicranial setae (*pes*), one anteroepicranial seta (*aes*), six externoepicranial setae (*ees*), two posterofrontal setae (*pfs*), one externofrontal seta (*efs*), one anterofrontal angle seta (*aas*), three minutes anterofrontal setae (*afs*). Stemmata present; frons anteromedial rugopunctate, posteromedial smooth. Clypeus subtrapezoidal, punctate uneven; each side with two externoclypeal setae (*ecs*), one anteroclypeal seta (*acs*). Labrum oval, symmetrical, rugopunctate; each side with one posterolabral seta (*pls*), 2–3 laterolabral setae (*lls*), one mediolabral seta (*mls*), and a group of 19 anterolabral setae (*als*). **Epipharynx** (Fig. 5I) ellipsoidal, wider than long. *Corypha* with a row of eight setae, epizygum and clythra absent. *Haptomerum* prominent, acuminate, with 28 setae and 10 sensilla, zygum crossbar-like, heli absent. *Paria*, each side of acroparia with 9–11 setae, each acanthoparia with 8–9 spine-like setae; right chaetoparia with 46 setae and three sensilla, left chaetoparia with 34 setae and five sensilla; gymnoparia distinct; phoba, plegmatia, and proplegmatia absent. *Pedium* oval, without sensilla, phoba absent. Each side of *Haptolachus* with three setae and 1–3 sensilla; crepis indistinct; sensorial cone acuminate with two sensilla; sclerotized plate indistinct; dexiotorma curved; apotorma indistinct, laeotorma short, almost straight, and pternotorma rounded, epitorma indistinct. **Mandibles** asymmetric, left mandible longer, right mandible subtriangular, stridulatory area formed by transverse ridges finely marked, ridges equidistant from each other, clearly visible at 90x magnification. Right mandible (Figs. 5C-D) with a set of 11 dorsomolar setae, and three ventromolar setae in a tuft; brustia with four setae; scrobe with seven setae; dorsolateral furrow with two setae; ventral process subrectangular. Right incisor with two teeth, acuminate apex; right molar with three lobes: m1 truncate, m2 and m3 acuminate, calx subquadrangular. Left mandible (Figs. 5A-B) with a

set of eight dorsomolar setae in a row, and three ventromolar setae in a tuft; brustia with 19 setae; scrobe with eight setae; dorsolateral furrow with two setae; ventral process subtriangular. Left incisor with three teeth similar to each other; molar with m1 robust, acuminate, m2 smaller; acia indistinct. **Maxilla** (Figs. 5E-F) symmetrical, galea and lacinia fused in a mala, mala setose, uncus of galea prominent and long, acute, uncus of lacinia reduced, weakly sclerotized, with a seta (Fig. 5G); palpus 4-segmented, palpomere III with two setae, palpomere IV fusiform; stipe with stridulatory area bearing a row of 6–7 teeth and a truncate process. **Labium.** Prementum with a set of nine anteromedial setae, each side with one anteromedial sensillum, each side with two anterolateral setae, and one posteromedial setae; each side of mentum with one posteromedial seta, right side with one sensillum; each side of submentum with 2–3 anterolateral setae, and one posterolateral seta; ligula with eight anteromedial setae, each side with 17–23 setae and a total of 22 sensilla, without phoba and heli. **Hypopharynx** (Fig. 5H) with scleroma asymmetrical, transversal, weakly sclerotized; right lobe with eight setae in the anterior margin; left lobe with six setae in the anterior margin, and a row of six setae; hypopharyngeal tubercle acuminate; right posterior preoral area (*ppa*) without setae and sensilla, left *ppa* with four setae, and without sensilla. **Antenna** 4- segmented; antennomeres I, II, IV with similar length, antennomere III slightly smaller; antennomere III with one ventral tubercle, antennomere IV with four dorsal sensorial spots (Figs. 4F-G). **Thorax.** Prothorax with one dorsal lobe, and a lateral sclerite, tergal lobe covered by 22 setae, spiracle lobe with 7–10 setae, pleural lobe with 2–5 setae, ventral lobe with 11 setae. Meso- and metathorax with three distinct dorsal lobes, anterior tergal lobe with 4–6 setae, medial tergal lobe with 30–35 setae, posterior tergal lobe with 6–7 setae; anterior pleural lobe with up to four setae, posterior pleural lobe with 3–4 setae; anteromedial ventral lobe with about 21 setae, posterior ventral lobe without setae. Thoracic spiracle: c-shaped, dorsoventral axis about 1.3x longer than dorsoventral axis of abdominal spiracles, dorsoventral diameter of bulla slightly longer than the distance between respiratory plate arms. **Legs** similar with

each other, in increasing size from anterior to posterior; pro- and mesopretarsus with two setae, metapretarsus with one seta (Figs. 4C-E). **Abdomen** 10-segmented; segment I with two dorsal lobes; segments II–VI with three dorsal lobes each; segment VII with two slightly distinct dorsal lobes; segments VIII–X without dorsal divisions. Segment I with tergal anterior lobe (*tal*) covered by 12 setae, tergal posteromedial lobe with 61 setae, tergal lateral lobe (*tll*) with about 04 setae; pleural anterior lobe (*pal*) with 4–7 setae, pleural posterior lobe (*ppl*) without setae, spiracle lobe (*esl*) with 2–3 setae; ventral anterior lobe (*val*) without setae, ventral medial lobe (*vml*) with six setae, and ventral posterior lobe (*vpl*) without setae. Segments II–VI with *tal* covered by 82–116 setae, tergal medial lobe (*tml*) with 55–90 setae, *tll* with 4–7 setae, tergal posterior lobe *tpl* with 104–130 setae; *pal* without setae, *ppl* with 5–10 setae, *esl* with 5–8 setae; *val* without seta, *vml* with 6–14 setae, and *vpl* without setae. Segment VII with *tal* covered by 81 setae, without *tll*, tergal posteromedial lobe with 19 setae; *pal, ppl, esl, val, vml, and vpl* with similar setation as segment II–VI. Segments VIII–IX with a tergal anterior row of 11–13 setae, and a tergal posterior row of 16–19 setae; pleural lobe with 5–6 setae, *esl* of the segment VIII with number of setae similar to the segments II–VII; ventral lobe with 7–8 setae. Segment X with dorsal surface covered by approximately 211 setae. Raster (Fig. 4H) with palidium amolst indistinct of tegillum, about 17 setae in each palidium, septula clearly distinct. Each tegillum with 85–97 setae, and 11 of them pre-septula. Campus visible, and barbula indistinct. Anal opening transverse. Spiracles c-shaped with dorsoventral diameter of bulla subequal to the distance between respiratory plate arms, and dorsoventral axis about 0.9x larger than anteroposterior axis.

**Remarks:** Third instar larval of *Macraspis variabilis* can be distinguished from other *Macraspis* species mainly by the stridulatory area of mandibles finely marked, clearly visible only 90x magnification; labrum with the external preapical tubercles weakly projected, and with 1

posterolabral seta each side; each side of epicranium with 2 dorsoepicranial setae; stridulatory area of maxilla with 6–7 teeth.

**Pupa** (Fig. 6)

*Total length:* 19.80 mm, *width*: 8.50 mm. The general aspect of body: Surface glabrous, straw yellow, oval-shaped. **Head.** Vertex visible dorsally. **Thorax.** Pronotum wider than long, posterior margin almost straight, lateral margin sinuous. Ecdysial longitudinal line obsolete in pronotum, clearly distinct in meso- metanotum. Prosternum hidden by pterothoracic ventrite process and procoxae. Pterothoracic-ventrite process projecting between meso- and procoxae. Mesonotum posteriorlly extended to approximately the posterior margin of metanotum, meso- metanotum projection dividing the tergite I. Pro- and mesocoxae subcontiguos, metacoxae contiguous. Spiracle ellipsoidal, well sclerotized, visible, reddish-brown. **Abdomen.** Four pairs of dioneiform organs are present between segments II–III, III–IV, IV–V, V–VI, all represented by anterior and posterior parts. Tergite II–V with a smooth transversal carina. Tergites VII–VIII posteriorly expanded. Spiracle I hidden by alar theca, spiracles I–IV with peritreme, V–VIII without peritreme.

**Remarks:** Pupa of *M. variabilis* is damaged, and in a poor state of conservation, impossibility of a complete description of this material, including sex determination and its inclusion in the key. Despite this, it can be differentiated by light yellow short setae in fold of abdominal tergite IX, and ecdysial line indistinct on pronotum.

**Key to the third instar larvae of *Macraspis* MacLeay** (modified from Begha & Santos 2020)

**1.** Labrum without preapical tubercles, septula and palidia present at midline of ventral anal lobe.....**2**

**1'.** Labrum with preapical tubercles, septula and palidia present at most in anterior third of anal ventral lobe.....**3**

**2.** Each side of frons with 1 posterofrontal seta, and 1 externofrontal seta; antennomere IV with 7 dorsal sensorial spots; labrum irregularly convex, without keel; maxilla with 6 stridulatory acute teeth. Distribution: Brazil, Guyanna, Venezuela.....***Macraspis pseudochrysis*** **Landin, 1956**

**2'.** Each side of frons with 2 posterofrontal setae and without externofrontal seta; antennomere IV with 5 dorsal sensorial spots; labrum convex and with weak preapical transverse keel; maxilla with 8 stridulatory acute teeth. Distribution: Venezuela, Ecuador, Peru, Bolivia, Brazil, Paraguay…….…….…….....***Macraspis festiva*** **Burmeister, 1844**

**3.** Each side of epicranium with 3 dorsoepicranial setae; labrum with 2 preapical tubercles.....**4**

**3'.** Each side of epicranium with 2–5 dorsoepicranial setae; labrum with 4 preapical tubercles.....**5**

**4.** Cranium yellowish red; antennomere IV with 5 dorsal sensorial spots; each side of labrum with 2–4 posterolabral setae; haptomerum with 19–20 spine-like setae; each palidium with 20–23 pali. Distribution: Mexico, Guatemala.....***Macraspis rufonitida*** **Burmeister, 1844**

**4'.** Cranium reddish brown; antennomere IV with 4 dorsal sensorial spots; each side of labrum with 10–14 posterolabral setae; haptomerum with 30–34 spine-like setae; each palidium with 11–18 pali. Distribution: Mexico, Nicaragua, Honduras, Costa Rica, Colombia, Venezuela, Guyana, Brazil, Ecuador, Paraguay, Argentina.....***Macraspis chrysis*** **(Linnaeus, 1764)**

**5.** Each side of epicranium with 3–5 dorsoepicranial setae; labrum with external preapical tubercles prominent, and 2–5 posterolabral setae each side; stridulatory area of mandibles strongly marked……..……...……..**6**

**5'.** Each side of epicranium with 2 dorsoepicranial setae; labrum with the external preapical tubercles weakly projected, and with 1 posterolabral seta each side; stridulatory area of mandibles

finely marked, clearly visible only 90x magnification. Distribution: Brazil……..…….***Macraspis variabilis*** **Burmeister, 1844**

**6.** Stipe of maxilla with 7–9 acute stridulatory teeth .....**7**

**6'.** Stipe of maxilla with 5–6 acute stridulatory teeth ……..…….....**9**

**7.** Each side of frons with 2–3 posterofrontal setae; antennomere IV with 4–6 dorsal sensorial spots; labrum with 3 posterolabral setae each side.....**8**

**7'.** Each side of frons with 6 posterofrontal setae; antennomere IV with 7 dorsal sensorial spots; labrum with 5 posterolabral setae each side. Distribution: Argentina, Brazil, Colombia, Venezuela…….....***Macraspis morio*** **(Burmeister, 1844)**

**8.** Epicranium with 4 dorsoepicranial setae each side; each side of frons with 2 posterofrontal setae; antennomere IV with 4 dorsal sensorial spots; each palidium with 20–24 pali. Distribution: Argentina, Uruguay, Brazil.....***Macraspis cribrata*** **Waterhouse, 1881**

**8'.** Epicranium with 5 dorsoepicranial setae each side; each side of frons with 3 posterofrontal setae; antennomere IV with 5–6 dorsal sensorial spots; each palidium with 26–30 pali. Distribution: Brazil.....***Macraspis cincta*** **(Drury, 1782)**

**9.** Each side of frons with 1–2 posterofrontal setae; antennomere IV with 6–8 dorsal sensorial spots; labrum with 4–6 posterolabral setae each side; lacinia of maxilla with 1 uncus…..……..……**10**

**9'.** Each side of frons with 4–5 posterofrontal setae; antennomere IV with 5 dorsal sensorial spots; labrum with 2–3 posterolabral setae each side; lacinia of maxilla with 2 unci. Distribution: Southeast Brazil……..…….***Macraspis laevicollis*** **(Waterhouse, 1881)**

**10.** Each side of frons with 1 posterofrontal seta; antennomere IV with 6 dorsal sensorial spots; labrum with 6 posterolabral setae each side; haptomerum with 25–28 spine-like setae. Distribution: Mexico, Guatemala, El Salvador, Honduras….…….…….....***Macraspis aterrima*** **Waterhouse, 1881**

**10'.** Each side of frons with 2 posterofrontal setae; antennomere IV with 8 dorsal sensorial spots; labrum with 4 posterolabral setae each side; haptomerum with 14 spine-like setae. Distribution: Brazil…….....***Macraspis clavata*** **(Olivier, 1789)**

Third-instar larva of *Macraspis* species is diagnosed by left mandible with incisor bearing three teeth, antennomere IV with four or more dorsal sensorial spots, metapretarsus reduced and weakly sclerotized relative to propretarsus and mesopretarsus, lacinia with one uncus, and epipharinx without clithra (Jameson & Morón 2001). Here, was observed that *Macraspis laevicollis* has two unci in lacinia, so this characteristic changes for the genus. Larvae of the genus *Macraspis* are similar to those of the genera *Lagochile* and *Chlorota* by the presence of epipharynx without clithra, left incisor of the mandible with three teeth, and raster with palidia and septula present in the ventral anal lobe, whereas *Macraspis* differs by the metapretarsus poorly sclerotized. In addition to the updated key, an updated chaetotaxy table is given here as suplementar data to identification (Table 1). About pupae, *Macraspis* is similar to *Lagochile*, but *Macraspis* has a scutellum longer than pronotum and its apex extended beyond the base of tergite I (Albertoni *et al.* 2014). *Lagochile* presents mesonotum as long as the pronotum or almost so, and not extended to abdominal tergite I, just as *Anticheiroides, Anticheira, Telaugis, and Vayana*. But *Anticheira* is distinguished by having five pairs of dioneiform organs, whereas *Telaugis* and *Vayana* present posteromedial lobe of metanotum not dividing the tergite I. To update the Rutelini pupae key provided by Bento & Fonseca (2020) the following amends are made to include *M. laevicollis*, *M. morio, A. capucina, A. brullei, T.aenescens,* and *V. bicolor*:

Key to genera and species of Rutelini based on known pupae (modified from Bento & Fonseca 2020, pag.5, access the paper to see complete key)

7. Posterior process of prosternum not flat and barely evident between procoxae; femur-tibia articulations hidden in dorsal view……...**A**

7'. Posterior process of prosternum flat and evident between procoxae; femur-tibia articulations exposed in dorsal view……..……9

**A**. Posterior margin of the mesonotum broadly rounded; posteromedial lobe of the metanotum weakly projected; pterothoracic ventrite process short, not extending beyond procoxae……...….***Chlorota***

**A'**. Posterior margin of the mesonotum narrowly rounded; posteromedial lobe of the metanotum strongly projected almost dividing the tergite I; pterothoracic ventrite process long, extending beyond procoxae……..……...***Anticheira capucina***

[…]

12. Mesonotum as long as the pronotum or almost so, and not extended to abdominal tergite I……..…...**B**

12'. Mesonotum longer than pronotum and extended to abdominal tergite I…….13

**B**. Metanotum with posteromedial lobe projected and dividing the tergite I……...……**C**

**B'**. Metanotum with posteromedial lobe weakly projected and not dividing the tergite I……..….**D**

**C**. Ecdysial line indistinct; thoracic spiracle visible in the cavity between pronotum and legs…….……..***Lagochile emarginata***

**C'**. Ecdysial line distinct in pro-, meso-, and metanotum; thoracic spiracle not visible……...……..…….***Anticheiroides brullei***

**D**. Mesonotum wider than long, posterior margin broadly projected……...…….***Vayana bicolor***

**D'**. Mesonotum longer than wide, posterior margin narrowly projected…….…....***Telaugis aenescens***

13. Head in dorsal view wider than half the pronotum at middle; profemur-tibia articulation exposed in dorsal view; abdominal spiracle I exposed, not hidden by wing thecae…….....***Rutela lineola***

13’. Head in dorsal view narrower than half the pronotum at middle; profemur-tibia articulation hidden in dorsal view; abdominal spiracle I hidden by wing thecae….....***Macraspis***…14

14. Fold of abdominal tergite IX with reddish-brown short setae.....15

14’. Fold of abdominal tergite IX with light yellow short setae.....16

15. Frontoclypeal suture somewhat straight and medially indistinct.....**E**

15’. Frontoclypeal suture weakly sinuate and medially distinct (suture complete).....***M. Chrysis***

**E.** Medial area of mesonotum almost 6.3x wider than apex of posterior margin projection; apex of tergite IX narrowed rounded……..***M. cinta***

**E’.** Medial area of mesonotum 4x wider than apex of posterior margin projection; apex of tergite IX broadly rounded…….……***M. morio***

16. Frontoclypeal suture somewhat straight or sinuous and medially indistinct.....**F**

16’. Frontoclypeal suture weakly or strongly sinuate and medially distinct (suture complete).....17

**F.** Frontoclypeal suture somewhat straight; protibia with apical spurs evident..…..……***M. festiva***

**F’.** Frontoclypeal suture sinuous; protibia with apical spur indistinct..……***M. laevicollis***

***Anticheira capucina* (Fabricius, 1787)**

**Specimens examined:** One female pupa: iii. 2020, Museu da Amazônia (MUSA), Manaus, Amazonas, Brazil, M. Bento (collector) (INPA).

