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NIKOLAS GIOIA CIPOLA

Sistemática de Seirinae Yosii, 1961 *sensu* Zhang & Deharveng, 2015 (Collembola: Entomobryidae)

Manaus, Amazonas

Novembro, 2018

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Tese apresentada ao Programa de Pós-Graduação em Entomologia do Instituto Nacional de Pesquisas da Amazônia, como parte dos requisitos para obtenção do título de Doutor em Entomologia.

Orientador: Dr. José Wellington de Morais
Co-Orientador: Dr. Bruno Cavalcante Bellini

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Sinopse:

Seirinae Yosii, 1961 (Collembola: Entomobryidae), foi estudada sistematicamente e a monofilia da subfamília foi recuperada contendo 108 espécies de representantes dos gêneros *Austroseira* e *Seira*, inseridos em Seirini, e *Lepidocyrtinus* na tribo Lepidocyrtinusini trib. nov. *Tyrannoseira* não foi recuperado e agora é um complexo de espécies. Uma nova diagnose é proposta para a subfamília, tribos e gêneros, incluindo a revisão de *Lepidocyrtinus* e *Tyrannoseira*. No total, 19 espécies são redescritas e 20 novas espécies são descritas provenientes da África, Brasil e Europa Ocidental.

Palavras-chave: Filogenia, Revisão taxonômica, Sistemática, Seirinae.

ISENÇÃO DE RESPONSABILIDADE TAXONÔMICA

Novos nomes taxonômicos, assim como as mudanças nomenclaturais propostas nesta tese, são provisórias e não devem ser consideradas validamente publicadas de acordo com as regras do Código Internacional de Nomenclatura Zoológica (ICZN 1991: artigos 8-10). Os nomes e os atos taxonômicos aqui estabelecidos devem, portanto, ser considerados inválidos na aceitação do Código, portanto não devem ser citados e/ou reproduzidos (ICZN 1999)[1].

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RESUMO

Seirinae Yosii, 1961 é a terceira maior subfamília de Entomobryidae (~1.800 spp.) com 210 espécies nominais. Atualmente Seirinae tem dois gêneros, *Seira* Lubbock, 1870 com ampla distribuição contendo 205 espécies, e *Tyrannoseira* Bellini and Zeppelini, 2011 com 5 espécies endêminas do nordeste Brasileiro. Além desses, *Lepidocyrtinus* Börner, 1903, *Ctenocyrtinus* Arlé, 1959 e *Austroseira* Yoshii and Suhardjono, 1992 são outros táxons considerado atualmente como sinônimos júnior de *Seira*, cujas validades genéricas ou subgenéricas têm sido discutidas devido a seus caracteres diagnósticos duvidosos para taxonomia atual. Estudos cladísticos com Seirinae são limitados a análises contendo menos de 2% das espécies descritas, todas do gênero *Seira*, portanto os demais subgêneros nunca foram utilizados em análises filogenéticas. Aqui é apresentada uma análise cladística de Seirinae baseada em 285 caracteres morfológicos codificados a partir de 120 táxons terminais de Entomobryidae (68 nominais), dos quais 108 são representados por espécies de Seirinae. Além disso, os três principais táxons de Seirinae são estudados taxonomicamente e novas diagnoses são propostas. A análise filogenética recuperou a seguinte proposta para as quatro subfamílias de Entomobryidae: Heteromurinae + (Lepidocyrtinae + (Entomobryinae + Seirinae)). Seirinae foi recuperada a partir de seis sinapomorfias, das quais três delas eram desconhecidas até o momento, e que aqui são incorporadas como diagnósticas. As relações genéricas recuperadas na nossa hipótese foram: *Lepidocyrtinus* + (*Austroseira* + (*Seira* s. str. + *Seira*), e consequente Lepidocyrtinusini trib. nov. foi proposta para abrigar 28 espécies de *Lepidocyrtinus*; e Seirini para os demais táxons, incluindo *Tyrannoseira*, agora como um dos subgrupos de *Seira*. Novas diagnoses para *Seira*, *Tyrannoseira* e *Lepidocyrtinus* são propostas, incluindo padrões de quetotaxia dorsal específicos para cada táxon. No total 19 espécies de Seirinae são revisadas e redescritas distribuídas em *Seira* (5 spp.), *Tyrannoseira* (5 spp.) e *Lepidocyrtinus* (9 spp.), baseadas em tipos primários e secundários, além de neótipos designados quando necessário. Além disso, 20 novas espécies são descritas, sendo 6 de *Seira* e 14 de *Lepidocyrtinus* provenientes da África do Sul (continental e de Madagascar), Espanha e Brasil. Seirinae agora abriga três gêneros válidos (*Austroseira*, *Seira* e *Lepidocyrtinus*) que juntos somam 231 espécies nominais, das quais 32% foram testadas filogeneticamente.

ABSTRACT

Seirinae Yosii, 1961 is the third largest subfamily of Entomobryidae (~ 1,800 spp.) with 210 nominal species. Currently Seirinae gathers two genera, *Seira* Lubbock, 1870 with wide distribution holding 205 species, and *Tyrannoseira* Bellini and Zeppelini, 2011 with 5 endemic species from Brazilian northeastern region. In addition to these, *Lepidocyrtinus* Börner, 1903, *Ctenocyrtinus* Arlé, 1959 and *Austroseira* Yoshii and Suhardjono, 1992 are other taxa currently considered as junior synonyms of *Seira*, which generic or subgeneric validity has been discussed due to theirs doubtful diagnostic characters for current taxonomy. Cladistic studies with Seirinae are limited to analyze less than 2% of the described species, all from *Seira*, while the other genera were never being used in phylogenetic analyzes. Here we present a cladistic analysis of Seirinae based on 285 morphological characters encoded from 120 terminals of Entomobryidae (68 nominal), of which 108 are represented by Seirinae species. In addition, the three main taxa of Seirinae are taxonomically studied and new diagnoses are proposed. Phylogenetic analyses recovered the following proposal for the four subfamilies of Entomobryidae: Heteromurinae + (Lepidocyrtinae + (Entomobryinae + Seirinae)). Seirinae was recovered based on six synapomorphies, three of which were unknown until now, and all of them are incorporated here as diagnostic. The generic relations recovered in our hypothesis were: *Lepidocyrtinus* + (*Austroseira* + (*Seira* s. str. + *Seira*), and consequently Lepidocyrtinusini trib. nov. was proposed to house 28 species of *Lepidocyrtinus*; and Seirini for the other taxa, including *Tyrannoseira*, now a subgroup of *Seira*. New diagnoses for *Seira*, *Tyrannoseira* and *Lepidocyrtinus* are proposed, including specific dorsal chaetotaxy patterns for each taxon. In total, 19 Seirinae species are reviewed and redescribed distributed in: *Seira* (5 spp.), *Tyrannoseira* (5 spp.) and *Lepidocyrtinus* (9 spp.), based on primary and secondary types, as well as designated neotypes whenever necessary. In addition, 20 new species are described, 6 of *Seira* and 14 of *Lepidocyrtinus* from South Africa (continental and from Madagascar), Spain and Brazil. Seirinae now gathers three valid genera (*Austroseira*, *Seira* and *Lepidocyrtinus*) that together add up to 231 nominal species, of which 32% have been phylogenetically tested.

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INTRODUÇÃO GERAL

Entomobryomorpha é uma ordem de Collembola que distingue-se das demais (Poduromorpha, Symphypleona e Neelipleona) caracterizada pelo corpo alongado e com o protórax reduzido e desprovido de cerdas tergais (Fig. 1) (Bellinger *et al.* 2018). Entomobryidae é um família de Entomobryomorpha que difere das outras famílias pela presença de crenulação na dens dorsalmente, mucro com um ou dois dentes dersais, órgão metatrocanteral com cerdas curtas e espiniformes arranjadas em fileiras, corpo com ou sem escamas, macrocerdas tergais apicalmente em forma de pé (Fig. 1) (Soto-Adames *et al.*, 2008; Zhang & Deharveng, 2015).

Seirinae Yosii, 1961 (*sensu* Zhang e Deharveng, 2015) atualmente é uma subfamilia de Entomobryidae com 213 espécies nominais distribuídas em dois gêneros, *Seira* Lubbock, 1870, o gênero tipo com 208 espécies de distribuição cosmopolita, e *Tyrannoseira* Bellini e Zeppelini, 2011 com cinco espécies endêmicas do Nordeste do Brasil (Bellini e Zeppelini, 2011; Bellinger *et al.*, 2018; Zeppelini *et al.*, 2018).

Espécies de Seirinae distinguem-se das demais subfamílias pelo corpo com escamas fortemente ciliadas sobre o corpo, incluindo a dens ventralmente, mesotórax ao quinto segmento abdominal com padrão específico de sensilas 1, 1 | 0, 2, 2, +, 3 sensilas, quarto segmento abdominal com três tricobótrias, placa genital do macho circinado, e mucro falcado sem espinho basal (Christiansen, 1958; Soto-Adames *et al.*, 2008; Zhang e Deharveng, 2015). Devido esta forma das escamas, Seirinae foi tradicionalmente considerado uma tribo de Entomobryidae que agrupava mais quatro gêneros: *Epimetrura* Schött, 1925, *Acanthocyrtus* Handschin, 1925, *Lepidosira* Schött, 1925 e *Lepidocyrtoides* Schött, 1917 (Yoshii e Suhardjono, 1989; Soto-Adames *et al.*, 2008). Desses, apenas *Lepidocyrtoides* foi registrado nas Américas com cinco espécies do Brasil (Cipola *et al.*, ,2017), enquanto os demais gêneros têm ocorrência nas regiões Australianas e Indo-Malaias (Salmon 1938, 1941; Greenslade e Sutrisno, 1994; Liu *et al.*, 2008; Yoshi e Greenslade, 1994; Yoshii e Suhardjno, 1992; Zhang *et al.*, 2009). Isso demonstra que análises filogenéticas precisam ser conduzidas para verificar se este agrupamento baseado na forma das escamas (fortemente ciliadas) e mucro (falcado), são caracteres que o sustentam em Seirinae (Yosii, 1961; Yoshi e Suhardjno, 1989; Soto-Adames *et al.*, 2008), uma vez que recentes estudos sugerem surgimentos independentes dessas estruturas em Entomobryidae (Zhang *et al.* 2014, 2015, Zhang e Deharveng, 2015).

Recentemente, estudos filogenéticos utilizando apenas quatro terminais de Seirinae foram conduzidos (Zhang *et al.*, 2014, 2015, 2016, 2017), os quais sugerem que muito provavelmente este é um táxon monofilético derivado, sustentado como subfamília de Entomobryidae de acordo com a topologia (Orchesellinae + (Heteromurinae + (Lepidocyrtinae + (Entomobryinae+Seirinae)))) (Zhang *et al.*, 2015, 2016, 2017). No entanto essas analises representam muito pouco (2% das espécies nominais) da riqueza de espécies descritas de Seirinae até o momento, e isto gera insegurança na monofilia do grupo. Além disso, nesses estudos poucos caracteres morfológicos foram utilizados, portanto os caracteres morfológicos utilizados para separar as subfamílias atualmente baseiam-se apenas na presença ou ausência de escamas, padrão das sensilas especializadas (S-quetas), e forma do mucro (Zhang *et al.*, 2014, 2015; Zhang e Deharveng, 2015).

Dentro de Seirinae, os táxons já propostos com status genéricos ou subgenéricos também nunca foram testados filogeneticamente, e a maioria deles possuem caracteres diagnósticos que sobrepõem e por essa razão são inconsistentes para sustentar a sua validade (Yosii, 1959; Yoshii e Suhardjno, 1992). A sistemática em *Seira* mostra conflitos históricos no reconhecimento de informações relevantes para a delimitação do gênero (Yoshii e Suhardjno, 1992; Zhang *et al.*, 2014). Isso se reflete no grupo possuir pelo menos dez sinonímias reconhecidas: *Sira* Tullberg, 1872, *Pseudosira* Schott, 1893, *Mesira* Scherbakov, 1898, *Lepidocyrtinus* Börner, 1903, *Drepanocyrtus* Handschin, 1924, *Lepidoregia* Delamare Deboutteville, 1948, *Afroseira* Yosii, 1959, *Ctenocyrtinus* Arlé, 1959, *Lepidokrugeria* Coates, 1969, *Austroseira* Yoshii e Suhardjono, 1992 (Christiansen e Bellinger, 2000; Soto-Adames *et al.*, 2008). Exemplo desses conflitos são vistos em *Ctenocyrtinus*, criado para abrigar três espécies do Brasil hoje inseridas em *Seira*: *S. nigrans* (Arlé, 1959), *S. prodiga* (Arlé, 1959) e *S. xinguensis* (Arlé, 1959). Embora esses táxons tenham sido sinonimizados, esse ato taxonômico nunca foi testado em um contexto filogenético (Yoshii e Suhardjono, 1989; Christiansen e Bellinger, 2000). De fato, *Lepidocyrtinus*, *Ctenocyrtinus* e *Austroseira* ainda são utilizados na literatura recente, em especial o primeiro, aceito hoje em dia como um subgênero de *Seira* (Yosii, 1959; Yoshii e Suhardjono, 1989; Bellini *et al.*, 2018), portanto esses três táxons, que talvez sejam sinônimos, precisam de validação filogenética para se manterem em uso.

Tyrannoseira também necessita de validação filogenética, uma vez que a quetotaxia dorsal e diversos outros elementos de sua morfologia não diferem significativamente dos vistos em *Seira*, sendo a descrição do gênero embasada apenas nas modificações das

pernas anteriores dos machos (Bellini e Zeppelini, 2011). Embora estes caracteres das pernas sugiram a presença de autapomorfias no táxon, não é possível avaliar se *Tyrannoseira* é um grupo-irmão de *Seira* ou se surgiu a partir de algum ramo interno de *Seira* (Bellini e Zeppelini, 2011). Além disso, há registros de espécies de *Seira* do Velho Mundo, com quetotaxias distintas (densas macroquetas) das vistas em *Tyrannoseira* (redução de macroquetas), que apresentam caracteres dimórficos relativos às pernas similares aos observados neste último gênero, o que gera certa sobreposição de diagnoses entre os dois táxons (Zeppelini e Bellini, 2006; Barra, 2010; Cipola *et al.*, 2018).

Consequentemente as relações entre *Seira* e *Tyrannoseira*, ou qualquer outro táxon de Seirinae também são incertas (Soto-Adames *et al.*, 2008). No entanto, Seirinae assim como qualquer outro gênero de Entomobryidae, possui padrões nas séries de cerdas (ex. séries AMP do mesotórax ao terceiro segmento abdominal) corporais de diferentes formas distribuídas em arranjos possivelmente homólogos que podem ser comparados a partir de uma padronização das séries quetal (Yosii, 1961; Szeptycki, 1979; Soto-Adames, 2008). De fato, essas cerdas podem gerar numerosos caracteres morfológicos uteis para estudos filogenéticos, como já foi observado para outros táxons de Entomobryidae (Christiansen e Bellinger, 1991; Soto-Adames, 2000), e outros grupos de Collembola (D'Haese, 2003).

Fica evidente que há grande necessidade de conduzir revisão morfológica detalhada dos grupos de Seirinae assim como um estudo filogenético baseado em caracteres morfológicos contendo uma quantidade significativa de espécies do táxon, incluindo todos os potenciais grupos internos, com o objetivo de revelar seus possíveis grupos naturais, assim como suas possíveis sinapomorfias. Além disso, é necessário estudar taxonomicamente a morfologia de Seirinae e seus respectivos gêneros, afim de descobrir caracteres que sustentem os grupos de acordo com a taxonomia atual, principalmente relacionados a elementos da quetotaxia.

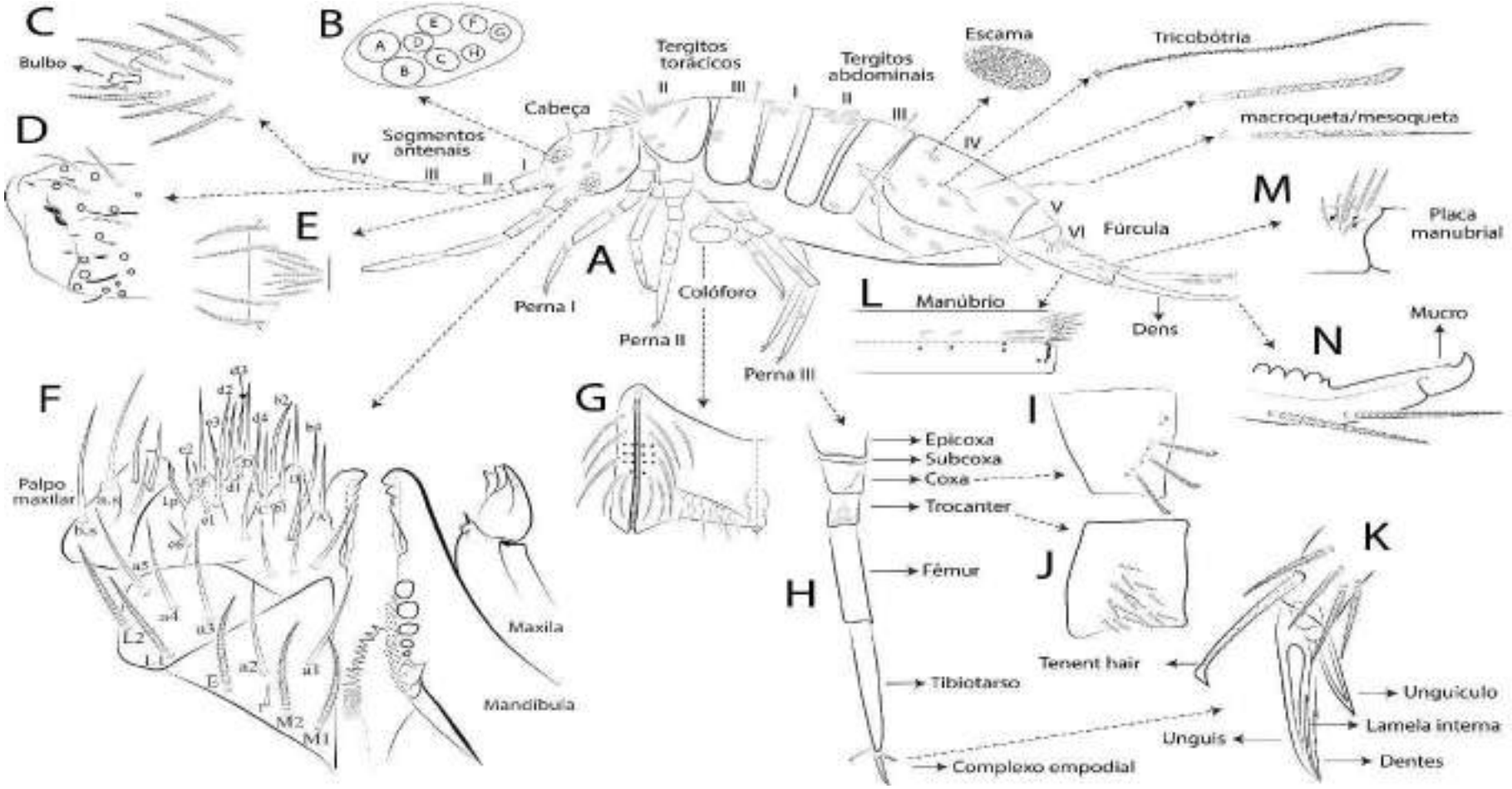

Figura 1. Estruturas morfológicas de Entomobryomorpha; **A –** hábito lateral; **B –** região ocular; **C –** ápice do segmento antenal IV; **D –** ápice do segmento antenal III; **E –** clípeo; **F –** região basomediana e basolateral labial, palpo maxilar e papilas labiais (A–E); **G** – colóforo; **H** – divisão da perna; **I –** coxa; **J –** órgão trocanteral; **K –** complexo empodial; **L –** cerdas ventrais do manúbrio; **M –** placa manubrial dorsalmente; **N –** dens distalmente e mucro.

OBJETIVOS

Objetivo geral

– Realizar um estudo sistemático de Seirinae Yosii, 1961 baseado em caracteres morfológicos.

Objetivos específicos

– Realizar uma análise cladística com Seirinae a partir de dados morfológicos (Capítulo I);
– Testar o monofiletismo de Seirinae (Capítulo I);
– Testar o status genérico de *Austroseira*, *Tyrannoseira* e *Lepidocyrtinus* (Capítulo I);
– Analisar as relações filogenéticas intergenéricas de Seirinae (Capítulo I);
– Estudar taxonomicamente e definir a nomenclatura da quetotaxia dorsal para os táxons de Seirinae (Capítulos II–V);
– Revisar taxonomicamente *Tyrannoseira* e *Lepidocyrtinus* (Capítulos IV–V);
– Redescrever e descrever eventuais novas espécies (Capítulos II–V).

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RESULTADOS

Os resultados obtidos encontram-se divididos em cinco capítulos, sendo o primeiro referente a filogenia de Seirinae, e os demais sobre taxonomia dos gêneros *Seira*, *Tyrannoseira* e *Lepidocyrtinus*. Os capítulos I e V estão em preparo para publicação, os capítulos III e IV estão submetidos e aceitos, e o capítulo II já está publicado.

CAPÍTULO I

Cipola, N.G; Morais, J.W. & Bellini, B.C. 2018. **Filogenia de Seirinae Yosii, 1961 *sensu* Zhang & Deharveng, 2015 (Collembola: Entomobryidae) baseada em dados morfológicos.** Em preparação para *Systematic Entomology*.

Resumo. Estudos filogenéticos com Seirinae estão limitados à análises contendo menos de 2% das espécies descritas (~210 espécies), portanto, a validade deste táxon é questionável do ponto de vista filogenético. Consequentemente, os táxons internos nunca foram testados usando uma metologia cladística, e por isso as relações internas, bem como as validades genéricas, são desconhecidas. Aqui é apresentada uma análise cladistica baseada em 285 caracteres morfológicos codificados para 120 terminais de Entomobryidae (68 espécies nominais), das quais 108 são representantes de Seirinae (*Austroseira*, *Lepidocyrtinus*, *Seira*, *Tyrannoseira*), 10 de Entomobryinae (*Acanthocyrtus*, *Amazhomidia*, *Coecobrya*, *Entomobrya*, *Drepanura*, *Homidia*, *Lepidocyrtoides*, *Lepidosira*, *Willowsia*), 1 de Lepidocyrtinae (*Lepidocyrtus*) e 1 de Heteromurinae (*Dicranocentrus*). As três árvores mais parcimoniosas recuperaram a seguinte proposta para as quatro subfamílias de Entomobryidae: Heteromurinae + (Lepidocyrtinae + (Entomobryinae + Seirinae)). Seirinae foi recuperada como monofilética sustentada por seis sinapomorfias, das quais três delas foram propostas pela primeira vez: cabeça com tricobótria subantenal, dente externo do unguis achatado dorsoventralmente e projetado rentemente ao unguis. Além disso, uma hipótese para origem da forma falcada do mucro é proposta baseada na perda do dente basal sendo outra sinapomorfia de Seirinae. Com relação aos gêneros, a seguinte hipótese foi recuperada: *Lepidocyrtinus* + (*Austroseira* + (*Seira* s. str. + *Seira*). Além disso, duas tribos são propostas, Lepidocyrtinusini trib. nov. para abrigar 28 espécies de *Lepidocyrtinus*, cujo táxon não foi recuperado conforme as classificações tradicionais, e Seirini para abrigar os demais gêneros. *Seira* s. lat. precisa futuramente ser investigada, pois agrupamentos distintos sugerem um novo táxon genérico para pelo menos 61 espécies com redução de macroquetotaxia. *Tyrannoseira* foi recuperado como um subgrupo de *Seira*, que agora passa a ser reconhecido por uma sinapomorfia: dilatação do fêmur anterior dos machos. Foi detectado na análise que a maior parte dos caracteres relacionados com a quetotaxia são homoplásticos, entretanto, eles foram úteis para separar as subfamílias de Entomobryidae, assim como os grupos inferiores. Seirinae foi testada filogeneticamente pela primeira vez utilizando dados morfológicos quantitativos e qualitativos, utilizando-se 32% da fauna de Seirinae conhecida, gerando uma nova proposta de classificação para o grupo, bem como caracteres desconhecidas até o momento.

Palavras chave: Cladística, *Lepidocyrtinus*, sistemática, suporte genérico, *Seira*, *Tyrannoseira*.

Introducão

Seirinae Yosii, 1961 inicialmente foi proposta como uma subfamilia de Entomobryidae, junto com Entomobryinae, Orchesellinae e Paronellinae. Seirinae foi caracterizada morfologicamente pelo corpo com escamas fortemente ciliadas e apicalmente arredondadas ou pontiagudas. Essa subfamília foi dividida em dois grupos, "Oligoquetosos" (*Seira* Lubbock e *Lepidosira* Schött), caracterizados pelas macrocerdas tergais amplamente distribuídas, e "Aquetosos" (*Lepidocyrtoides* Schött, *Lepidocyrtus* Bourlet, *Pseudosinella* Schäffer) caracterizados pela presença de macrocerdas restritas na região anterior do mesotórax (Yosii, 1961).

Szeptycki (1979), baseando-se em elementos da quetotaxia, dividiu Entomobryidae em quatro subfamílias (Entomobryinae, Lepidocyrtinae, Orchesellinae, Seirinae) e ainda elevou Paronellinae a nível de família. Depois, Yoshii & Suhardjono (1989) rebaixou essas subfamílias à nível tribal e criou mais uma tribo: Willowsini, a qual foi caracterizada pelas escamas pontiagudas sobre o corpo mas ausentes na dens. A partir disso, Seirini passou a distinguir-se de Willowsini pela presença de escamas arredondadas no corpo, incluindo ventralmente na dens. Além disso, Seirini foi dividida no grupo *Seira* (*Seira* s. lat.) caracterizado pelo mucro falcado, e grupo *Lepidosira* (*Acanthocyrtus* Handschin, *Epimetrura* Schött, *Lepidosira* Schött, *Lepidocyrtoides* Schött) com mucro bidenteado. Soto-Adames *et al.*, (2008) também aceitou esta classificação, mas adicionou mais três tribos, classificando Seirini pelas escamas fortemente estriadas.

Apenas recentemente, Zhang *et al.*, (2014) realizou o primeiro estudo filogenético para Entomobryidae, no qual dados moleculares revelaram surgimentos independentes das escamas dentro da família, e por essa razão, a forma das escamas passou a ser questionada em Seirinae, assim como em Entomobryinae. Embora neste trabalho a reconstrução filogenética de grupos basais de Entomobryidae não tenha sido esclarecida (por exemplo, agrupamentos de Orchesellinae escamados e não escamados), grupos derivados foram recuperados (Entomobryinae + (Lepidocyrtinae+Seirinae). A partir desta topologia, a classificação de Entomobryidae foi reformulada baseando-se em alguns caracteres morfológicos, especialmente o número e padrão de sensilas especializadas (S-chaeta) presentes do mesotórax ao quinto segmento abdominal (Zhang & Deharveng, 2015). Consequentemente, as tribos foram elevadas ao status de subfamília e Seirinae passou a alocar apenas o gênero *Seira*, caracterizado por ter do mesotórax ao quinto segmento abdominal o padrão de S-chaeta com 1, 1 | 0, 2, 2, +, 3 sensilas, quarto segmento

abdominal com três tricobótrias e mucro falcado sem espinho. Consequentemente os gêneros previamente inseridos em Seirinae (grupo *Lepidosira*) foram transferidos para Entomobryinae, devido padrão de 2, 2| 1, 2, 2, +, 3 sensilas sobre os mesmos segmentos tergais, quarto segmento abdominal com duas tricobótrias e mucro bidenteado com espinho dorsal (Zhang & Deharveng, 2015).

Estudos subsequentes (Zhang *et al.*, 2015, 2016, 2017) utilizando quase todos os mesmos terminais de Entomobryidae já testados até então em uma análise filogenética, suportaram a mesma topologia das subfamílias, e a mais aceita até o momento é Orchesellinae + (Heteromurinae + (Lepidocyrtinae + (Entomobryinae+Seirinae))). Conforme Zhang *et al.*, (2015), a forma do mucro falcado em Entomobryidae surgiu pelo menos três vezes (e.g. *Seira*, *Coecobrya* Yosii e *Drepanura* Schött), e por essa razão a hipótese dessa característica como uma possível sinapomorfia para Seirinae é descartada mais uma vez (assim como a origem das escamas). No entanto, em nenhum dos estudos filogenéticos foi questionado a origem independente dessas estruturas homoplásticas, como por exemplo, a perda do dente apical ou basal para a forma falcada do mucro, ou diferentes formas e ciliações das escamas (Zhang *et al.*, 2015, 2016, 2017).

Atualmente Seirinae (*sensu* Zhang & Deharveng, 2015) abriga cerca de 200 espécies de *Seira* (gênero amplamente distribuído) e *Tyrannoseira* Bellini & Zeppelini com apenas cinco espécies endêmicas para o nordeste Brasileiro. Outros táxons também foram propostos para Seirinae levando em consideração as modificações dorsais na dens, como cerdas robustas em *Lepidocyrtinus* Börner, 1903, *Ctenocyrtinus* Arlé, 1959 e *Austroseira* Yoshii & Suhardjono, 1992, e vesículas basais em *Afroseira* Yosii, 1959, mas todos eles atualmente estão sinonimizados com *Seira* (Soto-Adames *et al.* 2008). Esses três táxons já foram tratados como gêneros (Börner, 1903; Salmon 1964), ou subgêneros (Yosii, 1959; Yoshii & Suhardjono, 1992), mas até o momento nenhuma das propostas foram testadas filogeneticamente, e consequentemente é desconhecida a validade dos caracteres diagnóstico propostos.

Considerando que Seirinae representa 11,5% (~220 espécies) do total de 1900 espécies de Entomobryidae (Bellinger *et al.*, 2018), e nenhum estudo filogenético contendo mais que quatro terminais foi realizado até o momento (Zhang *et al.*, 2014, 2015, 2016, 2017; Zhang & Deharveng 2015), evidentemente nota-se a necessidade de se realizar um estudo para testar a monofilia de Seirinae, assim como dos respectivos grupos internos e suas sinapomorfias. O objetivo deste trabalho foi realizar um estudo filogenético para Seirinae

(*sensu* Zhang & Deharveng 2015), baseado em dados morfológicos, a fim de se verificar o seu monofiletismo, bem como suas relações intragenéricas.

Material e Métodos

Material examinado

Os espécimes examinados neste estudo estão depositados nas seguintes instituições a seguir. Africa do Sul: Iziko South African Museum (SAM/IZIKO). Austrália: Australian Museum (AMS), Sydney; South Australian Museum (SAM), Adelaide. Brasil: Coleção Entomológica "Prof. J.M.F. Camargo", Universidade de São Paulo (RPSP), Ribeirão Preto; Coleção de Collembola da Universidade Federal do Rio Grande do Norte (CC/UFRN), Natal; Coleção de Referência de Fauna de Solo, Universidade Estadual da Paraíba (CRFS-UEPB), João Pessoa; Instituto Nacional de Pesquisas da Amazônia (INPA), Manaus; Museu de Zoologia da Universidade de São Paulo (MZUSP), São Paulo; Museu Nacional do Rio de Janeiro (MNRJ), Rio de Janeiro. Colômbia: Instituto de Ciencias Naturales de la Universidad Nacional de Colombia (ICN), Bogotá. Espanha: Museo Nacional de Ciencias Naturales at Madri (MNCN), Madri; Museum of Zoology of University of Navarra (MZNA), Pamplona; Private Collembola Collection of Javier Arbea (JIAP), El Astillero. Estados Unidos: California Academy of Sciences (CAS), San Francisco; California Department of Food & Agriculture (CDFA), Sacramento; Illinois Natural History Survey (INHS), Champaign; Natural History Museum of Los Angeles County (NHMLA), Los Angeles. França: Muséum National d'Histoire Naturelle (MNHN), Paris. Hungria: Hungarian Natural History Museum (HNHM), Budapeste. México: Universidad Nacional Autónoma de México (UNAM), Cidade do México. Iran: Sari Agricultural Sciences and Natural Resources University (SANRU), Sari.