**Female pupa** (Figs. 7A-B)

Description. *Total length:* 34.50 mm, *width:* 15.00 mm. The general aspect of the body: surface glabrous, oval-shaped, little convex, slightly flattened. **Head.** Surface glabrous, wider than long, vertex visible in dorsal view. Eyes slightly covered by angles of pronotum and canthus. Canthus sinuous, prominent. Frons with two parallel grooves in the disc. Epistomal suture medially discontinued. Clypeus subrectangular, surface with ununiform grooves, slightly rugose. Labrum

subrectangular. Mandible subtrapezoidal, with rounded and prominent medial lobe, anterior margin bisinuous, posterior margin rounded. Maxilla tubercle-like, almost completely for the mandible, maxillary palpi 0.4x the length of the antenna. Labium rounded with posterior margin bilobed, palpi tubercle-like. Antenna subtriangular, out margin sinuous, inner margin almost straight, posterior margin rounded. **Thorax.** Pronotum subhexagonal, posterior margin sinuous, lateral margins rounded, anterior angles acute, anterior margin concave, surface slightly rugose. Ecdysial line well visible in pro-, meso-, and metanotum. Length of pronotum approximately 2/3 of the length of the meso- and metanotum combined. Length of mesonotum similar to pronotum, posteriorly extended, not reaching to posterior margin of metanotum. Metanotum with lobe posteromedial dividing tergite I. Prosternum hidden by pterothoracic ventrite process. Pterothoracic ventrite process between mesocoxae extends beyond procoxae. Thoracic spiracle transverse, visible, dark brown. Wing thecae covered partially the metatibiae, elytral thecae with four striae. Metacoxae contiguous. Femur-tibia articulations no visible in dorsal view. Protibia with indistinct tubercle-like spurs, mesotibia with two small inners spurs, and one out spur. Metatibia with prominent two inner spurs. Metatibia-tarso reaching the level of sternite VI. Legs increasing size from anterior to posterior. **Abdomen.** Presence of five pairs of the organs dioneiforms between the sternites I–II, II–III, III–IV, IV–V, V–VI; first pair formed only by the posterior part. Spiracle I hidden by alar theca, spiracles I–IV with peritreme, V–VIII with cuticular invagination. Sternites II–IV with slight lateral expansion. Length of the sternites VII–VIII combined approximately 1/3 of the length of the sternites II–VI combined. Fold of tergite IX with pubescence covered half of the surface of tergite, with yellow setae. Female terminalia composed of two symmetrical and prominent small tubercles.

**Remarks:** The pupa of *A. capucina* is the first immature described in the genus *Anticheira*. *Anticheira capucina* resembles the pupae of *Chlorota* by the presence of five pairs of dioneiform organs, but can be distinguished by the following set of characteristics: posterior margin of the

mesonotum narrowly rounded; posteromedial lobe of the metanotum strongly projected almost dividing the tergite I; pterothoracic ventrite process long, extending beyond procoxae. The male pupa is unknown.

***Anticheiroides brullei* (Castelnau, 1840)**

**Specimens examined:** One male pupa*:* xi. 2009, Jaguariaíva, Paraná, Brazil, P. Grossi (collector) (CERPE).

**Male pupa** (Figs. 8A-B)

Description. *Total length:* 20.40 mm, *width*: 13.00 mm. **Head.** Epistomal suture sinuous, less visible medially. Clypeus subquadrangular; labrum subtriangular; mandible, maxila, and palpi tubercle-like, maxillary palpi 0.5x the length of the antenna; mouth part well prominent. Antenna triangular with club distinct. **Thorax.** Pronotum with rounded margins, angles weakly defined, posterior margin almost straight. Prosternum hidden by pterothoracic ventrite process; pterothoracic ventrite process prominent, extending beyond the procoxae. Mesonotum with a length similar to pronotum, posteriorly expanded. Metanotum com posteromedial lobe dividing the tergite I. Ecdysial line distinct in pro-, meso- and metanotum. Prolegs partially covered by antennas and maxillae. Metacoxae contiguous. Meso- and metatibia with two inner spur tubercle-like. Femur-tibia articulations not visible in dorsal view. Wing theca almost completely covered by elytral theca. Spiracle not visible, covered by pronotum. Abdomen. Presence of four pairs of dioneiform organs barely defined. Sternite I–IV similar to each other in length, VII approximately twice the largest, VIII–IX posteriorly expanded. Tergite IX with pubescence dense, covering at least 2/3 of surface, with yellow setae; lobes well distinct and prominent. Spiracles I–IV with peritreme and well sclerotized, V–VIII with no peritreme. Tergite X visible. Male terminalia with genital ampulla anterior and posterior well defined in tergite IX.

**Remarks:** The pupa of *A. brullei* is the first immature described in the genus *Anticheiroides*. Due to a poor state of conservation, a complete description of this material was not possible. But it can be identified by the projected posteromedial lobe of metanotum dividing the tergite I; mesonotum longer than wide and narrowly projected; ecdysial line distinct in pro-, meso- and metanotum; and thoracic spiracle not visible. The female pupa is unknown.

***Telaugis aenescens* Burmeister, 1844**

**Specimens examined:** One female pupa: vi. 2020, Museu da Amazônia (MUSA), Manaus, Amazonas, Brazil, Bento, Lima & Deballos (collectors) (INPA).

**Female pupa** (Figs. 9A-B)

Description. *Total length*: 33.50 mm, *width*: 12.10 mm. The general aspect of the body: oval-shaped, elongated, convex. **Head.** Surface with micropubescence; vertex visible in dorsal view; head oval, longer than wide. Eyes not covered by pronotum, canthus, or antenna. Canthus small, acuminate, and prominent. Frons with two medial grooves parallel, and two transversal grooves mediolateral. Epistomal suture presents laterally. Clypeus subrectangular, with two parallel grooves medial and a transversal depression anterior, smooth. Labrum subtrapezoidal, anterior area prominent, lateral margins slightly sinuous, posterior margin rounded. Mandibles transverse, anterior margin sinuous, posterior margin curved. Maxilla subtriangular, inner margin sinuous, out margin convex. Maxillary palpi 0.6x the length of the antenna. **Thorax.** Pronotum subhexagonal, posterior margin almost straight, anterior margin slightly acuminate, laterals curved; broad, wider than long, with parallel grooves in the disc. Ecdysial line visible in pro-, meso-, and metanotum. Length of the mesonotum 2/3 of the length of the pronotum. Metanotum lesser mesonotum, posteromedial lobe not dividing the tergite I. Prosternum hidden by pterothoracic ventrite process. Pterothoracic ventrite process between mesocoxae, apex rounded and slightly flattened, as wide as the base. Pro- and mesocoxae

contiguous; all femur-tibia articulations not visible in dorsal view. Protibiae with indistinct spur tubercle-like, meso- and metatibiae with two inner spur tubercle-like. Pro- and mesotibia-tarso with similar length, which corresponds 2/3 to the length of metatibia-tarso. Elytral theca with five striae, wing theca partially covered the metatibia. Spiracle ellipsoidal, visible, with peritreme. **Abdomen.** Four pairs of the dioneiform organs between segments II–III, III–IV, IV–V, V–VI. Pubescence in the fold of tergite IX, covering posteriorly 1/3 of the surface, yellow setae. Sternites II–VI combined with twice the length of sternites VII–VIII combined. Spiracle I hidden under the alar thecae; spiracles I–IV with peritreme, V–VIII with no peritreme. Female terminalia formed by two symmetrical lobes.

**Remarks:** The pupa of *T. aenescens* is the first immature described in the genus *Telaugis* and can be identified by posteromedial lobe of metanotum weakly projected and not dividing the tergite I; and mesonotum longer than wide, with posterior margin narrowly projected. The male pupa is unknown.

***Vayana bicolor* (Olivier, 1789)**

**Specimens examined:** One last larval instar and one female pupa: xii. 2020, Tarumã, Manaus, Amazonas, Brazil, M. Bento (collector) (INPA).

**Third larval instar** (Figs. 10-11)

Description. *Total Length*: 24.90–32.00 mm. Surface with pubescence. *Colour*: head dark and light brown, pretarsus, spiracles, raster, and pubescence of the body reddish-brown (Fig. 10A). **Head** (Fig. 10B) *Length*: 8.45–8.60 mm, *width*: 7.10–7.30 mm. Epicranial suture present, each side with 3–4 dorsoepicranial setae (*des*), 1–6 posteroepicranial setae (*pes*), 1–2 anteroepicranial setae (*aes*), 4–9 externoepicranial setae (*ees*), 2–4 posterofrontal setae (*pfs*), 0–1 externofrontal seta (*efs*), 1–2 anterofrontal angle setae (*aas*), 5–6 anterofrontal setae (*afs*). Stemmata present. Clypeus trapezoidal,

slightly rugous, each side with 1–2 externoclypeal setae (*ecs*), and one anteroclypeal seta (*acs*). Labrum subrectangular, rugopunctate, each side with five posterolabral setae (*pls*), 2–5 laterolabral setae (*lls*), 1–2 mediolabral setae (*mls*), and 12–14 anterolabral setae (*als*). **Epipharynx** (Fig. 11I) ellipsoidal, wider than long. *Corypha* with a row of ten setae, without epizygum, and clythra. *Haptomerum* prominent with 20 tooth-like setae and 11 sensilla, zygum crossbar-like obsolete, heli absent. *Paria*, each side of acroparia with 10–11 setae, each acanthoparia with 11–12 spine-like setae; right chaetoparia with 50 setae and three sensilla, left chaetoparia with 27 setae and six sensilla; gymnoparia clearly distinct, phoba, plegmatia, and proplegmatia absent. *Pedium* asymmetric, without sensilla, phoba absent. *Haptolachus* with right side with three setae and two sensilla, left side with six setae and two sensilla; crepis indistinct; sensorial cone with four sensilla; sclerotized plate indistinct; dexiotorma almost reaching the sensorial cone; apotorma indistinct, laeotorma short and curved, pternotorma small and rounded, epitorma indistinct. **Mandibles** asymmetric, with left mandible longer. Stridulatory area fusiform, composed of transversal ridges, closest to each other distally. Right mandible (Figs. 11C-D) with 11 dorsomolar setae in a row, and four ventromolar setae in a tuft; brustia with four setae minute; scrobe with ten setae; dorsolateral furrow with two setae; ventral process quadrangular. Right incisor with two teeth, S1 longer and wider; a right molar with three lobes: m1 truncate, m2 and m3 acute, calx subquadrangular. Left mandible (Figs. 11A-B) with five dorsomolar setae in a row, and four ventromolar setae in a tuft; brustia with 17 setae; scrobe with six setae; dorsolateral furrow with three setae; ventral process subtriangular. Left incisor with three teeth, similar to each other in long, apex acute; molar with m1 truncate, robust, m2 acute; acia small and acuminate. **Maxilla** (Figs. 11E-F) symmetrical, galea and lacinia fused in a mala, mala setose; uncus of galea prominent, robust; lacinia with three small unci, all unci with acute apex, distal uncus with one seta, proximal uncus reduced (Fig. 11G); palpus 4-segmented, palpomere III with two setae, palpomere IV slightly fusiform; stipe with stridulatory area bearing a row of 6–7 teeth and

a wide, distal, subrectangular process. **Labium.** Prementum with a group of four anteromedial setae, each side of prementum with two anterolateral setae, and one posteromedial seta; each side of mentum with one posteromedial seta, and three sensilla; each side of submentum with 1–5 setae, and 5–6 sensillum; ligula with four anteromedial setae, each side with 27–29, and a total of six sensilla, without phoba and heli, a small sclerotized spot on the middle. **Hypopharynx** (Fig. 11H) with scleroma asymmetrical, transversal; right lobe with 12 setae in the anterior margin; left lobe with 13 setae in the anterior margin, and a row of 16 setae; hypopharyngeal tubercle subtriangular, with acuminate apex, recurved; right posterior preoral area (*ppa*) without setae and sensilla; left *ppa* with eight setae, without sensillum. **Antenna** 4-segmented; antennomeres I–III similar in length; antennomere III with ventral tubercle; antennomere IV with 7–10 dorsal sensorial spots and 9–13 ventral sensorial spots (Figs. 10F-G). **Thorax.** Prothorax with a distinct dorsal lobe and a lateral sclerite, meso- and metathorax with three distinct dorsal lobes. Thoracic spiracle: c-shaped, dorsoventral axis about 1.2x longer than dorsoventral axis of abdominal spiracles, respiratory plate arms contiguous. **Legs.** All legs with similar size and shape, femur with crescent length from anterior to posterior, pro- and mesopretarsus falciform with two lateral setae, metapretarsus shorter than pro- and mesopretarsus (Figs. 10C-E). **Abdomen** 10-segmented; segment I with two dorsal lobes; segments II–VI with three dorsal lobes each; segment VII with two slightly distinct dorsal lobes; segments VIII–X without dorsal divisions. Raster with palidium distinct, each palidium with about 16–19 pali. Each tegillum with 52–76 setae, with 89 more pre-septula setae. Campus visible, and barbula indistinct. Anal opening transverse. Spiracles c-shaped with dorsoventral diameter of bulla 1x longer than the distance between respiratory plate arms, and dorsoventral axis about 1.6x larger than anteroposterior axis.

**Remarks:** The larva and pupa of *V. bicolor* are the first immature ones described in the genus *Vayana*, and the third instar larval can be distinguished from others species of Rutelini by the left

mandible with 3 scissorial teeth, lacinia with 2 unci, 6–7 stridulatory teeth in the maxilla, epipharynx without crepis, zygum present, stemmata present, thoracic spiracle with coalescent respiratory plate arms.

**Female pupa** (Figs. 12A-B)

Description. *Total length*: 24.00 mm, *width*: 11.60 mm. The general aspect of the body: slightly fusiform, oval, slightly flattened, color creamy yellow, ventrally with some metallic green reflexes, micropubescence present on the surface of the body. **Head** longer than wide, vertex visible in dorsal view. Eyes visible, partially covered by canthus. Canthus acuminate. Frons with two parallel grooves obsoletes. Epistomal suture barely visible, sinuous. Clypeus rectangular, with smooth grooves ununiforms. Labrum subtrapezoidal. Mandible transverse, proximal lobe prominent rounded, distal lobe acuminate. Maxillary palpi 0.6x the length of the antenna. Antenna subtriangular, margins posterior and external almost straight, interior margin undulate. **Thorax.** Pronotum subtrapezoidal, posterior margin wavy, anterior margin slightly curved, lateral margins rounded. Ecdisial line visible in pro-, meso- and metanotum. Posteromedial lobe not dividing the tergite I. Mesonotum posteriorlly expanded. Prosternum hidden by pterothoracic ventrite process and prosternal process. Pterothoracic ventrite process fused with prosternal process, extended beyond to procoxae, inserted on mentum. Metacoxae contiguous. Thoracic spiracle ellipsoidal, visible, well sclerotized. Elytral theca with six longitudinal parallel grooves, well defined. Legs. Femur-tibia articulation no visible in the dorsal view. Protibia with indistinct tubercle-like spurs; mesotibia with two small inner spurs, without out spur; metatibia with two inner spurs, and one out spur. Metatibia-tarso reaching the level of sternite VIII. **Abdomen** with four complete dioneiform organs in the tergites II–III, III–IV, IV–V, V–VI. Spiracles I–IV with peritreme, V–VIII with cuticular invagination. Tergite IX with two well-defined acuminate lobes acuminates, densely setose, yellow setae. Genital ampulla of a female wider than long, composed of two small symmetric tubercles.

**Remarks**: Pupae of *V.bicolor* can be diagnosed as the posteromedial lobe of metanotum weakly projected and not dividing the tergite I; mesonotum wider than long, broadly projected; body shape fusiform. The male pupa is unknown.

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## Tables:

Table 1. Chaetotaxy of the known third instars of *Macraspis* MacLeay, 1819 (Modified from Medeiros *et al.* 2019).

| | Parietals | | | Frons | | | | | Clypeus | | Labrum | | | Raster | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **des** | **pes** | **aes** | **ees** | **pfs** | **efs** | **aas** | **afs** | **acs** | **ecs** | **pls** | **lls** | **mls** | **als** | **tg** | **pr** | **pa** | **al** |
| ***M. aterrima*** | 4 | 2-3 | 2 | 3-4 | 1 | 1 | 1 | 2-3 | 1 | 4-5 | 6 | ~3 | 1 | 1 | 16-19 | ~16-19 | 21-25 | ~225 |
| ***M. chrysis*** | 3 | 1-2 | 2 | ~5 | 3 | 1 | 1 | 3 | 1 | 2-3 | 10-14 | 2-4 | 1 | 2 | 37-40 | ~37-40 | 9-13 | 40-48 |
| ***M. cincta*** | 4 | 1 | 1 | ~4 | 3 | 1 | 1 | 3 | 1 | 2 | 3 | ~2 | 1 | - | 38-40 | 0-3 | 28-30 | ~60 |
| ***M. clavata*** | 4 | 3-4 | 1-2 | ~5 | 2 | 3 | 3 | 2 | 1 | 2 | 4 | 2-3 | 1 | 2-3 | 94-96 | 20-22 | 14 | 65-70 |
| ***M. cribata*** | 5 | - | 3 | - | 2 | - | 1 | - | 4 | 1 | 3 | ~2 | - | - | ~40-50 | ~30-40 | ~15 | ~70 |
| ***M. festiva*** | 3 | 2 | 2 | 5 | 1 | 1 | 1 | 3 | 0 | 2-4 | 3 | 4 | 1 | 1-2 | 40-41 | ~40-41 | 19 | ~150 |
| ***M. laevicollis*** | 3-4 | 2-5 | 1-2 | 2-7 | 4-5 | 1 | 1-2 | 2-3 | 1 | 2-3 | 2-3 | 2-3 | 1 | ~6-7 | 114-132 | 29 | 15-17 | 117-141 |
| ***M. morio*** | 4 | 3 | 2-3 | 5-8 | 6 | 1 | 1 | 3-4 | 0 | 2 | 5 | 3 | 1 | 8-11 | ~90 | 30 | 15-19 | ~63-71 |
| ***M. pseudochrysis*** | 3 | 3-4 | 1 | 3 | 1 | 1 | 1 | 2 | 1 | 2-3 | 3 | 2-4 | 1 | 2 | 10-12 | 10-12 | 18-22 | ~135 |
| ***M. rufonitida*** | 3 | 1 | 1 | 4-5 | 2 | 1 | 1-2 | 1-2 | 1 | 2 | 2 | 3-4 | 1 | 2 | 10-12 | ~10-12 | 20-23 | ~180 |
| ***M. variabilis*** | 2 | 1-2 | 1 | 6 | 2 | 1 | 1 | 3 | 1 | 2 | 1 | 2-3 | 1 | ~9-10 | 85-97 | 11 | ~17 | 64-83 |

The chaetotaxy is given for one side of the structure. "~" about

**aas**, anterofrontal angle setae; **acs**, anteroclypeal setae; **aes**, anteroepicranial setae; **afs**, anterofrontal setae; **al**, ventral anal lobe setae; **als**, anterolabral setae; **des**, dorsoepicranial setae; **lls**, laterolabral setae; **mls**, mediolabral setae; **ecs**, externoclypeal setae; **ees**, externoepicranial setae; **efs**, externofrontal setae; **pa**, palidium setae (pali); **pes**, posteroepicranial setae; **pfs**, posterofrontal setae; **pls**, posterolabral setae; **pr**, tegillar preseptular setae; **tg**, tegillar area setae (including the preseptular setae: pr).

**Figures:**

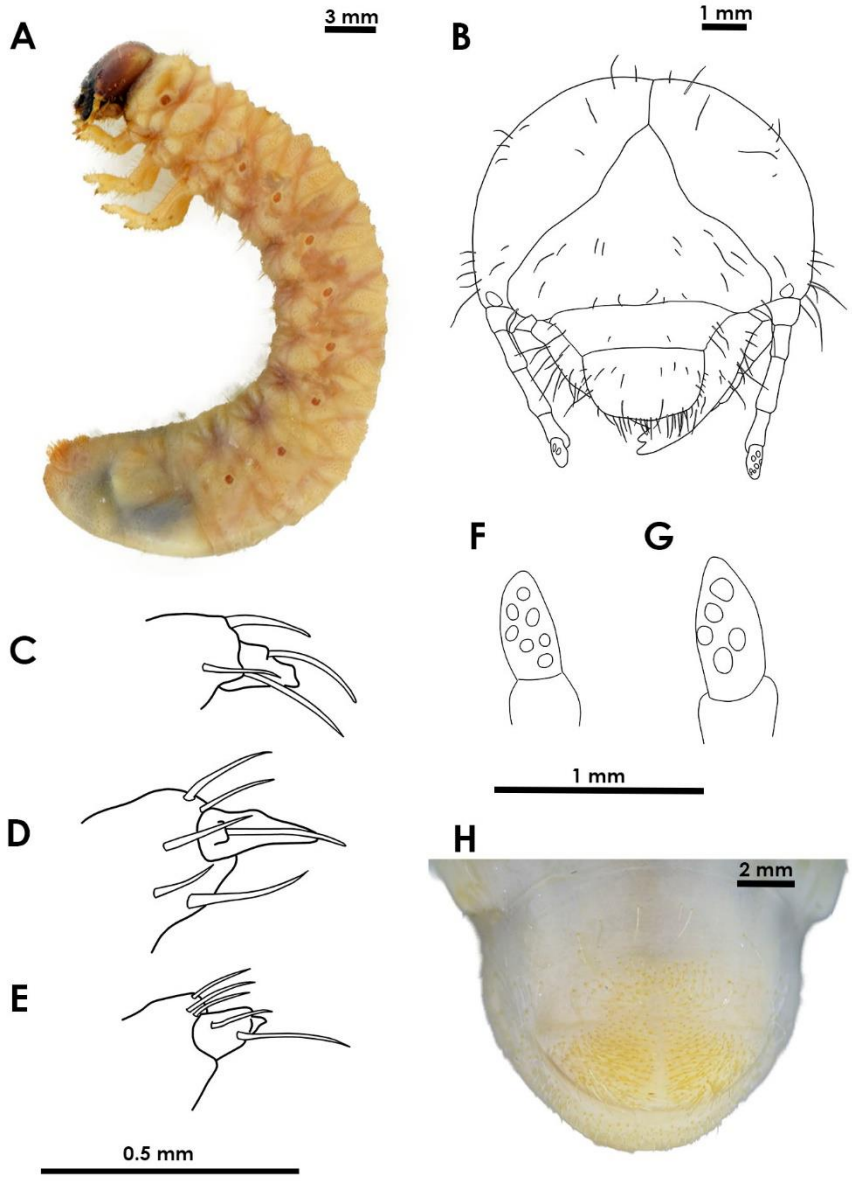


Figure 1. *Macraspis laevicollis* (Waterhouse, 1881); third larval instar. Body (A); head (B); pretarsus: pro- (C), meso- (D), and metapretarsus (E); antenna: ventral (F), dorsal (G); raster (H).

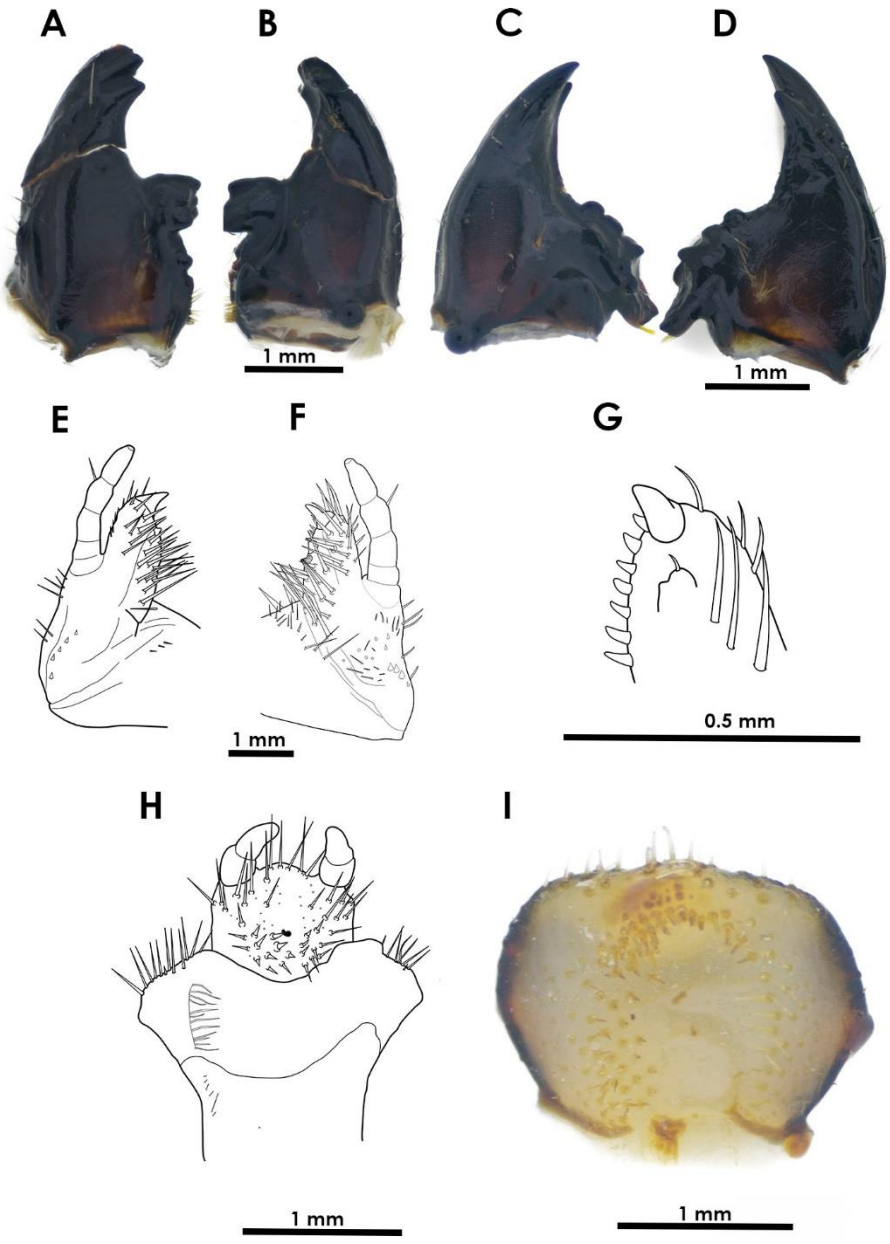


Figure 2. *Macraspis laevicollis* (Waterhouse, 1881); third larval instar. Mandibles: left dorsal (A), left ventral (B), right ventral (C), right dorsal (D); maxillae: left (E), right (F), uncus (G); hypopharynx (H); epipharynx (I).

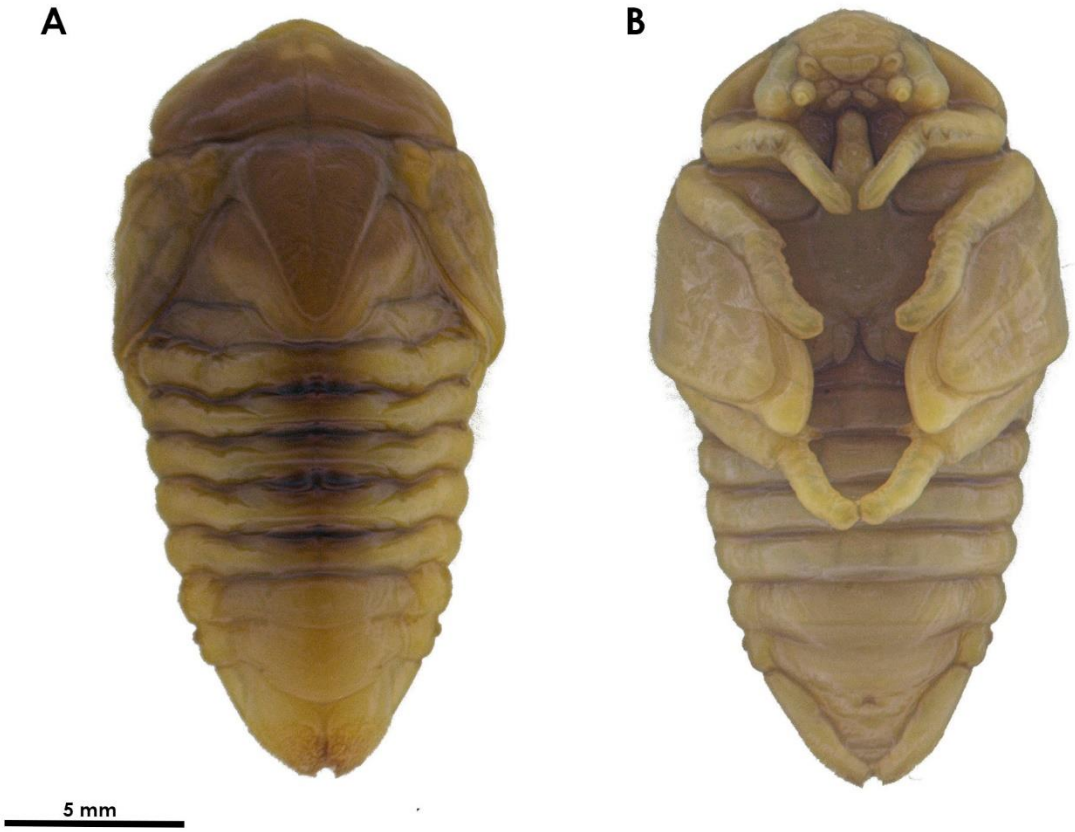


Figure 3. *Macraspis laevicollis* (Waterhouse, 1881). Female pupa: dorsal (A), ventral (B).

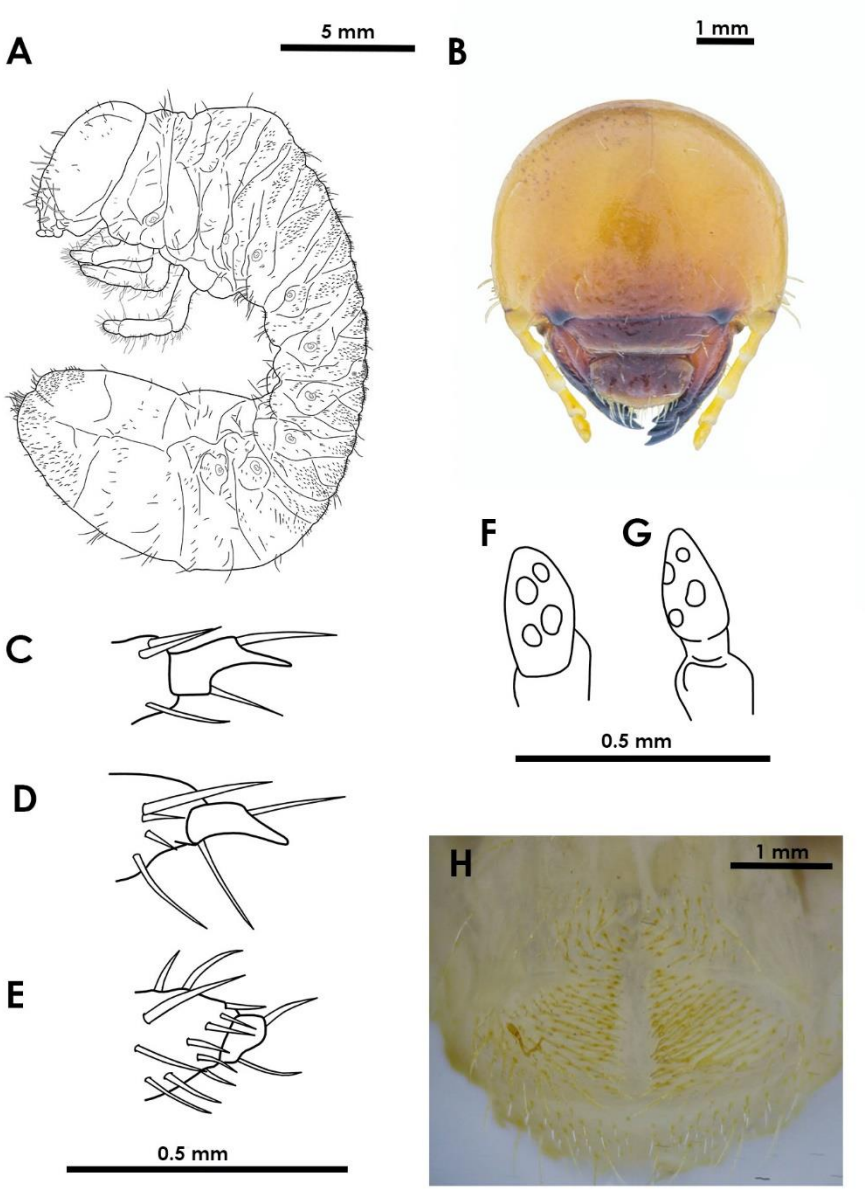


Figure 4. *Macraspis variabilis* Burmeister, 1844; third larval instar. Body (A); head (B); pretarsus: pro- (C), meso- (D), and metapretarsus (E); antenna: dorsal (F), ventral (G); raster (H).

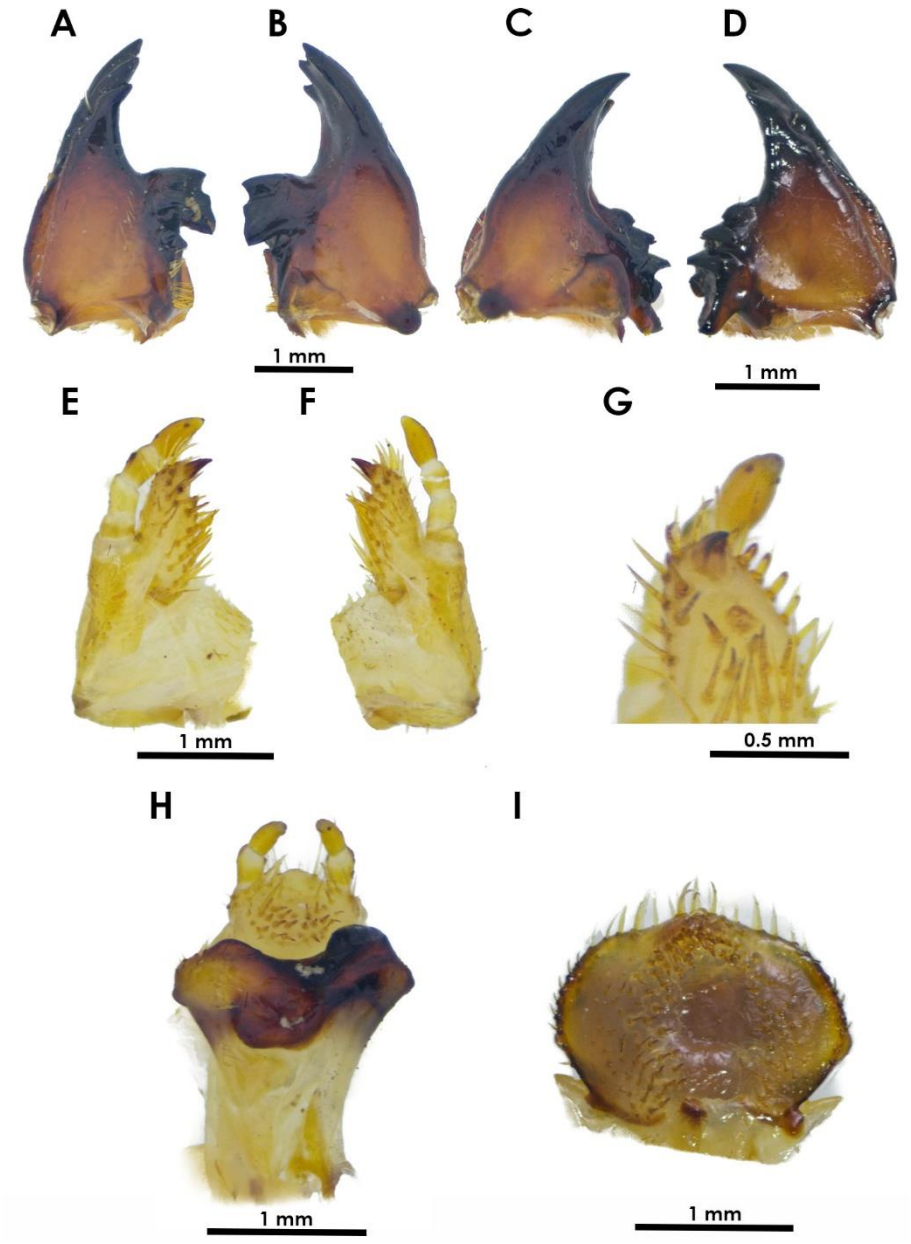


Figure 5. *Macraspis variabilis* Burmeister, 1844; third larval instar. Mandibles: left dorsal (A), left ventral (B), right ventral (C), right dorsal (D); maxilla: left (E), right (F), uncus (G); hypopharynx (H); epipharynx (I).