Foram utilizados um total de 120 táxons terminais (referente a 68 espécies nominais), dos quais 108 correspondem a Seirinae, distribuídos em *Seira* (74 spp.), *Tyrannoseira* (5 spp.) e *Lepidocyrtinus* (29 spp.). O grupo externo foi representado por 12 espécies: 10 de Entomobryinae (*Acanthocyrtus* [1], *Amazhomidia* [1], *Coecobrya* [1], *Entomobrya* [1], *Drepanura* [1], *Homidia* [1], *Lepidocyrtoides* [2], *Lepidosira* [1], *Willowsia* [1]), 1 por Lepidocyrtinae (*Lepidocyrtus*) e 1 por Heteromurinae (*Dicranocentrus*). Os terminais *Acanthocyrtus*, *Lepidocyrtoides* e *Lepidosira* foram selecionados porque tradicionalmente já perterceram a Seirinae (Yoshii & Suhardjono, 1989; Soto-Adames *et al.*, 2008) e os demais devido a classificação mais aceita atualmente (Orchesellinae + (Heteromurinae +

(Lepidocyrtinae + (Entomobryinae+Seirinae)))) (Zhang *et al*., 2015, 2016, 2017). Os táxons terminais utilizados, bem como suas respectivas subfamílias, localidades e Museus de depósitos encontram-se sumarizados na Tabela 1.

Prepação do material

Espécimes preservados em etanol foram clarificados com solução Nesbitt's ($HCl + C_2H_3Cl_3O_2 +$ água destilada), e montados em lâminas com solução de Hoyer (Jordana *et al.,* 1997). Caracteres morfológicos de cada espécie foram observados sob microscópio óptico Leica DM-750 onde foi realizado as ilustrações. Para a obtenção das imagens de microscopia eletrônica de varredura (MEV) os espécimes foram transferidos para etanol absoluto, inseridos no equipamento BAL-TEC CPD 030 para atingir o ponto crítico e, em seguida, pulverizados com ouro utilizando o equipamento BAL-TEC SPD 050. As imagens finais apresentadas nesse capítulo foram obtidas utilizando um microscópio eletrônico de varredura LEO VP 435 e TESCAN VEGA3.

Terminologia e abreviações

A quetotaxia labral segue Cipola *et al.*, (2014a) para cerdas posteriores (**P0**–**2**), a labial segue Gisin (1967) para cerda **R**, a formula ventral do manúbrio segue Christiansen & Bellinger (2000), a quetotaxia dorsal da cabeça segue Mari-Mutt (1979) e Jordana & Baquero (2005) com modificações de Soto-Adames (2008), a quetotaxia dorsal do tórax ao quarto segmento abdominal segue Szeptycki (1979) com modificações de Soto-Adames (2008), incluindo as sensilas especializadas (S-Chaeta) conforme Zhang & Deharveng (2015). As abreviações encontradas ao longo do texto seguem o seguinte esquema: amp = série de cerdas anterior(a), medial(m) e posterior(p), Abd = segmento abdominal, Ant = segmento antenal, acc.p = sensila acessória ordinária da queta posterior, mac = macrochaeta(e), mic = microchaeta(e), mp = quetas médio-posterior do Th II, Th = segmento toráxico.

Análises filogenéticas

A matriz com os 120 táxons terminais e 285 caracteres morfológicos foi construída no programa Mesquite (Maddison & Maddinson, 2017). Do total de caracteres, 273 foram codificados como binários e 12 como multiestado (apêndice 1). Todos caracteres foram tratados como não-aditivos. Os caracteres indicados com o símbolo [-] correspondem a

dados não aplicáveis e o símbolo [?] corresponde a dados não observados, embora o programa não reconheça a diferença entre os dois códigos (Tabela 2). Caracteres de quetotaxia polimórficos (mais de um estado) na mesma espécie/espécime foram desconsiderados, assim como variações com estados raros (menos de 5% dos espécimes). As séries da quetotaxia (mac/mic) do Abd IV também foram desconsideradas devido a dificuldade em traçar possíveis homologias com os grupos externos. Os caracteres propostos são aplicáveis para os adultos de ambos os sexos, exceto as modificações nas pernas anteriores dos machos (caracteres 18–23) de *Tyrannoseira* e algumas espécies de *Seira*, e a quetotaxia da placa genital (caráter 55) dos machos (Christiansen, 1958). As árvores foram enraizadas em *Dicranocentrus*, considerado o grupo externo mais distante baseado em evidências moleculares (Zhang *et al.*, 2015, 2016, 2017) e morfológicas (Zhang & Deharveng, 2015).

A parcimônia de Fitch (1971) foi o critério de otimização utilizado para as análises. Foram realizadas buscas heurísticas no programa TNT (*Tree Analysis Using New Technology*) (Goloboff *et al.*, 2008) com a opção de busca *Tree Bisection and Reconnection* (TBR). As análises foram conduzidas utilizando o comando de busca tradicional, com 10000 réplicas salvando 100 árvores ótimas por réplica, com espaço na memória para 10000 árvores. Durante as análises, os caracteres foram tratados de duas formas: inicialmente com pesagem uniforme e, posteriormente, com pesagem implícita utilizando-se diferentes valores para *K* (3, 5, 7, 9, 10, 11, 12, 13, 16, 20) com o objetivo de avaliar possíveis alterações na topologia sobre diferentes valores de *K* (Goloboff & Farris, 2001). O suporte relativo de Bremer (BS) foi calculado como medida de suporte de grupo (Bremer, 1994), usando 1000 árvores subótimas até cinco passos mais longas do que a árvore mais curta (obtida utilizando a busca tradicional, sob K = 5). A árvore final de consenso estrito obtida foi exportada para o programa WinClada (Nixon, 2002) onde foi visualizada a série de transformações dos estados dos caráteres, além dos índices de consistência (CI) e índices de retenção (RI) para cada caráter e para a árvore. Caracteres não informativos [UNINF] na análise foram mantidos porque pertencem a série de transformação do terminal enraizado (*Dicranocentrus*) e/ou tradicionais na classificação de Entomobryidae. Os cladogramas finais foram editados no programa Adobe Illustrator versão CS6.

Resultados

A análise cladística sob pesos iguais gerou 1000 árvores mais parcioniosas (AMP), sob pesagem implícita (K = 10) resultou em três árvores com comprimento (L) = 1299 passos, índice de consistência (IC) = 0,23 e índice de retenção (IR) = 0,72 (Fig. 1). Os diferentes valores de K subsequentes não alteraram o número de AMP e nem os grandes grupos recuperados. As diferenças entre os três cladogramas foram relacionadas apenas as relações entre seis espécies de *Seira* (*S. pallidipes*, *S.* cf. *squamoornata*, *S.* cf. *lusitânica*, *S.* cf. *dollfusi*, *S. pini* e *S. burgersi*) (Fig. 4).

As relações entre as quatro subfamílias de Entomobryidae recuperada na AMP (K=10) segue Heteromurinae + (Lepidocyrtinae + (Entomobryinae + Seirinae)). Conforme a hipótese recuperada, o agrupamento Lepidocyrtinae + (Entomobryinae + Seirinae) aparece fortemente sustentado (BS=100), já o clado Entomobryinae + Seirinae teve suporte relativamente baixo (BS=19). Essa última relação foi sustentada por seis caracteres: presença de cerdas apicais postero-lateral (alp) ventral do manúbrio [caráter 42: estado 0, Figs 11A–B], presença de escamas no Ant III [64: 1], cabeça dorsal desprovida da cerda **M0** [98: 1, Figs 18C–F, 19], presença da cerda **p2ep** do Th II [185: 0, Figs 20C–D, 21], e Abd II com macroqueta **a2** [272: 0] e ausência da cerda **p4** [281: 1, Figs 22C, 23]. Os índices de consistência para esses caracteres foram relativamente elevados (CI: 33 ou mais), exceto o caráter 185 (L: 6, CI: 16, RI: 61).

Monofilia de Seirinae

Seirinae foi recuperada como uma subfamília monofilética (Fig. 1) sustentada pelas seguintes sinapomorfias: dente basal externo impareado projetado rentemente ao unguis [27: 1] e achatado dorsoventralmente [28: 1, Figs 9G–H], mucro desprovido de espinho [53: 1] e dente basal [54: 1, Fig. 12E], Abd IV com tricobótria **D3** [88: 1], e cabeça com um par de tricobótrias subantenais [93: 1, Fig. 16C]. Os índices calculados para todos esses caracteres foram elevados, embora o suporte do clado tenha sido relativamente baixo (BS=19). Além das sinapomorfias, nove caracteres não-exclusivos sustentaram essa relação: tenent hair fortemente capitado [31: 1], colófóro anteriormente com espinho [32: 1], série apm com mic lisas e com cílios distais [80: 3], Th II com cerdas **m4ip**, **m5a** e cerdas extras de **p1ip** [caracteres 160, 164, 176: 0], Th III com cerda **p2a** [228: 0], e Abd I com cerdas **m2i** e **m4i** [261, 267: 0].

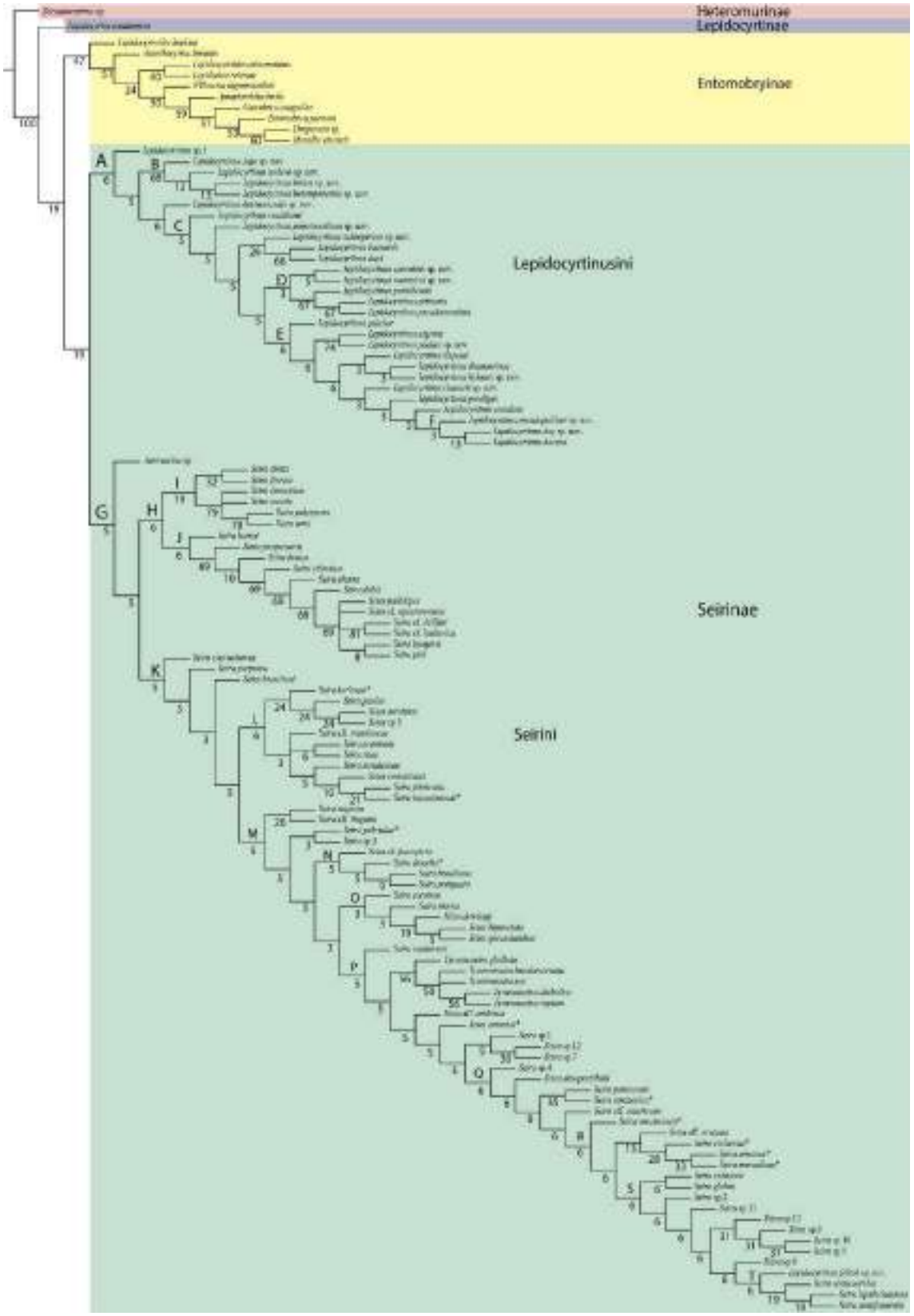

Fig. 1. Cladograma das três árvores mais parcimoniosas (AMP) gerado com pesagem implícita (*K* = 10) baseado em 285 caracteres morfológicos para 120 táxons de Entomobryidae (L=1299, CI=23, RI=72). Letras acima dos ramos são agrupamentos formados em Seirinae e números abaixo correspondem ao suporte relativo de Bremer. Símbolo "*" indica novas espécies em processo de descrição.

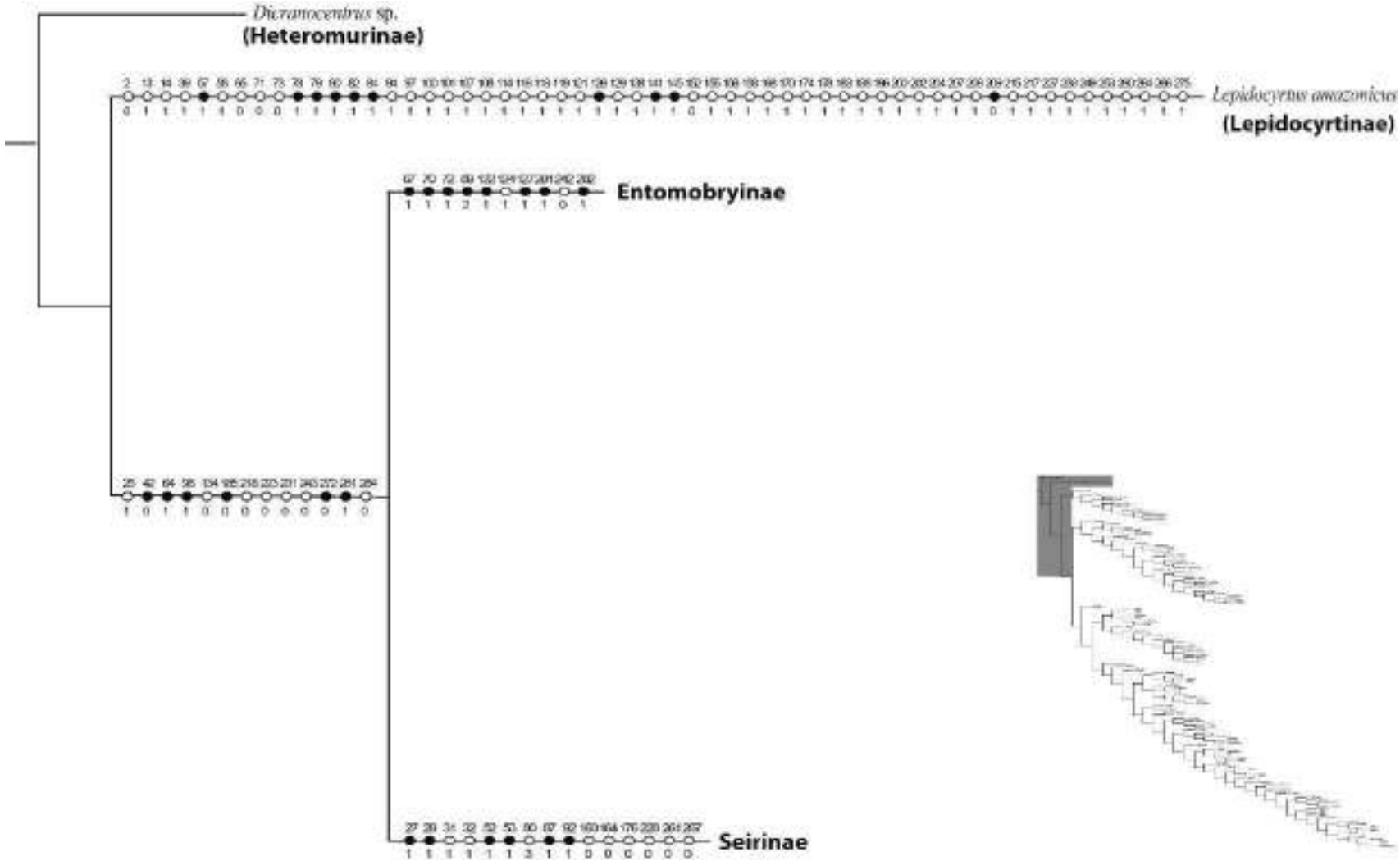

Fig. 2. Cladograma (parte 1) referente à hipótese filogenética gerada partir de 285 caracteres morfológicos tratados na análise para as relações das subfamílias de Entomobryidae, incluindo os caracteres dos ramos de Entomobryinae e Seirinae. Círculos pretos indicam apomorfias únicas, círculos abertos representam alterações não exclusivas, números acima dos círculos é o número do caráter, números abaixo dos círculos o estado do caráter.

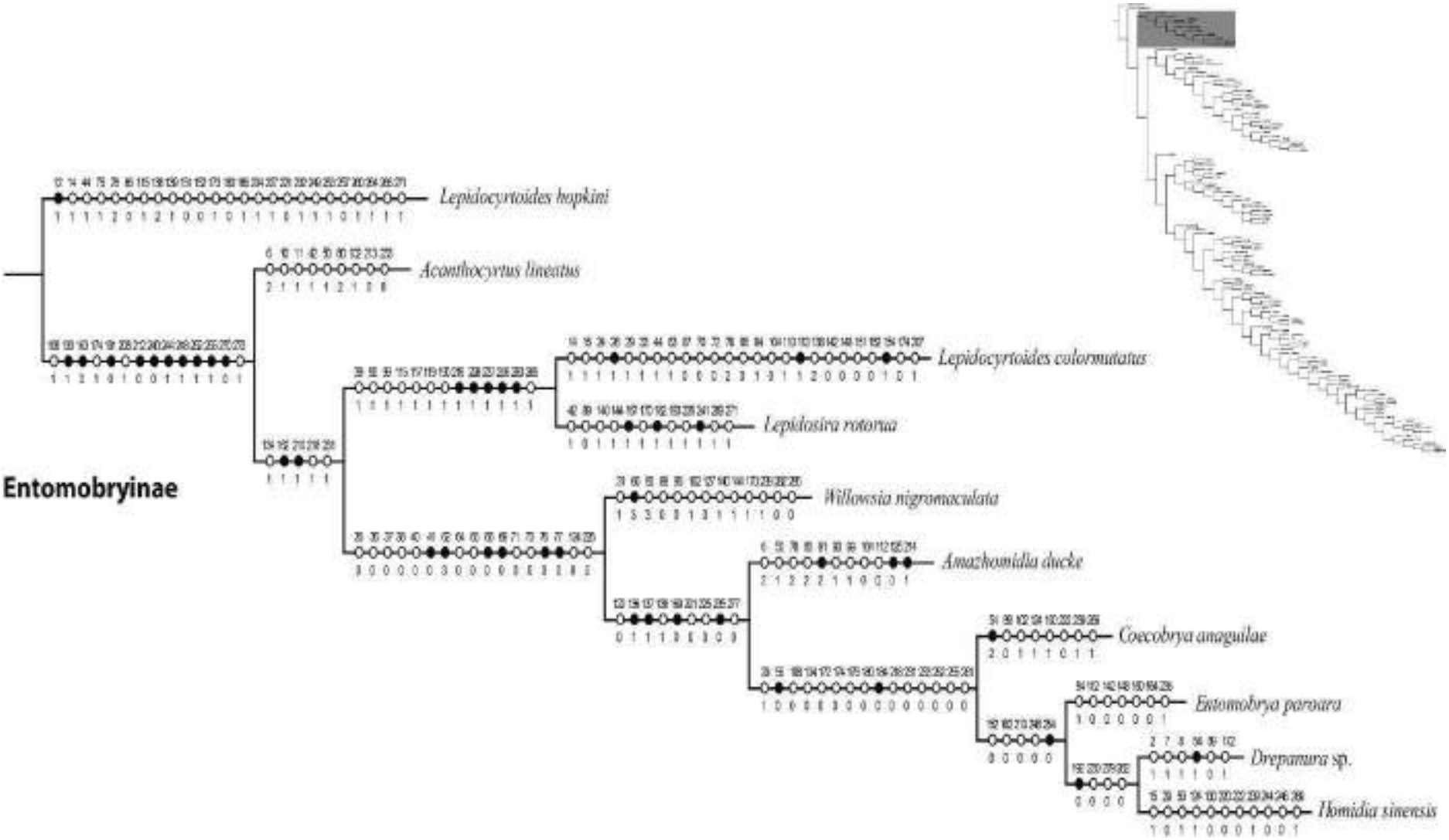

Fig. 3. Cladograma (parte 2) referente à hipótese filogenética para Entomobryinae. Círculos pretos indicam apomorfias únicas, círculos abertos representam alterações não exclusivas, números acima dos círculos é o número do caráter, números abaixo dos círculos o estado do caráter.

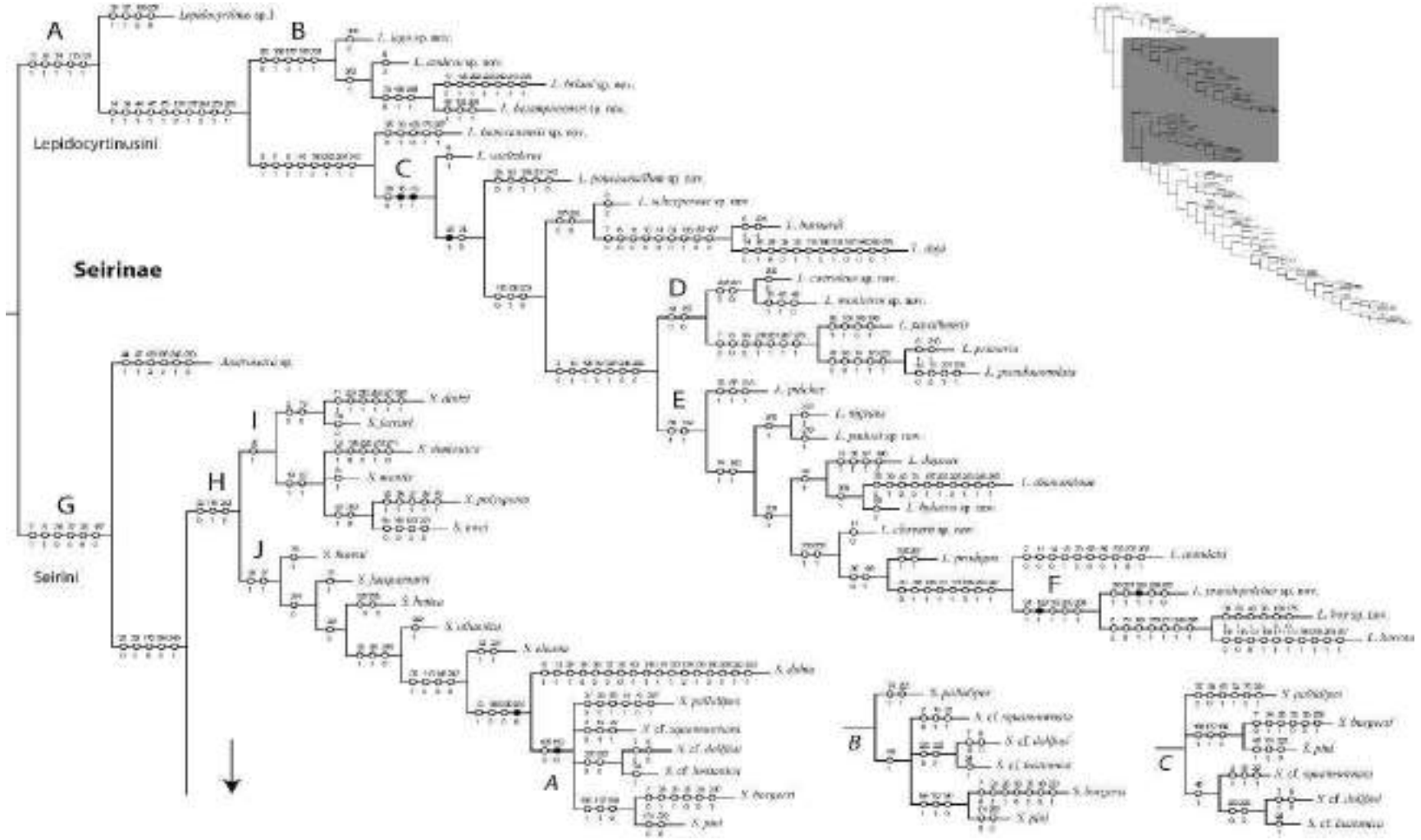

Fig. 4. Cladograma (parte 3) referente à hipótese filogenética para Seirinae. Letras acima dos ramos são agrupamentos formados em Seirinae, *A*–*C* (em itálico) representam três topologias igualmente parcimoniosas para o agrupamento de seis espécies. Círculos pretos indicam apomorfias únicas, círculos abertos representam alterações não exclusivas, números acima dos círculos é o número do caráter, números abaixo dos círculos o estado do caráter. Símbolo "*" indica novas espécies em processo de descrição. Seta para baixo indica continuação do ramo (Fig. 5).

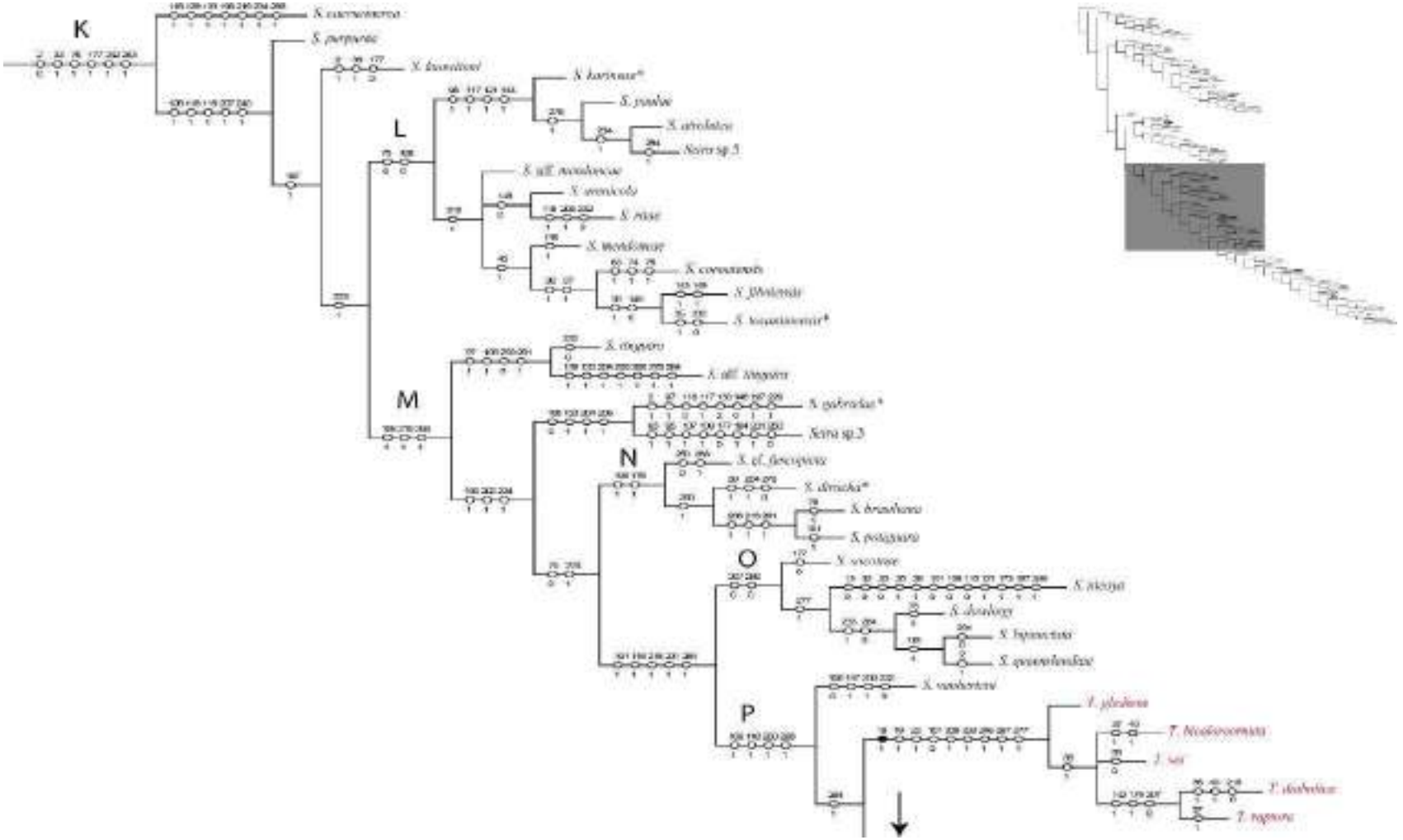

Fig. 5. Cladograma (parte 4) referente à hipótese filogenética para Seirinae. Letras acima dos ramos são agrupamentos formados em Seirinae. Círculos pretos indicam apomorfias únicas, círculos abertos representam alterações não exclusivas, números acima dos círculos é o número do caráter, números abaixo dos círculos o estado do caráter. Espécies em vermelho indicam representantes de *Tyrannoseira* no ramo de *Seira* s. lat. Símbolo "*" indica novas espécies em processo de descrição. Seta para baixo indica continuação do ramo (Fig. 6).

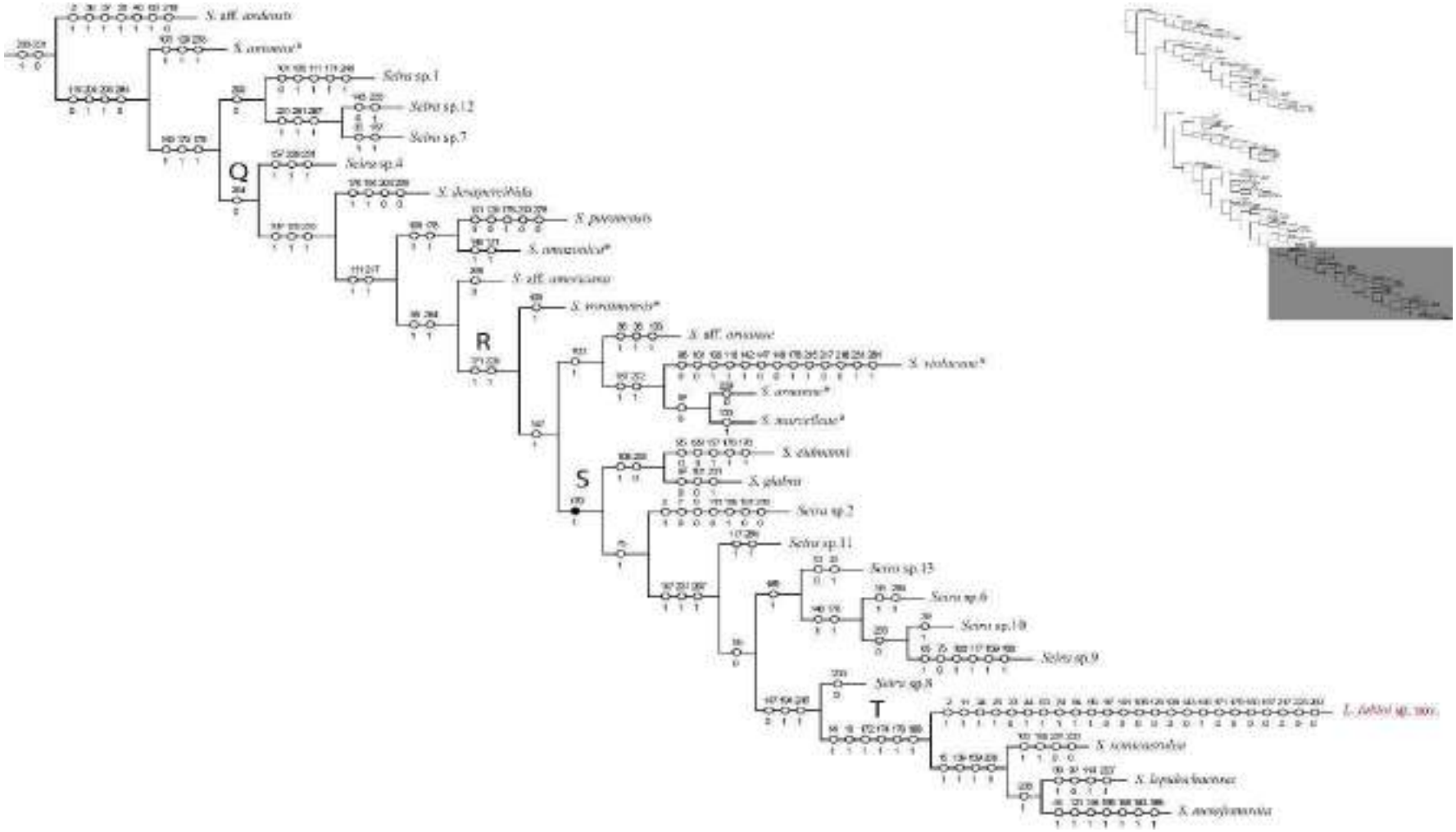

Fig. 6. Cladograma (parte 5) referente à hipótese filogenética para Seirinae. Letras acima dos ramos são agrupamentos formados em Seirinae. Círculos pretos indicam apomorfias únicas, círculos abertos representam alterações não exclusivas, números acima dos círculos é o número do caráter, números abaixo dos círculos o estado do caráter. Espécie em vermelho indica um representante de "*Lepidocyrtinus*" no ramo de *Seira* s. lat. Símbolo "*" indica novas espécies em processo de descrição.