Figure 6. *Macraspis variabilis* Burmeister, 1844; pupa.

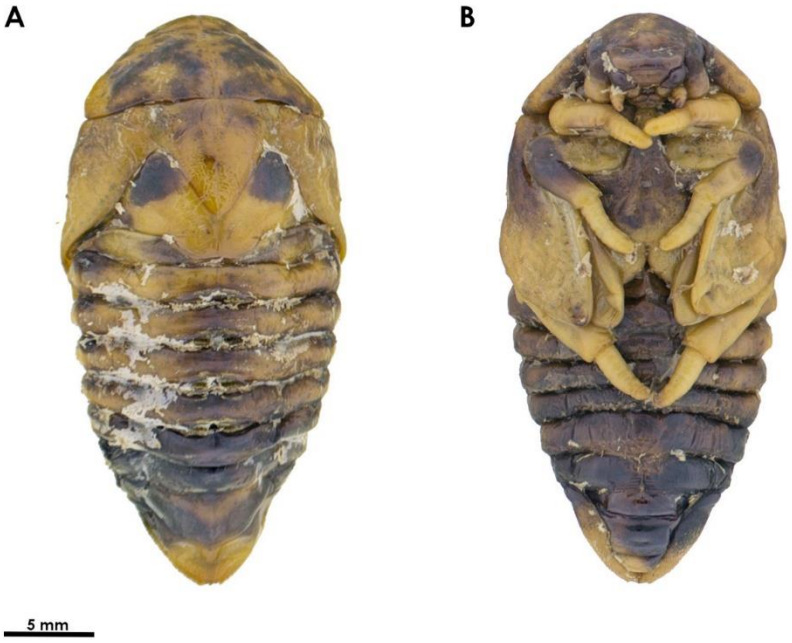


Figure 7. *Anticheira capucina* (Fabricius, 1787). Female pupa: dorsal (A), ventral (B).

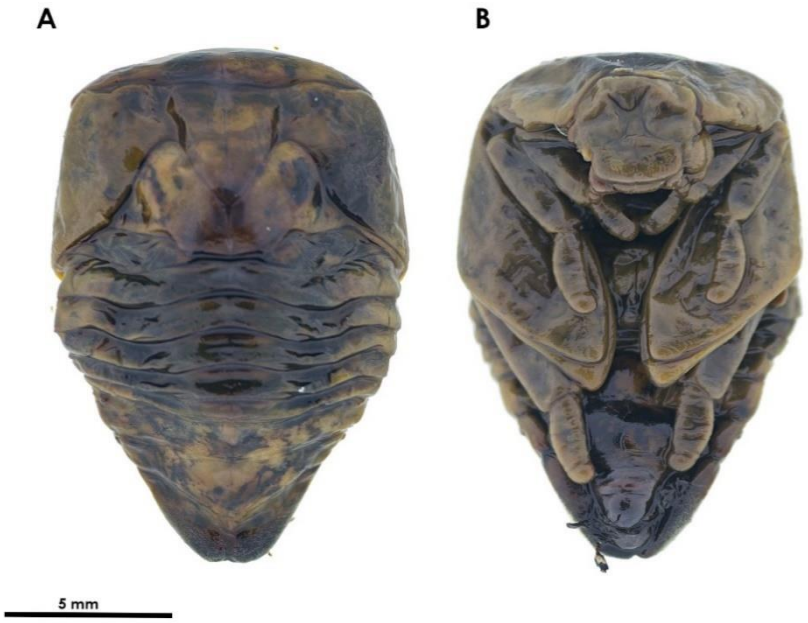


Figure 8. *Anticheirodes brullei* (Castelnau, 1840). Male pupa: dorsal (A), ventral (B).

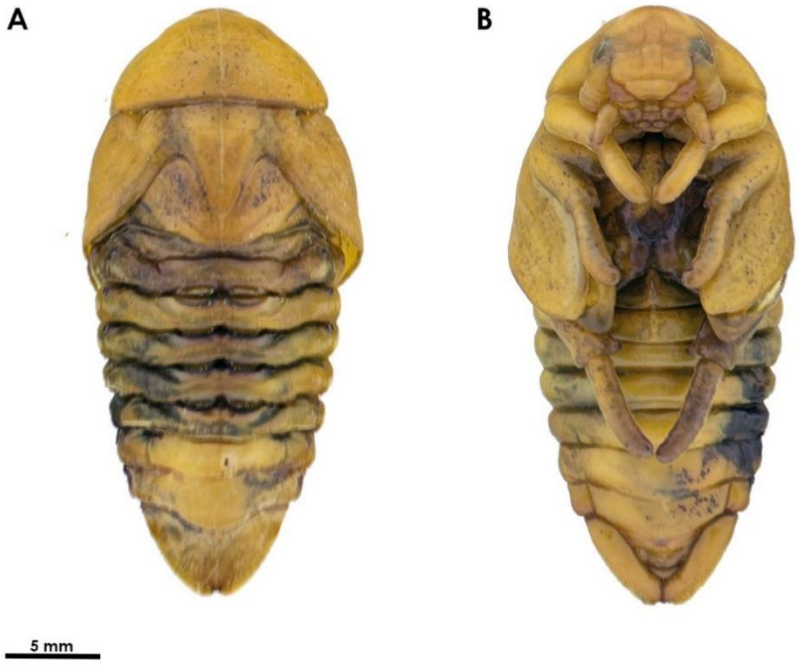


Figure 9. *Telaugis aenescens* Burmeister, 1844. Female pupa: dorsal (A), ventral (B).

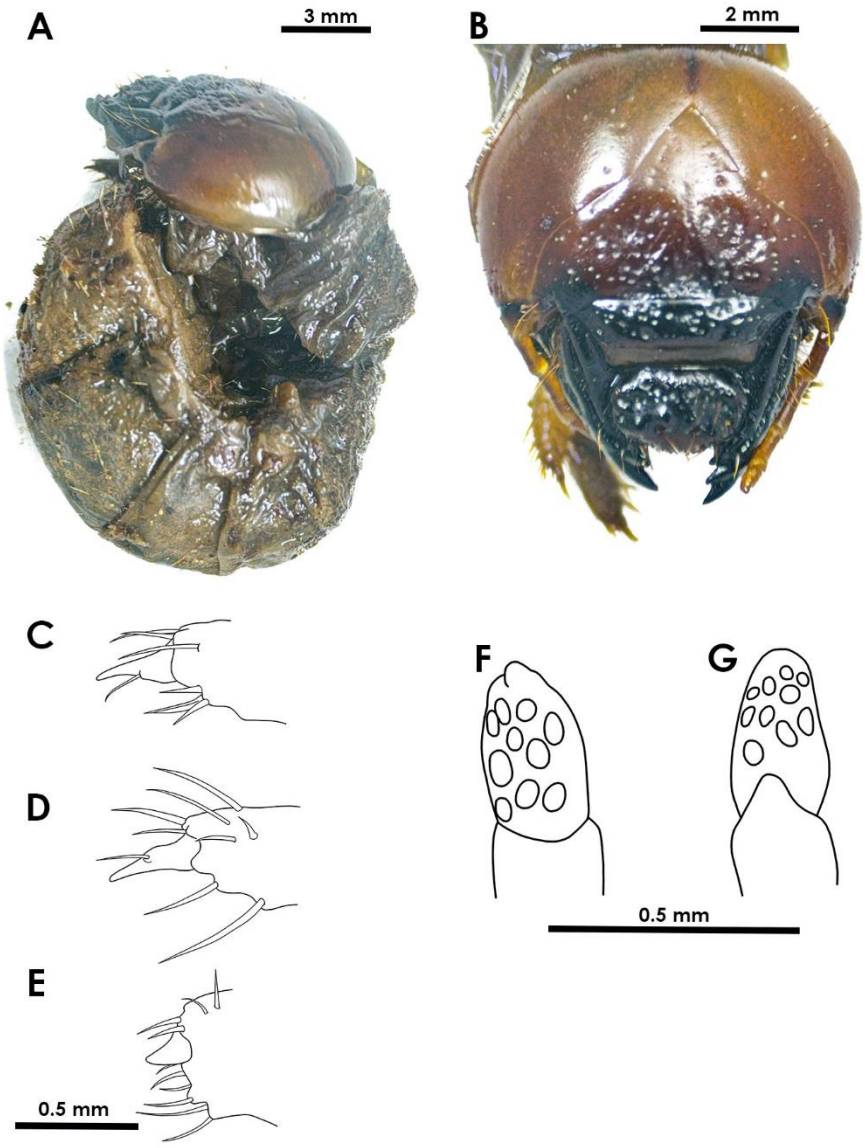


Figure 10. *Vayana bicolor* (Olivier, 1789); third larval instar. Body (A); head (B); pretarsus: pro- (C), meso- (D), and metapretarsus (E); antenna: dorsal (F), ventral (G).

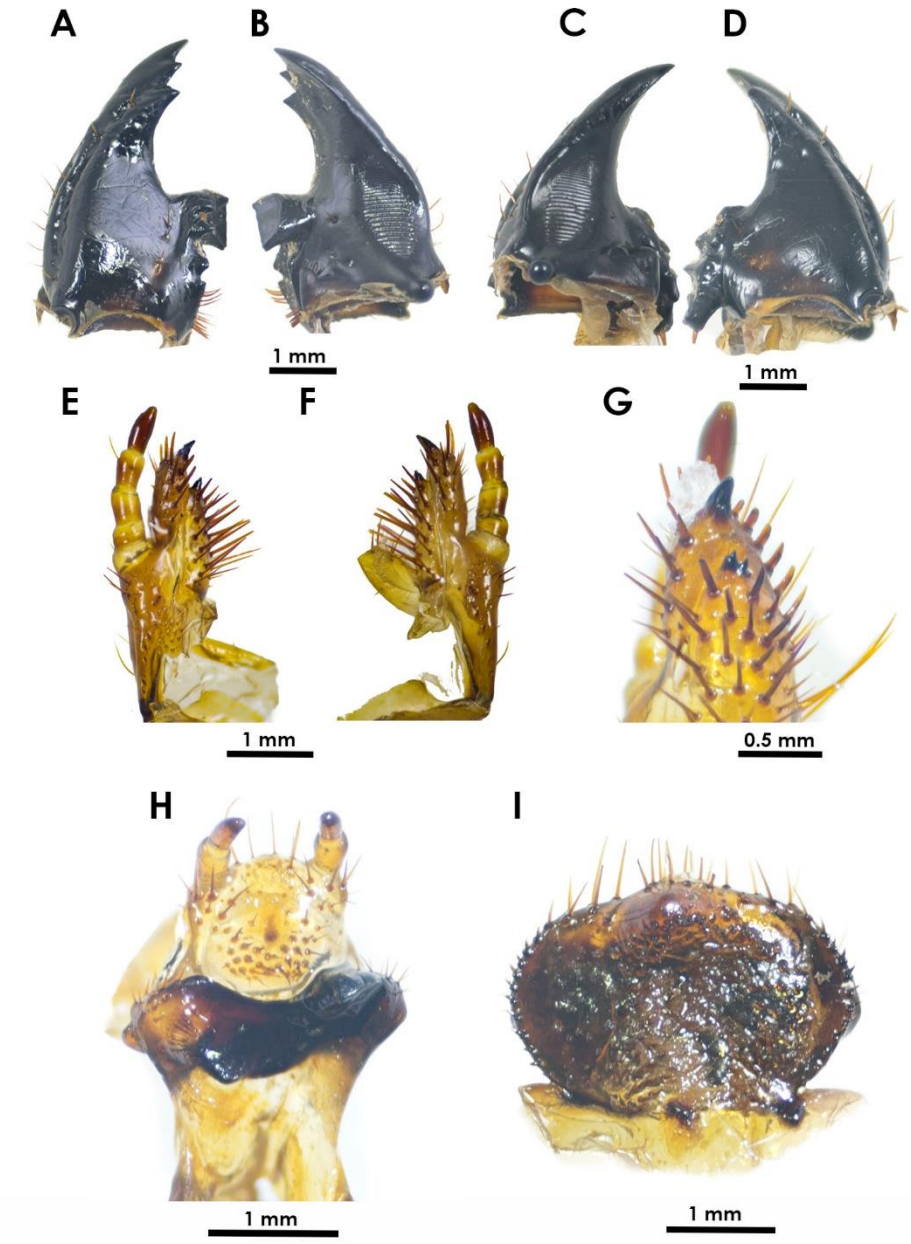


Figure 11. *Vayana bicolor* (Olivier, 1789); third larval instar. Mandibles: left dorsal (A), left ventral (B), right ventral (C), right dorsal (D); maxilla: left (E), right (F), uncus (G); hypopharynx (H); epipharynx (I).

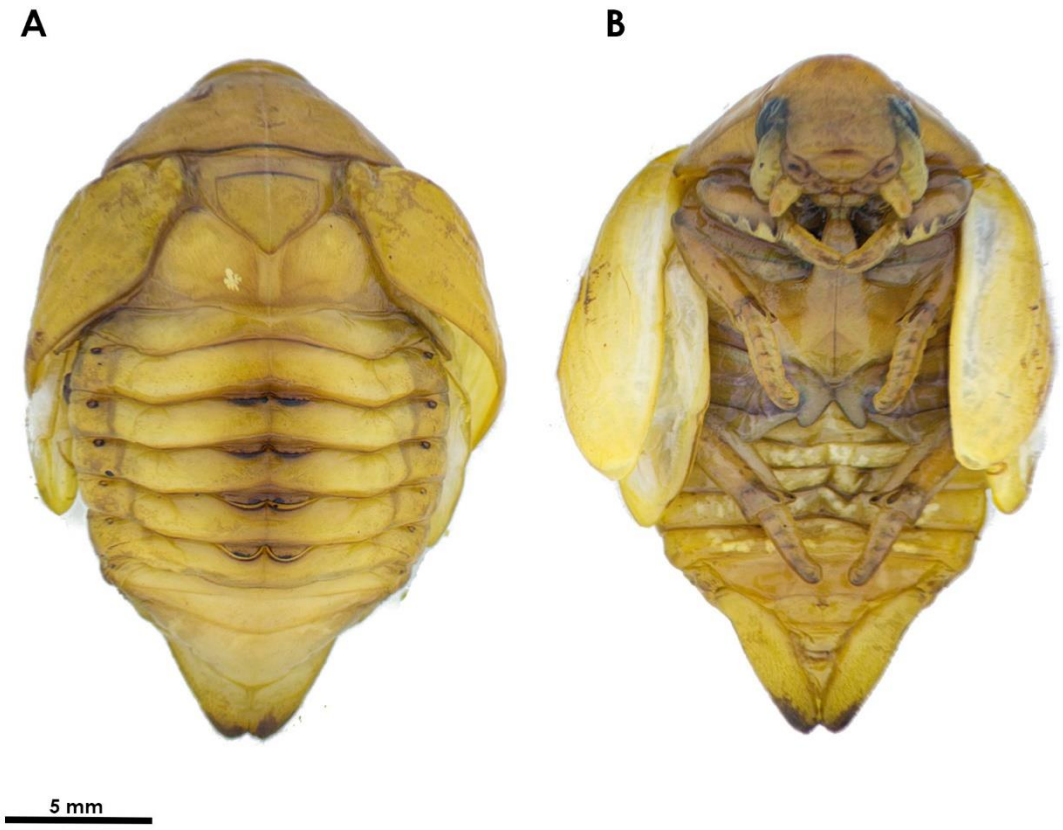


Figure 12. *Vayana bicolor* (Olivier, 1789). Female pupa: dorsal (A), ventral (B).

CAPÍTULO 3

# DESCRIPTION OF THE IMMATURES OF FOUR SPECIES OF GENUS *Pelidnota* MacLeay, 1819 (COLEOPTERA: MELOLONTHIDAE: RUTELINAE: RUTELINI) [1]

TAMARA G. CARVALHO[2], JUARES FUHRMANN[3], PASCHOAL C. GROSSI[2]

[2] Universidade Federal Rural de Pernambuco, Programa de Pós-Graduação em Entomologia, Recife, PE - Brazil

[3]Universidade de São Paulo, Museu de Zoologia, São Paulo, SP - Brazil

[1]Carvalho, T.G, J. Fuhrmann[3] & P.G. Grossi. Description of the immatures of four species of genus *Pelidnota* MacLeay, 1819 (Coleoptera: Melolonthidae: Rutelinae: Rutelini). For submission in Revista Brasileira de Entomologia.

ABSTRACT - Described here the last larval instar and pupa of *Pelidnota ancilla* Bates, 1904, the male pupa of *P. nitescens* (Vigors, 1825), the last larval instar and pupa of *P. pulchella* (Kirby, 1819), and the female pupa of *P. rugulosa* Burmeister, 1844. Illustrations and diagnostic characters are also presented, along with additional characters for the genus, and an updated third instar larvae key is given. In addition, is given the first report of *P.ancilla* to Pernambuco State, Brazil. With this study, 10 species of immatures of *Pelidnota* are now known and their diagnostic characters and differences are here discussed.