Agrupamentos e gêneros

A topologia proposta recuperou dois grandes clados (grupos **A** e **G**) para Seirinae, ambos fracamente suportados (BS=6 e 5, respectivamente) e sustentados por cinco e seis homoplasias, respectivamente (Figs 1, 4). Dentro do grupo **G**, *Austroseira* foi recuperado como o grupo mais basal ao grande grupo (**H**+**K**) correspondente a *Seira* s. lat., sendo todos fracamente suportados (BS=6 ou menos).

O grupo **A** corresponde aos 28 táxons de *Lepidocyrtinus*, o qual foi recuperado pelos seguintes caracteres não exclusivos: papila labral externa ausente [11: 1], tibiotarso com longas mac externas [24: 1], colóforo posteriormente com escamas [74: 1], cabeça desprovida de cerda **S4** [115: 1] e **Pe3** em forma de mic [133: 1] (Fig. 7E, 8E, 19B). Dentro desse grupo, o clado representado pela letra **B** (Figs 1, 4) aparece fortemente sustentado (BS=69), sendo constituído por quatro espécies caracterizadas pela cabeça com cerda **S4** [95: 0], Th II com cerdas extras de **p1i** [172: 0], mas desprovido das cerdas **m5p** [166: 1] e **p2ep** [185: 1], e Th III desprovido da cerda **p2e** [231: 1]. Outros grupos (**C**–**F**) em *Lepidocyrtinus* também foram recuperados (com valores de suporte baixo, BS = 3–6). Destes, o grupo **C,** formado por 22 espécies, foi sustentado por duas sinapomorfias: mac da dens finamente ciliadas e apicalmente em forma de mamilo [48, 49: 1]. Outro pequeno agrupamento (grupo **D**) é sustentado por dois caracteres não exclusivos: cerda subapical interna (si2) do manúbrio present [40: 0] e Th II com **m4p** mac [157: 0] (Fig. 11A). O grupo **E**, constituído por 12 espécies, aparece sustentado por dois caracteres não exclusivos: tricobótria **D3** do Abd IV com cerdas acessórias [88: 1] e Th II com mic **m4p** [159: 1] (Fig. 21B). Por fim, o grupo **F**, representado por três espécies, foi recuperado sustentado por uma autapomorfia: cabeça com mic **S6i** [120: 1], além de quatro caracteres não exclusivos [94, 197, 246, 250: 1].

Austroseira e o grupo (**H**+**K**) de *Seira* s. lat., juntos (Figs 1, 4), compartilham: cerdas pré-labrais ciliadas [7–8: 1], manúbrio ventralmente com cerdas pós basais (pb), mediana (m) e subapical externa (se) [36–38: 0], e Th II com mac **p2ep2** [187: 0]. *Austroseira* aparece sustentada por mac modificadas sobre a placa manubrial e dens [44 e 47: 1], Th II com mac anteriores agrupadas [138: 2], Th II com mac extras de **p3** do Th II [189: 0], Th III com mic **p6** [243: 1], e Abd I com cerda **a2e** [250: 0].

O grande grupo de *Seira* (**H**+**K**) foi recuperado sustentado pelos seguintes caracteres: dente externo do unguis não desenvolvido [25: 0, Figs 8F–G], manúbrio ventralmente com cerda basal (cb) [35: 0, Fig. 11A], Th II com cerdas extras de **p1i** e mac **p5** [172, 194: 0,

Fig. 21A], e Abd I com mic **a2** [249: 1, Fig. 23A]. Dentro desse clado, o grupo **H,** representado por 18 espécies de *Seira* s. str. compartilha alguns caracteres não exclusivos como colófóro anteriormente sem espinhos [32: 0], cabeça sem cerda **S4** [115: 1] e Th II com mac **p5** [242: 0]. Este grupo aparece dividido em dois subgrupos (**I** + **J**); espécies em **I** compartilham o dente mediano do unguis próximo ao dente apical [caráter 30: 1], enquanto que o clado representado pela letra **J** aparece sustentado pelo manúbrio ventralmente desprovidos de cerdas pós basal (pb) e mediana (m) [36–37: 1, Fig. 11A]. Ainda com relação à **J**, alguns agrupamentos foram recuperados com bons valores de suporte (BS=69) (Figs 1, 4).

O grupo **K**, representado por 61 táxons terminais (Figs 1, 5), foi recuperado suportado por seis homoplasias: Ant IV não anelado [2: 0], colófóro posteriormente com queta sublateral modificada [33: 1], manúbrio com escamas dorsais [75: 1], Th II com mic extras de **p1ip** [177: 1], Th III com mic **p2e** [232: 1], e Abd I com mic **a3** [253: 1]. Dento de grande grupo alguns agupamentos foram recuperados, sendo eles apresentados a seguir.

O clado **L** corresponde à 11 espécies as quais compartilham manúbrio dorsalmente sem escamas [75: 0] e cabeça com cerda **S1** [108: 0]. Já o clado **M** sustentado pelo Th III com mic **a1a** e **p1i** [198, 219: 1] e Abd I com mic **m4** [266: 1] é composto pelas demais espécies. O grupo **N** foi recuperado suportado por duas homoplasias: cabeça desprovida de cerda **S0** [106: 1] e Th II com mic **p1ip** [175: 1], assim como o grupo **O**: Th III com mac **a6** [207: 0] e Abd I com mac **m4** [266: 0], ambos com quatro espécies. O grupo **P**, representado por 36 táxons, foi recuperado sustentado por: cabeça com mic **S1** e **S5** mic [109, 118: 1] e Abd I com mic **m2** e **m4i** [260, 268: 1]. *Tyrannoseira* aparece como integrante desse grupo; esse táxon foi recuperado com alto valor de suporte (BS=56), e sustentado por uma sinapomorfia: dilatação do fêmur anterior dos machos (Fig. 8B). Dois outros caracteres são compartilhados exclusivamente por representantes desse clado: pernas anteriores dos machos com espinhos femurais curtos, cônicos e distribuídos transversalmente [20–21: 1] e quetas tibiotarsais com ápice curvado distalmente [23: 1] (Fig. 8D) apesar deles não terem sido recuperado na hipótese apresentada. O clado **Q** (Figs 1, 6) foi recuperado na análise sustentado por uma reversão da mac **m3** no Abd I [264: 0], uma vez que esta cerda transformou em mic na base do ramo de *Tyrannoseira*. No grupo **R** (representado por 18 espécies) esta cerda novamente reduz em mic, e, também, há perda da cerda **A4** da cabeça [95: 1]. Por fim, o grupo **S** compreende 13 espécies que compartilham o caráter sinapomórfico Th II com mic **p1p** [caráter 179: 1], enquanto que o grupo **T**

(representado por quatro espécies da África) aparece sustentado por algumas homoplasias compartilhadas também por *Lepidocyrtinus*, tais como Th II com projeção anterior [14: 1], incluindo da margem posterior [16: 1].

Discussão

O cladograma recuperado nesta análise com 120 terminais de Entomobryidae gerou AMPs com baixos valores de índice de consistência e alto índice de retenção, devido ao grande número de homoplasias (apenas 17% dos caracteres representam sinapomorfias), o que justifica os baixos valores de suporte registrados para a maioria dos ramos. Excessão disso pode ser notada nos valores elevados de suporte relativo que sustentam Entomobryinae (Fig. 1), onde há um número inferior de homoplasias (Figs 2–3). Soto-Adames (2000), em uma análise com base em 100 caracteres morfológicos e 28 espécies Neotropicais de Lepidocyrtinae (*Lepidocyrtus*, *Pseudosinella* e *Metasinella*), assim como D'Haese (2003) analisando 131 caracteres morfológicos para 64 táxons de Collembola, também obtiveram dados similares em relação ao número de homoplasias e índices, no entanto, isso não influenciou na recuperação dos grupos propostos, tanto a nível genérico, como supragenérico. Assim, esses índices baixos, assim como a quantidade de homoplasias recuperadas, não comprometem a robustez da hipótese proposta, principalmente em análises filogenéticas para Collembola baseada em grandes conjuntos de dados morfógicos.

A topologia recuperada na análise proposta (Fig. 1) corrobora com a classificação mais aceita atualmente para Entomobryidae baseada em dados moleculares e poucos dados morfológicos (Orchesellinae + (Heteromurinae + (Lepidocyrtinae + (Entomobryinae + Seirinae)))) (Zhang *et al*., 2015, 2016, 2017). Consequentemente aqui mais uma vez é descartada a hipótese prévia de Lepidocyrtinae como grupo irmão de Seirinae (Soto-Adames, 2008; Zhang *et al.*, 2014).

A relação de Seirinae + Entomobryinae pode ser evidenciada aqui pelas seis sinapomorfias [42: 2, 64: 1, 98: 1, 185: 0, 272: 0, 281: 1] recuperadas, as quais, até o momento, não haviam sido testadas em nenhuma análise (Soto-Adames *et al.*, 2008). Dentre essas características, Seirinae + Entomobryinae compartilham cerdas apicalmente na região postero-lateral (alp) ventralmente no manúbrio (42: 2, Figs 11A–B), enquanto que em Heteromurinae (Cipola *et al.*, 2016; Zhang *et al.*, 2018) e Lepidocyrtinae (Yoshii, 1982; Cipola *et al.*, 2018a) essas cerdas estão ausentes (Fig. 11C). O surgimento das

escamas no Ant III [64: 1] de Seirinae + Entomobryinae na análise apareceu como uma característica autapomórfica, mas isso deve ser investigado no ramo de Heteromurinae e/ou Lepidocyrtinae, pois há registros de escamas neste segmento em alguns grupos de ambas subfamílias (Cipola *et al.*, 2016, 2018a). A ausência da cerda **M0** na cabeça [98: 1] certamente é uma perda secundária a partir do segundo ínstar de Seirinae (como apresentado por Soto-Adames, 2008), e provavelmente em Entomobryinae, uma vez que estão preservadas em Heteromurinae e Lepidocyrtinae (Figs 18A–B), assim como a cerda **p4** no Abd II [281: 0, Figs 22A–B]. A presença de mac **p2ep** no Th II [185: 0] e mac **a2** no Abd II [272: 0] são sinapomorfias de Seirinae + Entomobryinae (mic em Heteromurinae e Lepidocyrtinae), apesar de o primeiro caráter estar perdido em alguns ramos internos de Entomobryinae (ex. Figs 20D–E). A forma da mac tergal [78: 0], embora seja compartilhada pela maioria dos Entomobryidae (Soto-Adames *et al.*, 2008), também foi útil para indicar a relação de Entomobryinae + Seirinae (CI: 50), uma vez que em Lepidocyrtinae esta característica é modificada. Nesse mesmo sentido, caracteres da S-chaeta (**acc**.**p6**) sobre o Abd II–III (82, 84: 0) não foram recuperados como sinapomórficos porque estão presentes em Seirinae + Entomobryinae, embora sejam perdidos em Lepidocyrtinae (Fig. 16D) (Zhang & Deharveng, 2015).

Em Seirinae, dentre as seis sinapomorfias recuperadas [27, 28, 52, 53, 87, 92: 1], a forma dos unguis [27, 28: 1, Figs 9G–H] assim como a presença de tricobótrias subantenais [92: 1, Fig. 19C] foram ignoradas até então como caracteres diagnósticos da subfamília (Soto-Adames *et al.*, 2008; Zhang & Deharveng, 2015). A presença de tricobótria subantenal, assim como a presença da terceira tricobótria (**D3**) no Abd IV [87: 1, Fig. 19C], são caracteres também presentes em alguns gêneros de Paronellidae (Soto-Adames *et al.*, 2014), mas dentre os Entomobryidae s. str., estão presentes apenas em Seirinae (Soto-Adames *et al.*, 2008; Zhang & Deharveng, 2015). Yosii (1959) reporta exclusivamente para *Seira rowani* Yosii, o Abd IV desprovido da tricobótria **D3**, mas isso precisa ser investigado porque nunca foi confirmado em outro estudo, portanto esse estado não foi considerado aqui. A forma falcada do mucro de Seirinae (Fig. 12E) já foi indicada com tendo origem independente (Zhang *et al.*, 2015), portanto a hipótese proposta aqui, indica que isso aconteceu a partir de uma convergência, com a perda do dente basal em Seirinae [53: 1], enquanto nos gêneros de Entomobryidae (*Coecobrya*, *Drepanura* e provavelmente *Drepanosira*) houve a perda do dente distal [54: 2]. Essa hipótese pode ser sustentada por três evidências morfológicas a seguir: 1) o dente basal em Seirinae está

vestigial no interior da membrana mucronal; 2) o dente distal em Entomobryinae pode ser vestigial em algumas espécies de *Drepanura*, ou menor que o basal em *Entomobrya*; 3) o espinho basal do mucro atinge o ápice do dente independente dos gêneros de Entomobryinae com mucro falcado (*Coecobrya*, *Drepanura*) ou bidenteado (ex. *Entomobrya*, *Homidia*). Levando em consideração essas hipóteses, é mais parcimonioso supor que o espinho atinja o ápice do mesmo dente (basal), que dois surgimentos evolutivos tenham ocorrido. Consequentemente, isto indica também que a perda do espinho mucronal provavelmente é uma característica [52: 1] não exclusiva de Seirinae, uma vez que algumas espécies de Heteromurinae (*Alloscopus*, *Heteromurus*, *Heteromurtrella*) também compartilham esta condição (Cipola *et al.*, 2016; Zhang *et al.*, 2019). Embora a análise filogenética não tenha recuperado como uma sinapomorfia a forma circinada da placa genital nos machos [55: 2], esta condição está apenas nos 108 terminais de Seirinae do presente estudo. Dessa forma essa característica pode ser utilizada para diagnosticar Seirinae, apesar de estar presente em alguns grupos de Paronellidae, Tomoceridae e Isotomidae (Christiansen, 1958; Soto *et al.*, 2008).

Seirinae, conforme estabelecido por Yosii (1961) baseado na forma das escamas (fortemente ciliadas, Fig. 13F), não foi recuperado na nossa hipótese filogenética, uma vez que esta forma [58: 0] também está em grupos basais de Entomobryinae (ex. *L. hopkini*, *A. lineatus*), assumindo-se assim um surgimento único dessa caracteristica para a base do clado (*Dicranocentrus* sp.). Zhang *et al.*, (2014) reporta que as escamas surgiram cinco vezes no corpo de Entomobryidae. No entanto, considerando apenas as subfamílias tratadas aqui, elas podem ter surgido uma única vez; nesse caso, eventos secundários de perda e ganho das escamas em alguns apêndices [ex. 63, 65–67], bem como suas diferentes esculturações [57, 59–62, Fig. 13] específicas de cada grupo. Esta hipótese reflete-se nas propostas de Yoshii & Suhardjono (1989) e Soto-Adames *et al.*, (2008), pois a presença de escamas ventralmente na dens [77: 1] não corresponde a uma sinapomorfia de Seirinae, e sim de grupos basais de Entomobryidae (ex. Heteromurinae e Lepidocyrtinae). Outros caracteres incluídos em ambas propostas não foram recuperados aqui, tais como mucro com dois dentes e espinho basal (Fig. 12D), e placa genital dos machos papilado [55: 2], pois essas características foram propostas para táxons tradicionalmente inseridos em Seirinae (grupo *Lepidosira*, como *Acanthocyrtus*, *Lepidosira*, *Lepidocyrtoides*) mas que atualmente pertencem a Entomobryinae, de acordo com o padrão de S-chaeta (Zhang & Deharveng, 2015).

A partir do padrão da quetoxia dorsal dos grandes grupos formados em Seirinae (**A**+**G**), é notável que a macroquetotaxia é uma condição plesiomórfica, e que as reduções ocorreram independentes nos grupos derivados. Na cabeça (Figs 19A–C) as espécies basais compartilham pelo menos 3 (**M1**–**2**, **M4**) e 6 (**S0**–**3**, **S5**–**6**) mac nas séries **M** e **S**, respectivamente, mas o grupo **G** inclui também as mac postocipitais. No Th II as espécies possuem cerdas extras em todas as séries amp (exceto série A em *Seira* s. lat.), enquanto no Th III em parte das séries M e P (Figs 21A–C). Isto também ocorre no Abd I–II, pois tem pelo menos 6 (**a2**, **m2i**, **m2**, **m3**, **m4i**, **m4**) e 4 (**a2**, **m3**, **m3e**, **m3p**) mac centrais, respectivamente (Figs 23A–C).

Seirinae (Fig. 1) é dividida aqui em duas tribos correspondentes aos grandes clados **A** e **G**: Lepidocyrtinusini trib. nov. (grupo **A**), com um único gênero (*Lepidocyrtinus*), e Seirini (grupo **G**) com *Austroseira* e *Seira* s. lat. A hipótese de relações genéricas recuperadas aqui foi *Lepidocyrtinus* + (*Austroseira* + (*Seira* s. str. + *Seira*).

Em Lepidocyrtinusini trib. nov., dentre as cinco características recuperadas [11, 24, 74, 115, 133: 1], a ausência da papila labral externa [11: 1, Fig. 7E] e longas mac externas no tibiotarso [24: 1, Fig. 8E], são autapomorfias não exclusivas, uma vez que também estão presentes em alguns Entomobryinae (*Amazhomidia*, *Acanthocyrtus* e *Lepidocyrtoides*). Essas semelhanças, possivelmente caracteres conservados, indicam que *Lepidocyrtinus* surgiu a partir de alguma dessas linhagens de Entomobryinae escamados. Outras evidências que podem reforçar essa hipótese são: Th II projetado anteriormente [14: 1], unguis com dentes externos desenvolvido [25: 1] e placa manubrial com mac modificadas [44: 1] compartilhadas entre *Lepidocyrtinus* e *Lepidocyrtoides*, por exemplo. Com relação a essa última característica, vale ressaltar que a forma e a ciliação em espécies Africanas de *Lepidocyrtinus* são mais semelhantes a *Lepidocyrtoides* (Cipola *et al.*, 2017), enquanto que nas 17 espécies do Brasil (agrupamento **D**+**E**) elas têm um estado derivado tipicamente característico [45: 2, 46: 1].

Lepidocyrtinus conforme Yosii (1959) e Yoshii & Suhardjono (1989) não foi recuperado em nossas análises, pois em parte do gênero a dens pode ter reduções de mac (*L. dayi*, *L. caeruleus*, *L. monteiroi*), ou até mesmo ser desprovido da mesma, como ocorre no complexo *pseudoannulata* (*L. paraibensis*, *L. primaria*, *L. pseudoannulata*).

Essas características da dens, somadas às características compartilhadas com Entomobryinae e ao padrão da quetotaxia plesiomórfica de Seirinae, foram consistentes para sustentar o ramo de *Lepidocyrtinus*. Isto acontece pela maior parte das cerdas ter um

padrão similar na série de transformação neste táxon. Exemplo disso é a redução de pelo menos 8 mac da cabeça (**A3**, **M2**, **S0**–**2**, **S4**–**6i**) que ocorreu uma única vez em *Lepidocyrtinus* (grupo **F**). Outro exemplo é a presença de uma mac extra (**M4i**) em espécies africanas de *Lepidocyrtinus* (assim como em *Seira* s. str.), mas que se perde uma única vez nas espécies brasileiras (Fig. 19C). No Th II–III a situação não é diferente, pois os terminais basais (ex. grupo **B**) tendem a ter mais mac (ex. **m4i**, **m4p**, **p2ep** e **p3** no Th II), enquanto nas espécies brasileiras ocorreu a redução parcial (ex. grupo **E**) ou total (grupo **F**). Por fim, no Abd I geralmente a cerda **a2** está como mac em *Lepidocyrtinus* (Fig. 23C), enquanto em *Seira* s. lat. esta cerda está como mic, exceto no grupo *squamoornata* (Cipola *et al.*, 2018).

Dentro de Seirini, o grupo mais basal é representado por *Austroseira*, cujo táxon foi estabelecido baseando-se em poucas mac dorsais sobre a dens (Yoshii & Suhardjono, 1992). No presente estudo, não foi codificada a quantidade de mac dorsais sobre a dens, portanto não se sabe se esta condição seria recuperada para *Austroseira*, embora essa característica não seja exclusiva deste táxon, pois também está presente em parte das espécies de *Lepidocyrtinus*. Na realidade, os caracteres homoplásticos recuperados em *Austroseira* [44: 1, 47: 1, 138: 2, 189: 0, 243: 1, 250: 0], indicam semelhanças tanto com *Lepidocyrtinus* [44, 47, 138, 250] quanto com *Seira* s. lat. [189, 243]. Assim, essas características precisam ser investigadas nas outras duas espécies australianas (Yoshii & Suhardjono, 1992), e consequentemente testadas filogeneticamente para verificar a validade de *Austroseira*.

Seira s. str. (grupo **H**) é formado por espécies do Velho Mundo e Neárticas, as quais são morfologicamente distintas das demais espécies de *Seira* pela densa macroquetotaxia e ausência de espinhos no colóforo (exceto *S. eleana*), sendo esta última característica presente nos demais Seirinae (Yoshii & Greenslade, 1994; Barra, 2004; Cipola *et al.*, 2018b). No clado **I** estão seis espécies do oeste paleártico, as quais assemelham-se pela cabeça desprovida de mac **M4i** e **S4**, Abd I com 6 mac (**a3**, **m2i**, **m2**, **m3**, **m4i**, **m4**) centrais (exceto *S. dinizi*), e unguis com o dente mediano próximo do dente apical [30: 1]. Além disso, quatro dessas espécies (*S. domestica*, *S. mantis*, *S. polysperes*, *S. uwei*) compartilham quetas modificadas no femur [19: 1] e tibiotarso [22: 1] anterior dos machos, ambas autapomorfias não exclusivas. No grupo **J**, as espécies mais basais são semelhantes às espécies do grupo **I** por compartilharem Abd I–II com 6 e 4 (**a2**, **m3**, **m3e**, **m3ep**) mac centrais, respectivamente, apesar de serem diferenciadas pelas cerdas do manúbrio [36, 37:

1]. O ramo distal é composto por um pequeno grupo formado por seis espécies Paleárticas, as quais compartilham o Th II com múltiplas cerdas no complexo **m1**–**2** [150: 0] e grupo PmA e Abd I com pelo menos 8 mac centrais (como apresentado em Cipola *et al.*, 2018b).

O grupo **K**, é composto por outra linhagem de *Seira* que precisa ser investigado para testar uma possível validade genérica, já que este clado é grupo irmão de *Seira* s. str. (Fig. 1). As espécies basais deste grupo (ex. *S. purpurea*, *S. knowtoni* e grupo **L**) possuem a quetotaxia relativamente densa, parcialmente semelhante a *Seira* s. str., mas que tende a se perder gradativamente nos clados derivados (grupo **M**). O grupo **L** constiui-se apenas de espécies brasileiras morfologicamente similares (Bellini & Zeppelini, 2008; Cipola *et al.*, 2014b; Godeiro & Bellini, 2014, 2015). Essas espécies compartilham na cabeça as séries A, M, S, Pa, Pm e Pp respectivamente com 4 (**A0**, **A2**–**3**, **A5**), 3 (**M1**–**2**), 4 (**S0**–**3**), 4 (**Pa1**–**3**, **Pa5**), 2 (**Pm1**, **Pm3**) e 4 (**Pp1**–**3**, **Pp5**) mac, Th II com 11–12 mac posteriores (**p1**–**3**), e Th III ao Abd III com 11–12 (**a1**–**5**, **p1**–**1i**, **p2**–**2a**, **p3**), 5 (**m2**–**4**) e 4 (**a2**, **m3**–**3e**) mac centrais, respectivamente. Ainda dentro do grupo **L**, a diferença entre seus dois subclados está na perda secundária de três mac na cabeça (**S5**, **S6** e **Pa4**) e uma no Abd I (**m3ep**) no complexo de *S. atrolutea* Arlé. No grupo **M**, ocorre a redução (mac para mic) de algumas cerdas citadas anteriormente (exceto no Th II), e consequentemente no nó de *Seira tinguira* até grupo **N** na série **S** cabeça se perdem as cerdas **S0**–**2**, e no Abd I uma (**m4**) ou duas (**m4**, **m4i**) mac centrais (Soto-Adames 2008; Cipola *et al.* 2014b).

No grupo **O**, na cabeça, ocorre a reversão de duas mac (**S0** e **S2**) e a perda da cerda **M1**, além de mais duas reversões no Abd I (**m4** e **m4i**) e a perda de **m2i** (Yoshii & Greenslade, 1994; Soto-Adames, 2008; Barra, 2004). Esse padrão da quetotaxia da cabeça se mantém estável até os terminais basais do grupo **P** (*Seira vanherteni* e *Tyrannoseira*), mas no Abd I ocorre a perda de todas as mac (**m2**, **m3**, **m4**–**4i**) pelo menos em *Tyrannoseira* e nos próximos cinco terminais seguintes (de *Seira* aff. *andensis* até o nó do grupo **Q**), portanto não é uma característica exclusiva do primeiro táxon.

Tyrannoseira, conforme proposto por Bellini & Zeppelini (2011), é recuperado aqui apenas pela dilatação do fêmur anterior nos machos [18: 1], característica jamais observada em qualquer outro Entomobryioidea (Christiansen & Bellinger, 2000; Soto-Adames *et al.*, 2008; Cipola *et al.*, 2014a, 2014b, 2016, 2018a; Soto-Adames, 2014; Zhang & Deharveng, 2015). As outras características diagnósticas [20–23: 1] propostas pelos autores são sinapomorfias não exclusivas presentes em algumas espécies do velho mundo (parte do grupo **I**). No entanto, a forma cônica [20: 1] e distribuição transversal [21: 1] dos espinhos

no fêmur anterior dos machos são autapomórficas, assim como o ápice das quetas modificadas no tibiotarso [23: 1]. Assim, a partir desta análise, *Tyrannoseira* é recuperado aqui como um subgrupo de *Seira*, sendo considerado a partir de agora como um complexo de espécies endêmicas do Brasil.

No grupo **Q** ocorrem várias reduções de mac em todas as espécies no geral, especialmente no Th II (**m1i**, **p1i**, **p1p**, **p2p**) e Th III (**a1**–**5**, **p1**) (Soto-Adames 2008; Godeiro & Bellini 2015). No entanto, neste grupo, também ocorre reversão (mic para mac) da cerda **m3** no Abd I [264: 0] dos cinco terminais subsequentes (de *Seira* sp.4 até o nó do grupo **R**), mas pela segunda vez **m3** transforma-se em mic [264: 1] neste último grupo. Assim o grupo **R** compreende 17 espécies da América do Sul e África caracterizadas pela modificação de mac em mic de **p1p** e **p2a** [171, 229: 1] respectivamente no Th II e III. Essas espécies também são diagnosticadas pela cabeça não possuir mais que três mac centrais nas séries **M** e **S** (**M1**, **M2**, **S3**) além de perda parcial das mac postocipital, Th II com cinco ou menos mac medial (**m1**, **m2**–**2i**, **m4**, **m4p**), Th III com três ou menos mac centrais (**p2**–**2a**, **p3**), Abd I desprovido de mac (exceto *L. fabioi* sp. nov.), e Abd II com 3 mac centrais (**a2**, **m3**–**3e**) (Godeiro & Bellini, 2015). O grupo **S**, mantem-se suportado pela mac **M1** da cabeça [100: 0] e pela redução de **p1p** (mac para mic) no Th II [179: 1], enquanto nas quatro espécies brasileiras que partem deste nó, os estados dessas cerdas são o oposto [100: 1, 179: 0].

Os 10 terminais subsequentes (de *Seira* sp.11 até o grupo **T**), constituem-se de espécies de Madagascar (exceto *Lepidocyrtinus fabioi* sp. nov.), as quais sofreram fortes reduções da quetotaxia, tanto na mudança de mac para mic, quanto em cerdas secundárias [157, 231, 267: 1]. Na cabeça são caracterizadas por possuírem, no máximo, 1 mac central nas séries **M** e **S** (**M1** e **S3**) e pela perda total (exceto **Pa5**) das mac postocipitais (ex. Fig. 19C). No Th II a situação não é diferente, pois **m4i** reduz de mac para mic [157: 1], restanto apenas 4 mac medial (**m1**, **m2**, **m4**, **m4p**), enquanto na série posterior resta no máximo 5 mac (**p1**, **p2**, **p2ep**, **p3** e **p5**). Ainda nessas espécies, no Th III, existem apenas 3 mac centrais (**p1**, **p2**, **p3**) e 1 lateral (**m6**), enquanto que no Abd I–II há 0 e 3 (**a2**, **m3**, **m3e**) mac centrais, respectivamente. No grupo **T**, as espécies são atípicas dentro de *Seira* por possuírem algumas características semelhantes a *Lepidocyrtinus*, como Th II projetado anteriormente e com numerosas mic no ápice [14, 15: 1], incluindo também a projeção da margem posterior [16: 1], além da mudança da cerda **p5** para mic [194: 1], embora essa última mudança também inclui *Seira* sp.8 (Fig. 6). Ainda no Th II do grupo **T**, três cerdas

secundárias (**p1i**, **p1ip** e extras de **p1ip**) são perdidas [172, 174, 176: 1], além da modificação de **p2ep** em mic [186: 1], sendo essa última característica tipicamente presente em *Lepidocyrtinus* (Fig. 21C). Com base nas reduções citadas, somado com a presença de macroquetas externas longas no tibiotarso [24: 1] e dente externo do unguis desenvolvido [24, 25: 1], *Lepidocyrtinus fabioi* sp. nov. foi equivocadamente inserido em *Lepidocyrtinus* (veja capítulo V); após as novas evidências apresentadas aqui é proposto a sua transferência para *Seira*.

Taxonomia

Familia Entomobryidae Schäffer, 1896

Subfamila Seirinae Yosii, 1961

Gênero tipo: *Seira* Lubbock, 1870

Diagnose: Corpo com escamas apicalmente arredondadas presentes sobre os apêndices, colóforo e manúbrio posteriormente com ou sem escamas; cílios das escamas apicalmente acuminados, desalinhados, e com comprimento em até 1/10 da metade do comprimento da escama (Figs 13F, I). Mac tergal finamente ciliada e apicalmente em forma de pé, e mic lisas ou com ramificações distais (Figs 14, 15E). Cabeça com cerda **Pe5**, **M0** ausente nos adultos (Fig. 19). Th II com cerdas secundárias **m4ip**, **m5a** e **p2ep**, cerdas extras de **p1ip** presente ou ausente; Th III com cerda **p2a**, cerdas **p1i**, **p1p** e **p2e** presentes ou ausentes, **p6** como mac ou mic (Fig. 21). Abd I com ou sem cerdas secundárias **m2i** e **m4i**; Abd II com mac **a2**, **p4** ausente; Abd III geralmente com mac **am6** (Fig. 23). Cabeça com tricobótria subantenal e Abd IV com 3 tricobótrias (**T2**, **T4**, **D3**) (Fig. 16C). Cerdas acessórias das tricobótrias abdominais fortemente ciliadas (Fig. 17F). Th II–Abd V com fórmula das sensilas 1, 1 | 0, 2, 2, +, 3 (Fig. 16C). Pernas anteriores dos machos raramente com modificações internas (Figs 8A–D). Tibiotarso eventualmente com longas mac externas (Fig. 8F). Lado externo do unguis com um par de dentes laterais normais ou desenvolvidos, dente basal impareado com alongamento proximal, achatado dorsoventralmente, e projetado rentemente ao unguis (Figs 8F–H, 9G–H). Colóforo geralmente com espinhos lisos anteriores e posteriores (Figs 10A–B). Placa genital dos machos circinada, com cerdas lisas circugenitais e eugenitais. Manúbrio ventralmente com cerdas na região **alp**, mas ausentes em **ala** (Fig. 11A). Placa manubrial e dens dorsal com ou sem mac modificadas (Fig. 12A–B); mucro dorsalmente sem dente e espinho basal (Fig. 12E).

Tribo Lepidocyrtinusini trib. nov. Cipola & Bellini

Gênero tipo: *Lepidocyrtinus* Börner, 1903

Diagnose: Antenas com comprimento variado, frequentemente subiguais ou maiores que o comprimento do tronco; Ant IV e III frequentemente com anelações (Fig. 7B). Papila labral externa frequentemente ausente ou quando presente reduzida (Fig. 7E). Quetotaxia dorsal da cabeça com 8 cerdas postocipitais (**Pa1**, **Pa2**, **Pa3**, **Pm1**, **Pm3**, **Pp1**, **Pp2**, **Pp3**) como mic, **Pa3**, **Pm3** e **Pp3** raramente como mac, **Ps2** sempre como mic (Fig. 19C). Th II geralmente projetado anteriormente e com um grupo anterior de mac (grupo **a5**), às vezes com numerosas mic no ápice; série medial no máximo com 6 cerdas no complexo **m1**–**2**, mac **m1ip** geralmente ausente; cerda **p3** mac ou mic e **p5** sempre mic. Th II frequentemente com redução de cerdas primárias (**a3**, **a4**, **a5**, **p3**) (Fig. 21C). Abd I com até 7 mac centrais (**a2**, **a3**, **m2i**, **m2**, **m3**, **m4i**, **m4**), **a3** raramente como mac, assim como **a2** e **m2i** como mic. Abd II com **a3** como mic, assim como **m3e** eventualmente, mas **m3ep** sempre como mac (Fig. 23C). Abd IV eventualmente com cerdas acessórias presentes na tricobótria **D3** (Fig. 17F). Pernas anteriores dos machos sem modificações. Tibiotarso geralmente com longas mac externas (Fig. 8F). Lado externo do unguis com um par de dentes laterais desenvolvidos (Figs 8H, 9H). Colóforo sempre com espinhos anteriores, espinhos posteriores eventualmente ausentes (Figs 10A–B). Placa manubrial e dens dorsal geralmente com mac modificadas (Fig. 12A–B).

Tribo Seirini Yosii, 1961

Gênero tipo: *Seira* Lubbock, 1870

Diagnose: Antenas subiguais ou menores que o comprimento do tronco; Ant IV e III geralmente sem anelações (Fig. 7B). Papila labral externa geralmente presente (Fig. 7E). Quetotaxia dorsal da cabeça nas séries **M**, **S**, **Ps**, **Pa**, **Pm** e **Pp** respectivamente com 1–4 (**M1**, **M2**, **M4i**, **M4**), 1–8 (**S0**–**6**), 0–1 (**Ps2**), 1–5 (**Pa1–5**), 0–2 (**Pm1**–**3**) e 0–4 (**Pp1**–**3**, **Pp5**) mac, **Ps2** como mac ou mic (Figs 19A–B, D). Th II geralmente normal, não projetado e sem grupo de mac anterior e de mic no ápice; série medial eventualmente com múltiplas cerdas no complexo **m1**–**2**, mac **m1ip** geralmente ausente; cerdas **p3** e **p5** geralmente como mac. Th II variável, desde mac centrais ausentes a múltiplas cerdas extras de **p1**–**2** (Figs 21A–B, D). Abd I com 0–10 mac centrais (**a1**, **a1e**, **a2**, **a2e**, **a3**, **m2i**, **m2**, **m3**, **m4i**, **m4**). Abd II eventualmente com **a3** como mac e **m3e** como mic, mas **m3e** sempre como

mac (Figs 23A–B, D). Cerdas acessórias presentes apenas nas tricobótrias **T2** e **T3** no Abd IV (Fig. 17F). Pernas anteriores dos machos eventualmente com cerdas modificadas internamente (Figs 8A–D). Tibiotarso raramente com longas mac externas (Fig. 8F). Lado externo do unguis com um par de dentes laterais geralmente normais (Figs 8F–G, 9G). Colóforo com ou sem espinhos anteriores e posteriores (Figs 10A–B). Placa manubrial e dens dorsal raramente com mac modificadas (Fig. 12A–B)

Conclusão

A partir de 32% (75 espécies nominais) da fauna de Seirinae conhecida, este táxon foi testado filogeneticamente pela primeira vez utilizando-se dados morfológicos quantitativos e qualitativos, resultando em uma nova proposta de classificação para os grupos inferiores de Seirinae, assim como caracteres diagnósticos desconhecidos até o momento. Embora a maior parte da quetotaxia nos grupos de Seirinae consista de autapomorfias não-exclusivas, muitas delas influenciaram nos agrupamentos dos grandes grupos, assim como subgrupos, resultando no reconhecimento da validade genérica de *Lepidocyrtinus*, e consequentemente de Lepidocyrtinusini trib. nov. Além disso, foi possível revelar que a redução da macroquetotaxia em Seirinae teve origens independentes pelo menos em dois grupos distintos (Lepidocyrtinusini trib. nov. e Seirini), e portanto, a condição plesiomórfica da subfamília é composta pela macroquetotaxia densa. Contudo, futuramente, estudos filogenéticos precisam ser realizados para revelar sinapomorfias (caso existam) nos diferentes níveis dos agrupamentos fornecidos aqui, especialmente nas linhagens de *Seira* (ex. Grupo **K**, *Tyrannoseira*) que possam eventualmente compor outros gêneros. Assim, os resultados obtidos aqui também fornecerão subsídios para futuras revisões taxonômicas para alguns táxons ainda problemáticos (ex. *Austroseira*, *Tyrannoseira*), possibilitando um melhor entendimento sobre a evolução de Entomobryidae no geral.

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Apêndice 1

Tabela 1. Lista dos 120 terminais de Entomobryidae usadas na análise cladística, e suas respectivas subfamílias, localidades e coleções onde estão depositadas. Símbolo "*" indica novas espécies em processo de descrição.

	Espécies	Subfamília	Localidades	Coleção
1	*Dicranocentrus* sp.	Heteromurinae	BRASIL: Rio Grande do Sul	INPA
2	*Lepidocyrtinus amazonicus* Cipola & Bellini, 2018	Lepidocyrtinae	BRASIL: Amazonas, Manaus	INPA, CC/UFRN
3	*Willowsia nigromaculata* (Lubbock, 1873)	Entomobryinae	FRANÇA: Paris.	MNHN
4	*Acanthocyrtus lineatus* Womersley, 1934	Entomobryinae	AUSTRÁLIA: Queensland, Brisbane	SAM
5	*Amazhomidia ducke* Cipola & Bellini, 2016	Entomobryinae	BRASIL: Amazonas, Manaus	INPA
6	*Lepidocyrtoides hopkini* Cipola & Bellini, 2017	Entomobryinae	AUSTRALIA: New South Wales, Taree	AMS
7	*Lepidocyrtoides colormutatus* Cipola & Bellini 2017	Entomobryinae	BRASIL: Amazonas e Roraima	INPA
8	*Lepidosira rotorua* Salmon, 1938	Entomobryinae	NOVA ZELANDIA: Waikato, Hauraki,	NHMLA
9	*Coecobrya anaguilae* Cipola & Bellini 2017	Entomobryinae	ÁFRICA DO SUL: Oudtshoorn, Cango Caves	INPA, MNRJ
10	*Drepanura* sp.	Entomobryinae	BRASIL: Santa Catarina, Braço do Norte	INPA, CC/UFRN
11	*Entomobrya paroara* Arlé & Guimaraes, 1978	Entomobryinae	BRASIL: Amazonas, Manaus	INPA, MNRJ,
12	*Homidia sinensis* Denis, 1929	Entomobryinae	MALÁSIA: Pahang, Tanah Rata	RPSP, INPA
13	*Seira atlantica* Negri, Pellecchia & Fanciulli, 2005	Seirinae	IRAN: Fars Province, Shiraz	INPA, SANRU
14	*Seira arenicola* Bellini & Zeppelini, 2008	Seirinae	BRASIL: Paraíba, Mataraca	MNRJ, CC/UFRN
15	*Seira atrolutea* (Arlé, 1939)	Seirinae	BRASIL: Minas Gerais, São Paulo, Mato Grosso do Sul, Paraná	MNRJ, CC/UFRN
16	*Seira barrai* Cipola & Baquero, 2018	Seirinae	ESPANHA: Navarra, Viana	MZNA
17	*Seira betica* Cipola & Arbea, 2018	Seirinae	ESPANHA: Minas de Riotinto e Vera	MNCN, INPA
18	*Seira bipunctata* (Packard, 1873)	Seirinae	MÉXICO: Guerrero, El Peral	UNAM
19	*Seira brasiliana* (Arlé, 1939)	Seirinae	BRASIL: Minas Gerais, São Paulo, Mato Grosso do Sul, Paraná	INPA, MNRJ
20	*Seira burgersi* Cipola & Arbea, 2018	Seirinae	ESPANHA: Minas de Riotinto e El Campillo	MNCN, INPA
21	*Seira caerucinerea* Cipola & Bellini, 2014	Seirinae	BRASIL: Tocantins, Palmas	INPA
22	*Seira coroatensis* Godeiro & Bellini, 2015	Seirinae	BRASIL: Rio Grande do Norte, Almino Afonso	CC/UFRN
23	*Seira desapercibida* Soto-Adames, 2002	Seirinae	ILHAS VIRGENS: St. John, Cinnamon	INHS
24	*Seira dinizi* da Gama, 1988	Seirinae	ILHAS CANÁRIAS: Isla of Montaña Clara	JIAP, INPA
25	*Seira domestica* (Nicolet, 1842)	Seirinae	INGLATERRA, ESPANHA, IRAN, AUSTRÁLIA	NHM, INPA, JIAP, MZNA CC/UFRN, SAM
26	*Seira dowlingi* (Wray, 1953)	Seirinae	BRASIL: Amazonas, Pará e Rio de Janeiro	INPA, MNRJ
27	*Seira dubia* Christiansen & Bellinger, 1980	Seirinae	MÉXICO: Michoacán	UNAM
28	*Seira eidmanni* (Stach, 1935)	Seirinae	BRASIL: Minas Gerais, Cássia	INPA
29	*Seira eleana* Coates, 1968	Seirinae	BOTSUANA: Lobatse, Moroekwe	NHMLA
30	*Seira ferrarii* Parona, 1888	Seirinae	ESPANHA: Andra e Lloret of Mar	INPA, JIAP
31	*Seira glabra* Godeiro & Bellini, 2013	Seirinae	BRASIL: Paraíba, Areia	MNRJ
32	*Seira jacquemarti* Barra, 2004	Seirinae	IÊMEN: Sana'a	MNHN, INPA
33	*Seira jiboiensis* Godeiro & Bellini, 2014	Seirinae	BRASIL: Bahia, Santa Terezinha	CC/UFRN
34	*Seira knowltoni* (Wray, 1953)	Seirinae	MÉXICO: Hidalgo	UNAM
35	*Seira mantis* Zeppelini & Bellini, 2006	Seirinae	ILHAS CANÁRIAS: Fuerteventura	MZUSP
36	*Seira mendoncae* Bellini & Zeppelini, 2008	Seirinae	BRASIL: Paraíba, Santa Terezinha	MNRJ
37	*Seira nicoya* Christiansen & Bellinger, 1988	Seirinae	MÉXICO: Oaxaca, Huatulco	UNAM

38	*Seira pallidipes* Reuter, 1895	Seirinae	HUNGRIA: Kecskemét	HNHM
39	*Seira paranensis* (Stach, 1935)	Seirinae	BRASIL: Paraná, Colombo	INPA
40	*Seira paulae* Cipola & Bellini, 2014	Seirinae	BRASIL: Paraná, Rancho Alegre	INPA
41	*Seira pini* Jordana & Arbea, 1989	Seirinae	ESPANHA: Olaberri, Valle de Lónguida	MZNA
42	*Seira polysperes* Barra, 2004	Seirinae	IÊMEN: Sana'a	MNHN, INPA
43	*Seira potiguara* Bellini, Fernandes & Zeppelini, 2010	Seirinae	BRASIL: Rio Grande do Norte, Extremoz	MNRJ
44	*Seira purpurea* Schött, 1891	Seirinae	MÉXICO: Chiapas, Chajul	UNAM
45	*Seira queenslandiae* (Womersley, 1935)	Seirinae	AUSTRÁLIA: Queensland, Brisbane	SAM
46	*Seira ritae* Bellini & Zeppelini, 2011	Seirinae	BRASIL: Paraíba, João Pessoa	CRFS-UEPB
47	*Seira socotrae* Barra, 2004	Seirinae	IÊMEN: Socotra Island, Hadibo	MNHN, INPA
48	*Seira tinguira* Cipola & Bellini, 2014	Seirinae	BRASIL: Paraná, Cornélio Procópio	INPA
49	*Seira uwei* Barra, 2010	Seirinae	TUNÍSIA: Bou-Hedma National Park	MNHN, INPA
50	*Seira vanharteni* Barra, 2004	Seirinae	IÊMEN: Socotra Island, Hadibo	MNHN, INPA
51	*Seira* cf. *dollfusi* Carl, 1899	Seirinae	ESPANHA: Adra	MZNA
52	*Seira* cf. *lusitanica* da Gama, 1964	Seirinae	ESPANHA: Olula de Castro	MZNA
53	*Seira* cf. *squamoornata* (Scherbakov, 1898)	Seirinae	ESPANHA: Almería	MZNA
54	*Seira* cf. *fuscopicta* Schäffer, 1898	Seirinae	AUSTRÁLIA: Western Australia, St. Ives	SAM
55	*Seira* aff. *andensis*	Seirinae	BRASIL: Piauí, Piracuruca	INPA
56	*Seira* aff. *americana*	Seirinae	COLÔMBIA: Guaviare, San José del Guaviare	ICN
57	*Seira* aff. *aruanae*	Seirinae	COLÔMBIA: Guaviare, San José del Guaviare	ICN
58	*Seira* aff. *mendoncae*	Seirinae	BRASIL: Rio Grande do Norte, Serra Negra do Norte	CC/UFRN
59	*Seira* aff. *tinguira*	Seirinae	BRASIL: São Paulo, São Paulo	INPA
60	*Seira antonioi* sp. nov.*	Seirinae	BRASIL: Roraima, Caracaraí, Serra da Mocidade	INPA
61	*Seira gabrielae* sp. nov.*	Seirinae	BRASIL: Paraná, Cornélio Procópio	CC/UFRN
62	*Seira violaceae* sp. nov.*	Seirinae	BRASIL: São Paulo, Salesópolis	MZUSP
63	*Seira amazonica* sp. nov.*	Seirinae	BRASIL: Amazonas, Mato Grosso, Pará, Roraima	INPA
64	*Seira aruanae* sp. nov.*	Seirinae	BRASIL: Acre, Amapá, Amazonas, Pará, Roraima	INPA
65	*Seira karinae* sp. nov.*	Seirinae	BRASIL: Acre, Amazonas, Pará	INPA
66	*Seira marcellaeae* sp. nov.*	Seirinae	BRASIL: Amazonas	INPA
67	*Seira dirocha* sp. nov.*	Seirinae	BRASIL: Amazonas, Pará, Roraima	INPA
68	*Seira roraimensis* sp. nov.*	Seirinae	BRASIL: Roraima, Amajari	INPA
69	*Seira tocantinensis* sp. nov.*	Seirinae	BRASIL: Tocantins, Palmas	INPA
70	*Seira* sp.1	Seirinae	URUGUAI: Rocha, Castillos	INPA
71	*Seira* sp.2	Seirinae	ECUADOR: Napo, Cosanga	INPA
72	*Seira* sp.3	Seirinae	MÉXICO: Jalisco, Zopopan	UNAM
73	*Seira* sp.4	Seirinae	MÉXICO: Estado do México, Ozumba	UNAM
74	*Seira* sp.5	Seirinae	BRASIL: Amazonas	INPA
75	*Seira* sp.6	Seirinae	SEYCHELLES: Mahé, Mont Plaisir	CAS
76	*Seira* sp.7	Seirinae	MADAGASCAR: Toamasina, Betampona	CAS
77	*Seira* sp.8	Seirinae	MADAGASCAR: Toamasina, Tsaravoniana	CAS
78	*Seira* sp.9	Seirinae	MADAGASCAR: Toamasina, Tsaravoniana	CAS
79	*Seira* sp.10	Seirinae	MADAGASCAR: Toamasina, Ambatoharanana	CAS
80	*Seira* sp.11	Seirinae	MADAGASCAR: Fianarantsoa, Haute Matsiatra	CAS
81	*Seira* sp.12	Seirinae	MADAGASCAR: Toliara, Ambohimahavelona	CAS
82	*Seira* sp.13	Seirinae	MADAGASCAR: Toliara, Kirindy	CAS
83	*Seira lepidochaetosa* Cipola & Bellini, 2018	Seirinae	MADAGASCAR: Toliara, Ambohimahavelona	CAS, INPA
84	*Seira semicaerulea* Cipola & Bellini, 2018	Seirinae	MADAGASCAR: Fianarantsoa, Ambalavao	CAS, INPA
85	*Seira metafemurata* Cipola & Bellini, 2018	Seirinae	MADAGASCAR: Toamasina, Betampona	CAS, INPA

86	*Tyrannoseira bicolorcornuta* (Bellini, Pais & Zeppelini, 2009)	Seirinae	BRASIL: Ceará, Paraíba, Pernambuco, Rio Grande do Norte	MNRJ
87	*Tyrannoseira diabolica* Bellini & Godeiro, 2012	Seirinae	BRASIL: Rio Grande do Norte, Parnamirim	MNRJ
88	*Tyrannoseira gladiata* Zeppelini & Lima, 2012	Seirinae	BRASIL: Paraíba, Araruna	MNRJ
89	*Tyrannoseira raptora* (Zeppelini & Bellini, 2006)	Seirinae	BRASIL: Paraíba, Cacimba de Dentro	MZUSP, CC/UFRN
90	*Tyrannoseira sex* Bellini & Zeppelini, 2011	Seirinae	BRASIL: Paraíba, São João do Cariri	MNRJ
91	*Austroseira* sp.	Seirinae	AUSTRÁLIA: Queensland, Cape York, Weipa	SAM
92	*Lepidocyrtinus andevo* sp. nov.	Seirinae	MADAGASCAR: Toamasina, Ankerana	CAS
93	*Lepidocyrtinus annulata* (Handschin, 1927)	Seirinae	BRASIL: Bahia, Santa Teresinha	INPA
94	*Lepidocyrtinus barnardi* Womersley, 1934	Seirinae	ÁFRICA DO SUL: Cape Town, Newlands	INPA
95	*Lepidocyrtinus botswanensis* sp. nov.	Seirinae	BOTSUANA: Lobatse, Moroekwe	NHMLA
96	*Lepidocyrtinus boy* sp. nov.	Seirinae	BRASIL: Rio de Janeiro, Teresópolis	MNRJ, MZUSP
97	*Lepidocyrtinus briani* sp. nov.	Seirinae	MADAGASCAR: Antsiranana, Daraina	CAS
98	*Lepidocyrtinus caeruleus* sp. nov.	Seirinae	BRASIL: Minas Gerais, Cabo Verde	MZUSP, INPA
99	*Lepidocyrtinus chavarii* sp. nov.	Seirinae	BRASIL: São Paulo, São Paulo	INPA
100	*Lepidocyrtinus betamponensis* sp. nov.	Seirinae	MADAGASCAR: Toamasina, Betampona	CAS
101	*Lepidocyrtinus dapeste* Santos & Bellini, 2018	Seirinae	BRAZIL: Rio Grande do Norte, Natal	CC/UFRN
102	*Lepidocyrtinus dayi* Yosii, 1959	Seirinae	ÁFRICA DO SUL: Cape Town, Kirstenbosch	SAM/IZIKO, INPA
103	*Lepidocyrtinus diamantinae* (Godeiro & Bellini, 2015)	Seirinae	BRASIL: Bahia, Abaíra	CC/UFRN
104	*Lepidocyrtinus fabioi* sp. nov.	Seirinae	REPÚBLICA DO CONGO: Nagbe, Lesio-Louna	NHMLA
105	*Lepidocyrtinus harena* (Godeiro & Bellini, 2014)	Seirinae	BRASIL: Paraíba, Areia	CC/UFRN
106	*Lepidocyrtinus hylaeus* sp. nov.	Seirinae	BRASIL: Amazonas	INPA
107	*Lepidocyrtinus iego* sp. nov.	Seirinae	MADAGASCAR: Toamasina, Moramanga	CAS
108	*Lepidocyrtinus monteiroi* sp. nov.	Seirinae	BRASIL: Rio de Janeiro, Teresópolis	MNRJ
109	*Lepidocyrtinus nigrans* sp. nov.	Seirinae	BRASIL: Mato Grosso, Alto Xingu	MNRJ
110	*Lepidocyrtinus paduai* sp. nov.	Seirinae	BRASIL: Minas Gerais,	INPA, CC/UFRN
111	*Lepidocyrtinus paraibensis* (Bellini & Zeppelini, 2009)	Seirinae	BRASIL: Paraíba, Cássia	MNRJ, CC/UFRN
112	*Lepidocyrtinus paucisensillum* sp. nov.	Seirinae	REPÚBLICA DO CONGO: Nagbe, Lesio-Louna	NHMLA
113	*Lepidocyrtinus primaria* (Godeiro & Bellini, 2014)	Seirinae	BRASIL: Ceará, Crato	CC/UFRN
114	*Lepidocyrtinus prodigus* (Arlé, 1959)	Seirinae	BRASIL: Rio de Janeiro, São Gonçalo	MNRJ
115	*Lepidocyrtinus pseudoannulata* (Bellini & Zeppelini, 2008)	Seirinae	BRASIL: Paraíba, Mataraca	MNRJ
116	*Lepidocyrtinus pseudopulcher* sp. nov.	Seirinae	BRASIL: Minas Gerais, Cabo Verde	MZUSP, INPA
117	*Lepidocyrtinus pulcher* Handschin, 1924	Seirinae	BRASIL: Paraná, rancho Alegre	INPA
118	*Lepidocyrtinus scheepersae* sp. nov.	Seirinae	ÁFRICA DO SUL: Cape Town, Somerset West	SAM/IZIKO
119	*Lepidocyrtinus voeltzkowi* (Börner, 1907)	Seirinae	MADAGASCAR: Fianarantsoa, Haute Matsiatra	CAS
120	*Lepidocyrtinus* sp.1	Seirinae	MADAGASCAR: Toliara, Kirindy	CAS

Tabela 2. Matriz dos dados morfológicos para os 120 terminais de Entomobryidae. O símbolo "?" Representa dados ausentes; "-" representa caracteres não aplicáveis. Os caracteres são listados de 1 a 285, e os terminais conforme a tabela 1.

Caracteres 1–149

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
	12345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890123456789													
Dicranocentrus sp.	01111000000000000000--0-0000000000-00000011-0--0--1000001001201001101101011011000000010-11-0000000000001-00001-1000000000010100010011-1-0000001-001-1-													
L. amazonicus	10000000010001100100--0-0000000000-11111111-0--0--0-000011100210001-1100-000111111111110-0010011-100110100011-0110101011-101011011011-1-0010011-01011-													
W. nigromaculata	10000011100000000100--0-0000000100-0000000000--0--0-000210003330000-00-0-000000031010110-00000001010001-1-1-1-0010000000001-0100001-001-00001-1-1-1-1-													
A. lineatus	11000211001100000100--0-0100000000-11110111-0--0--1100021000130011117?111110011002101011O-2000001-010001-1-001-0010000000001-1-01-01-00000000001-001-1-													
A. ducke	11000200001100000100--0-0100000000-0000000000--0--1100021010133000-00-0-000002021010100-2020101-011-00000001-0000000000000000001-01-001-1110001-00001-													
L. hopkini	11000000010001-100100--0-0100000000-1111011011100--0-0002100013111111111111101112001010100-2000001-01000001-0000001001-000001-1-01-0011-0000210000000000													
L. colormutatus	11000000100000110100--0-111--1000111111111011100--0-0002100013111110010101001120010101O0-21-0011-011-000011-1-1-11-1-1-1-01-1-01-01-1-1-00200000000000													
L. rotorua	10000011000000000100--0-0000000000-11111111-0--0--0-0002100013001111111111110011000101010-01-0001-011-0001-1-1-001001-1-1-01-1-01-01-1-1-00001-1-1-1-1-													
C. anaguilae	10000000001100000100--0-0000-10000-0000000000--0--0-00220------0000-00-0-000000001010110-0000001-010001-1-000000100000000001-01-01-00001110001-001-1-													
Drepanura sp.	11000011000000000100--0-0000-10000-0000000000--0--0-00120------0000-00-0-000000001010110-0000001-01000001-000000100000000000101-01-00001110001-00001-													
E. paroara	10000000000000000100--0-0000-10000-0000000000--0--0-00020------0000-00-0-000000001010100-2000011-01000001-0000000000000000000101-01-0000111000000000000													
H. sinensis	10000000001100010100--0-0000000000-0000000000--0--1100020------0000-00-0-000000001010100-2000001-01000001-000000100000000001-01-00000001110001-00001-													
S. atlantica	11000011100000000100--0-0001100100-1111001000--0--0-1101100011001110110101001100310101110003100l-0100001010000001001-0000000010010010001000000000001-													
S. arenicola	10000011100001000100--0-0001100111200000001000--0--0-1101100011001110110101001100310101110003100010100001010000001000l001-0010100100100010000000000000													
S. atrolutea	10000011100001000100--0-0001100111200000001000--0--0-1101100011001110110101001100310101110003100l-0100001010000000100011-1-1010100100100010000000100001-													
S. barrai	11000011100000000100--0-0001100100-0111011000--0--0-1101100011001110110101001100310101110003100l-0100001010000001001-0000000010010010001000000000001-													
S. betica	11000011100000000100--0-0001100100-0110011000--0--0-1101100011001110110101001100310101110003100l-0100001010000001001-0000000010010010001000000000001-													
S. bipunctata	10000011100001000100--0-0001100111200000001000--0--0-1101100011001110110101001100310101110003100010100101001-001001-011-0010100100100010000000000001-													
S. brasiliana	10000011100001000100--0-0001100111200000001000--0--0-1101100011001110110101011100310101110003100l-0100001011-1-0110001001-0010100110100010000000000001-													
S. burgersi	11000001100000000100--0-1101100100-0111001000--0--0-1101100011001110110101011100310101110003100l-0100001000000001000000000000100100100010000000000000													
S. caerucinerea	10000011100001000100--0-0001100111200000001000--0--0-1101100011001110110101011100310101110003100010100001010000001000001000010100110101000000000000													
S. coroatensis	10000011100001000100--0-0001100111201100l1000--0--0-1101100011011110110101111100310101110003100010100001010000001000l001-0010100100100010000000000001-													
S. desapercebida	10000011100001000100--0-0001100111200000001000--0--0-1101100011001110110101001100310101110003100011100101010l011-0010001001-0010100110101??0000000100001-													
S. dinizi	10000011101000000100--0-0001101100-0000001000--0--0-1101100011001110110100001100310101110003100l-0100001010000001001-0000000010010010001000000000001-													
S. domestica	11000011100000001010010000l101100-0000001000--0--0-1101100011011110110101001100310101110003100l-0100001010000001001-0000000010010010001000000000001-													
S. dowlingi	10000011100001000100--0-0001100111200000001000--0--0-1101100011001110110101011100310101110003100010100101001-001001-001-0010100100100010000000000001-													
S. dubia	11000111100001000100--0-0101101100-0000001000--0--0-1101100011011110110101011100310101110003100010100001010000001000l001-0010100100100010021000000000													
S. eidmanni	10000011100001000100--0-0001100111200000001000--0--0-1101100011001110110101001100310101110003100011100101011-1-0110001001-0010100100100010000000100011-													
S. eleana	11000011100000000100--0-0001101110-1111011000--0--0-1101100011001110110101001100310101110003100010100001010000001000000000000100100100010000000000000													
S. ferrarii	10000011100000000100--0-0001101100-0000001000--0--0-1101100011000110110100001100310101110003100l-0100001010000001001-0000000010010010001000000000001-													
S. glabra	10000011100001000100--0-0001100111200000001000--0--0-1101100011001110110101001100310101110003100l-0100001011-1-0110001001-0010100110100010000000100011-													
S. jacquemarti	11000011100000000100--0-0001101100-0110001000--0--0-1101100011001110110101001100310101110003100l-0100001010000001001-0000000010010010001000000000001-													
S. jiboiensis	10000011100001000100--0-0001100111201110l1000--0--0-1101100011001110110101001100310101110003100l-0100001010000001000l001-0010100100100010000000l000001													
S. knowltoni	11000011100001000100--0-0001101111200000001000--0--0-1101100011001110110101011100310101110003100010100001010l001-0010001001-0010100100100010000-000000001-													
S. mantis	11000011100000001010010000l1011???0000001000--0--0-1101100011001110110l0??111003101011100031001-0100001010000001001-0000000010010010001000000000001-													
S. mendoncae	10000011100001000100--0-0001100111200000l1000--0--0-1101100011001110110101001100310101110003100l-0100001010000001000l011-0010100100100010000000000001-													
S. nicoya	10000011100000000100--0-0001100100-1000101000--0--0-1101100011001110110101001100310101110003100010100001010000001000000l-1010100100100010000000000001-													