KEYWORDS: Neotropical, Scarabaeoidea, taxonomy, white grubs

DESCRIÇÃO DOS IMATUROS DE QUATRO ESPÉCIES DO GÊNERO *Pelidnota* MacLeay, 1819 (COLEOPTERA: MELOLONTHIDAE: RUTELINAE: RUTELINI)

RESUMO – São descritos aqui, o último ínstar larval e a pupa de *Pelidnota ancilla* Bates, 1904, a pupa macho de *P. nitescens* (Vigors, 1825), a larva de terceiro ínstar e pupa de *P. pulchella* (Kirby, 1819), e a pupa fêmea de *P. rugulosa* Burmeister, 1844. Ilustrações e caracteres diagnósticos das larvas e pupas são também apresentados, incluindo caracteres adicionais para o gênero e uma chave atualizada para as larvas de terceiro ínstar. Além disso, é feito aqui o primeiro registro de *P. ancilla* para o Estado de Permambuco, Brasil. Com esse estudo, dez espécies de imaturos de *Pelidnota* são agora conhecidos e suas semelhanças e diferenças são aqui discutidos.

PALAVRAS-CHAVE: Coró, Neotropical, Scarabaeoidea, taxonomia

## Introduction

*Pelidnota* MacLeay, 1819 is one of the most speciose genus within Rutelini (Coleoptera: Scarabaeidae: Rutelinae), with 198 species and subspecies in the Americas, occurring from Canada to central Argentina (Moore *et al*. 2017, Ferreira *et al*. 2022). Seventy-three species and 27 subspecies have been recorded from Brazil (Vaz-de-Mello & Grossi 2023). Despite this diversity, only six species have immatures described: *Pelidnota punctata* (Linnaeus, 1785) described by Ritcher (1966), *Pelidnota virescens* Burmeister, 1844 described by Morón (1976), *Pelidnota fulva* Blanchard, 1850 described by Rodrigues *et al*. (2012), *Pelidnota lugubris* (LeConte, 1874) described by Lugo-Garcia *et al.* (2019), *Pelidnota granulata* (Gory, 1834) described by Bento & Fonseca (2020), and *Pelidnota prolixa* Sharp, 1877 described by Barria *et al.* (2021), totaling five larvae and three pupae described. Of these, *P. granulata* and *P. fulva* are reported from Brazil (Rodrigues *et al*. 2012, Bento & Fonseca 2020).

Historically, *Pelidnota* belongs to the 'Pelidnotine scarabs', a paraphyletic group once treated as the subtribe Pelidnotina (tribe Rutelini), but currently synonymized with Rutelina due to lack of phylogenetic support (Jameson 1998, Bouchard *et al*. 2011). The genus was revised by Soula (2009) and studied by Moore *et al.* (2017), and according to the latter, it is possible that *Pelidnota* includes several natural groups and its diagnosis is difficult because of paraphyly, in need of a comprehensive taxonomic and phylogenetics revision, including identification resources for all species. *Pelidnota* was divided into species groups (Ohaus 1918, Soula 2009), although there is no explicit set of characters that delimit each group of species, except for group *liturella* (Ferreira & Grossi 2022).

About natural history, adults are phytophagous, feeding on leaves, flowers, and fruits (Rodrigues & Falco 2011), commonly captured in night light traps (Neita *et al*. 2006, Rodrigues *et al*. 2012). The larvae develop on substrates such as soil (Lugo-García *et al*. 2019) and rotting trunks (Morón 1976, Neita *et al*. 2006), playing an important function in the decomposition and recycling

of nutrients (Rodrigues & Falco 2011). The complete life cycle and biological notes are described to *Pelidnota virescens* (Morón & Deloya 2002), *P.fulva* (Rodrigues & Falco 2011), and *P. prolixa* (Barria *et al.* 2021).

This study intends to contribute to the knowledge of the immature stages of *Pelidnota* MacLeay, 1819. Here, we describe the immature of following Brazilian species: pupa and last larval instar of *Pelidnota ancilla* Bates, 1904, pupa of *P. nitescens* (Vigors, 1825), pupa and last larval instar of *P.pulchella* (Kirby, 1819), and pupa of *P.rugulosa* Burmeister, 1844. A discussion of the immature characters for the genus is presented as well as an updated identification key.

## Methodology

Collections of immatures were made from rotten logs from different locations, raised in the laboratory, following the standard method of Costa *et al*. (1988) for the emergence of adults and subsequent identification. One male pupa of *Pelidnota nitescens* was collected on x. 2002, in Caraça, Catas Altas, Minas Gerais, Brazil, by Paschoal Grossi (P.G). For descriptions of *Pelidnota pulchella* a third instar larva was used, and two female pupae, all collected on xi. 2008, in Piraquara municipality, Paraná, Brazil, by P.G, and two male pupae collected on 02. ix. 2011, in the same locality. One female pupa of *Pelidnota rugulosa* was collected in Nova Friburgo (1500m), Rio de Janeiro, Brazil, on xi. 2001, by P.G. All specimens were deposited in CERPE (Coleção Entomológica da Universidade Federal Rural de Pernambuco, Recife, Brazil - Paschoal Grossi curator).

Adults of *Pelidnota ancilla* were collected with a light trap during the period February to May 2019 in Aldeia, PE 027, km 14, Camaragibe municipality, Pernambuco, Brazil. In the laboratory, couples were kept in plastic pot containers containing crushed rotten wood and fed banana and apple pieces. Male beetles were removed after copula, females were removed when they showed signs of near death, and containers were checked every two days for the presence of eggs.

After the observation of galleries inside the substrate indicating the hatching of the eggs, emergent larvae were transferred and individualized in plastic containers containing crushed rotten wood, where they were kept until complete development. The larvae and pupae were killed in boiling water and preserved in 80% alcohol. Descriptions of *P. ancilla* were based on seventeen larvae (three first instar, three second instar, and eleven third instar), four male pupae, and two female pupae. All specimens were deposited in CERPE (Coleção Entomológica da Universidade Federal Rural de Pernambuco, Recife, Brazil – Paschoal Grossi curator).

For the morphological study, the specimens were dissected and stored in containers containing 80% ethanol. The head, mouthparts, and spiracles were mounted on temporary laminas and, after being analyzed, stored. Structure analysis, comparison, and description of the larvae and pupae were performed with the assistance of ZEISS STEMI 508 stereoscope and OLYMPUS BX41 optical microscope. Drawings were made with the assistance of OLYMPUS SZX12 stereoscopic microscope with an attached clear camera and scanned. Photographs were taken with a NIKON D5300 camera attached to a ZEISS STEMI 508 stereo microscope. Images editing was done using the GIMP®.

The terminology of larval structures follows Böving (1936) and Lawrence (1991), head chaetotaxy and pupa terminology follows Sousa *et al*. (2018). Family-level classification follows Cherman & Morón (2014).

## Results

### *Pelidnota ancilla* Bates, 1904

**Specimens examined:** Seventeen reared larvae (three 1º instars, three 2º instars, and eleven 3º instars), four male pupae, and two female pupae of *P. ancilla*, deposited in CERPE. Rearing was

established from adults collected with a night light trap during the period February to May 2019 in Aldeia, PE 027, km 14, Camaragibe municipality, Pernambuco, Brazil; Grossi P. (collector).

**Third larval instar** (Figs. 1-2)

Description. *Total Length:* 26.80–29.80 mm. Surface pubescent. *Colour:* body yellowish white; head yellowish to reddish-brown, mandibles dark brown; pretarsus, spiracles, and pubescence yellowish-brown (Fig. 1A). **Head** (Fig. 1B) *Length:* 7.55–8.70 mm, *width:* 7.00–8.60 mm. Epicranial suture present, each side of cranium with 5–7 dorsoepicranial setae (*des*), 3–11 posteroepicranial setae (*pes*), 0–2 anteroepicranial setae (*aes*), 5–12 externoepicranial setae (*ees*), 2–4 posterofrontal setae (*pfs*), 1 externofrontal seta (*efs*), 0–2 anterofrontal angle setae (*aas*), 3–4 anterofrontal setae (*afs*). Stemmata absent. Clypeus subtrapezoidal, surface smooth, each side with 1–2 externoclypeal setae (*ecs*), one anteroclypeal seta (*acs*). Labrum ellipsoidal, surface smooth, each side with 4–6 posterolabral setae (*pls*), 4–7 laterolabral setae (*lls*), 1–2 mediolabral setae (*mls*), and a group of 11–16 anterolabral setae (*als*). **Epipharynx** (Fig. 2I) ellipsoidal, wider than long. *Corypha* with a row of 7–9 setae, epizygum and clythra absent. *Haptomerum* prominent, rounded, with 29–43 tooth-like setae and 4–8 sensilla, evident zygum crossbar-like, heli absent. *Paria*, each side of acroparia with 6–9 setae, each acanthoparia with 10–14 spine-like setae; right chaetoparia with 65–81 setae and 2–7 sensilla, left chaetoparia with 45–68 setae and 2–10 sensilla; gymnoparia distinct; phoba, plegmatia, and proplegmatia absent. *Pedium* asymmetric, wider than long, without sensilla, phoba absent. *Haptolachus* with right side with 2–5 setae and 3–7 sensilla, left side with 6–7 setae and two sensilla; crepis indistinct; sensorial cone prominent, transverse, with distinct sclerotized cross-bar, and with 4–5 sensilla; sclerotized plate indistinct; dexiotorma slightly sinuous; apotorma and epitorma indistinct, laeotorma short and curved, and prominent pternotorma, rounded. **Mandibles** asymmetric, right mandible more curved and subtriangular, left mandible truncated. Stridulatory area fusiform, elongated, formed by transversal ridges, closest to each other distally. Right mandible

(Figs. 2C-D) with a set of 18–22 dorsomolar setae, and 5–10 ventromolar setae in a tuft; brustia with 3–4 setae; scrobe with 8–11 setae; dorsolateral furrow with 2–4 setae; ventral process subquadrangular. Right incisor with two teeth, S1 largest, apex slightly rounded; a right molar with three truncate lobes, calx subquadrangular. Left mandible (Figs. 2A-B) with a set of 13–16 dorsomolar setae, and 5–7 ventromolar setae in a tuft; brustia with 17–20 setae; scrobe with 10–11 setae; dorsolateral furrow with 2–3 setae; ventral process subtriangular. Left incisor with three similar teeth; molar with m1 robust, m2 short, truncate; acia indistinct. **Maxilla** (Figs. 2E-F) symmetrical, galea and lacinia fused in a mala, mala setose; uncus of galea robust, prominent; two unci in the lacinia, both small, reduced, with a seta (Fig. 2G); palpus 4-segmented, palpomere III with two setae, palpomere IV fusiform; stipe with stridulatory area bearing a row of 13–16 teeth and a truncate process. **Labium.** Each side of prementum with 5–6 anteromedial setae, 1–3 lateral setae, one posteromedial seta, and 8–12 anteromedial sensilla; each side of mentum with 1–2 posteromedial setae; each side of submentum with 3–5 anterolateral setae, 2–3 anterolateral sensilla; ligula with 7–9 anteromedial setae, each side with 24–30 setae, and a total of 18–23 sensilla, without phoba and heli. **Hypopharynx** (Fig. 2H) with scleroma asymmetrical, transversal; right lobe with 12 setae in the anterior margin; left lobe with 13–14 setae in the anterior margin, and a row of 13–15 setae; hypopharyngeal tubercle with acuminate apex; right posterior preoral area (*ppa*) without setae and sensilla, left *ppa* with 5–10 setae, without sensilla. **Antenna** 4-segmented; antennomere I, II, III with subequal length, IV shorter; antennomere IV with 4–6 dorsal sensorial spots and 4–5 ventral sensorial spots (Figs. 1F-G). **Thorax.** Prothorax with a distinct dorsal lobe and a lateral sclerite, tergal lobe covered by 42–44 setae, spiracle lobe with 10–18 setae, pleural lobe with 27–28 setae, ventral lobe with 40–47 setae. Meso- and metathorax with three distinct dorsal lobes, anterior tergal lobe with 13–16 setae, medial tergal lobe with 49–75 setae, posterior tergal lobe with 9–24 setae; anterior pleural lobe with 0–7 setae, posterior pleural lobe with 9–14 setae; anteromedial ventral lobe with

40–71 setae, posterior ventral lobe with 4–6 setae. Thoracic spiracle: c-shaped, dorsoventral axis about 1.5–1.6x longer than dorsoventral axis of abdominal spiracles, dorsoventral diameter of bulla 1.3–1.7x longer than the distance between respiratory plate arms. **Legs.** All legs similar to each other, pro- shorter, meso- and meta- subequal; pro- and mesopretarsus truncate; metapretarsus rounded, shorter (Figs. 1C-E). **Abdomen** with 10 segments; segment I with two dorsal lobes; segments II–V with three dorsal lobes each; segment VI–VII with two distinct dorsal lobes; segments VIII–X without distinct dorsal divisions. Segment I with tergal anterior lobe (*tal*) covered by 26–28 setae, tergal posteromedial lobe with 88–90 setae, tergal lateral lobe (*tll*) with 9–15 setae; pleural anterior lobe (*pal*) with 2–4 setae, pleural posterior lobe (*ppl*) with 19–22 setae, spiracle lobe (*esl*) with 13–15 setae; ventral anterior lobe (*val*) with 0–1 seta, ventral posteromedial lobe with 18–21 setae. Segments II–V with *tal* covered by 70–85 setae, tergal medial lobe (*tml*) with 50–68 setae, *tll* with 8–13 setae, tergal posterior lobe (*tpl*) with 125–149 setae; *pal* with 0–5 setae, *ppl* with 17–30 setae, *esl* with 12–19 setae; *val* with 7–21 setae, ventral posteromedial lobe (in segments II–III only) with 6–11 setae, ventral medial lobe (*vml*) (in segments IV–V only) with 10–13 setae, and ventral posterior lobe (*vpl*) without setae. Segments VI–VII with *tal* covered by 64–99 setae, tergal posteromedial lobe with 64–99 setae, *tll* with 4–10 setae; *pal* with 0–7 setae, *ppl* with 13–24 setae, *esl* with 13–15 setae; *val* without setae, *vml* with 8–13 setae, and *vpl* without setae. Segments VIII–IX with a tergal lobe covered by 25–42 setae; segment VIII with *pal* with 0–5 setae, *ppl* with 10–13 setae, *esl* with 9–14 setae; pleural lobe of segment IX with 26–32 setae; ventral lobe of segments VIII–IX with 15–18 setae. Segment X dorsally covered by approximately 100–117 setae. Raster without palidium. Raster with transversal palidium, composed of a single row of 38–42 pali. Teges with 49–74 setae; ventral anal lobe with a total of 76–96 setae; these, 38–42 long setae border the anal opening; 70–83 spine-like setae in the anal dorsal lobe. Campus visible, and barbula indistinct. Anal opening transverse. Spiracles c-shaped with a dorsoventral diameter of bulla 1.3–2x longer the

distance between respiratory plate arms, and a dorsoventral axis about 1.5–1.6x larger than anteroposterior axis.

**Remarks:** *Pelidnota ancilla* is reported for the following Brazillian states: Espírito Santo, Goiás, and Santa Catarina (Moore *et al*. 2017). A new record for Pernambuco State is added here. Larvae of *P. ancilla* can be diagnosed from the other species of *Pelidnota* by the combined characteristics: stemmata absent, haptomerum with 29–43 setae arranged in 3 rows, acroparia present with 6–9 setae, left mandible with 3 teeth, lacinia of maxilla with 2 unci.

**Pupa** (Figs. 3A-C)

Description. *Total length*: 21.60–31.40 mm, *width*: 9.40–13.00 mm. The general aspect of the body: Oval-shaped, surface glabrous. **Head.** Vertex visible in dorsal view, surface slightly rugose with small elevations. Eyes visible, slightly covered by angles of pronotum and canthus. Canthus elliptical, no prominent. Epistomal suture sinuous, medially interrupted. Clypeus subrectangular, with two medial elevations, slightly rugose; lateral margins dommed, anterior margin sinuous, posterior margin slightly sinuous. Labrum subtrapezoidal, anterior margin slightly sinuous, posterior margins truncate. Mandible with prominent medial lobe. Maxillary palpi 0.4–0.6x the length of the antenna. Antenna subtriangular, with posterior and inner margins of similar length, outer margin notched. **Thorax.** Pronotum subhexagonal, wider than long, with two mediolateral foveae, lateral margins slightly angled, posterior margin sinuous, anterior margin slightly curved, anterior angles well defined. Prosternum barely visible. Prosternal process prominent, acuminate, dividing the procoxae. Ecdysial line distinct in pro-, meso-, and metanotum. Length of the mesonotum approximately 1/3 of the length of pronotum. Metanotum broader, not posteriorly expanded, posterior margin almost straight. Pterothoracic ventrite process extending longitudinally to the posterior border of the prosternum, process dividing the mesocoxae, apex rounded. Articulations of pro-, and mesolegs dorsally visible in the constriction between pronotum and alar thecae. Metacoxae

contiguous. Protibia with three out tubercle-like spur and one inner; meso- and metatibiae with one out tubercle-like spur, and two inners. Spiracle visible, rounded, well sclerotized, dark brown. Alar thecae with 3–6 striae. **Abdomen.** Five pairs of the dioneiform organs between segments I–II, II–III, III–IV, IV–V, V–VI, all represented by anterior and posterior parts. Tergite II–IV slightly laterally expanded. Tergites VII–VIII posteriorly expanded. Sternites VII–VIII combined with 2/3 of the length of sternites II–VI combined. Dense posterolateral pubescence in the fold of tergite IX, dark brown setae; prominent lobes. Spiracle I partially covered by alar thecae, spiracles I–IV with peritreme, V–VIII without peritreme. Male terminalia prominent, convex, with anterior ampulla subrectangular, and posterior ampulla rounded, sternite X almost completely covered by posterior ampulla. Female terminalia formed by two small symmetrical laminar tubercles, contiguous, with sternite X visible.

**Remarks:** Pupae of *P. ancilla* can be identified by: the posterior margin of metanotum almost straight with a medial lobe; pterothoracic ventrite process with a lateral constriction before widening towards the apex; abdominal spiracle VIII prominent, visible in ventral view.

***Pelidnota nitescens* (Vigors, 1825)**

**Species examined:** One male pupa of *Pelidnota nitescens*: x. 2002, Caraça, Catas Altas, Minas Gerais, Brazil, Paschoal Grossi (collector) (CERPE).