Parte 1, continuação

Caracteres 1–149

	1 2 3 4 5 6 7 8 9 10 11 12 13 14
	12345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890123456789
S. pallidipes	1100001110000000100--0-0001101100-1100001000--0--0-11011000110111101101011011003101011100031001-0100001000000001000000000000100100100??00000000000000
S. paranensis	1000001110001000100--0-0001100111200000001000--0--0-1101100011001110110101001100310101110003100010100001011-1-0110001001-00101001001000100000000100001-
S. paulae	1000001110001000100--0-0001100111200000001000--0--0-11011000110011101101010011003101011100031001-0100001010000000100011-1-10101001001000100000000100001-
S. pini	1100001110000000100--0-0001101100-1111011000--0--0-11011000110011101101010111003101011100031001-01000010000000010000000000001001000000100000000000000
S. polysperes	110000111000000001010010000110110101111011000--0--0-11011000110011101101010011003101011100031001-0100001010000001001-000000001001001000100000000000001-
S. potiguara	1000001110001000100--0-0001100111200000001000--0--0-11011000110011101101010011003101011100031001-0100101011-1-0110001001-00101001101000100000000000001-
S. purpurea	1000001110001000100--0-0001100111200000001000--0--0-110110001100111011010101110031010111000310001010000101001-0010001001-001010010010001000-000000001-
S. queenslandiae	1100001110001000100--0-0001100111200000001000--0--0-110110001100111011010100110031010111000310001010010101001-001001-011-00101001001000100000000000001-
S. ritae	1000001110001000100--0-0001100111200000001000--0--0-110110001100111011010100110031010111000310001010000101000000010001011-00101001001000100000000000000000
S. socotrae	1000001110001000100--0-0001100111200000001000--0--0-110110001100111011010100110031010111000310001010010101001-001001-001-0010100100100??0000000000001-
S. tinguira	1000001110001000100--0-0001100111200000001000--0--0-1101100011001110110101011100310101110003100011100001011-1-0110001001-00101001101000100000000000001-
S. uwei	110000111000000001010010000110110100000001000--0--0-1101100011001110110101001100310101110003100010100001010000001001-000000001001001000100000000000000000
S. vanharteni	1000001110001000100--0-0001100111200000001000--0--0-1101100011001110110101001100310101110003100010100101010001001001-011-00101001001000100000000000001-
S. cf. *dollfusi*	1100000010000000100--0-0001101100-1111011000--0--0-11011000110?11101101010111003101011100031001-01000010000000010000000000001001001000100000000000000
S. cf. lusitanica	1100001110000000100--0-1001101100-1111011000--0--0-11011000110011101101010111003101011100031001-01000010000000010000000000001001001000100000000000000
S. cf. *squamoornata*	1000001110000000010100100001101100-1111011000--0--0-11011000110011101101010111003101011100031001-01000010000000010000000000001001001000100000000000000
S. cf. *fuscopicta*	1000001110001000100--0-00011001112??????1000--0--0-11011000110011101101010011003101011100031001-0100001011-1-0110001001-00101001101000100000000000001-
S. aff. *andensis*	1100001110001000100--0-000110011120111011000--0--0-11011000110111101101010111003101011100031001-010010101001-001001-011-00101001001000100000000000001-
S. aff. *americana*	1000001110001000100--0-0001100111200000001000--0--0-11011000110011101101010011003101011100031001-110010101011-0110001001-00101001101000100000000100001-
S. aff. *aruanae*	1000001110001000100--0-000110011120101001000--0--0-11011000110011101101010011003101011100031001-110110101011-0110001001-00101001101010100000000100011-
S. aff. *mendoncae*	1000001110001000100--0-0001100111200000001000--0--0-110110001100111011010100110031010111000310001010000101000000010001001-00101001001000100000000000001-
S. aff. *tinguira*	1000001110001000100--0-0001100111200000001000--0--0-1101100011001110110101011100310101110003100011100001011-1-0110001011-00101001101010100000000000001-
*S. antonioi**	1000001110001000100--0-0001100111200000001000--0--0-1101100011001110110101011100310101110003100010100101011-1-0010001011-00101001101000100000000000001-
*S. gabrielae**	1100001110001000100--0-0001100111200000001000--0--0-1101100011001110110101011100310101110003100011100001010000000100001-1-00101001101010100200000000000
*S. violaceae**	1000001110001000100--0-0001100111200000001000--0--0-1101100011001110110101001100310101110003100011101001011-1-0110001011-00101001101000100000001-000001
*S. amazonica**	1000001110001000100--0-0001100111200000001000--0--0-1101100011001110110101001100310101110003100010100101011-1-0110001001-00101001101000100000001001-1-
*S. aruanae**	1000001110001000100--0-0001100111200000001000--0--0-11011000110011101101010011003101011100031001-010110101011-0110001001-00101001101000100000000100011-
*S. karineae**	1000001110001000100--0-0001100111200000001000--0--0-11011000110011101101010011003101011100031001-0100001010000000100011-1-10101001001000100000000100001-
S. marcelleae*	1000001110001000100--0-0001100111200000001000--0--0-11011000110011101101010011003101011100031001-010110101011-0110001001-00101001101010100000000100011-
*S. dirocha**	1000001110001000100--0-0001100111200000101000--0--0-1101100011001110110101001100310101110003100010100001011-1-0110001001-00101001101000100000000000001-
*S. roraimensis**	1000001110001000100--0-0001100111200000001000--0--0-11011000110011101101010011003101011100031001-1100101011-1-0110001001-00101001101000100000000100001-
S. tocantinenses*	1000001110001000100--0-000110011121111011000--0--0-11011000110011101101010011003101011100031001-010000101000000010001001-00101001001000100000000000000000
Seira sp.1	1000001110001000100--0-0001100111200000001000--0--0-1101100011001110110101001100310101110003100010100001011-1-0110001001-00101001001000100000000100001-
Seira sp.2	1100000010001000100--0-0001100111200000001000--0--0-11011000110011101101010111003101011100031001-110010101011-0010001001-00101001101010100000000100011-
Seira sp.3	1000001110001000100--0-0001100111200000001000--0--0-11011000110111101101010111003101011100031001-01000010101010110001001-00101001001010100000000000001-
Seira sp.4	1000001110001000100--0-0001100111200000001000--0--0-110110001100111011010100110031010111000310001010010101001-0010001011-00101001001010100000000100001-
Seira sp.5	1000001110001000100--0-0001100111200000001000--0--0-11011000110011101101010011003101011100031001-0100001010000000100011-1-10101001001000100000000100001-
Seira sp.6	1000001110001000100--0-0001100111200000001000--0--0-11011000110011101101010111003101011100031001-110010101011-0110001001-00101001101010100000001001-1-
Seira sp.7	1000001110001000100--0-0001100111200000001000--0--0-11011000110011101101010?110031010111000310001010010101001-0010001001-00101001001000100000000000001-
Seira sp.8	1000001110001000100--0-0001100111200000001000--0--0-110110001100111011010101110031010111000310001110010101011-0110001001-00101001101000100000000100001-
Seira sp.9	1000001110001000100--0-0001100111200000101000--0--0-110110001100111011010101110031010111000310001110010101011-0110001011-00101001101010100000001001-1-
Seira sp.10	1000001110001000100--0-0001100111200000001000--0--0-110110001101111011010100110031010111000310001110110101011-01100011-1-00101001101010100000001001-1-
Seira sp.11	1000001110001000100--0-0001100111200000001000--0--0-11011000110011101101010111003101011100031001-110010101011-01100011-1-00101001101000100000000100011-

Parte 1, continuação

Caracteres 1–149

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
	12345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890123456789
Seira sp.12	10000011100010000100--0-0001101111200000010000--0--0-1101100011001110110101001100310101110003100010100101010010-0010001001-0010100100100010000000100001-
Seira sp.13	10000011100000000100--0-0001101111200000010000--0--0-1101100011001110110101011100310101110003100011100101010110-0110001001-0010100110101010000000100011-
S. lepidochaetosa	10000011100011111100--0-0001100111200001010000--0--0-1101100011001110110101011100310101110003100010100101010110-0110101011-0010100110101010001000100001-
S. metafemurata	10000011100011111100--0-0001100111200000001001100--0-1101100011001110110101011100310101110003100011100101010110-01100011-1-1010100110101010001000100001-1-
S. semicaerulea	10000011100011111100--0-0001100111200000001000--0--0-1101100011001110110101011100310101110003100011101101010110-01100011-1-0010100110101010001000100001-
T. bicolorcornuta	10000011100010001111111000110011120110011000--0--0-1101100011001110110101001100310101110003 1001-010000101001-001001-011-0010100100100010000000000001-
T. diabolica	10000011100010001111111000110011120101011000--0--0-1101100011001110110101001100310101110003 1001-010000101001-001001-011-0010100100100010000001-00001-
T. gladiata	10000011100010001111111000110011120000001000--0--0-1101100011001110110101001100310101110003 1001-010000101001-001001-011-0010100100100010000000000001-
T. raptora	10000011100010001111111000110011120110001000--0--0-1101100011001110110101001100310101110003 1001-010000101001-001001-011-0010100100100010000001-00001-
T. sex	10000011100010001111111000110011120100001000--0--0-1101100011001110110101001100310101110003100010100001010 01-001001-011-0010100100100010000000-00001-
A. hudsoni sp. nov.	110000111??01000100--0-0101100110-1000001001001000-1101100011011110110101001100310101110003100010100001010000001000000000000100100100010020000000000
L. andevo sp. nov.	110002001010010110 0--0-1101100111211100100100 1000-1101100011011110110101111100310101110003100010100001010000001001-000000101001101010100200000000000
L. annulata	10000011100010111100--0-1101100111200000001000--0--0-1101100011001110110101111100310101110003100010100101011-00011001-010000101001101010100210000000000
L. barnardi	11100100100001001 00--0-1101100110-1110011000--1110-1101100011001110110101011100310101110003 1001-010000100000000100000000001010010011-0100110000000000
L. botswanensis sp. nov.	11100011101001011 00--0-1101100110-0111111001001000-1101100011011110110101111100310101110003 1001-010000100000000 1001-000000101001011-0100200000000000
L. boy sp. nov.	11000211101011011 00--0-1101100111211001110012111 10-1101100011011110110101011100310101111 10031111-110010101010110 01-010100101001101010100210000000000
L. briani sp. nov.	11000000101001011 00--0-1101100111211110010010 00-0--0-1101100011011110110101011100310101110003100010100001010000001001-000000101001101010100200000000000
L. caeruleus sp. nov.	11000011101011011 00--0-1101100111210000010012111 10-1101100011011110110101011100310101110003 1001-010000101000000100000000001010010010101002100000000000
L. chavarii sp. nov.	11000111100011011 00--0-1101100111210000110012111 10-1101100011011110110101111100310101111003 1001-010000101000000100000000001010011010101002100000000000
L. betamponensis sp. nov.	11000100101001011 00--0-1101100111211110010010 00-1101100011011110110101011100310101111003100010100001010000001001-000000101001101 1-010020000000000
L. dapeste	11000011101011011 00--0-1101100111211110110012111 10-1101100011011110110101111100310101111100311-110000101000000 1001-000000101001101010100210000000000
L. dayi	11100000100000100 00--0-0101100110-0000111000--1110-1101100011001110110101011100310101110003 1001-010000100000000 1001-000000101001001 1-010011000000000
L. diamantinae	11000211101011011 00--0-1101100111200001010012111 10-1101100011011110110101011100310101111003 1011-010000101000000 1001-000000101001101010100210000000000
L. fabioi sp. nov.	11000011101011011 00--0-1101100110-0000001001000--0-1101100011011110110101111100310101110003 1011-010000101010101100 01001-001010010010101002000000000 1-
L. harena	11000211101011011 00--0-1101100111210000010012111 10-1101100011011110110101011100310101111003 1011-0100001011-1-011001-000100101001101010100210000000000
L. hylaeus sp. nov.	11000211101011011 00--0-1101100111211000110012111 10-1101100011011110110101111100310101111003 1011-010000101000000 1001-000000101001101010100210000000000
L. iego sp. nov.	11000100101001011 00--0-1101100111211110010010 00-1101100011011110110101111100310101110003100010100001010000001001-000000101001101010100200000000000
L. monteiroi sp. nov.	11000011101011111 00--0-1101100111210000010011011 10-1101100011011110110101011100310101111003 1001-010000101000000100000000001010010010101002100000000000
L. nigrans	11000111101011011 00--0-?1011001??????????001211110-1101100011011110110101111100310101111003 1001-010000101000000100000000001010011010101002100000000000
L. paduai sp. nov.	11000111101011011 00--0-1101100111210000110012111 10-1101100011011110110101111100310101111003 1001-010000101000000100000000001010011010101002100000000000
L. paraibensis	11000000101011011 00--0-1101100111200000010012111 10-1101100011011110110101011100310101111003100010100001010000001000000000001010011010101002100000000000
L. paucisensillum sp. nov.	1?100?111010010110 0--0-1101100110-0000011001211110-1101100011001110110101011100310101110003 1001-010000101000000 1001-000000101001011 1-010020000000000
L. primaria	11000100101011011 00--0-1101100111200000001001010--0-1101100011001110110101111100310101110003100010100001010000001000000000001010011010101002100000000000
L. prodigus	11000111100011011 00--0-1101100111210000110012111 10-1101100011011110110101111100310101110003 1001-010000101000000 1001-000000101001101010100210000000000
L. pseudoannulata	11000000101011011 00--0-1101100111210000001000--0--0-1101100011001110110101101100310101110003100010100001010000001000000000001010011010101002100000000000
L. pseudopulcher sp. nov.	11000011101011011 00--0-1101100111210000001000--0--0-1101100011011110110101111100310101111003 1011-1101101011-1-011001-010100101001101010100210000000000
L. pulcher	11000011101011011 00--0-1101100111211100110012111 10-1101100011011110110101011100310101111003 1101-110000101000000100000000001010011010101002100000000000
L. scheepersae sp. nov.	11100211101001011 00--0-1101100110-1110011001211110-1101100011011110110101011100310101111003 1001-010000100000000100000000001010011011-0100210000000000
L. voeltzkowi	11100111101001011 00--0-1101100111211100110011011 10-1101100011011110110101111100310101111003 1001-010000101000000 1001-000000101001001010100200000000000
Lepidocyrtinus sp.1	11000000101000001 00--0-1101100111211111010 00--0--0-1101100011011110110101101100310101111003 1001-110000101000000 1001-000000101001101010100000000000000

Parte 2

Caracteres 150–285

	15 16 17 18 19 20 21 22 23 24 25 26 27 28 012345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012345
Dicranocentrus sp.	111-0000001-011-0001001-011-001-0011-10101101001-0000000000001001100001-1111-1001-11-1-110001011011-001-001011-001-00001-010101001-1-00010
L. amazonicus	1101011-1-1-011-10111-1-1-1-1-1-0111-11101101011-0101010111001110101l-1111-1011-11-1-110101011011-011-011011-011-01011-0101011-1-1-00110
W. nigromaculata	111-001-1-1-1-1-10011-1-1-1-1-1-0011-101001001-1-1-1-001-0111-0100001-1111-1000011-1-11001-0001-1-1-1-1-11-1-001-00001-00001-001-1-10000
A. lineatus	111-0000001-001-1001000001-1-1-1-0010010100100001-001-1-000110000000000111001001-1000011100000001-1-1-1-1-11-1-001-00001-00001-001-1-11-01
A. ducke	111-0000001-1-1-1000001-1-1-001-001001010011-001-00001-000111-011-001-111000000011-1-0100000001-1-1-1-1-11-1-001-000000001-0000001-11-01
L. hopkini	100100??????01???0010001001-000000101101011011-1-1-1-0101101011100000010100l001-1011-110001000011-011-0110101011-01011-011-0100000111-00
L. colormutatus	10001-1-1-1-1-1-1001001-001-001-0011-1011-1011-1-1-1-1-1-1111-01001-1-1111-11-1-11-1-111-000001-1-1-1-1-11-1-1-1-1-1-1-00001-001-1-11-01
L. rotorua	111-001-1-1-1-1-11-11-1-1-1-1-1-1-11-1011-11-1-1-1-1-1-1-0111-01001-1-1111-11-1-11-1-111-1-1-01-1-1-1-1-11-1-1-1-1-1-1-1-1-1-001-1-11-01
C. anaguilae	111-0000001-1-1-1000000000000000000000011-11-001-000000000111-0100000010000000001000000001-0001-1-1-1-0010000000000001-1-1-1-00001-11-01
Drepanura sp.	11000000001-001-1000001-000000000000000100000001-000000000111-000000001010000000000000000000001-1-001-000001-0000000000000000000000010001
E. paroara	10000000000000001000000000000000000000010010000l-000000000111-000000001110000000100001000000001-1-001-000000000000000000000000001-11-01
H. sinensis	10000000001-001-1000000000000000000000000100000001-000000000111-000000000000000000000000001-0000000001-000001-00000000001-000000000010001
S. atlantica	111-000000010101000100000000001-00100001011000000000000000001011100000010100100001000011000100001010001001011-000100000001000000000110101
S. arenicola	111-000000010101000100000001001-00100101011000000000000000101011100001-1111-100001010011000101101010l1-011011-000000000001000100000110101
S. atrolutea	111-000000010101000100000001001-00100101011000000000000000101011100000001111-100001010111000101101010l1-011011-000000000001000100010110101
S. barrai	111-000000010101000100000000001-00100001011000000000000000010111000000111001000010000110001000001010l1-001011-000000000001000100000110101
S. betica	111-000000010101000100000000001-00100001011000000000000000010111000000100000000010000110001000001010l1-001011-000000000001000000000110101
S. bipunctata	111-000000010101000100000001001-00100101011000001000100000010111000l-1111-100001011-110001011010101l-011011-001-000000010001001-0110101
S. brasiliana	111-000000010101000100000101001-00100101011000101000100011010111000l-1111-100001010111000101101010l1-011011-011-000100010001000101l0101
S. burgersi	011-000000010101100l001-000000000010000001100000000000000000010111000000101001000010000110001000010000000001011-000000000001000000000110101
S. caerucinerea	111-000000010101000100000001000000100001011000100000000000001011100000111100100001010111000101001010l1-011011-000000010001000100000110101
S. coroatensis	111-000000010101000100000001001-00100101011000000000000000010101110000l-1111-100001010011000101101010l1-011011-000000000001000100000110101
S. desapercebida	111-000000010101000100010l1-001-00100101011011-010100000010111000l-1-11-100001011-110001011011-011-011011-010100010101000100010110101
S. dinizi	111-000000010101000100000000001-00100001011000000000000000101011101000011100100001000011000100001010l1-011011-000000000001000l1001-0110111
S. domestica	111-000000010101000100000000001-00100000011000000000000000010111000000001100100001000011000100101010l1-001011-000000000001000000000110101
S. dowlingi	111-000000010101000100000001001-00100101011000000100010000001011100001-1111-1000011-1-110001011010101l-011011-001-000000010001001-0110101
S. dubia	111-000000010101000100000000000000010000001100000000000001001011100000010100100000000011000101101000000001011-000000000001000000000110101
S. eidmanni	111-000100010101000101010l1-1-1-00100101011001l-010101011010111000l1-1111-100011010111000101101l-011-011011-010101010101000100010110101
S. eleana	111-000000010101000100000000001-00100001011000000000000000010111000000111001000010000110001000010000001001011-000000000001000000000110101
S. ferrarii	111-000000010101000100000000001-00100001011000000000000000010111000000111001000010000110001000001010l1-001011-000000000001000100000110101
S. glabra	111-000000010101000101010101011-00100101011001l-010101011010111000l1-1111-1000111-011100010111011-011-011011-011-010101010001000101l0101
S. jacquemarti	111-000000010101000100000000001-00100001011000000000000000010111000000111001000010000110001000010101001011-000000000001000000000110101
S. jiboiensis	111-000000010101000100000001001-00100101011000000000000000010111000001-1111-100001010011000101101010l1-011011-000000000001000100000110101
S. knowltoni	111-000000010101000100000000001-00100100011000000000000000101011100000011100100001010011000101101010l1-011011-000000000001000100000110101
S. mantis	111-000000010101000100000000001-00100001011000000000000000010111000000111001000010000110001000010101l-001011-000000000001000100000110101
S. mendoncae	111-000000010101000100000001001-00100101011000000000000000101011100001-1111-100001010011000101101010l1-011011-000000000001000100000110101
S. nicoya	111-000000010101000100010001001-00100101011001l-000100000010111000l1-1111-1000011-011100010111011-011-011011-001-000000010001001-0110111
S. pallidipes	011-000000010101000100000000001-00100000011000000000000000010111000000111001000000001100010000100000000l011-000000000001000000000110101
S. paranensis	111-000000010101000100010l1-1-1-00100101011001l-010101011010111000l1-1111-100001010111000101101l-011-011011-010100010101000100000110101
S. paulae	111-000000010101000100000001001-00100101011000000000000000101011100000011111-100001010011000101101010l1-011011-000000000001000100001010101
S. pini	011-000000010101100l001-000000000010000001100000000000000000010111000000100001000000000110001000010000000001011-000000000001000000000110101
S. polysperes	111-000000010101000100000000001-00100001011000000000000000010111000000111001000010000110001000010101001011-000000000001000100000110101

Parte 2, continuação

Caracteres 150–285

	15	16	17	18	19	20	21	22	23	24	25	26	27	28
	012345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012345													
S. potiguara	111-0000000101010001000001010 01-0010010101100010100010001101011100001-1111-1000010101110001011010101 1-011011-011-0001000100010001011010 1													
S. purpurea	111-0000000101010001000000010000001000000110000000000000010101110000001110010000101001100010110101011-011011-0000000000001000100000110101													
S. queenslandiae	111-0000000101010001000000001001-0010010101100000100010000001011100001-1111-1000011-1-1100010110101011-011011-00??000000100010010-0110101													
S. ritae	111-0000000101010001000000001001-0010010101100000000000000110101110000 1-1111-1000010000110001011010101 1-011011-0000000000001000100000110101													
S. socotrae	111-0000000101010001000000000001-0010010101100000100010000001011100001-1111-1000011-0111000101101010 1-011011-001-0000000100010001011011 1													
S. tinguira	111-0000000101010001000000001001-0010010101100000100000000101011100000011111-1000010000110001011010101010111011-001-0001000100010000011010 1													
S. uwei	111-0000000101010001000000000000000100001011000000000000000001011100000010100100001000011000100001010101001011-0000000000010001000001101 01													
S. vanharteni	111-0000000101010001000000001001-0010010101100011-0001000110101110000 1-1111-1000011001110001011010101 1-011011-01??000101010001000101101 11													
S. cf. *dollfusi*	011-0000000101010001000000000001-0010000001100000000000000000101110000000000001000000000110001000010000000001011-0000000000010000000000110101													
S. cf. lusitanica	011-0000000101010001000000000001-0010000001100000000000000000101110000000000001000000000110001000010000000001011-0000000000010000000000110101													
S. cf. *squamoornata*	011-0000000101010001000000000001-0010000001100000000000000000101110000001010010000000001100010000010000000001011-0000000000010000000000110101													
S. cf. *fuscopicta*	111-0000000101010001000000101001-0010010101100010101010000101011100000011111-1000010101110001011010101011011-0001000101010001000101101 01													
S. aff. *andensis*	111-0000000101010001000000001001-0010010101100010101010000101011100000001111-1000010101110001011010101 1-011011-0101010101010001000101 11													
S. aff. *americana*	111-0000000101010001000101010 01-0010010101100011-0101010110101011100011-1111-1000010 11-1100010110 11-011-011011-0101010100010001000101 01													
S. aff. *aruanae*	111-0000000101010001010101010 01-0010110101100011-0101010110101011100011-1111-1000110 11-1100010110 11-011-011011-0101010101010001000101 01													
S. aff. *mendoncae*	111-0000000101010001000000001001-0010010101100000000000000010101110000 1-1111-1000010100110001011010101 1-011011-0000000000010001000001101 01													
S. aff. *tinguira*	111-0000000101010001000000001001-0010010101100000100000101101011100000011111-1000010100110001011010101010111011-001-0001010100010001011011 1													
*S. antonioi**	111-0000000101010001000000001001-0010010101100011-0101010110101110000011111-100001011-1100010110101011-011011-0101010101010001000101101 01													
*S. gabrielae**	111-0000000101010001000000001001-0010010101100011-0001010110101110000011111-1000110101110001011010101-011011-0001000100010001000001101 01													
*S. violaceae**	111-0001000101010001010101011-1-0010110101100011-0101010110101110100011111-1000111-1-1100010110101011-011011-0101010101010101000101101 11													
*S. amazonica**	111-0000000101010001010101011-1-0010010101100011-0101010110101011100011-1111-100001011-1100010110101011-011011-0101000101010001000101101 01													
*S. aruanae**	111-0001000101010001010101001-0010010101100011-0101010110101011100011-1111-100001011-1100010110101011-011011-0101010101010101000101101 01													
*S. karineae**	111-0000000101010001000000001001-0010010101100000000000000010101110000001111-1000010100110001011010101011-011011-0000000000010001000001101 01													
S. marcelleae*	111-0001000101010001010101001-0010010101100011-0101010110101011100011-1111-100011011-1100010110101011-011011-0101010101010101000101101 01													
*S. dirocha**	111-0000000101010001000001001-0010010101100010100010100101011100000011111-1000010101110001011010101011-011011-0101000100010001000001101 01													
*S. roraimensis**	111-0000000101010001010101001-0010010101100011-0101010110101011100011-1111-100011011-1100010110101011-011011-0101010101010001000101101 01													
S. tocantinenses*	111-0000000101010001000000001001-0010010101100000000000000010101110000 1-1111-1000010000110001011010101 1-011011-0000000000010001000001101 01													
Seira sp.1	111-0000000101010001010101001-0010010101100010100010101101011100001-1111-1000010101110001011011-011-011011-0101010101010001000101101 01													
Seira sp.2	111-0000000101010001010101011-0010110101100010101010101101011100011011111-100011011-1100010110101011-011011-011-0101010100010001011010 1													
Seira sp.3	111-0000000101010001000000000001-0010010101101010100010101101011100000011111-1000011-0111000101101010101011011-0001000100010001000001101 01													
Seira sp.4	111-0001000101010001000101010 01-0010010101100010101010101001011100001-1111-1000111-0111000101101010 1-011011-0101000101010001000101101 01													
Seira sp.5	111-0000000101010001000000001001-0010010101100000000000000010101110000001111-1000010101110001011010101011-011011-0000000000010001000101101 11													
Seira sp.6	111-0001000101010001010101011-1-0011-10101100011-0101010110101011100011-1111-1000111-1-1100010110101011-011011-011-01011-0100010001011011 1													
Seira sp.7	111-0000000101010001000101010 01-0010010101100011-0001010110101110000011111-1000011-1-1100010110101011-011011-011-01011-0100010001011010 1													
Seira sp.8	111-0001000101010001010101011-0010010101101011-0101010110101110001111-1111-1000111-0111000101101 1-011-011011-011-01011-0100010001011010 1													
Seira sp.9	111-0001000101010001010101011-1-0011-10101100011-0101010110101011100011-1111-1000111-0111000101101010 1-011011-011-01011-0100010001011010 1													
Seira sp.10	111-0001010101010011010101011-1-0011-10101100011-0101010110101011100011-1111-1000111-0111000101101010 1-011011-011-01011-0100010001011010 1													
Seira sp.11	111-0001000101010001010101011-0010010101100011-0101010110101011100011-1111-1000111-1-1100010110101011-011011-011-01011-0100010001011011 1													
Seira sp.12	111-0001000101010001000101001-0010010101100011-0001010110101011100001-1111-1000011-0111000101101010 1-011011-011-01011-0100010001011010 1													
Seira sp.13	111-0001000101010001010101011-0011-10101100011-0101010110101011100011-1111-1000111-1-1100010110101011-011011-011-01011-0100010001011010 1													
S. lepidochaetosa	111-0001010101010001011-1-1-011-0010110101101011-0101010111101110000 1-1111-1010111-1-1101010111011-011-011011-011-01011-0100010001011010 1													
S. metafemurata	111-0101010101010011011-1-1-011-0110111101101011-0101010111101110000 1-1111-1000111-1-1101010111011-011-011011-011-01011-0100010001011010 1													
S. semicaerulea	111-0001010101010001011-1-1-011-0011-10101101011-0101010111101110000 1-1111-1000110101110001011011-011-011011-011-01011-0100010001011010 1													

Parte 2, continuação

Caracteres 150–285

	15	16	17	18	19	20	21	22	23	24	25	26	27	28
	012345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012345													
T. bicolorcornuta	111-0000000101010001000000001001-0010010101100010100010000011011100001-1111-1000011-1-110001011011-011-011011-011-01011-010001001-0110111													
T. diabolica	111-0000000101010001000000101001-0010010101100010100010000011011100000011111-1000011-1-110001011011-011-011011-011-01011-010001001-0110111													
T. gladiata	111-0000000101010001000000001001-0010010101100010100010000011011100001-1111-1000011-1-110001011011-011-011011-011-01011-010001001-0110111													
T. raptora	111-0000000101010001000000101001-0010010101100010100010000011011100001-1111-1000011-1-110001011011-011-011011-011-01011-010001001-0110111													
T. sex	111-0000000101010001000000001001-0010010101100010100010000011011100001-1111-1000011-1-110001011011-011-011011-011-01011-010001001-0110111													
A. hudsoni sp. nov.	111-0000000101010001001-0000000000010000001101000000000000000101110000001110010000100001100010110101000100101 1-0000000000010001000000110101													
L. andevo sp. nov.	111-0001000101011001000000001001-0011-1010110100000000000010010111000001-111001000011-1-110001000011-001-011011-0001000100010001000000110101													
L. annulata	111-0001010101010001001-001-0000000100111011010101010101011010111000001111001000010101110101011010100010110 11-0001000100010001000000110101													
L. barnardi	111-0000000101010001001-0000000000010000101101001-0000010100101110000001110010000100 1-110001001011-001-011011-0000000000010001000000110101													
L. botswanensis sp. nov.	111-0001000101010001001-001-0000001001110110100 1-000101011010111010000111001000010 01-110001001011-001-011011-000000010001000100000110101													
L. boy sp. nov.	111-0101010101010001001-0001000000100111011010 11-010101011010111000001111001000111-1-110101011011-011-011011-0000000101010001010000110101													
L. briani sp. nov.	111-0001000101011001000000001001-0011-1010110101010001000100101111000001-1111-1000011-1-110001011011-011-011011-0001000100010001010000110101													
L. caeruleus sp. nov.	111-0000000101010001001-0000000000100101011010100000000001001011100000011100100001000111000101101010001011011-0000000000010001000000110101													
L. chavarii sp. nov.	111-0001010101011001001-0010000000100101011010100000101010010111000001111001000010 01-110101011010100010110 11-0000000100010001000000110101													
L. betamponensis sp. nov.	111-0001000101011001000000001001-0011-1010110100010000000100101111000000111001000011-1-110001000011-011-011011-0001000101010001000000110101													
L. dapeste	111-0001??0101011001001-0000000000100101011010000000010101001011100001-1110010000100011101010110101000101101 1-0000000100010001000000110101													
L. dayi	111-0000000101010001001-0000000000100000011010100000001010010111000000111001000010000110001011010100010110 11-0000001000100011-000110101													
L. diamantinae	111-0001010101011001001-001-0000001001010110101 1-010101010010111000 01-111000000001001-110101011011-0001011011-0000001-0101000100000110101													
L. fabioi sp. nov.	111-0001000101011001001-1-1-0001001011010110101010101010111010111000 01-111001000111-1-110001011011-011-011011-001-01011-0100010001010110101													
L. harena	111-0100010101011001011-011-0000001011110110101 1-010101011110111000 01-111001000111-1-110101011011-011-011011-001-00011-0100010100011010 1													
L. hylaeus sp. nov.	111-0001010101011001001-001-0000001001010110101000001010100101110000001110010000100011101010110101000101101 1-0000001010100010000011010 1													
L. iego sp. nov.	111-0001000101011001000000001001-0011-10101101001-0000000000010111000000111001000011-1-110001000011-001-011011-0000000100010001000000110101													
L. monteiroi sp. nov.	111-0000000101010001000000001-0000001001010110101000000000010010111000000111001000010001110001011010100010110 11-0000001000100010000011010 1													
L. nigrus	111-0001010101011001001-0000000000100101011010100000101010010111000000111001000010 01-110001011010100010110 11-0000001-0001000100000110101													
L. paduai sp. nov.	111-0001010101011001001-0000000000100101011010100000101010010111000001111001000010001110001011010100010110 11-0000001-0001000100000110101													
L. paraibensis	111-0000000101011001000000 1-0000001011010110100010001010100101110000001111001000011-0111000101101010001011011-001-00011-0100010100011010 1													
L. paucisensillum sp. nov.	111-0001000101010001001-001-0000001001010110110 1-000101011010111000000111001000010 01-110001010011-001-011011-0000000100010001000000110101													
L. primaria	111-0000000101010001000100 1-0000001011010110101000001010100101110000 1-111001000011-1-110001011010100010110 11-001-00011-0100010100011010 1													
L. prodigus	111-0001010101011001001-001-0000001011110110101000001010100101110000001111001000110 01-110101011010100010110 11-000000011-0100010000011010 1													
L. pseudoannulata	111-0000000101010001000100 1-0000001001010110101000001010110101110000001111001000010 01-110101011010100010110 11-001-00011-0100010100011010 1													
L. pseudopulcher sp. nov.	111-0001010101010001001-001-0000001001110110101 1-010101011010111000 11-111011001-1001-110101011011-001-011011-0000000000010001000000110101													
L. pulcher	111-0001010101010001001-0000000000100101011010100000101010010111000001-111001000010001110001011010100010110 11-0000001000100010000011010 1													
L. scheepersae sp. nov.	111-0001000101010001001-0000000000100101011010 01-000001010010111000000111001000010000110001001011-001-011011-0000000000010001000000110101													
L. voeltzkowi	111-0000000101010001001-0000000000100111011010 01-000101010010111010000111001000010001-110001001011-001-011011-0000000100010001000000110101													
Lepidocyrtinus sp.1	111-0000000101010001001-0001001-0010010001101000000000001001011100000011100100001000011000101001010001001011-0000000000010001000000110101													

Lista dos 285 caracteres morfológicos usados na análise filogenética, incluindo o comprimento e índices de consistência e retenção de cada caractere.

1 Cerda bifurcada apical da Ant IV: (0) presente (Fig. 7A), (1) ausente. (L: 1, UNINF)

2 Anelação do Ant IV (Fig. 7B): (0) ausente, (1) presente. (L: 15, CI: 6, RI: 73)

3 Anelação do Ant III (Fig. 7B): (0) ausente, (1) presente. (L: 3, CI: 33, RI: 66)

4 Subdivisão do Ant II (Fig. 7B): (0) ausente, (1) presente. (L: 1, UNINF)

5 Subdivisão do Ant I (Fig. 7B): (0) ausente, (1) presente. (L: 1, UNINF)

6 Comprimento da antena: (0) menor que o tronco, (1) subigual o tronco, (2) maior que o tronco. (L: 15, CI: 13, RI: 18)

7 Escultura das cerdas pré-labrais internas (Fig. 7C): (0) lisas, (1) ciliadas. (L: 11, CI: 9, RI: 50)

8 Escultura das cerdas pré-labrais externas (Fig. 7C): (0) lisas, (1) ciliadas. (L: 10, CI: 10, RI: 52)

9 Comprimento da cerda **p2** labral (Fig. 7D): (0) subigual a P0-1, (1) menor que P0-1. (L: 4, CI: 25, RI: 57)

10 Papila labral interna (Fig. 7E): (0) presente, (1) ausente. (L: 4, CI: 25, RI: 0)

11 Papila labral externa (Fig. 7E): (0) presente, (1) ausente. (L: 10, CI: 10, RI: 68)

12 Queta **R** do campo basomediano labial: (0) presente (Fig. 7F), (1) ausente. (L: 1, UNINF)

13 Forma da queta **R** do campo basomediano labial (Fig. F): (0) cerda, (1) espinho. (L: 7, CI: 14, RI: 84)

14 Proporção do Th II–III: (0) menos de 1.5, (1) mais de 1.5. (L: 7, CI: 14, RI: 80)

15 Conjunto de mic extras no ápice do Th II: (0) ausente, (1) presente. (L: 6, CI: 16, RI: 28)

16 Margem tergal posterior do Th II: (0) reta, (1) projetada anteriormente. (L: 3, CI: 33, RI: 92)

17 Proporção do Abd III–IV: (0) menos de 1.5 (Fig. 16A), (1) mais de 2.0 (Figs 16B–D). (L: 1, UNINF)

18 Dilatação do fêmur I dos machos: (0) ausente (Fig. 8A), (1) presente (Fig. 8B). (L: 1, CI: 100, RI: 100)

19 Quetas modificadas internas no fêmur I dos machos: (0) ausente, (1) presente (Figs 8A–B). (L: 3, CI: 33, RI: 77)

20 Forma das quetas modificadas no fêmur I dos machos: (0) longas mac como-espinhos (Fig. 8A), (1) curtos espinhos cônicos (Fig. 8B). (L: 1, CI: 100, RI: 100)

21 Distribuição das quetas modificadas no fêmur I dos machos: (0) longitudinal (Fig. 8A), (1) transversal (Fig. 8B). (L: 1, CI: 100, RI: 100)

22 Quetas modificadas internas no tibiotarso I dos machos: (0) ausente, (1) presente (Figs 8C–D). (L: 3, CI: 33, RI: 77)

23 Forma do ápice das quetas modificadas medianas do tibiotarso I dos machos: (0) reta (Fig. 8C), (1) curvado (Fig. 8D). (L: 1, CI: 100, RI: 100)

24 Mac externas com 2/3 o comprimento do tibiotarso: (0) ausente (Figs 8C–D), (1) presente (Fig. 8E). (L: 6, CI: 16, RI: 82)

25 Forma do dente externo pareado do unguis: (0) normal (Figs 8F–G, 9G), (1) desenvolvido (Fig. 8H, 9H). (L: 8, CI: 12, RI: 80)

26 Dente externo basal impareado do unguis: (0) presente (Figs 9A–B, D–H), (1) ausente (Fig. 9C). (L: 1, UNINF)

27 Projeção do dente externo basal impareado do unguis: (0) proeminente (Figs 9A–B, D–F), (1) rente ao unguis (Figs 8F–H, 9G – H). (L: 1, CI: 100, RI: 100)

28 Achatamento do dente externo basal do unguis: (0) lateralmente (Figs 9A–B, D–F), (1) dorsoventral (Figs 8F–H, 9G – H). (L: 1, CI: 100, RI: 100)

29 Alongamento proximal do dente externo basal do unguis: (0) presente (Figs 9A–B, D–E, G–H), (1) ausente (Fig. 9F). (L: 3, CI: 33, RI: 33)

30 Posição do dente mediano interno do unguis: (0) subigual aos dentes proximais e apical (Fig. 8G), (1) próximo ao dente apical (Fig. 8F). (L: 7, CI: 14, RI: 62)

31 Ápice do tenent hair: (0) fracamente capitado (Fig. 9A), (1) fortemente capitado (Fig.8C). (L: 2, CI: 50, RI: 90)

32 Espinho proximal anterior do colófóro: (0) ausente, (1) presente (Fig. 10A). (L: 4, CI: 25, RI: 89)

33 Queta modificada sublateral posterior do colófóro: (0) ausente, (1) presente (Fig. 10B–C). (L: 9, CI: 11, RI: 75)

34 Escultura da queta modificada sublateral posterior do colófóro: (0) mic, (1) mic reduzida (Fig. 10C), (2) espinho (Fig. 10B). (L: 2, CI: 100, RI: 100)

35 Cerda impareada basal (cb) ventral do manúbrio: (0) presente (Fig. 11A), (1) ausente (Figs 11B–C). (L: 16, CI: 6, RI: 57)

36 Cerda pareada pós basal (pb) do manúbrio: (0) presente (Fig. 11A), (1) ausente (Figs 11B–C). (L: 17, CI: 5, RI: 77)

37 Cerda pareada mediana (m) do manúbrio: (0) presente (Fig. 11A), (1) ausente (Figs 11B–C). (L: 16, CI: 6, RI: 53)

38 Cerda subapical externa (se) ventral do manúbrio: (0) presente (Figs 11A–B), (1) ausente (Fig. 11C). (L: 14, CI: 7, RI: 48)

39 Cerda subapical interna (si1) ventral do manúbrio: (0) presente (Figs 11A–B), (1) ausente (Fig. 11C). (L: 11, CI: 9, RI: 9)

40 Cerda subapical interna (si2) ventral do manúbrio: (0) presente (Figs 11A–B), (1) ausente (Fig. 11C). (L: 19, CI: 5, RI: 43)

41 Cerdas apicais antero-lateral (ala) ventral do manúbrio: (0) presente (Fig. 11B), (1) ausente (Figs 11A, C). (L: 1, CI: 100, RI: 100)

42 Cerdas apical postero-lateral (alp) ventral do manúbrio: (0) presente (Fig. 11A–B), (1) ausente (Fig. 11C). (L: 3, CI: 33, RI: 33)

43 Forma da cerda apical postero-lateral ventral do manúbrio: (0) ciliada, (1) como escama. (L: 2, CI: 50, RI: 0)

44 Mac modificadas sobre a placa manubrial: (0) ausente, (1) presente (Fig. 12A). (L: 10, CI: 10, RI: 65)

45 Forma apical das mac da placa manubrial: (0) acuminado, (1) como-bala (Fig. 12A), (2) como-mamilo (como Fig. 12B). (L: 6, CI: 33, RI: 63)

46 Ciliação da mac modificada da placa manubrial: (0) fracamente ciliada (Fig. 12A), (1) finamente ciliada (Fig. 12B). (L: 2, CI: 50, RI: 90)

47 Mac dorsais na dens: (0) ausente, (1) presente (Fig. 12B). (L: 6, CI: 16, RI: 77)

48 Forma apical das mac dorsais da dens: (0) como-bala (como Fig. 12A), (1) como-mamilo (Fig. 12B). (L: 1, CI: 100, RI: 100)

49 Ciliação das Mac dorsais internas da dens: (0) fracamente ciliada (Fig. 12A), (1) finamente ciliada (Fig. 12B). (L: 1, CI: 100, RI: 100)

50 Espinhos internos da dens: (0) ausente, (1) presente (Fig. 12C). (L: 4, CI: 25, RI: 0)

51 Posição dos espinhos internos da dens: (0) agrupados basalmente, (1) em 2-3 fileiras irregulares ao longo da dens (Fig.12C). (L: 1, UNINF)

52 Espinhos basal do mucro: (0) presente (Fig. 12D), (1) ausente (Fig. 12E). (L: 1, CI: 100, RI: 100)

53 Dente basal do mucro: (0) presente (Fig. 12D), (1) ausente (Fig. 12E). (L: 1, CI: 100, RI: 100)

54 Dente apical do mucro: (0) normal (Figs 12D–E), (1) reduzido, (2) ausente. (L: 2, UNINF)

55 Forma da placa genital dos machos: (0) multicetaseo, (1) circinado, (2) papilado. (L: 2, CI: 100, RI: 100)

Escamas

56 Escamas sobre cabeça e tronco: (0) ausente, (1) presente. (L: 1, CI: 100, RI: 100)

57 Conexão transversal entre os cílios das escamas: (0) ausente (Figs 13A–C, G, I), (1) presente (Fig. 13H). (L: 1, UNINF)

58 Forma do ápice dos cílios das escamas: (0) acuminado (Fig. 13I), (1) arredondado (Figs 13G–H). (L: 2, CI: 50, RI: 0)

59 Alinhamento dos cílios das escamas tergais: (0) desalinhado (Figs 13A, C), (1) alinhado (Figs 13B, D–F). (L: 1, UNINF)

60 Comprimento dos cílios das escamas tergais: (0) menos de 1/14 da metade do comprimento da escama (Fig. 13E), (1) até 1/10 da metade do comprimento da escama (Figs 13B, D, F), (2) 1/3 da metade do comprimento da escama (Fig. 13A), (3) mais da metade do comprimento da escama (Fig. 13C). (L: 3, UNINF)

61 Forma do ápice das escamas tergais (predominante): (0) irregular (Fig. 13A), (1) arredondada (Fig. 13F), (2) truncada (Fig. 13E), (3) pontiaguda (Figs 13B–D). (L: 3, CI: 100, RI: 100)

62 Forma do ápice das escamas tergais na margem posterior tergal: (0) arredondada (Fig. 13F), (1) truncada (Fig. 13E), (3) pontiaguda (Figs13B–D). (L: 4, CI: 50, RI: 50)

63 Escama do Ant IV: (0) ausente, (1) presente. (L: 16, CI: 6, RI: 53)

64 Escama do Ant III: (0) ausente, (1) presente. (L: 3, CI: 33, RI: 75)

65 Escama do Ant II: (0) ausente, (1) presente. (L: 2, CI: 50, RI: 83)

66 Escama do Ant I: (0) ausente, (1) presente. (L: 1, CI: 100, RI: 100)

67 Forma do ápice da escama do Ant II: (0) arredondado, (1) pontiagudo. (L: 2, CI: 50, RI: 50)

68 Escama ventral da cabeça: (0) ausente, (1) presente. (L: 2, CI: 50, RI: 83)

69 Escama do fêmur: (0) ausente, (1) presente. (L: 1, CI: 100, RI: 100)

70 Forma do ápice da escama do fêmur: (0) arredondado, (1) pontiagudo. (L: 2, CI: 50, RI: 50)

71 Escama do tibiotarso: (0) ausente, (1) presente. (L: 2, CI: 50, RI: 83)

72 Forma do ápice da escama do tibiotarso: (0) arredondado, (1) pontiagudo. (L: 2, CI: 50, RI: 50)

73 Escama anterior do colóforo: (0) ausente, (1) presente. (L: 3, CI: 33, RI: 75)

74 Escama posterior do colóforo: (0) ausente, (1) presente. (L: 11, CI: 9, RI: 44)

75 Escama dorsal do manúbrio: (0) ausente, (1) presente. (L: 16, CI: 6, RI: 72)

76 Escama ventral do manúbrio: (0) ausente, (1) presente. (L: 1, CI: 100, RI: 100)

77 Escama ventral da dens: (0) ausente, (1) presente. (L: 1, CI: 100, RI: 100)

Quetotaxia dorsal

78 Forma apical das mac tergais (Fig. 14): (0) pé, (1) acuminada, (2) como-palito. (L: 4, CI: 50, RI: 0)

79 Comprimento dos cílios das mac tergais (Fig. 14): (0) curto, (1) longo. (L: 1, UNINF)

80 Ciliação das mic tergais das séries amp: (0) farpada (Fig. 15A), (1) estriada (Fig. 15B), (2) franjada (Fig. 15C), (3) lisa com cílios distais (Fig. 15D–E). (L: 5, CI: 60, RI: 75)

81 Sensila **acc.p4** do Abd II: (0) presente (Fig. 16A), (1) ausente (Figs 16B–D). (L: 1, UNINF)

82 Sensila **acc.p6** do Abd II: (0) presente (Figs 16A–C), (1) ausente (Fig. 16D). (L: 1, UNINF)

83 Sensila **acc.p4** do Abd III: (0) presente (Fig. 16A), (1) ausente (Figs 16B–D). (L: 1, UNINF)

84 Sensila **acc.p6** do Abd III: (0) presente (Figs 16A–C), (1) ausente (Fig. 16D). (L: 1, UNINF)

85 Sensila **acc.p3** do Abd V: (0) presente (Fig. 16A), (1) ausente (Figs 16B–D). (L: 1, UNINF)

86 Distancia entre as tricobótrias no Abd III: (0) subiguais (Fig. 22C), (1) **a5** próxima a **m5** (Figs 22D, 23A–C). (L: 5, CI: 20, RI: 0)

87 Tricobótria **D3** do Abd IV: (0) ausente (Figs 16A–B, D), (1) presente (Fig. 16C). (L: 1, CI: 100, RI: 100)

88 Cerdas acessórias na tricobótria **D3** do Abd IV: (0) ausente, (1) presente. (L: 6, CI: 16, RI: 44)

89 Posição das tricobótrias **T2** e **T4** no Abd IV: (0) anteriormente (Fig. 16C–D), (1) medialmente (Fig. 16A), (2) posteriormente (Fig. 16B). (L: 6, CI: 33, RI: 20)

90 Tipo de quetas acessórias das tricobótrias do Abd II–IV: (0) cerdas (Fig. 17C–F), (1) escamas (Figs 17A–B). (L: 2, CI: 50, RI: 50)

91 Forma dos cílios das cerdas acessórias das tricobótrias do Abd II–IV: (0) farpada (Fig. 17C), (1) finamente ciliada (Fig. 17D), (2) franjada (Fig. 17E), (3) fortemente (Fig. 17F). (L: 3, CI: 100, RI: 100)

Quetotaxia dorsal da cabeça (Figs 18–19)

92 Tricobótria subantenal (Bsa): (0) ausente (Fig. 16A–B, D), (1) presente (Fig. 16C). (L: 1, CI: 100, RI: 100)

93 Cerda **A2** da cabeça: (0) mac, (1) mic. (L: 3, CI: 33, RI: 0)

94 Cerda **A3** da cabeça: (0) mac, (1) mic. (L: 6, CI: 16, RI: 44)

95 Cerda **A4** da cabeça: (0) presente, (1) ausente. (L: 25, CI: 4, RI: 50)

96 Forma da cerda **A4** da cabeça: (0) mac, (1) mic. (L: 1, UNINF)

97 Cerda **A5** da cabeça: (0) mac, (1) mic. (L: 14, CI: 7, RI: 43)

98 Cerda **M0** da cabeça: (0) presente, (1) ausente. (L: 1, CI: 100, RI: 100)

99 Cerda **M1** da cabeça: (0) presente, (1) ausente. (L: 2, CI: 50, RI: 50)

100 Forma da cerda **M1** da cabeça: (0) mac, (1) mic. (L: 5, CI: 20, RI: 42)
101 Forma da cerda **M2** da cabeça: (0) mac, (1) mic. (L: 12, CI: 8, RI: 65)
102 Cerda **M3** da cabeça: (0) presente, (1) ausente. (L: 3, CI: 33, RI: 0)
103 Forma da cerda **M3** da cabeça: (0) mac, (1) mic. (L: 2, CI: 50, RI: 85)
104 Cerda **M4i** da cabeça: (0) presente, (1) ausente. (L: 4, CI: 25, RI: 62)
105 Forma da cerda **M4i** da cabeça: (0) mac, (1) mic. (L: 5, CI: 20, RI: 63)
106 Cerda **S0** da cabeça: (0) presente, (1) ausente. (L: 12, CI: 8, RI: 42)
107 Forma da cerda **S0** da cabeça: (0) mac, (1) mic. (L: 4, CI: 25, RI: 83)
108 Cerda **S1** da cabeça: (0) presente, (1) ausente. (L: 11, CI: 9, RI: 80)
109 Forma da cerda **S1** da cabeça: (0) mac, (1) mic. (L: 3, CI: 33, RI: 33)
110 Cerda **S2** da cabeça: (0) presente, (1) ausente. (L: 2, CI: 50, RI: 0)
111 Forma da cerda **S2** da cabeça: (0) mac, (1) mic. (L: 8, CI: 12, RI: 78)
112 Cerda **S2e** da cabeça: (0) presente, (1) ausente. (L: 2, CI: 50, RI: 0)
113 Cerda **S3** da cabeça: (0) presente, (1) ausente. (L: 1, UNINF)
114 Forma da cerda **S3** da cabeça: (0) mac, (1) mic. (L: 2, CI: 50, RI: 0)
115 Cerda **S4** da cabeça: (0) presente, (1) ausente. (L: 12, CI: 8, RI: 72)
116 Forma da cerda **S4** da cabeça: (0) mac, (1) mic. (L: 5, CI: 20, RI: 86)
117 Cerda **S5** da cabeça: (0) presente, (1) ausente. (L: 7, CI: 14, RI: 40)
118 Forma da cerda **S5** da cabeça: (0) mac, (1) mic. (L: 14, CI: 7, RI: 38)
119 Cerda **S6i** da cabeça: (0) presente, (1) ausente. (L: 4, CI: 25, RI: 94)
120 Forma da cerda **S6i** da cabeça: (0) mac, (1) mic. (L: 1, CI: 100, RI: 100)
121 Forma da cerda **S6** da cabeça: (0) mac, (1) mic. (L: 4, CI: 25, RI: 50)
122 Cerda **Ps2** da cabeça: (0) presente, (1) ausente. (L: 2, CI: 50, RI: 75)
123 Forma da cerda **Ps2** da cabeça: (0) mac, (1) mic. (L: 4, CI: 25, RI: 86)
124 Cerda **Ps3** da cabeça: (0) presente, (1) ausente. (L: 4, CI: 25, RI: 40)
125 Forma da cerda **Ps3** da cabeça: (0) mac, (1) mic. (L: 1, UNINF)
126 Forma da cerda **Pa5** da cabeça: (0) mac, (1) mic. (L: 1, UNINF)
127 Cerda **Pp4** da cabeça: presente, (1) ausente. (L: 2, CI: 50, RI: 87)
128 Forma da cerda **Pp4** da cabeça: (0) mac, (1) mic. (L: 1, UNINF)
129 Forma da cerda **Pp5** da cabeça: (0) mac, (1) mic. (L: 15, CI: 6, RI: 71)
130 Cerda **Pp6** da cabeça: (0) presente, (1) ausente. (L: 2, CI: 50, RI: 85)
131 Forma da cerda **Pp6** da cabeça: (0) mac, (1) mic. (L: 2, CI: 50, RI: 0)
132 Cerda **Pe3** da cabeça: (0) presente, (1) ausente. (L: 7, CI: 14, RI: 40)

133 Forma da cerda **Pe3** da cabeça: (0) mac, (1) mic. (L: 11, CI: 9, RI: 73)

134 Cerda **Pe5** da cabeça: (0) presente, (1) ausente. (L: 3, CI: 33, RI: 60)

135 Forma da cerda **Pe5** da cabeça: (0) mac, (1) mic. (L: 1, CI: 100, RI: 100)

136 Mac da série **Pi** da cabeça: (0) ausente, (1) presente. (L: 1, CI: 100, RI: 100)

137 Mac da série **Pap** da cabeça: (0) ausente, (1) presente. (L: 1, CI: 100, RI: 100)

Quetotaxia dorsal do Th II (Figs 20–21)

138 Distribuição das mac do colar anterior do Th II: (0) retidas na margem anterior, (1) espaçadas, (2) agrupadas. (L: 10, CI: 20, RI: 78)

139 Mic **mp** do Th II: (0) ausente, (1) presente. (L: 4, CI: 25, RI: 87)

140 Cerda **m1** do Th II: (0) presente, (1) ausente. (L: 2, CI: 50, RI: 0)

141 Forma da cerda **m1** do Th II: (0) mac, (1) mic. (L: 1, UNINF)

142 Cerda **m1i** do Th II: (0) presente, (1) ausente. (L: 6, CI: 16, RI: 54)

143 Forma da cerda **m1i** do Th II: (0) mac, (1) mic. (L: 5, CI: 20, RI: 85)

144 Cerda **m2** do Th II: (0) presente, (1) ausente. (L: 2, CI: 50, RI: 0)

145 Forma da cerda **m2** do Th II: (0) mac, (1) mic. (L: 1, UNINF)

146 Cerda **m2i** do Th II: (0) presente, (1) ausente. (L: 8, CI: 12, RI: 22)

147 Forma da cerda **m2i** do Th II: (0) mac, (1) mic. (L: 4, CI: 25, RI: 62)

148 Cerda **m2i2** do Th II: (0) presente, (1) ausente. (L: 12, CI: 8, RI: 76)

149 Forma da cerda **m2i2** do Th II: (0) mac, (1) mic. (L: 2, CI: 50, RI: 0)

150 Cerdas múltiplas do complexo **m1**–**2**: (0) presente, (1) ausente. (L: 1, CI: 100, RI: 100)

151 Mac **m2ip** do Th II: (0) presente, (1) ausente. (L: 4, CI: 25, RI: 0)

152 Cerda **m2p** do Th II: (0) presente, (1) ausente. (L: 4, CI: 25, RI: 40)

153 Forma da cerda **m2p** do Th II: (0) mac, (1) mic. (L: 1, CI: 100, RI: 100)

154 Cerda **m4** do Th II: (0) presente, (1) ausente. (L: 1, UNINF)

155 Forma da cerda **m4** do Th II: (0) mac, (1) mic. (L: 3, CI: 33, RI: 33)

156 Cerda **m4i** do Th II: (0) presente, (1) ausente. (L: 3, CI: 33, RI: 33)

157 Forma da cerda **m4i** do Th II: (0) mac, (1) mic. (L: 9, CI: 11, RI: 76)

158 Cerda **m4p** do Th II: (0) presente, (1) ausente. (L: 3, CI: 33, RI: 33)

159 Forma da cerda **m4p** do Th II: (0) mac, (1) mic. (L: 3, CI: 33, RI: 85)

160 Cerda **m4ip** do Th II: (0) presente, (1) ausente. (L: 2, CI: 50, RI: 88)

161 Forma da cerda **m4ip** do Th II: (0) mac, (1) mic. (L: 1, UNINF)

162 Cerda **m5** do Th II: (0) presente, (1) ausente. (L: 2, CI: 50, RI: 75)

163 Forma da cerda **m5** do Th II: (0) mac, (1) mic. (L: 1, CI: 100, RI: 100)

164 Cerda **m5a** do Th II: (0) presente, (1) ausente. (L: 2, CI: 50, RI: 88)

165 Forma da cerda **m5a** do Th II: (0) mac, (1) mic. (L: 1, UNINF)

166 Cerda **m5p** do Th II: (0) presente, (1) ausente. (L: 9, CI: 11, RI: 68)

167 Cerda **p1** do Th II: (0) presente, (1) ausente. (L: 1, UNINF)

168 Forma da cerda **p1** do Th II: (0) mac, (1) mic. (L: 3, CI: 33, RI: 0)

169 Mac **p1a** do Th II: (0) presente, (1) ausente. (L: 1, CI: 100, RI: 100)

170 Cerda **p1i** do Th II: (0) presente, (1) ausente. (L: 3, CI: 33, RI: 0)

171 Forma da cerda **p1i** do Th II: (0) mac, (1) mic. (L: 5, CI: 20, RI: 78)

172 Cerdas extras de **p1i** do Th II: (0) presente, (1) ausente. (L: 10, CI: 10, RI: 72)

173 Forma das cerdas extras de **p1i** do Th II: (0) mac, (1) mic. (L: 4, CI: 25, RI: 88)

174 Cerda **p1ip** do Th II: (0) presente, (1) ausente. (L: 5, CI: 20, RI: 50)

175 Forma da cerda **p1ip** do Th II: (0) mac, (1) mic. (L: 5, CI: 20, RI: 86)

176 Cerdas extras de **p1ip** do Th II: (0) presente, (1) ausente. (L: 13, CI: 7, RI: 55)

177 Forma das cerdas extras de **p1ip** do Th II: (0) mac, (1) mic. (L: 7, CI: 14, RI: 82)

178 Cerda **p1p** do Th II: (0) presente, (1) ausente. (L: 8, CI: 12, RI: 30)

179 Forma da cerda **p1p** do Th II: (0) mac, (1) mic. (L: 2, CI: 50, RI: 85)

180 Cerdas extras de **p1p** do Th II: (0) presente, (1) ausente. (L: 10, CI: 10, RI: 74)

181 Forma das cerdas extras de **p1p** do Th II: (0) mac, (1) mic. (L: 1, UNINF)

182 Cerda **p2** do Th II: (0) presente, (1) ausente. (L: 1, UNINF)

183 Forma da cerda **p2** do Th II: (0) mac, (1) mic. (L: 2, CI: 50, RI: 0)

184 Mac extras de **p2a** do Th II: (0) presente, (1) ausente. (L: 1, CI: 100, RI: 100)

185 Cerda **p2ep** do Th II: (0) presente, (1) ausente. (L: 6, CI: 16, RI: 61)

186 Forma da cerda **p2ep** do Th II: (0) mac, (1) mic. (L: 9, CI: 11, RI: 20)

187 Mac **p2ep2** do Th II: (0) presente, (1) ausente. (L: 5, CI: 20, RI: 84)

188 Forma da cerda **p3** do Th II: (0) mac, (1) mic. (L: 5, CI: 20, RI: 50)

189 Mac extras de **p3** do Th II: (0) presente, (1) ausente. (L: 7, CI: 14, RI: 50)

190 Cerda **p4** do Th II: (0) presente, (1) ausente. (L: 2, CI: 50, RI: 50)

191 Forma da cerda **p4** do Th II: (0) mac, (1) mic. (L: 1, CI: 100, RI: 100)

192 Mac **p4i** do Th II: (0) presente, (1) ausente. (L: 1, CI: 100, RI: 100)

193 Cerda **p5** do Th II: (0) presente, (1) ausente. (L: 3, CI: 33, RI: 0)

194 Forma da cerda **p5** do Th II: (0) mac, (1) mic. (L: 6, CI: 16, RI: 87)

Quetotaxia dorsal do Th III (Figs 20–21)

195 Cerda **a1** do Th III: (0) presente, (1) ausente. (L: 3, CI: 33, RI: 33)

196 Forma da cerda **a1** do Th III: (0) mac, (1) mic. (L: 10, CI: 10, RI: 83)

197 Cerda **a1a** do Th III: (0) presente, (1) ausente. (L: 15, CI: 6, RI: 70)

198 Forma da cerda **a1a** do Th III: (0) mac, (1) mic. (L: 4, CI: 25, RI: 87)

199 Cerda **a2** do Th III: (0) presente, (1) ausente. (L: 3, CI: 33, RI: 33)

200 Forma da cerda **a2** do Th III: (0) mac, (1) mic. (L: 5, CI: 20, RI: 86)

201 Cerda **a3** do Th III: (0) presente, (1) ausente. (L: 2, CI: 50, RI: 75)

202 Forma da cerda **a3** do Th III: (0) mac, (1) mic. (L: 6, CI: 16, RI: 89)

203 Cerda **a4** do Th III: (0) presente, (1) ausente. (L: 3, CI: 33, RI: 33)

204 Forma da cerda **a4** do Th III: (0) mac, (1) mic. (L: 9, CI: 11, RI: 84)

205 Cerda **a5** do Th III: (0) presente, (1) ausente. (L: 2, CI: 50, RI: 50)

206 Forma da cerda **a5** do Th III: (0) mac, (1) mic. (L: 12, CI: 8, RI: 79)

207 Forma da cerda **a6** do Th III: (0) mac, (1) mic. (L: 13, CI: 7, RI: 78)

208 Cerda **m1** do Th III: (0) presente, (1) ausente. (L: 5, CI: 20, RI: 77)

209 Cerda **m2** do Th III: (0) presente, (1) ausente. (L: 1, UNINF)

210 Cerda **m4** do Th III: (0) presente, (1) ausente. (L: 1, CI: 100, RI: 100)

211 Forma da cerda **m4** do Th III: (0) mac, (1) mic. (L: 2, CI: 50, RI: 0)

212 Forma da cerda **m5** do Th III: (0) mac, (1) mic. (L: 1, CI: 100, RI: 100)

213 Mac **m5e** do Th III: (0) presente, (1) ausente. (L: 2, CI: 50, RI: 66)

214 Cerda **m6** do Th III: (0) presente, (1) ausente. (L: 1, UNINF)

215 Forma da cerda **m6** do Th III: (0) mac, (1) mic. (L: 5, CI: 20, RI: 0)

216 Cerda **p1** do Th III: (0) presente, (1) ausente. (L: 1, CI: 100, RI: 100)

217 Forma da cerda **p1** do Th III: (0) mac, (1) mic. (L: 5, CI: 20, RI:80)

218 Cerda **p1i** do Th III: (0) presente, (1) ausente. (L: 19, CI: 5, RI: 67)

219 Forma da cerda **p1i** do Th III: (0) mac, (1) mic. (L: 6, CI: 16, RI: 70)

220 Cerdas extra(s) **p1i** do Th III: (0) presente, (1) ausente. (L: 3, CI: 33, RI: 33)

221 Cerda **p1ip** do Th III: (0) presente, (1) ausente. (L: 7, CI: 14, RI: 50)

222 Cerdas extra(s) **p1ip** do Th III: (0) presente, (1) ausente. (L: 5, CI: 20, RI: 20)

223 Cerda **p1p** do Th III: (0) presente, (1) ausente. (L: 6, CI: 16, RI: 91)

224 Forma da cerda **p1p** do Th III: (0) mac, (1) mic. (L: 1, UNINF)

225 Cerdas extra(s) **p1p** do Th III: (0) presente, (1) ausente. (L: 3, CI: 33, RI: 66)

226 Cerda **p2** do Th III: (0) presente, (1) ausente. (L: 1, CI: 100, RI: 100)

227 Forma da cerda **p2** do Th III: (0) mac, (1) mic. (L: 2, CI: 50, RI: 0)

228 Cerda **p2a** do Th III: (0) presente, (1) ausente. (L: 3, CI: 33, RI: 66)

229 Forma da cerda **p2a** do Th III: (0) mac, (1) mic. (L: 6, CI: 16, RI: 76)

230 Cerdas extra(s) **p2a** do Th III: (0) presente, (1) ausente. (L: 3, CI: 33, RI: 71)

231 Cerda **p2e** do Th III: (0) presente, (1) ausente. (L: 17, CI: 5, RI: 57)

232 Forma da cerda **p2e** do Th III: (0) mac, (1) mic. (L: 7, CI: 14, RI: 82)

233 Cerda **p2ea** do Th III: (0) presente, (1) ausente. (L: 21, CI: 4, RI: 58)

234 Forma da cerda **p2ea** do Th III: (0) mac, (1) mic. (L: 4, CI: 25, RI: 90)

235 Mac **p2p** do Th III: (0) presente, (1) ausente. (L: 2, CI: 50, RI: 66)

236 Mac **p2ep** do Th III: (0) presente, (1) ausente. (L: 2, CI: 50, RI: 50)

237 Cerda **p3** do Th III: (0) presente, (1) ausente. (L: 1, CI: 100, RI: 100)

238 Forma da cerda **p3** do Th III: (0) mac, (1) mic. (L: 4, CI: 25, RI: 75)

239 Cerda **p4** do Th III: (0) presente, (1) ausente. (L: 4, CI: 25, RI: 0)

240 Forma da cerda **p4** do Th III: (0) mac, (1) mic. (L: 1, CI: 100, RI: 100)

241 Cerda **p5** do Th III: (0) presente, (1) ausente. (L: 1, UNINF)

242 Forma da cerda **p5** do Th III: (0) mac, (1) mic. (L: 8, CI: 12, RI: 78)

243 Forma da cerda **p6** do Th III: (0) mac, (1) mic. (L: 8, CI: 12, RI: 77)

Quetotaxia dorsal do Abd I (Figs 22–23)

244 Cerda **a1** do Abd I: (0) presente, (1) ausente. (L: 2, CI: 50, RI: 85)

245 Forma da cerda **a1** do Abd I: (0) mac, (1) mic. (L: 1, UNINF)

246 Cerda **a1e** do Abd I: (0) presente, (1) ausente. (L: 16, CI: 6, RI: 63)

247 Forma da cerda **a1e** do Abd I: (0) mac, (1) mic. (L: 2, CI: 50, RI: 87)

248 Cerda **a2** do Abd I: (0) presente, (1) ausente. (L: 2, CI: 50, RI: 80)

249 Forma da cerda **a2** do Abd I: (0) mac, (1) mic. (L: 6, CI: 16, RI: 86)

250 Cerda **a2e** do Abd I: (0) presente, (1) ausente. (L: 11, CI: 9, RI: 68)

251 Forma da cerda **a2e** do Abd I: (0) mac, (1) mic. (L: 1, CI: 100, RI: 100)

252 Cerda **a3** do Abd I: (0) presente, (1) ausente. (L: 2, CI: 50, RI: 75)

253 Forma da cerda **a3** do Abd I: (0) mac, (1) mic. (L: 2, CI: 20, RI: 82)

254 Mac **a3e** do Abd I: (0) presente, (1) ausente. (L: 1, CI: 100, RI: 100)

255 Cerda **a5** do Abd I: (0) presente, (1) ausente. (L: 2, CI: 50, RI: 75)

256 Forma da cerda **a5** do Abd I: (0) mac, (1) mic. (L: 1, CI: 100, RI: 100)

257 Cerda **m1** do Abd I: (0) presente, (1) ausente. (L: 3, CI: 33, RI: 0)

258 Forma da cerda **m1** do Abd I: (0) mac, (1) mic. (L: 1, UNINF)

259 Cerda **m2** do Abd I: (0) presente, (1) ausente. (L: 1, CI: 100, RI: 100)

260 Forma da cerda **m2** do Abd I: (0) mac, (1) mic. (L: 5, CI: 20, RI: 89)

261 Cerda **m2i** do Abd I: (0) presente, (1) ausente. (L: 11, CI: 9, RI: 73)

262 Forma da cerda **m2i** do Abd I: (0) mac, (1) mic. (L: 4, CI: 25, RI: 86)

263 Cerda **m3** do Abd I: (0) presente, (1) ausente. (L: 1, CI: 100, RI: 100)

264 Forma da cerda **m3** do Abd I: (0) mac, (1) mic. (L: 5, CI: 20, RI: 86)

265 Cerda **m4** do Abd I: (0) presente, (1) ausente. (L: 3, CI: 33, RI: 50)

266 Forma da cerda **m4** do Abd I: (0) mac, (1) mic. (L: 10, CI: 10, RI: 81)

267 Cerda **m4i** do Abd I: (0) presente, (1) ausente. (L: 9, CI: 11, RI: 72)

268 Forma da cerda **m4i** do Abd I: (0) mac, (1) mic. (L: 7, CI: 14, RI: 71)

269 Cerda **m5** do Abd I: (0) presente, (1) ausente. (L: 3, CI: 33, RI: 0)

270 Forma da cerda **m5** do Abd I: (0) mac, (1) mic. (L: 1, CI: 100, RI: 100)

Quetotaxia dorsal do Abd II (Figs 22–23)

271 Cerda **a2** do Abd II: (0) presente, (1) ausente. (L: 4, CI: 25, RI: 0)

272 Forma da cerda **a2** do Abd II: (0) mac, (1) mic. (L: 2, CI: 50, RI: 75)

273 Cerda **a3** do Abd II: (0) presente, (1) ausente. (L: 3, CI: 33, RI: 50)

274 Forma da cerda **a3** do Abd II: (0) mac, (1) mic. (L: 3, CI: 33, RI: 86)

275 Cerda **m3e** do Abd II: (0) presente, (1) ausente. (L: 2, CI: 50, RI: 0)

276 Forma da cerda **m3e** do Abd II: (0) mac, (1) mic. (L: 3, CI: 33, RI: 60)

277 Cerda **m3ep** do Abd II: (0) presente, (1) ausente. (L: 6, CI: 16, RI: 66)

278 Forma da cerda **m3ep** do Abd II: (0) mac, (1) mic. (L: 5, CI: 20, RI: 88)

279 Cerda **m3ea** do Abd II: (0) presente, (1) ausente. (L: 3, CI: 33, RI: 75)

280 Forma da cerda **m3ea** do Abd II: (0) presente, (1) ausente. (L: 1, CI: 100, RI: 100)

281 Cerda **p4** do Abd II: (0) presente, (1) ausente. (L: 1, CI: 100, RI: 100)

Quetotaxia dorsal do Abd III (Figs 22–23)

282 Cerda **a3** do Abd III: (0) presente, (1) ausente. (L: 3, CI: 33, RI: 66)

283 Forma da cerda **a3** do Abd III: (0) mac, (1) mic. (L: 2, CI: 50, RI: 66)

284 Forma da cerda **am6** do Abd III: (0) mac, (1) mic. (L: 10, CI: 10, RI: 43)

285 Cerda **p4** do Abd III: (0) presente, (1) ausente. (L: 3, CI: 33, RI: 33)

Apêndice 2

Figuras 07–23 a seguir referem-se aos caracteres e os estados observados para os 120 terminais utilizados na análise filogenética.