**Male pupa** (Figs. 4A-B)

Description. *Total length*: 20.70 mm, *width:* 7.20 mm. The general aspect of the body: Elliptical-shaped, elongated, convex, surface glabrous. **Head.** Surface glabrous, vertex visible in dorsal view. Frons with one obsolete groove on each side. Eyes visible, partially covered by angles of pronotum. Canthus obsolete, rounded. Epistomal suture obsolete, curved, medially interrupted. Clypeus subrectangular, with three slight depressions, and an anterior groove transverse. Labrum

subtrapezoidal, with one slight medial depression. Mandible with anterior lobe rounded, and posterior lobe truncate. Maxillary palpi prominent with 0.5x the length of the antenna. Labium rounded, visible in ventral view. Antenna subtriangular, with a well-distinct club. **Thorax.** Pronotum subhexagonal, lateral margins rounded, posterior margin slightly sinuous, anterior margin sinuous, anterior angles obtuse; wider than long, two posteromedial foveae. Prosternum barely visible, prosternal process small, acuminate, dividing the procoxae. Mesonotum with a length similar to the metanotum, and both combined with a length similar to the pronotum. Ecydisial line weakly visible in pro-, meso-, and metanotum. Articulations of pro-, meso- and metalegs dorsally visible. Pterothoracic ventrite process prominent, broad, apex rounded with the same width of the basis, dividing mesocoxae, and extended to the middle of prosternal process. Metacoxae contiguous. Pro- and mesotibia with indistinct spur tubercle-like, metatibia with two inners obsolete spurs. Metatibias covered by alar thecae. Elytral thecae with six striae. Spiracle visible, circular, well sclerotized, dark brown. **Abdomen.** Five complete pairs of dioneiform between the tergites I–II, II–III, III–IV, IV–V, V–VI. Tergites II–VI laterally expanded. Tergites VIII and IX posteriorly expanded. Smooth pubescence in the posterior half of tergite IX, yellow setae; lobes obsolete. Sternites clearly convex, with similar size. Spiracles I–IV with peritreme, V–VIII without peritreme; spiracle VIII prominent and visible in ventral view; spiracle I visible, partially covered by alar thecae. Male terminalia prominent, formed by an anterior ampulla transverse, semicircular, and posterior ampulla rounded.

**Remarks**: From the known pupae of *Pelidnota* species, *P. nitescens* can be distinguished from the posterior margin of metanotum without a medial lobe; pterothoracic ventrite process broadly rounded; ecdysial line weakly visible in pro-, meso-, and metanotum; and maxillary palpi 0.5x the length of the antenna. Female pupae unknown.

***Pelidnota pulchella* (Kirby, 1819)**

**Specimens examined:** A third instar larva of *P. pulchella*, and two female pupae: xi. 2008, decaying trunk, Piraquara municipality, Paraná, Brazil, Grossi, P. (collector); and two male pupae: 02. ix. 2011, decaying trunk, Piraquara municipality, Paraná, Brazil, Grossi, P. (collector) (CERPE).

**Third larval instar** (Figs. 5-6)

Description. *Total Length:* 17.80 mm. Surface pubescent. *Colour:* body yellowish white; head yellowish-brown, mandibles dark brown; pretarsus, spiracles, raster, and pubescence light-brown (Fig. 5A). **Head** (Fig. 5B) *Length:* 6.00 mm, *width:* 5.60 mm. Epicranial suture present, weakly delimited; each side of cranium with 8–9 dorsoepicranial setae (*des*), 8–10 posteroepicranial setae (*pes*), 1 anteroepicranial seta (*aes*), 10–12 externoepicranial setae (*ees*), 3–5 posterofrontal setae (*pfs*), 1 externofrontal seta (*efs*), 1 anterofrontal angle seta (*aas*), 4–7 anterofrontal setae (*afs*). Stemmata present. Clypeus subtrapezoidal, surface smooth, each side with 1–2 externoclypeal setae (*ecs*), and one anteroclypeal seta (*acs*). Labrum ellipsoidal, slightly rugose, each side with 3–12 posterolabral setae (*pls*), 3–6 laterolabral setae (*lls*), 1 mediolabral seta (*mls*), and a group of 14–22 anterolabral setae (*als*). **Epipharynx** (Fig. 6I) oval, wider than long. *Corypha* with a row of 7–8 setae, epizygum and clythra absent. *Haptomerum* acuminate, with 23–33 tooth-like setae and seven sensilla, zygum crossbar-like, heli absent. *Paria*, each side of acroparia with 10–14 setae, each acanthoparia with 7–10 spine-like setae; right chaetoparia with 57–68 setae, without sensilla, left chaetoparia with 50–57 setae and one sensillum; gymnoparia distinct; phoba, plegmatia, and proplegmatia absent. *Pedium* oval, without sensilla, phoba absent. *Haptolachus* with right side with 1–2 setae and 0–2 sensilla, left side with 4–5 setae and 0–2 sensilla; crepis indistinct; sensorial cone with 3 sensilla, transverse; sclerotized plate indistinct; dexiotorma slightly curved; apotorma and epitorma indistinct, laeotorma short and curved, and prominent pternotorma, rounded. **Mandibles** asymmetric, right more curved and subtriangular, left mandible longer, truncate. Stridulatory area fusiform, formed by transversal ridges, equidistant from each other. Right mandible (Figs. 6C-D)

with a set of 9–11 dorsomolar setae, and 3–4 ventromolar setae in a tuft; brustia with 4–7 setae; scrobe with 10 setae; dorsolateral furrow with three setae; ventral process subquadrangular. Right incisor with two teeth, S1 largest; a right molar with three lobes: m1 truncate, m2 and m3 acuminate, calx subquadrangular. Left mandible (Figs. 6A-B) with a set of 8–10 dorsomolar setae, and three ventromolar setae in a tuft; brustia with 16–19 setae; scrobe with 8–11 setae; dorsolateral furrow with three setae; ventral process subtriangular. Left incisor with three teeth, S1 largest; molar with m1 robust, m2 short; acia indistinct. **Maxilla** (Figs. 6E-F) symmetrical, galea and lacinia fused in a mala, mala setose; uncus of galea robust; two unci in the lacinia, both small, reduced, weakly sclerotized, with a seta (Fig. 6G); palpus 4-segmented, palpomere III with two setae, palpomere IV fusiform; stipe with stridulatory area bearing a row of 7–9 teeth and a truncate process. **Labium.** Each side of prementum with 5–6 anteromedial setae, 2–3 lateral setae, one posteromedial seta, and 2–5 sensilla; each side of mentum with 1–2 posteromedial setae, and 2–5 sensilla; each side of submentum with 2–4 anterolateral setae, 1–2 posterolateral setae, and 2–9 sensilla; ligula with 8–9 anteromedial setae, each side with 21–25 setae, and a total of 3–7 sensilla, without phoba and heli. **Hypopharynx** (Fig. 6H) with scleroma asymmetrical, transversal; right lobe with 8–11 setae in the anterior margin; left lobe with 8–13 setae in the anterior margin, and a row of 10–11 setae; hypopharyngeal tubercle acuminate, distinctly acute lateral projections; right posterior preoral area (*ppa*) without setae and sensilla, left *ppa* with three setae, without sensilla. **Antenna** 4-segmented; antennomere II longer than I, I and III subequal, IV shorter than the antennomeres I–III; antennomere IV with 2–3 dorsal sensorial spots and 3–4 ventral sensorial spots (Figs. 5F-G). **Thorax.** Prothorax with a distinct dorsal lobe and a lateral sclerite, meso- and metathorax with three distinct dorsal lobes. Thoracic spiracle: c-shaped, dorsoventral axis about 1.4x longer than the dorsoventral axis of abdominal spiracles, the dorsoventral diameter of bulla 3.3x longer than the distance between respiratory plate arms. **Legs.** All legs similar to each other; pro- and mesopretarsus truncate,

metapretarsus rounded, shorter (Figs. 5C-E). **Abdomen** 10-segmented; segment I with two dorsal lobes; segments II–V with three dorsal lobes each; segments VI–VII with two slightly distinct dorsal lobes; segments VIII–X without dorsal divisions. Raster with palidium present, tegillum distinct, campus visible, and barbula indistinct. Anal opening transverse. Spiracles c-shaped with a dorsoventral diameter of bulla 2x longer than the distance between respiratory plate arms, and a dorsoventral axis about 1.4x larger than anteroposterior axis.

**Remarks:** Due to the station of preservation of the material, it was not possible to realize the chaetotaxy of the body and raster of the third instar larvae of *P. pulchella*. From the larvae described for *Pelidnota*, *P.pulchella* is the only one that presents palidium, and 2–3 dorsal sensorial spots in the last antennomere. In addition, it has stemmata (shared characteristic with *P. virescens*), lacinia of maxilla with 2 unci, left mandible with 3 scissorial teeth, and acroparia present with 10–14 setae.

**Pupa** (Figs. 7A-C)

Description. *Total length*: 17.15–20.00 mm, *width*: 7.80–8.30 mm. The general aspect of the body: oval-shaped, slightly flattened. **Head.** Surface glabrous, slightly rugose. Vertex visible dorsally. Eyes visible, partially covered by angles of pronotum and canthus. Canthus small, rounded, almost obsolete. Frons with a medial carina longitudinal, and each side with a longitudinal groove. Epistomal suture distinct, sinuous, medially interrupted. Clypeus subtrapezoidal, lateral margins sinuous, posterior margin truncate, ventral surface with medial depression longitudinal, and a transverse groove notched. Labrum subtrapezoidal, lateral margins slightly sinuous. Maxilla with palpi robust, with 0.6x–0.7x the length of the antenna. Mandible with an anterior tubercle rounded, prominent, and a posterior tubercle subtriangular. Antenna triangular, inner and outer margins with similar lengths, outer margin notched, inner and posterior margins almost straight. **Thorax.** Pronotum subhexagonal, anterior and posterior margins sinuous, lateral margins rounded; anterior angles acute; surface with lateral slightly rugose. Prosternum hidden by prosternal process, prosternal

process prominent, apex acuminate, dividing the procoxae; procoxae subcontiguous. Meso- and metanotum with similar lengths, both combined with similar length to the pronotum. Ecdysial line visible in pro-, meso-, and metanotum. Pro-, meso- and metalegs articulations visible in dorsal view. Pterothoracic ventrite process prominent, dividing the mesocoxae, apex rounded, reaching the posterior margin of prosternal process. Metacoxae subcontiguous. Mesotibia with two inner tubercle-like spurs obsolete. Metatibia with two inner tubercle-like spurs prominent. Alar thecae with five striae. Spiracle visible, elliptical, dark brown. **Abdomen.** Five complete pairs of dioneiform organs between the tergites I–II, II–III, III–IV, IV–V, V–VI. Tergites I–VI with similar length, tergites VII–IX posteriorly expanded; tergites I–VI combined with a length longer than the length of tergites VII–VIII combined; tergites, and sternites slightly convex, flattened. Fold of tergite IX rounded, with distinct lobs, surface with sparse posterolateral pubescence, yellow setae. Spiracles I–IV with peritreme, V–VIII without peritreme, spiracle VIII dorsally visible. Male terminalia formed by an anterior rectangular ampulla, and posterior rounded ampulla, both prominent, covering totally the sternite X. Female terminalia compound by two small tubercles, acuminates, no prominent, subcontiguous.

**Remarks:** Between the species of *Pelidnota* with pupae described, *P. pulchella* differs by abdominal spiracle I not exposed; posterior margin of metanotum with a medial lobe; pterothoracic ventrite process broadly rounded; maxillary palpi with 0.6x–0.7x the length of the antenna.

***Pelidnota rugulosa* Burmeister, 1844**

**Species examined**: One female pupa: xi.2001, Nova Friburgo (1500m), Rio de Janeiro, Brazil, Paschoal G. (collector) (CERPE).

**Female pupa** (Figs. 8A-B)

Description. *Total length*: 28.40 mm, *width*: 12.10 mm. The general aspect of the body: Oval-shaped, slightly flattened, surface glabrous. **Head.** Vertex not visible in the dorsal view. Eyes visible, not covered by pronotum or canthus. Canthus small, obsolete, slightly acuminate. Frons plane, each side with one longitudinal groove obsolete. Epistomal suture obsolete, sinuous, medially interrupted. Clypeus subrectangular, surface smooth, all margins almost straight. Labrum subtrapezoidal, with a smooth medial depression. Mandible with an anterior tubercle broad, prominent, truncate, and a posterior tubercle small, subtriangular. Maxilla covered almost completely by mandibles, palpi tubercle-like with 0.7x the length of the antenna. Antenna triangular, inner and posterior margins almost straight, outer margin sinuous. **Thorax.** Pronotum subhexagonal, lateral margins rounded, anterior margin slightly sinuous, posterior margin concave. Meso- and metanotum with similar lengths, both combined with similar length to the pronotum. Ecdysial line visible in pro-, meso-, and metanotum. Prosternum not completely covered by prosternal process; prosternal process small, rounded, dividing the procoxae. Pterothoracic ventrite process prominent, dividing the mesocoxae, with the apex contiguous to the basis of the prosternal process. Metacoxae contiguous. Leg articulations no visible in the dorsal view. Protibia with one inner tubercle-like spur, obsolete; meso- and metatibia with two inner tubercle-like spurs. Metatibia partially covered by alar theca. Elytral thecae with five striae. Spiracle visible, elliptical, light brown. **Abdomen.** Five complete pairs of dioneiform between the tergites I–II, II–III, III–IV, IV–V, V–VI. Tergite IX with well distinct lobes, covered posterolaterally by small yellow setae. Sternites II–VI combined with similar length to sternites VII–VIII combined. Spiracles I–IV with peritreme, V–VIII without peritreme; spiracles VIII visible in ventral view. Female terminalia composed of two small tubercles, rounds, subcontiguous.

**Remarks**: Male pupa unknown. *Pelidnota rugulosa* differs from the others by the length of sternites VII–VIII combined similar to the length of sternites II–VI combined; vertex of head and legs articulations not visible in dorsal view, and abdominal spiracle I not exposed.

**Key to the known third instar larvae of *Pelidnota* MacLeay** (modified from Lugo-García *et al.* 2019)

**1.** Last antennomere with 2–3 dorsal sensorial spots. Raster with palidium. Distribution: Argentina, Brazil, and Paraguay…….……...…….***Pelidnota pulchella* (Kirby)**

**1'.** Last antennomere with 4–6 dorsal sensorial spots. Raster without palidium…….……...**2**

**2.** Acroparia absent……..**3**

**2'.** Acroparia present……...……**5**

**3.** Cranium with 9 dorsoepicranial setae. Haptomerum with 15 spine-like setae arranged in 3 irregular rows. Acanthoparia with 12–14 spine-like setae. Left mandible with 2 scissorial teeth. Distribution: Northwestern Mexico……..……....……...…..***Pelidnota lugubris* (LeConte)**

**3'.** Cranium with 5–7 dorsoepicranial setae. Acanthoparia with 8–10 spine-like setae. Left mandible with 3 scissorial teeth……...…….……...**4**

**4.** Cranium with 5–7 dorsoepicranial setae. Haptomerum with 20 spine-like setae arranged in 3–4 irregular rows. Acanthoparia with 9 spine-like setae. Distribution: Eastern USA.....***Pelidnota punctata* (L.)**

**4′.** Cranium with 5 dorsoepicranial setae. Haptomerum with 15 spine-like setae arranged in 3 rows and 8 spine-like setae in 2 rows. Acanthoparia with 8–10 spine-like setae. Distribution: Colombia, Costa Rica, Ecuador, Nicaragua, and Panama.....***Pelidnota prolixa* Sharp**

**5.** Cranium with 9–10 dorsoepicranial setae. Haptomerum with 17–19 spine-like setae arranged in 2 irregular rows. Acroparia with 13–15 setae. Acanthoparia with 9 spine-like setae. Southern and northwestern Mexico……..…….....…….***Pelidnota virescens*** **Burmeister**

**5'.** Cranium with 5–7 dorsoepicranial setae. Haptomerum with 3 rows of spine-like setae. Acroparia with 4–9 setae. Acanthoparia with 10–14 setae……..……..…...……**6**

**6.** Cranium with 6 dorsoepicranial setae. Haptomerum with 28 spine-like setae arranged in 3 irregular rows. Acroparia with 4 setae. Acanthoparia with 10–12 spine-like setae. Lacinia of maxilla with 1 uncus. Distribution: Argentina, Bolivia, Brazil, and Paraguay…….…..***Pelidnota fulva*** **Blanchard**

**6'.** Cranium with 5–7 dorsoepicranial setae. Haptomerum with 29–43 spine-like setae arranged in 3 irregular rows. Acroparia with 6–9 setae. Acanthoparia with 10–14 spine-like setae. Lacinia of maxilla with 2 unci. Distribution: Brazil…….…… ***Pelidnota ancilla*** **Bates**

## Discussion

Barria *et al.* (2021) indicate the following characteristics to differentiate the five *Pelidnota* larvae described previously (see table 2 in Barria *et al*. 2021, p.7): number of dorsoepicranial setae (*des*), anterofrontal setae (*afs*), heli of haptomerum, setae of acroparia, and setae of achantoparia. These characteristics are also used in the key proposed by Rodrigues *et al.* (2012) with modifications by Lugo-García *et al.* (2019). In this study, the presence of stemmata, the presence of palidium, the number of dorsal sensorial spots of the antenna, and uncus of lacinia have shown to be interesting for the diagnosis of the species. About the characteristic "heli of haptomerum", we consider here "spine-like setae of haptomerum" because Böving (1936) originally describes helus (plural heli) as a fixed spine without a cup, as widely discussed in Albertoni *et al.* (2014), so *Pelidnota* larvae have

epipharynx without heli. Here, an updated table by Barria *et al.* (2021) is given (Table 1), in addition, to the complete chaetotaxy of the head, raster, and ventral anal lobe (Table 2).