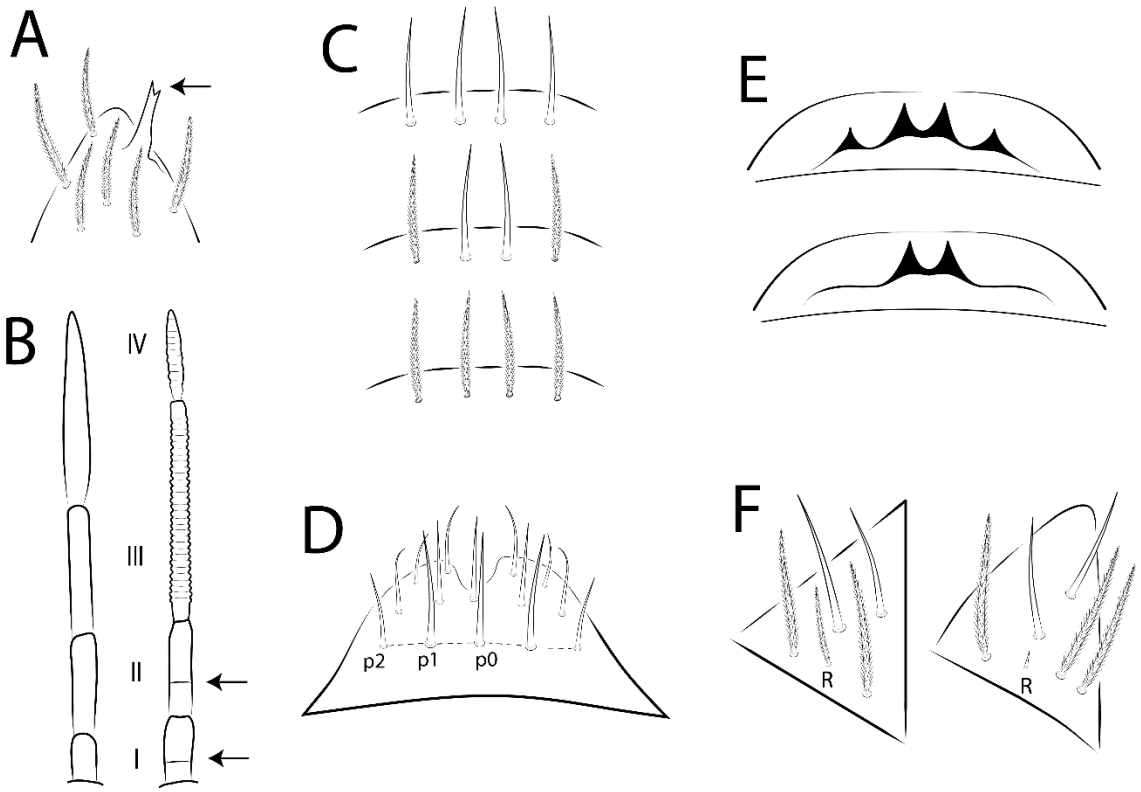

Fig. 7. Estruturas da cabeça. A, ápice da Ant IV direita de *Dicranocentrus* sp. (Heteromurinae), seta indica cerda bifurcada. B, segmentos antenais I–IV: *S. dowlingi* (Seirinae) e *Dicranocentrus* sp. (Heteromurinae), respectivamente, setas indicam subsegmentação do Ant I–II. C, quetotaxia pré-labral (visão dorsal): *Dicranocentrus* sp. (Heteromurinae), *S. burgersi* (Seirinae), *W. nigromaculata* (Entomobryinae), respectivamente. D, quetotaxia labral (visão dorsal): *W. nigromaculata*. E, papilas labrais (visão ventral): *S. domestica* e *L. prodigus* (Seirinae). F, campo basomediano labial (lado esquerdo): *W. nigromaculata* e *L. prodigus*, respectivamente.

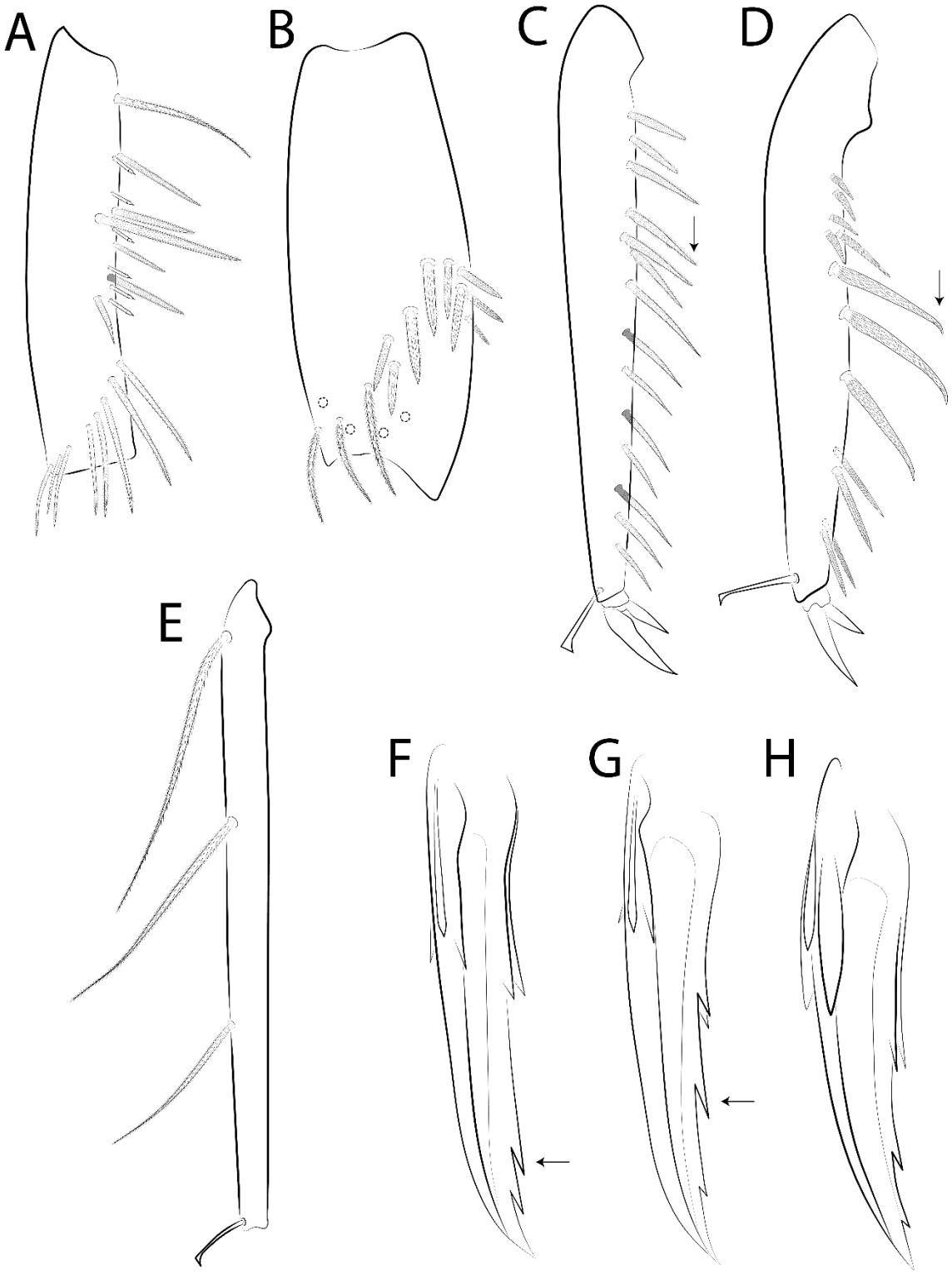

Fig. 8. Estruturas das pernas de Seirinae. A–B, fêmur I do macho (lado anterior): A, *S. domestica*, B, *T. bicolorcornuta*. C–D, tibiotarso I do macho (lado anterior): C, *S. domestica*, D, *T. bicolorcornuta*, setas indicam quetas modificadas internas. E, *L. prodigus* (lado posterior), tibiotarso esquerdo III. F–H, unguis III (lado posterior): F, *S. mantis*, G, *T. raptora*, H, *L. prodigus*, setas indicam diferente posição do dente mediano interno.

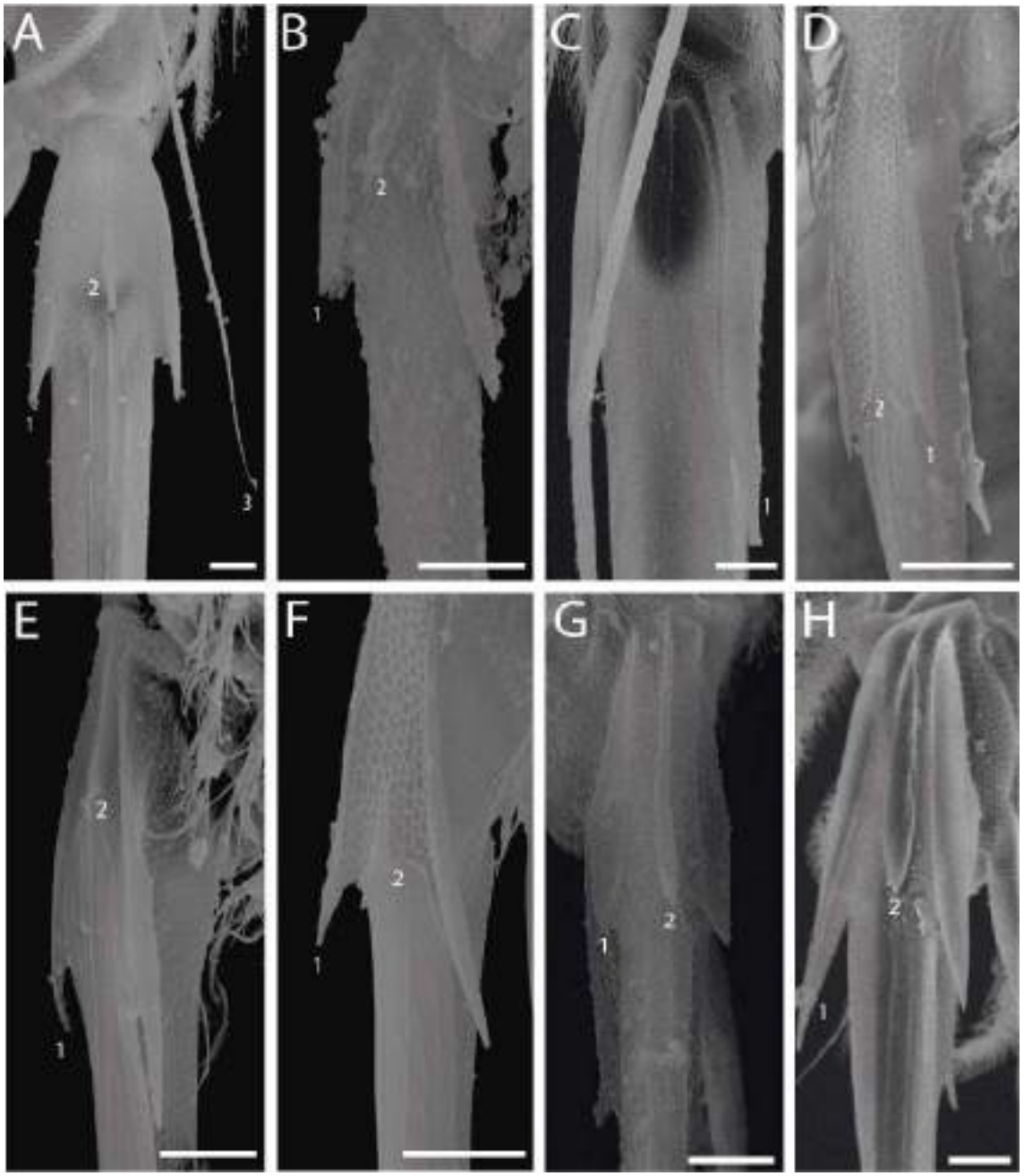

Fig. 9. Parte proximal do unguis III (imagens de MEV), lado externo. A, *Dicranocentrus* sp. (Heteromurinae), visão dorsal. B, *L. amazonicus* (Lepidocyrtinae), visão laterodorsal. C, *L. colormutatus* (Entomobryinae), visão laterodorsal. D, *W. nigromaculata* (Entomobryinae), visão laterodorsal. E, *A. ducke* (Entomobryinae), visão laterodorsal. F, *E. paroara* (Entomobryinae), visão laterodorsal. G, *T. bicolorcornuta* (Seirinae), visão dorsal. H, *L. hylaeus* (Seirinae), visão dorsal. 1= dente externo pareado, 2= dente externo basal impareado, 3= tenent hair. Barra de escala: 5 µm.

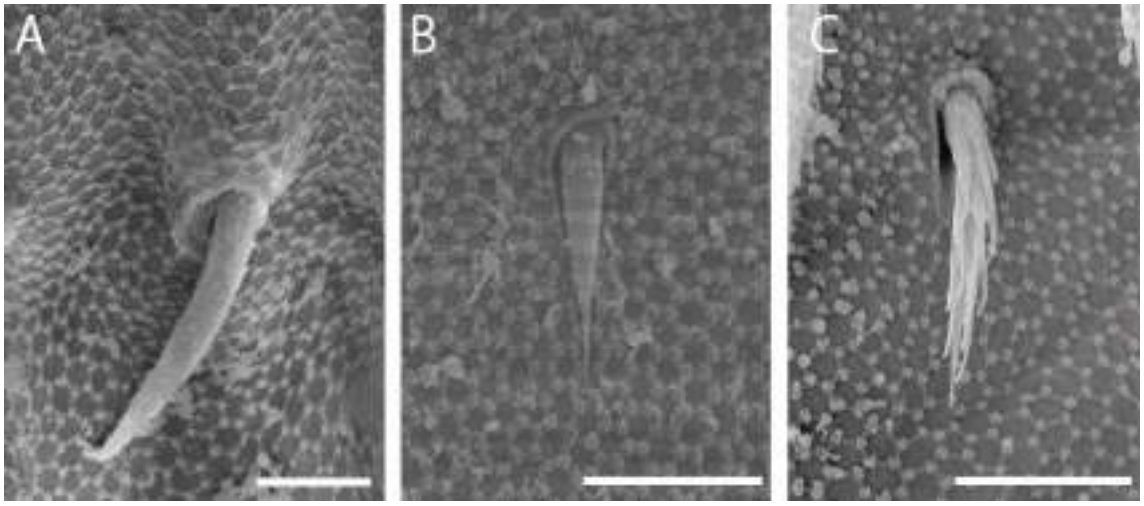

Fig. 10. Quetas modificadas do colóforo (imagens de MEV). A–B, *L. hylaeus* (Seirinae). A, espinho proximal do lado anterior, B, espinho sublateral do lado posterior. C, *L. colormutatus* (Entomobryinae), mic reduzida sublateral do lado posterior. Barra de escala: 4 µm.

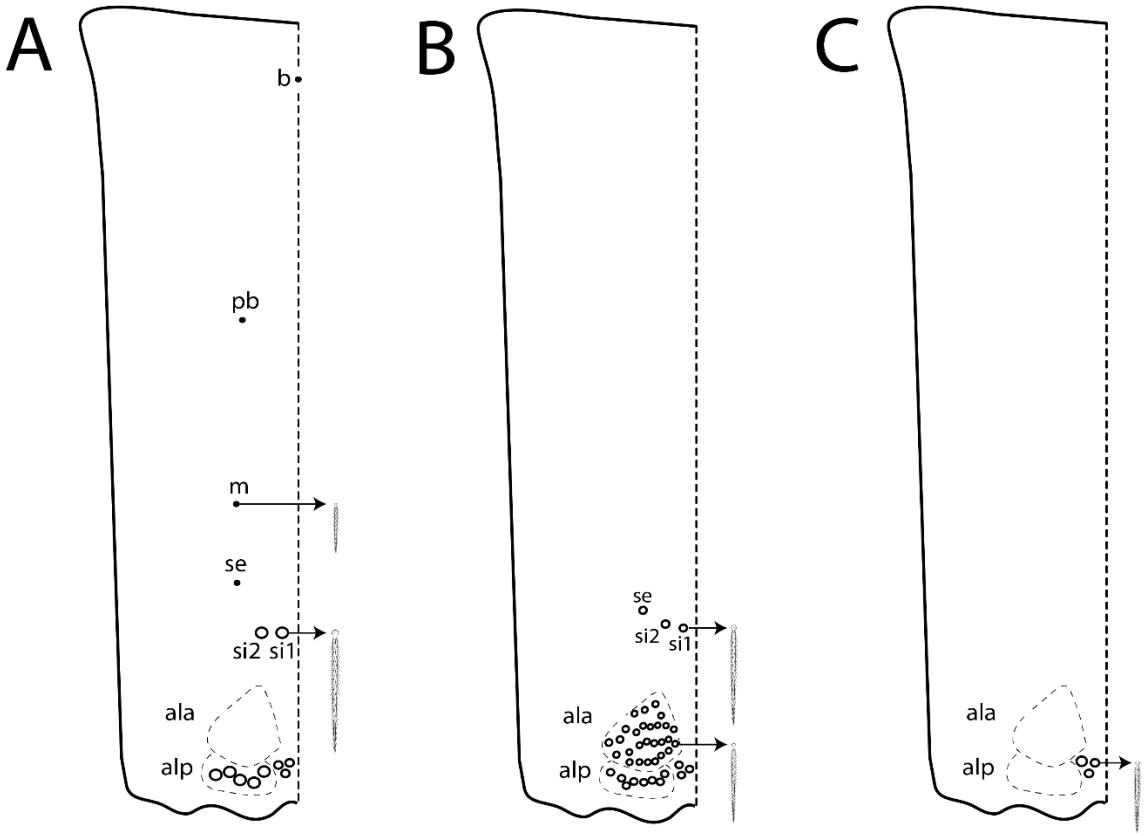

Fig. 11. Estruturas ventrais da fúrcula (lado esquerdo). A, *S. semicaerulea* (Seirinae). B, *A. ducke* (Entomobryinae). C, *L. amazonicus* (Lepidocyrtinae).

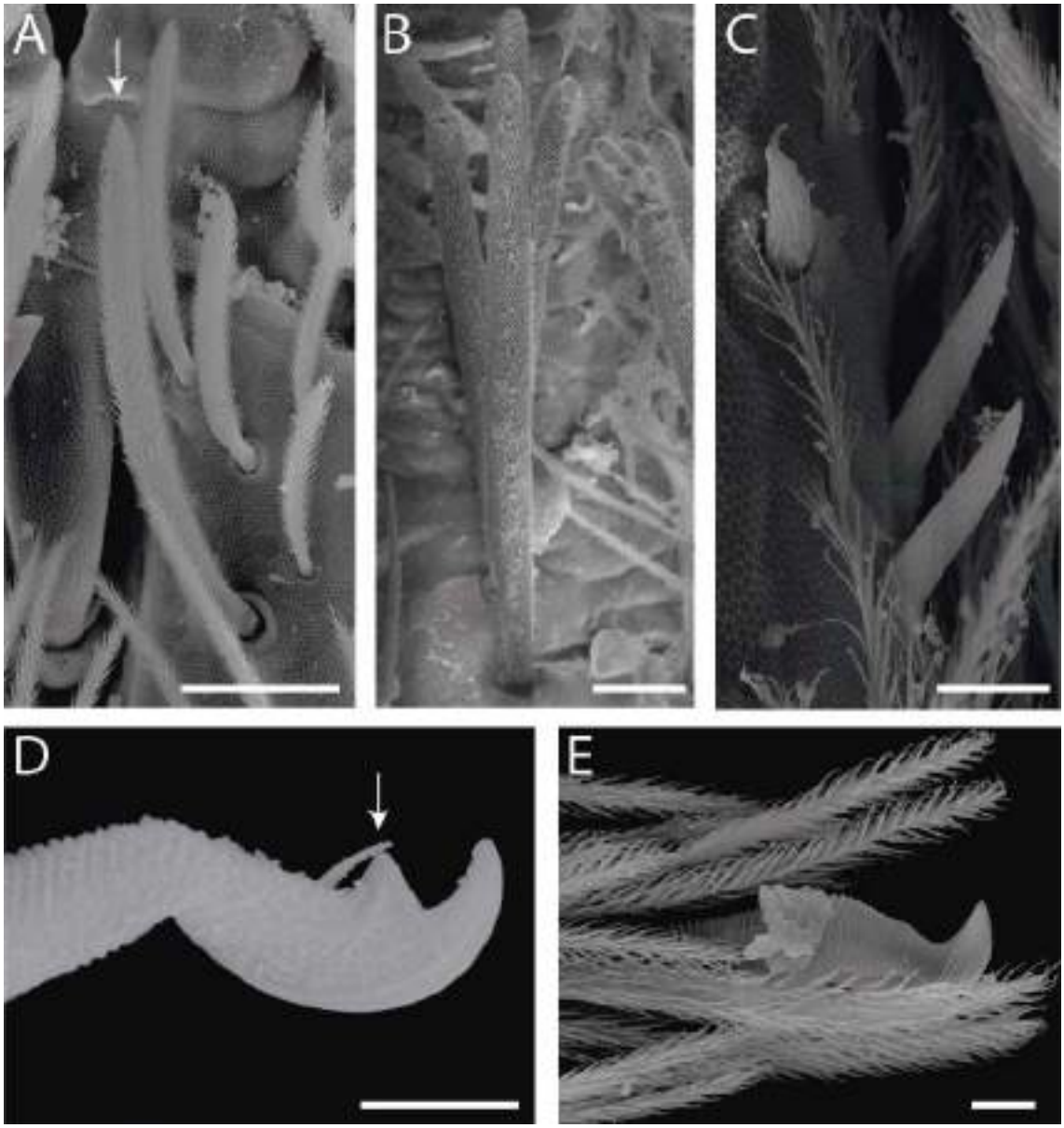

Fig. 12. Estruturas dorsais da fúrcula (imagens de MEV). A, *L. colormutatus* (Entomobryinae), placa manubrial (lado direito), seta indica mac modificada. B, *L. hylaeus* (Seirinae), mac dorsais na dens (lado esquerdo). C, *H. sinensis* (Entomobryinae), espinhos internos da dens (lado esquerdo). D, *W. nigromaculata* (Entomobryinae), dens distal e mucro (visão lateral), seta indica espinho basal sobre o dente proximal. E, *L. hylaeus* (Seirinae), dens distal e mucro (visão lateral). Barra de escala: A–B: 20 µm, C–E: 5 µm.

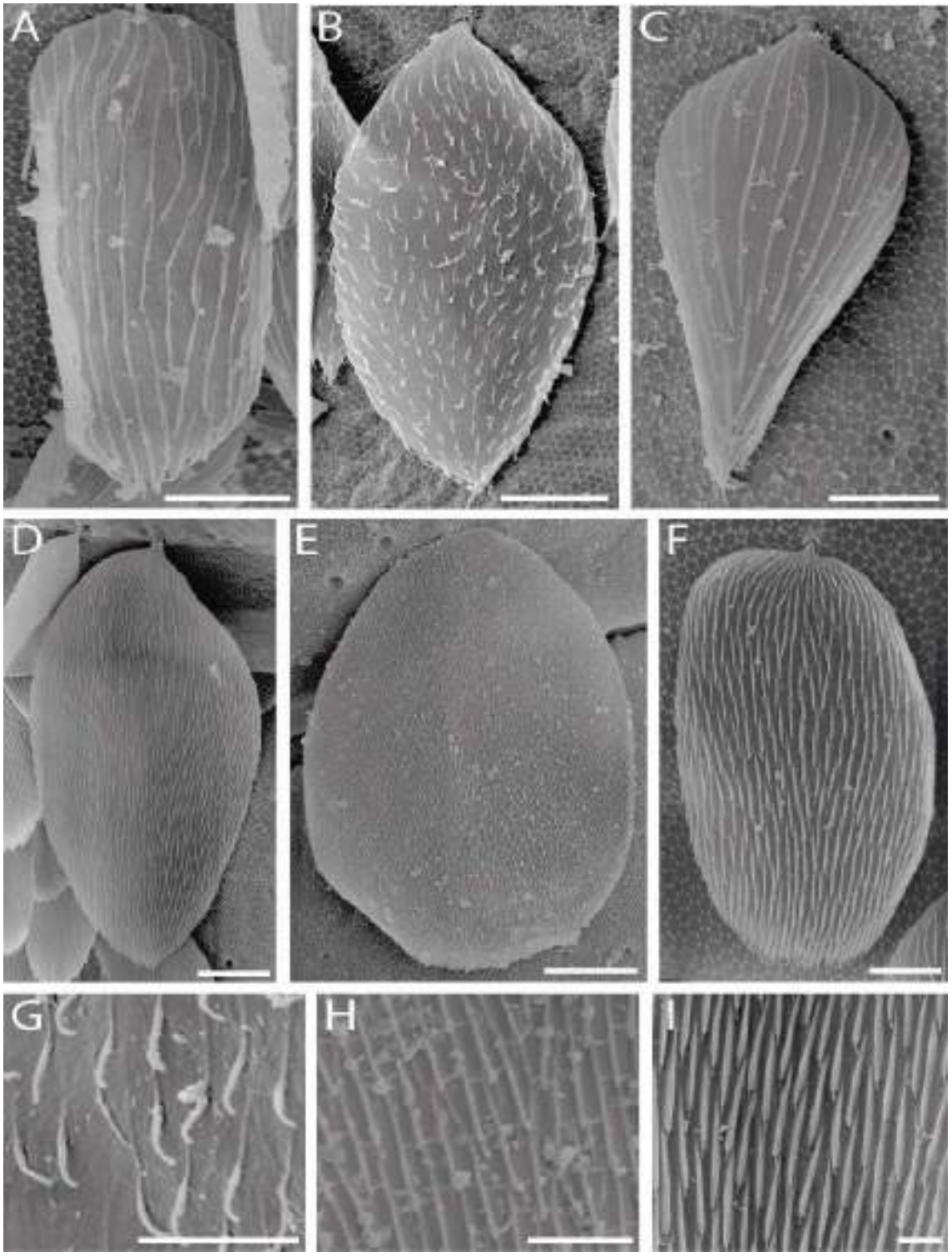

Fig.13. Escamas tergais (imagens de MEV). A, *Dicranocentrus* sp. (Heteromurinae), Th II (lado esquerdo). B, *A. ducke* (Entomobryinae), Abd IV (lado direito). C, *W. nigromaculata* (Entomobryinae), Abd IV (lado esquerdo). D, *L. colormutatus* (Entomobryinae), Th III (lado esquerdo). E, *L. amazonicus* (Lepidocyrtinae), Th III (lado esquerdo). F, *T. bicolorcornuta* (Seirinae), Abd II (lado direito). G–I, escultura das escamas. G, *A. ducke*. H, *L. amazonicus*. I, *L. colormutatus*. Barra de escala: D e E: 10 µm, A–C, F: 5 µm, G–I: 2 µm.

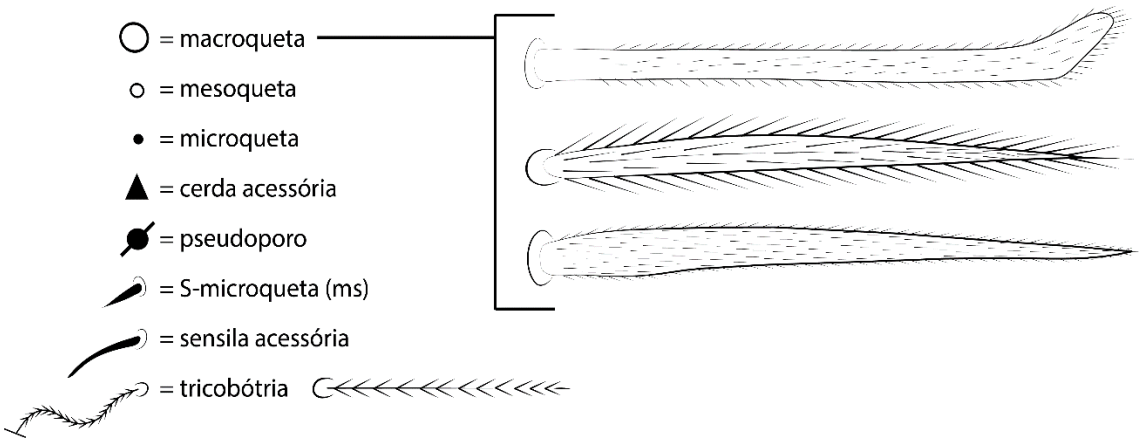

Fig. 14. Representação da quetotaxia e formas das mac tergais. Simbolos são representações das cerdas para as figuras 18–23.