Among the known described Rutelini larvae, the genus *Pelidnota* is most similar to those of *Chrysina* Kirby, 1828 (Morón 1976) but differs from it by the absence of epizygum [present in *Chrysina*]; 2–6 dorsal sensorial spots in the last antennomere [varying up to 13 in *Chrysina*]; lacinia of maxilla with 1 or 2 unci [2 unci in *Chrysina*]; the maxillary stridulatory area with up to 16 teeth [8–11 in *Chrysina*]. Based on the third instar larvae described, the genus *Pelidnota* can be identified by the set of characteristics: left mandible with 2 or 3 scissorial teeth; lacinia of maxilla with 1 or 2 unci, the maxillary stridulatory area with 7–16 teeth and a truncate process anterior; epipharynx without plegmatia, epizygum, and heli, zygum cross-bar where present; last segment antennal with 2–6 dorsal sensorial spots; palidium where absent forming a set of long setae bordering anal opening.

*Pelidnota* is divided into species groups (Ohaus 1918, Soula 2009): *P. burmeisteri, P. cuprea, P. cyanipes, P. ebenina, P. granulata, P. kirbyi*, *P. liturella, P. lucida, P. pulchella, P. punctata, P. nitescens, P. quadripunctata, P. tibialis, P. rubripennis,* and *P. rugulosa* groups. *Pelidnota pulchella* belongs to the *pulchella* group, while other larvae described to the genus *Pelidnota* belong to the *punctata* group. *Pelidnota pulchella* is differentiated by the presence of palidium (absent in species congeners), stemmata (shared characteristic with *P. virescens*), and 2–3 dorsal sensorial spots in the last antennomere (4–6 in species congeners). About described pupae, *P. ancilla, P. lugubris*, and *P. prolixa* (all three belonging to *punctata* group) are most similar to each other. Whereas *P. rugulosa* (*rugulosa* group) is the only one that presents vertex of head and legs articulations not visible in dorsal view. Immature characters may help to better delimit definitions of these species groups and can be an interesting tool to help understand the taxonomy of *Pelidnota*, a genus that needs more studies for its better understanding and delimitation.

Bento & Fonseca (2020) present an upped key to the known Rutelini pupae. The authors indicate that *Pelidnota*, of pupae described for Rutelini, is most similar to that of *Homonyx chalceus* Blanchard, 1850. We agree that these species have a similar general body shape, five pairs of dioneiform organs, and abdominal tergite IX fold setose. But they do not share the characteristics: femur-tibia articulations exposed in dorsal view (not visible in *P.rugulosa*), and abdominal spiracle I exposed (not exposed in *P.pulchella*, and *P.rugulosa*). To include the present results, that key should be amended as follows:

Key to genera and species of Rutelini based on known pupae (modified from Bento & Fonseca 2020, pag.5, access the paper to see complete key)

**10.** Pronotum with ecdysial line indistinct……..……. ***Homonyx chalceus***

**10'.** Pronotum with ecdysial line distinct….…….…….....….……...***Pelidnota***…. **a**

**a.** Mesonotum with posteromedial margin narrowly rounded……...…….……**b**

**a'.** Mesonotum with posteromedial margin broadly rounded……..……...…….…….**d**

**b.** Posterior margin of metanotum sinuous without a medial lobe; dioneiform organs between abdominal tergites I–II barely defined…….……..……. ***P. lugubris***

**b'.** Posterior margin of metanotum almost straight with a medial lobe; dioneiform organs between abdominal tergites I–II well defined……...…….**c**

**c.** Abdominal spiracle VIII prominent, visible in ventral view; pterothoracic ventrite process with a lateral constriction before widening towards the apex…….....……***P. ancilla***

**c'.** Abdominal spiracle VIII not visible in ventral view; pterothoracic ventrite process with lateral homogeneous…….……..…….…….***P. prolixa***

**d.** Length of sternites VII–VIII combined less than the length of sternites II – VI combined; vertex of head and legs articulations visible in dorsal view……..……..**e**

**d'.** Length of sternites VII–VIII combined similar to the length of sternites II–VI combined; vertex of head and legs articulations not visible in dorsal view…….***P.rugulosa***

**e.** Medial area of mesonotum wider than long; pterothoracic ventrite process broadly rounded; abdominal spiracle VIII visible in ventral view……..……**f**

**e'.** Medial area of mesonotum as long as wide; pterothoracic ventrite process narrowly rounded; abdominal spiracle VIII not visible in ventral view……..……***P. granulata***

**f.** Posterior margin of metanotum with a medial lobe; ecdysial line clearly visible in pro-, meso- and metanotum; maxillary palpi with 0.6x–0.7x the length of the antenna…….……..***P. pulchella***

**f'.** Posterior margin of metanotum without a medial lobe; ecdysial line weakly visible in pro-, meso-, and metanotum; maxillary palpi 0.5x the length of the antenna……..…***P.nitescens***

The larvae of *Pelidnota* are saproxylophagous, feed on decaying wood or soil near decaying wood, and larvae and pupa can be found on rotten trunks, sometimes at the rotting bases of standing trees (Ritcher 1966, Morón 1976, Neita *et al.* 2006, Rodrigues & Falco 2011, Lugo-García *et al.* 2019, Bento & Fonseca 2020, Barria *et al.* 2021). Here *P. nitescens*, *P. pulchella*, and *P. rugulosa* were found in rotten trunks in south and southeast Brazil. Adults of *P.ancilla* was collected with a night light trap (northeast Brazil) and reared in a laboratory, so observations on its life cycle were made. Following a similar pattern as the other immatures of *Pelidnota* described, the combined first and second instar larvae of *P. ancilla* lasted 44–55 days, the third instar 99–176 days, and the pupa 25 days. *Pelidnota virescens* presented 60 days in the first and second instar combined, 200 days in the third instar, and 29 days in pupa (Morón & Deloya 2002). Rodrigues & Falco (2011) reported 59.3 days in the first and second instar combined, 209 days in the third instar, and 20.7 days in the pupa of *P.fulva*. Whereas Barria *et al.* (2021) observed 108–133 days in the third instar of *P. prolixa*,

and 22 days in the pupa. Ritcher (1966) indicates the life cycle duration of *P. punctata* as two years, and this species has the longest duration among *Pelidnota* immature.

## Acknowledgments

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**Tables:**

Table 1. Diagnostic characters of third instar larvae described for the genus *Pelidnota* MacLeay, 1819 (Melolonthidae: Rutelinae) (modified from Barria *et al*. 2021).

| | **des** | **afs** | **Setae of haptomerum** | **Setae of acroparia** | **Setae of achantoparia** | **Stemmata** | **Dorsal sensorial spots of the antenna** | **Uncus of lacinia** | **Palidium** |
|---|---|---|---|---|---|---|---|---|---|
| ***Pelidnota ancilla*** | 5-7 | 3-4 | 29-43 (3 rows) | 6-9 | 10-14 | Absent | 4-6 | 2 | Absent |
| ***Pelidnota fulva*** | 6 | 2 | 28 (3 rows) | 4 | 10-12 | Absent | 4 | 1 | Absent |
| ***Pelidnota lugubris*** | 9 | 4 | 15 (3 rows) | Absent | 12-14 | Absent | 4 | 1 | Absent |
| ***Pelidnota prolixa*** | 5 | 4 | 15 (3 rows) 8 (2 rows) | Absent | 8-10 | Absent | 4 | 1 | Absent |
| ***Pelidnota pulchella*** | 8-9 | 4-7 | 23-33 (3-4 rows) | 10-14 | 7-10 | Present | 2-3 | 2 | Present |
| ***Pelidnota punctata*** | 5-7 | 2-4 | 20 (3-4 rows) | Absent | 9 | Absent | 4-5 | 2 | Absent |
| ***Pelidnota virescens*** | 9-10 | 4 | 17-19 (2 rows) | 13-15 | 9 | Present | 5 | - | Absent |

The chaetotaxy of *des*, *afs*, and achantoparia is given for one side of the structure. Here are considered the spine-like setae of haptomerum.

***afs***, anterofrontal setae; ***des,*** dorsoepicranial setae.

Table 2. Chaetotaxy of the known third instars of *Pelidnota* MacLeay, 1819 (Melolonthidae: Rutelinae).

| | **Parietals** | | | | **Frons** | | | | **Clypeus** | | **Labrum** | | | | **Raster** | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **des** | **pes** | **aes** | **ees** | **pfs** | **efs** | **aas** | **afs** | **acs** | **ecs** | **pls** | **lls** | **mls** | **als** | **tg** | **pr** | **pa** | **al** | **ao** | **ad** |
| ***Pelidnota ancilla*** | 5-7 | 3-11 | 0-2 | 5-12 | 2-4 | 1 | 0-2 | 3-4 | 1 | 1-2 | 4-6 | 4-7 | 1-2 | 11-16 | 49-74 | u | u | 76-96 | 38-42 | 70-83 |
| ***Pelidnota fulva*** | 6 | 0-2 | 0 | 5 | 3 | 2 | 2 | 2 | 1 | 2 | 5-7 | 4 | 1 | 30 | (57) | u | u | 87 | 42 | 50 |
| ***Pelidnota lugubris*** | 9 | 0-2 | 0-2 | 9-10 | 9 | 3 | 2 | 4 | 1 | 2 | 8 | 2-3 | 2-1 | 14 | (57) | u | u | 70 | 28 | 47 |
| ***Pelidnota prolixa*** | 5 | 2 | 0 | 4 | 3 | 0 | 2 | 4 | 1 | 2 | 7 | 3 | 1 | 16 | 55 | u | u | 45 | 22 | 52 |
| ***Pelidnota pulchella*** | 8-9 | 8-10 | 1 | 10-12 | 3-5 | 1 | 1 | 4-7 | 1 | 1-2 | 3-12 | 3-6 | 1 | 14-22 | - | - | - | - | u | u |
| ***Pelidnota punctata*** | 5-7 | - | - | - | 4-7 | - | 2 | 2-4 | - | - | - | - | - | - | (42) | u | u | 71 | 44-52 | - |
| ***Pelidnota virescens*** | 9-10 | 5 | 1 | 6 | 4 | 1 | 2 | 4 | 1 | 2 | 6 | 2 | 1 | 18 | (47) | u | u | (66) | (32) | 48-52 |

The chaetotaxy of parietals, frons, clypeus, and labrum is given for one side of the structure, except for *als*. Here we follow the terminology of the head chaetotaxy as detailed in Souza *et al.* (2018), which in turn follows Ritcher (1966) with modifications of Sawada (1991). “u” unapplied data; “()” estimated quantity using the illustrations provided in the descriptions.

**Anal opening setae (ao):** when the palidium is absent in *Pelidnota*, a row of thin, long setae appear bordering the anal opening.

**Anal dorsal lobe (ad):** set of spine-like setae in the anal dorsal lobe.

**aas**, anterofrontal angle setae; **acs**, anteroclypeal setae; **ad**, dorsal anal lobe setae; **aes**, anteroepicranial setae; **afs**, anterofrontal setae; **al**, ventral anal lobe setae; **als**, anterolabral setae; **ao**, anal opening setae; **des**, dorsoepicranial setae; **lls**, laterolabral setae; **mls**, mediolabral setae; **ecs**, externoclypeal setae; **ees**, externoepicranial setae; **efs**, externofrontal setae; **pa**, palidium setae (pali); **pes**, posteroepicranial setae; **pfs**, posterofrontal setae; **pls**, posterolabral setae; **pr**, tegillar preseptular setae; **tg**, tegillar area setae (including the preseptular setae: pr).

**Figures:**

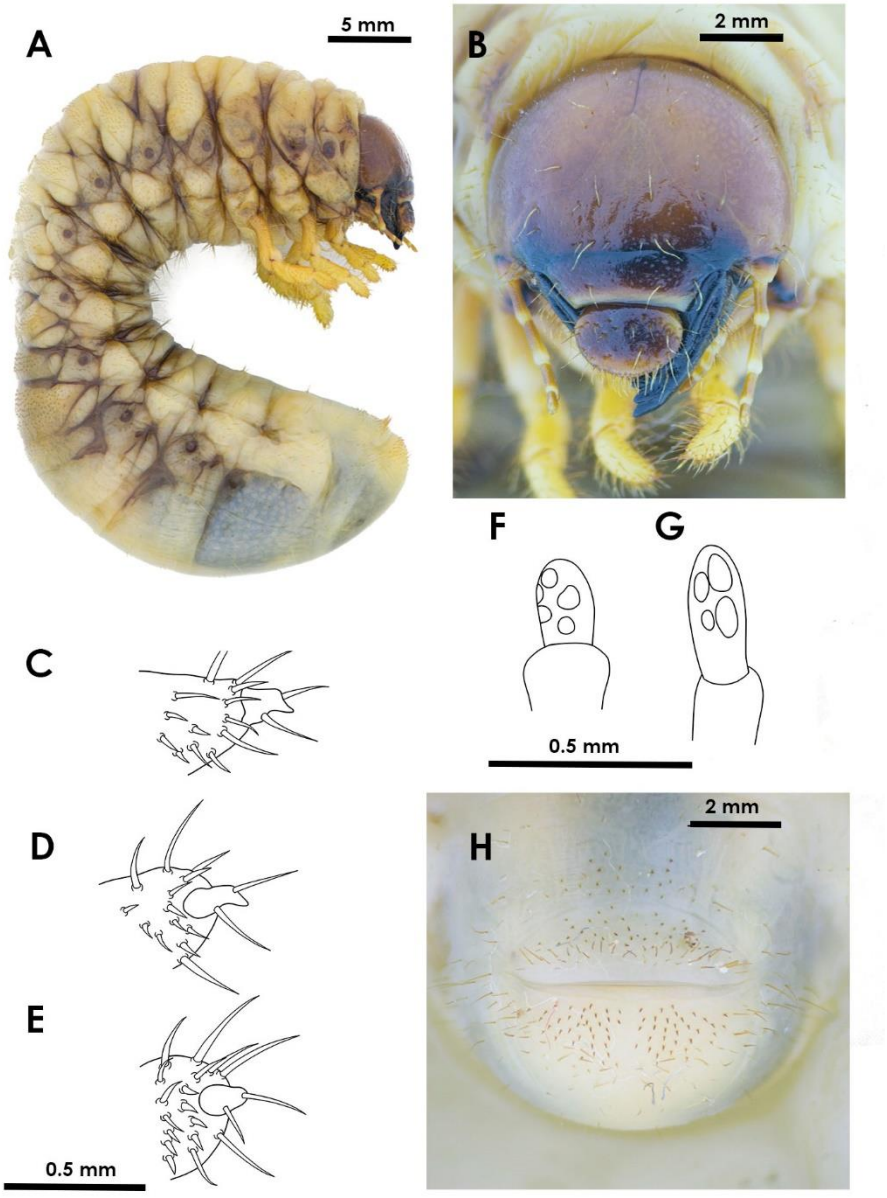


Figure 1. *Pelidnota ancilla* Bates, 1904; third larval instar. Body (A); head (B); pretarsus: pro- (C), meso- (D), and metapretarsus (E); antenna: ventral (F), dorsal (G); raster (H).

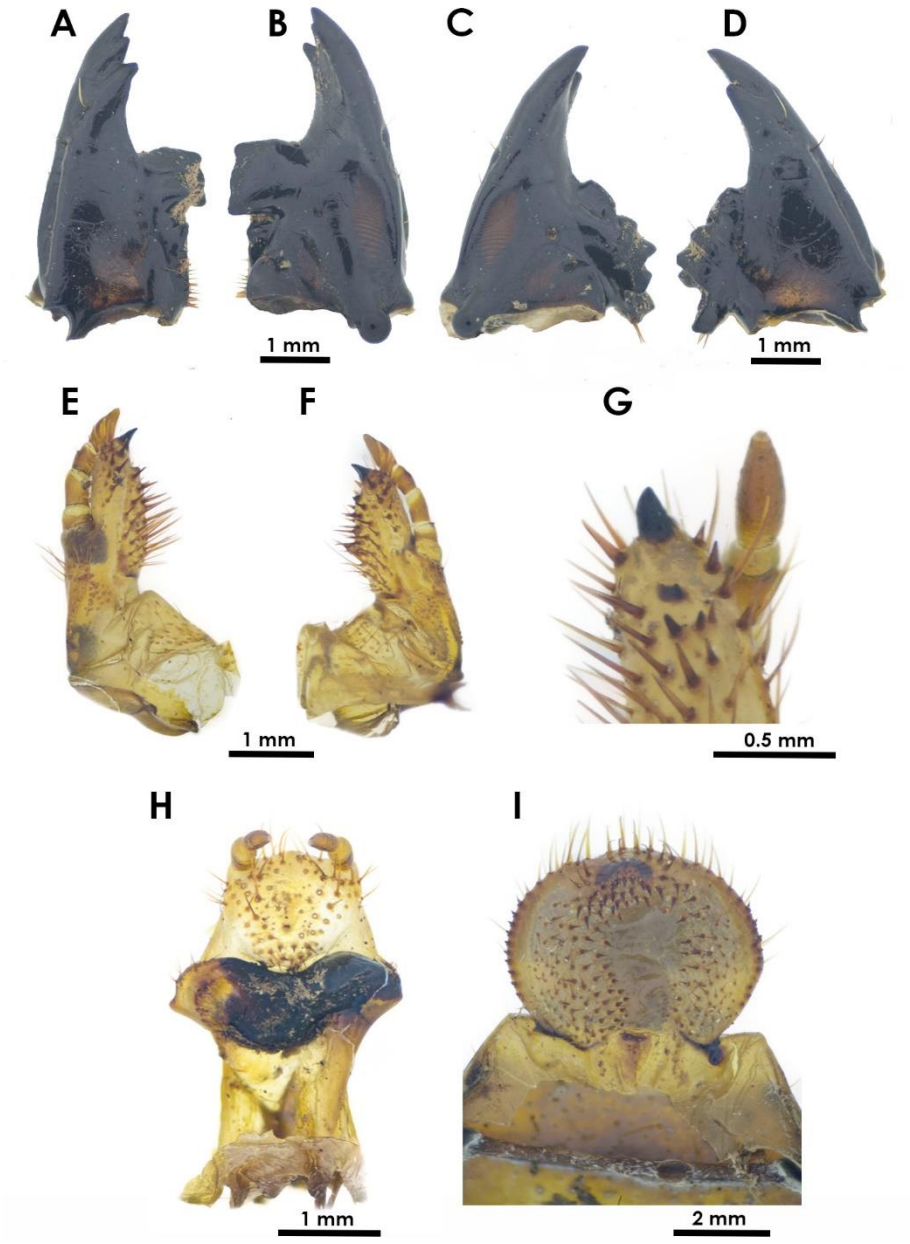


Figure 2. *Pelidnota ancilla* Bates, 1904; third larval instar. Mandibles: left dorsal (A), left ventral (B), right ventral (C), right dorsal (D); maxillae: left (E), right (F), uncus (G); hypopharynx (H); epipharynx (I).

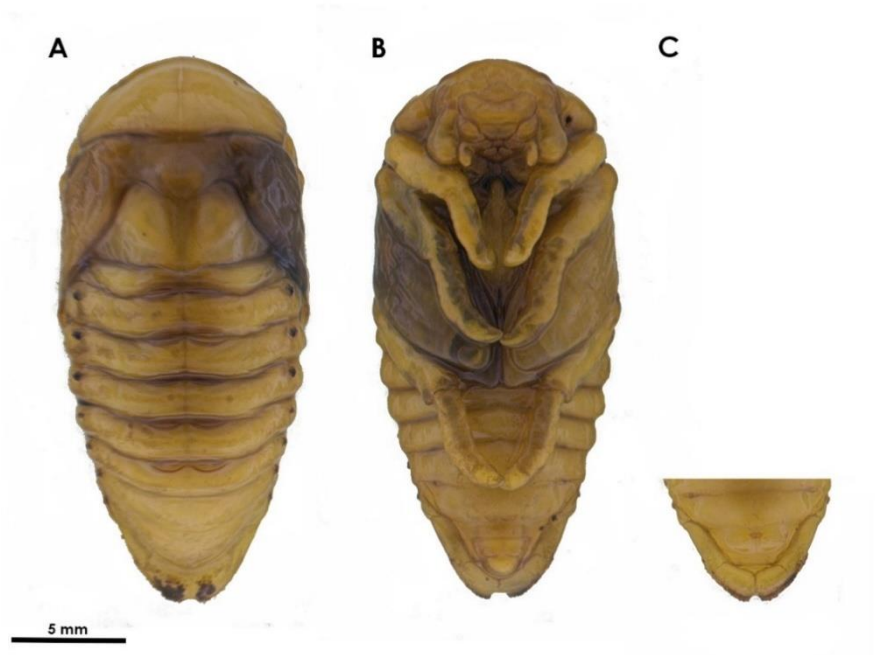


Figure 3. *Pelidnota ancilla* Bates, 1904. Male pupa: dorsal (A), ventral (B); female terminalia (C).

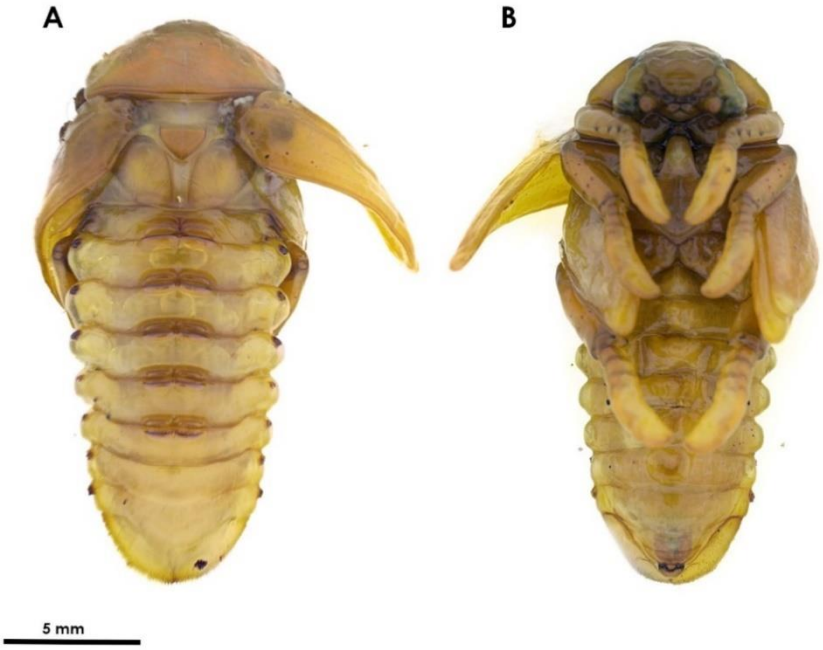


Figure 4. *Pelidnota nitescens* (Vigors, 1825). Male pupa: dorsal (A), ventral (B).

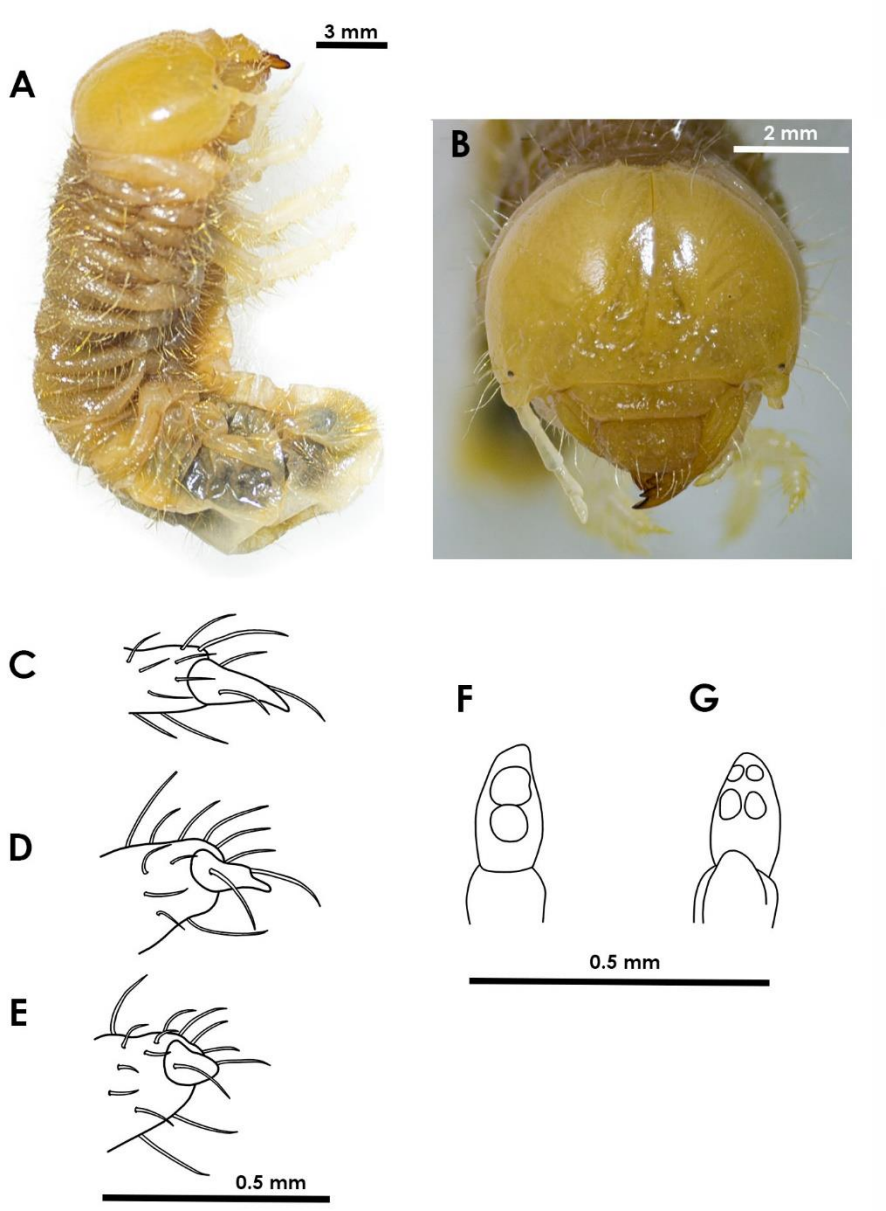


Figure 5. *Pelidnota pulchella* (Kirby, 1819); third larval instar. Body (A); head (B); pretarsus: pro- (C), meso- (D), and metapretarsus (E); antenna: dorsal (F), ventral (G).

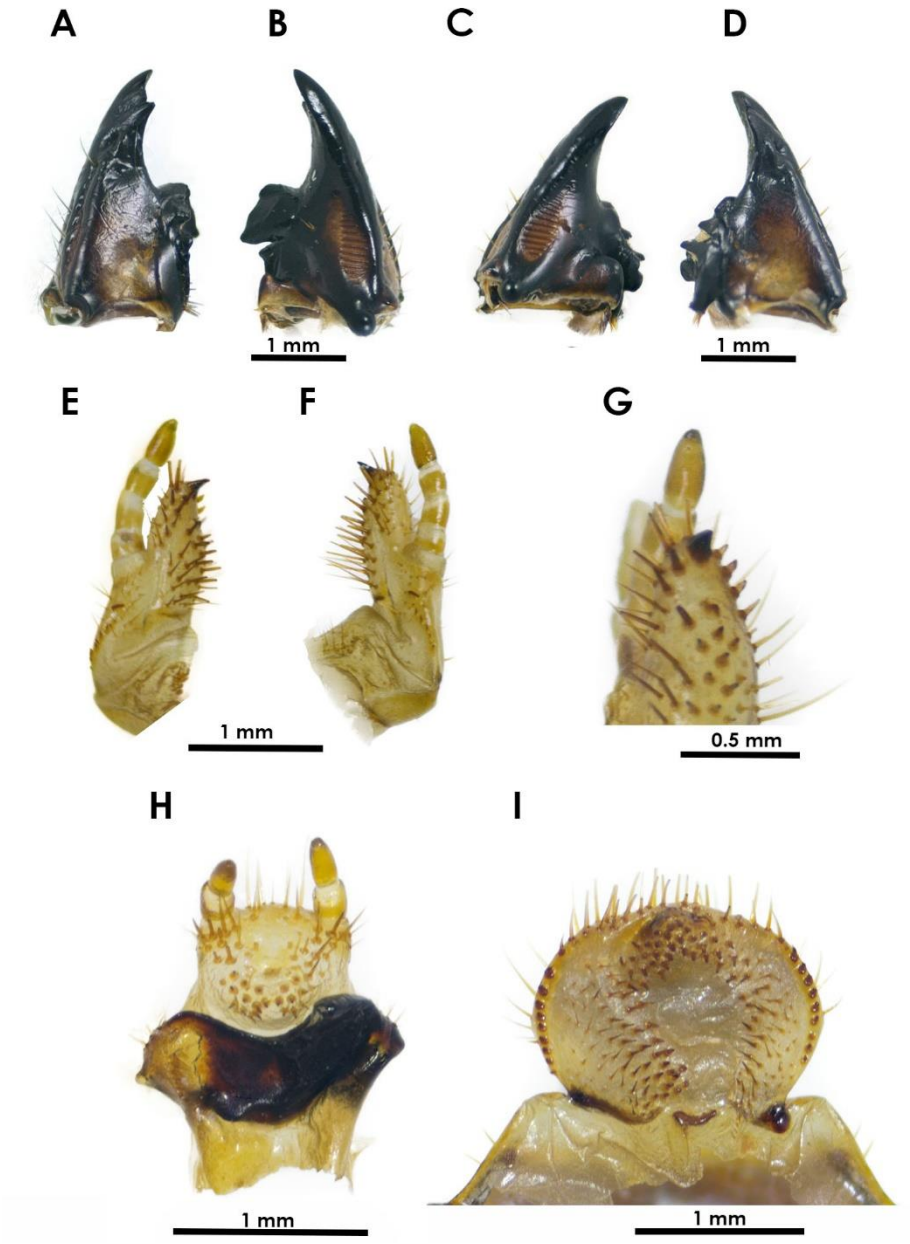


Figure 6. *Pelidnota pulchella* (Kirby, 1819); third larval instar. Mandibles: left dorsal (A), left ventral (B), right ventral (C), right dorsal (D); maxilla: left (E), right (F), uncus (G); hypopharynx (H); epipharynx (I).

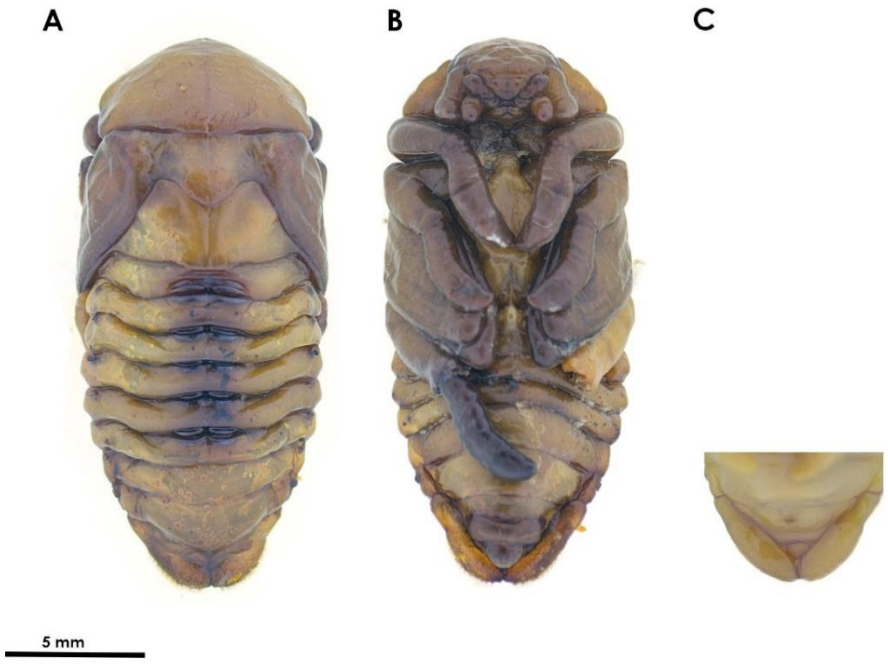


Figure 7. *Pelidnota pulchella* (Kirby, 1819). Male pupa: dorsal (A), ventral (B); female terminalia (C).

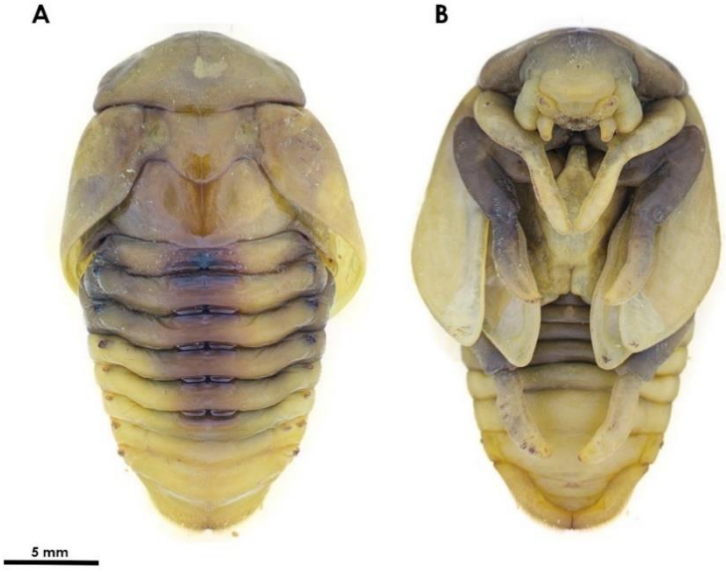


Figure 8. *Pelidnota rugulosa* Burmeister, 1844. Female pupa: dorsal (A), ventral (B).

## CAPÍTULO 4

## CONSIDERAÇÕES FINAIS

Dentre as tribos de Rutelinae, Rutelini é a mais especiosa na região Neotropical com o maior registro de espécies (243) de Rutelinae registradas no Brasil, seguida por Geniatini (com 209 espécies registradas). As outras quatro tribos juntas (Alvarengiini, Anatistini, Anoplognathini e Anomalini) possuem 24 espécies registradas no país. Até então, 13 espécies de Rutelini registradas no Brasil possuíam descrição de larvas e/ou pupas e Geniatini apenas duas. Neste estudo, foram descritos dez imaturos de Rutelini, seis do grupo Anticheirina: *Anticheira capucina* (Fabricius, 1787), *Anticheiroides brullei* (Castelnau, 1840), *Macraspis laevicollis* (Waterhouse, 1881) e *M. variabilis* Ohaus, 1914, *Telaugis aenescens* Burmeister, 1844 e *Vayana bicolor* (Olivier, 1789), sendo as primeiras descrições de imaturos para os gêneros *Anticheira* Eschscholtz, 1818, *Anticheiroides* Soula, 1998, *Telaugis* Burmeister, 1844, e *Vayana* Ohaus, 1915; e quatro espécies do gênero *Pelidnota* MacLeay, 1819: *Pelidnota ancilla* Bates, 1904, *P. nitescens* (Vigors, 1825), *P. pulchella* (Kirby, 1819) e *P. rugulosa* Burmeister, 1844.

Com os resultados aqui apresentados, 23 espécies de Rutelini com descrição de imaturos são agora conhecidas para o Brasil, totalizando 28 espécies de Rutelinae, esse valor corresponde a um aumento de 3,8% para 5,9% de espécies de Rutelinae registradas no país com imaturos conhecidos. No entanto, esses valores são baixos quando comparados à diversidade de espécies descritas em Rutelinae. Das subtribos de Rutelini que ocorrem no Brasil (Anticheirina, Areodina, Pelidnotina e Rutelina,) somente Areodina não possui imaturos descritos; e nesse estudo avançou-se no conhecimento de imaturos de Anticheirina e Pelidnotina. A lacuna ainda é grande principalmente quanto aos Geniatini, que possuem uma diversidade significativa no Brasil, bem

como Rutelini. Estudos da morfologia dos imaturos de Rutelinae devem ser realizados até chegar, ao menos, na maioria dos gêneros, pois podem contribuir como ferramentas valiosas em estudos filogenéticos e de evolução, além de contribuir na preservação das espécies e de seus habitats.