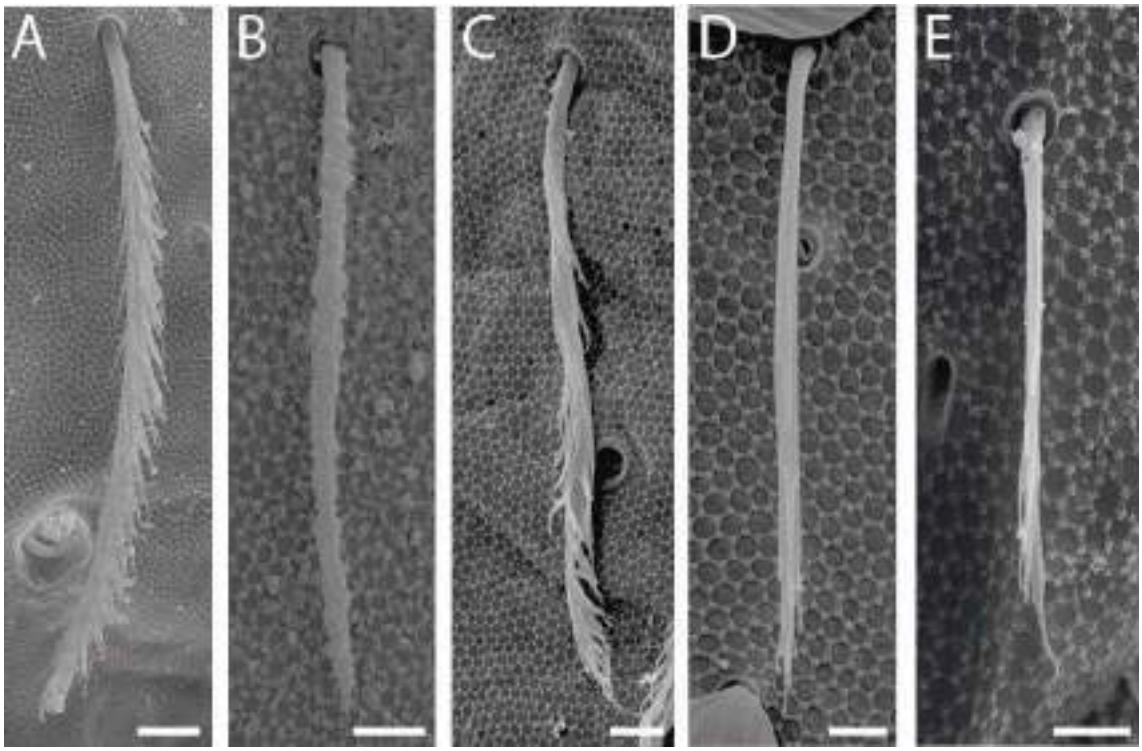

Fig. 15. Mic tergais da série amp do tronco (imagens de MEV). A, *H. sinensis* (Entomobryinae), Th II (lado esquerdo). B, *L. amazonicus* (Lepidocyrtinae), Abd IV (lado direito). C, *A. ducke* (Entomobryinae), Abd IV (lado direito). D, *W. nigromaculata* (Entomobryinae), Th II (lado direito). E, *T. bicolorcornuta* (Seirinae), Th II (lado direito). Barra de escala: A: 4 µm, B–E: 2 µm.

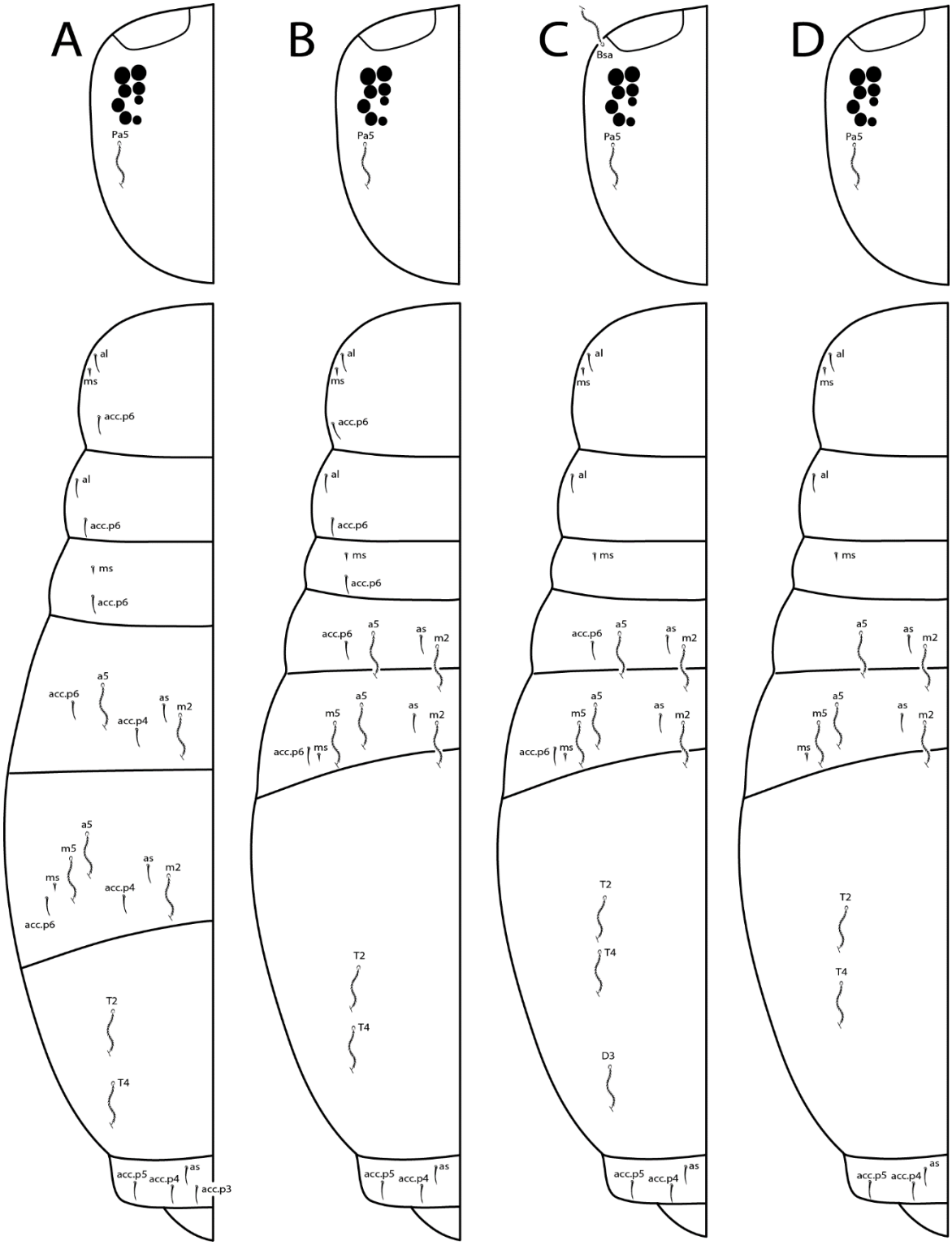

Fig. 16. Distribuição de tricobótrias e sensilas especializadas (S-chaetae) da cabeça ao Abd V (lado esquerdo dorsal). A, Heteromurinae. B, Entomobryinae. C, Seirinae. D, Lepidocyrtinae.

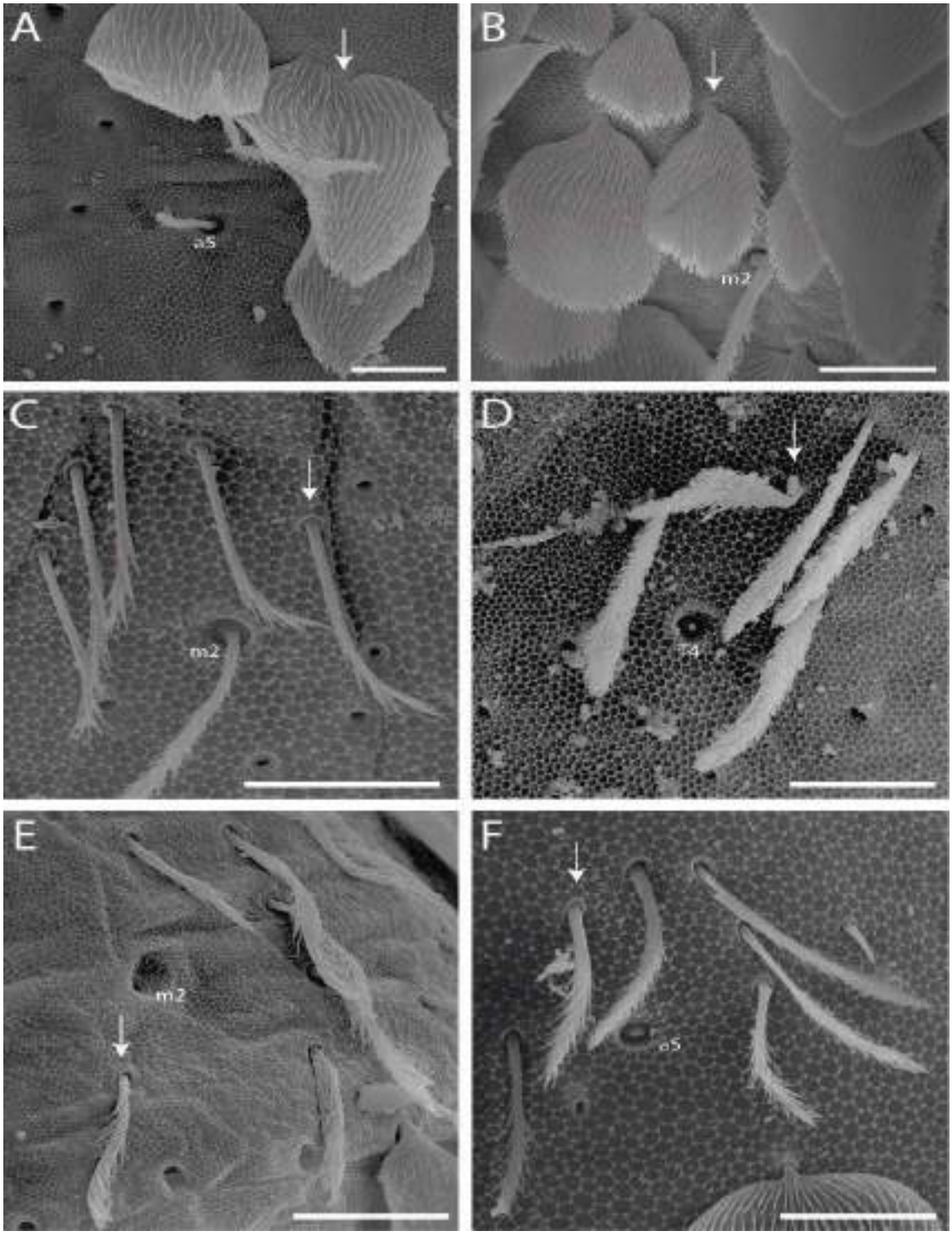

Fig. 17. Complexo tricobotrial do Abd II–IV (imagens de MEV). A, *Dicranocentrus* sp. (Heteromurinae), tricobótria **a5** do Abd III (lado esquerdo). B, *L. colormutatus* (Entomobryinae), tricobótria **m2** do Abd III (lado esquerdo). C, *W. nigromaculata* (Entomobryinae), tricobótria **m2** do Abd II (lado esquerdo). D, *L. amazonicus* (Lepidocyrtinae), tricobótria **T4** do Abd IV (lado esquerdo). E, *A. ducke* (Entomobryinae), tricobótria **m2** do Abd II (lado esquerdo). F, *T. bicolorcornuta* (Seirinae), tricobótria **a5** do Abd II (lado esquerdo). Setas indicam quetas acessórias das tricobótrias, A–B são escamas, C–D são diferentes tipos de cerdas. Barra de escala: 10 µm.

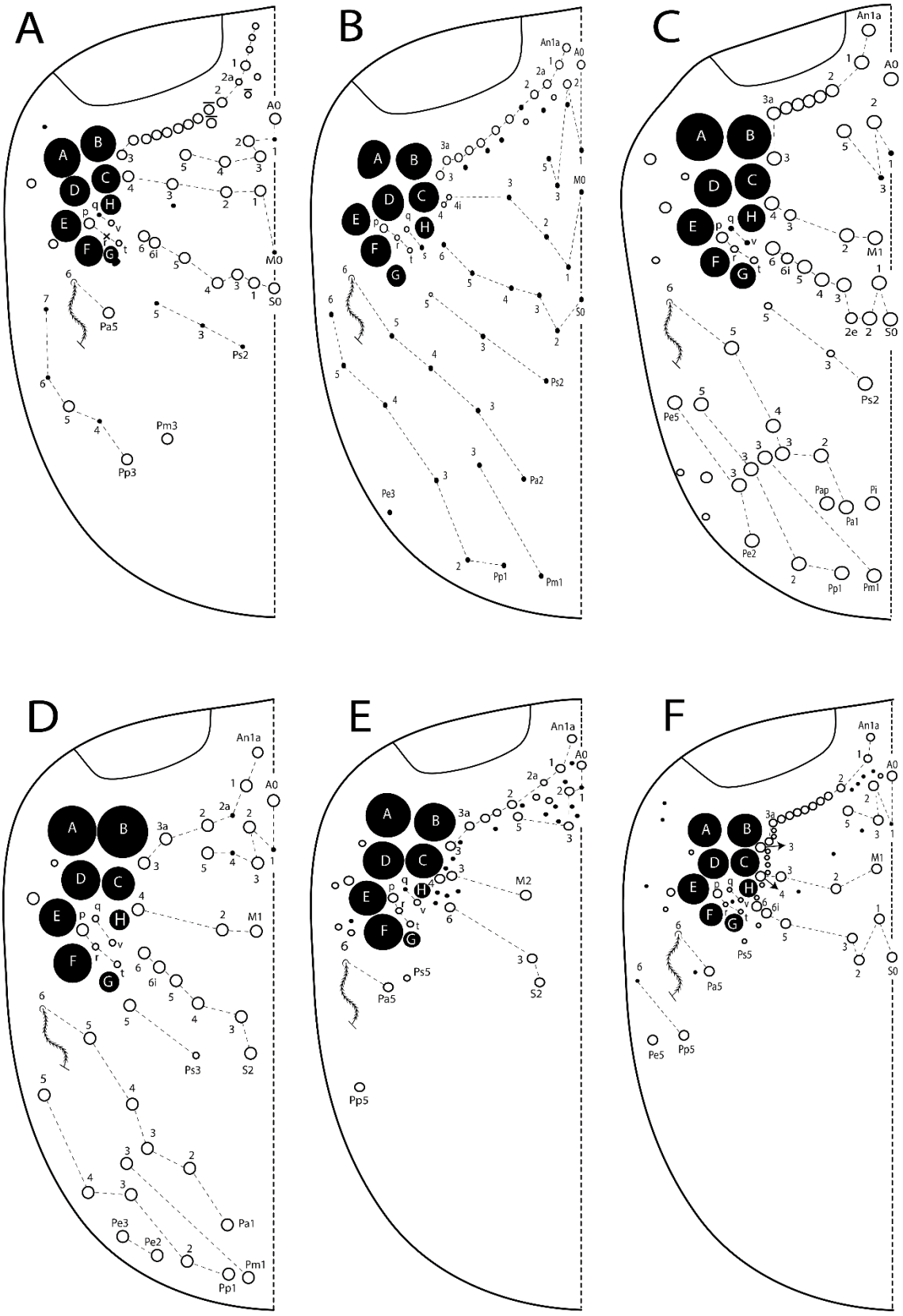

Fig. 18. Quetotaxia dorsal da cabeça (lado esquerdo). A, *Dicranocentrus* sp. (Heteromurinae). B, *L. amazonicus* (Lepidocyrtinae). C, *E. paroara* (Entomobryinae). D, *W. nigromaculata* (Entomobryinae). E, *L. rotorua* (Entomobryinae). F, *L. hopkini* (Entomobryinae).

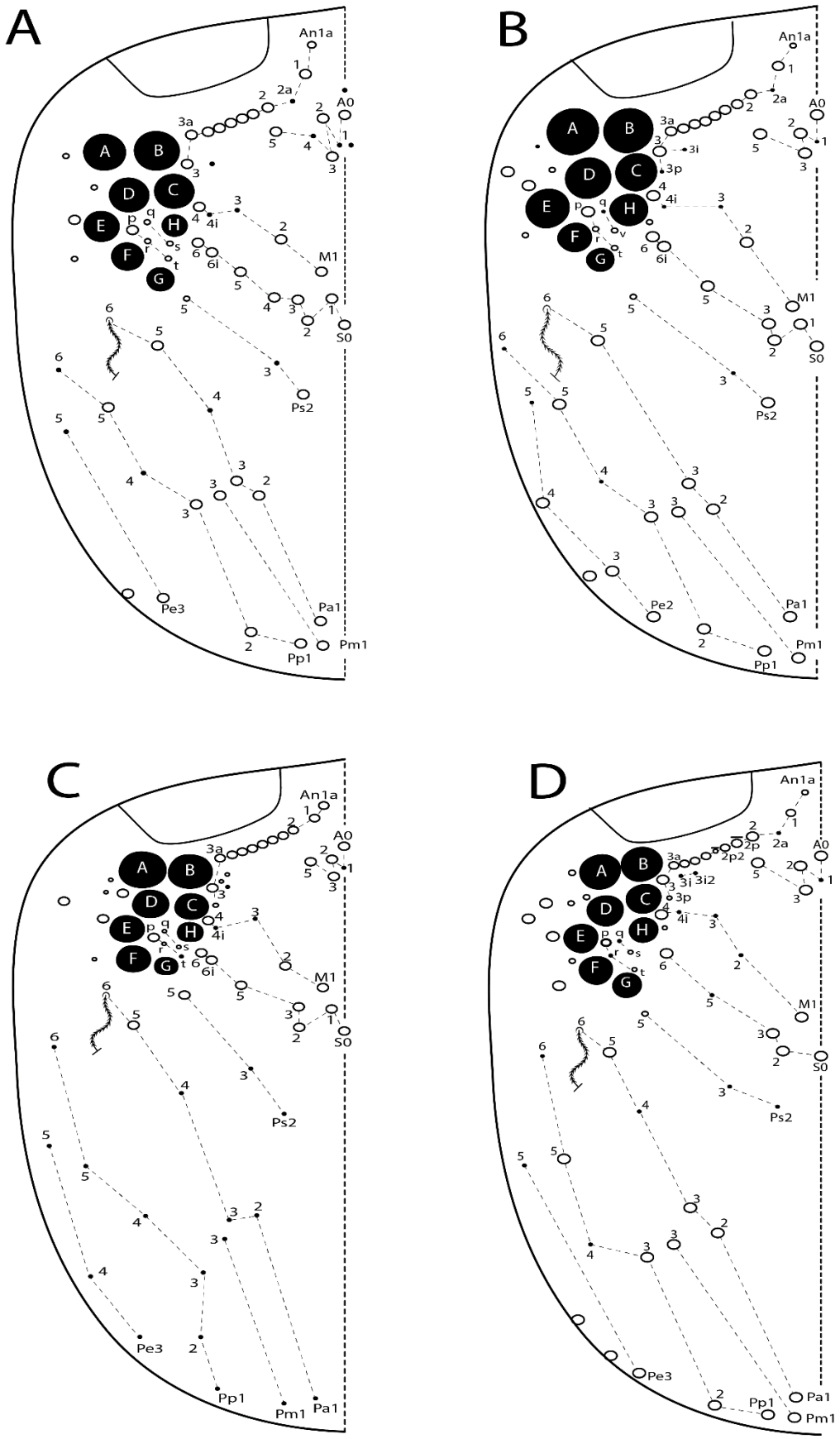

Fig. 19. Quetotaxia dorsal da cabeça (lado esquerdo) de Seirinae. A, *Austroseira* sp., B, *S. domestica*. C, *L. prodigus*. D, *T. raptora*.

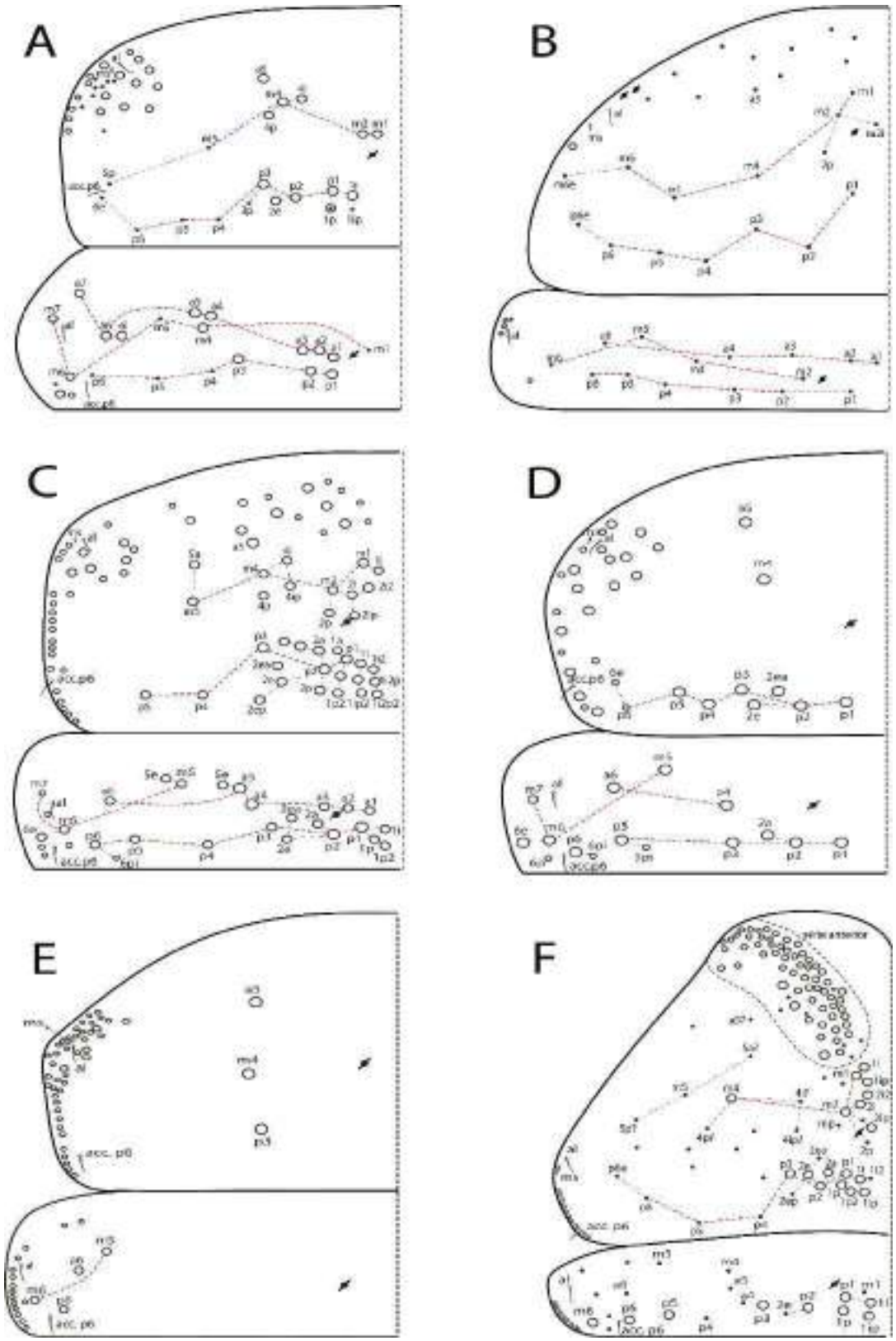

Fig. 20. Quetotaxia dorsal do Th II–III (lado esquerdo). A, *Dicranocentrus* sp. (Heteromurinae). B, *L. amazonicus* (Lepidocyrtinae). C, *E. paroara* (Entomobryinae). D, *W. nigromaculata* (Entomobryinae). E, *L. rotorua* (Entomobryinae). F, *L. hopkini* (Entomobryinae). Linhas vermelhas indicam cerdas primárias, linhas pretas indicam cerdas secundárias associadas às cerdas primárias.

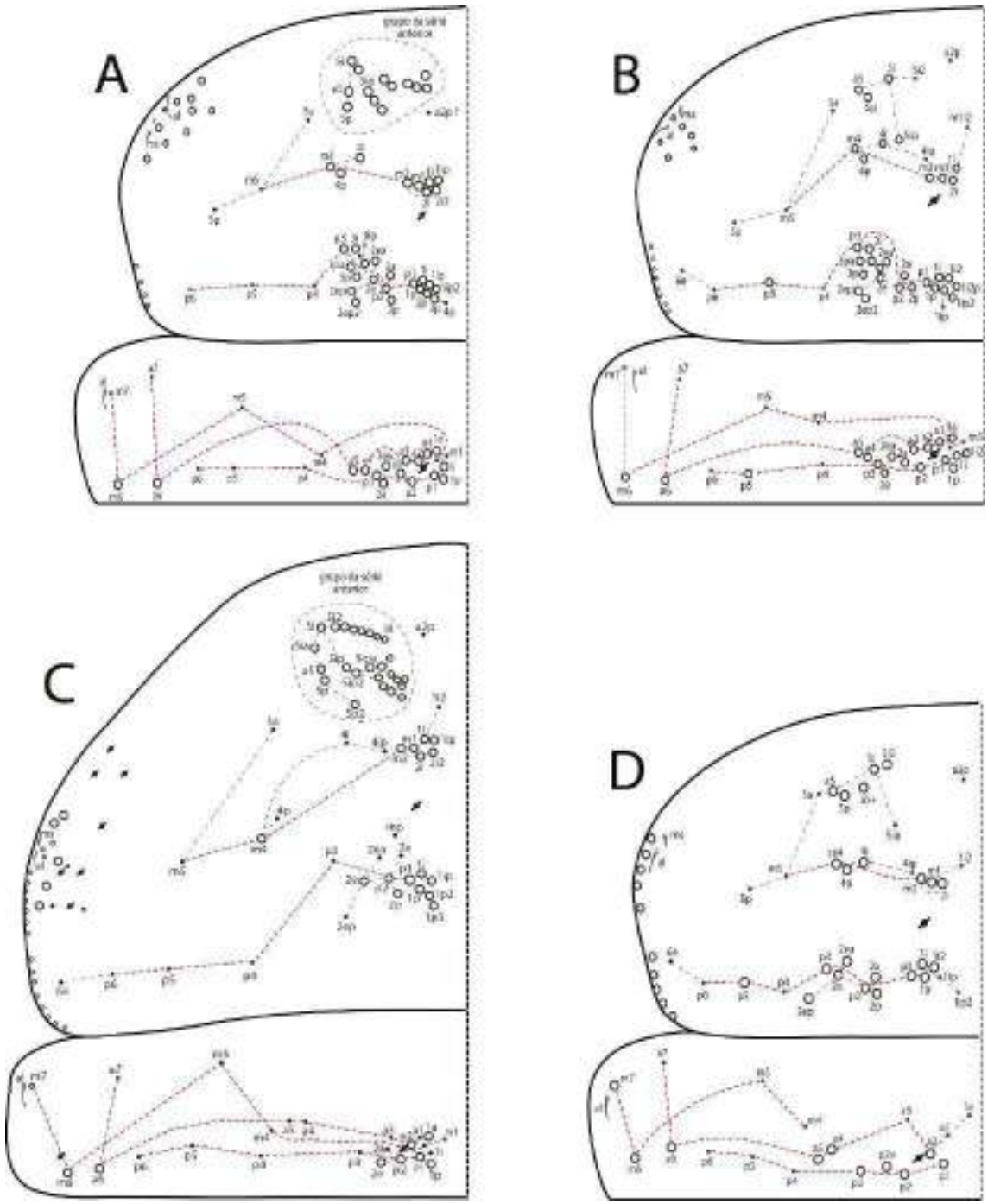

Fig. 21. Quetotaxia dorsal do Th II–III (lado esquerdo) de Seirinae. A, *Austroseira* sp. B, *S. domestica*. C, *L. prodigus*. D, *T. raptora*. Linhas vermelhas indicam cerdas primárias, linhas pretas indicam cerdas secundárias associadas às cerdas primárias.

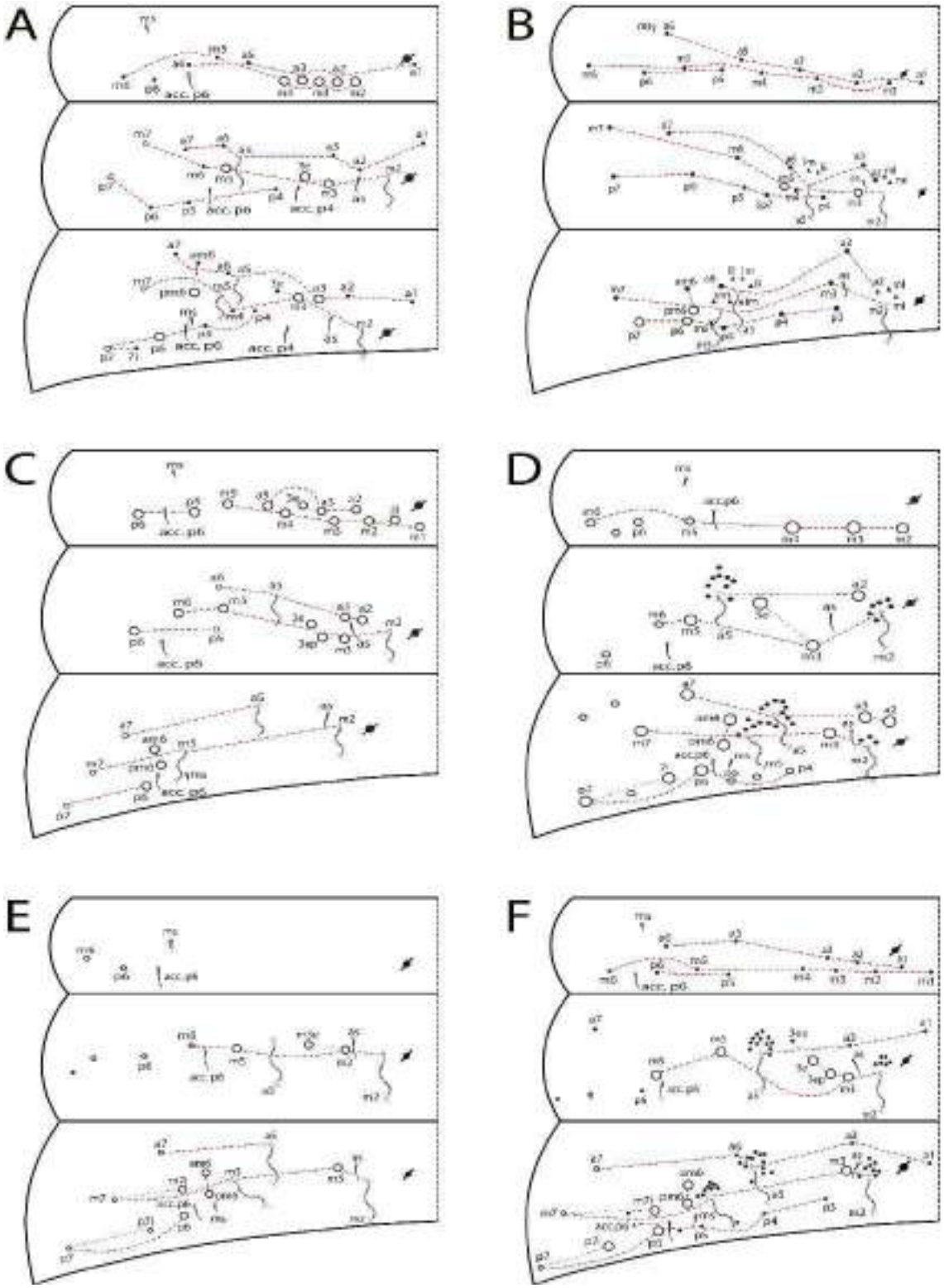

Fig. 22. Quetotaxia dorsal do Abd I–III (lado esquerdo). A, *Dicranocentrus* sp. (Heteromurinae). B, *L. amazonicus* (Lepidocyrtinae). C, *E. paroara* (Entomobryinae). D, *W. nigromaculata* (Entomobryinae). E, *L. rotorua* (Entomobryinae). F, *L. hopkini* (Entomobryinae). Linhas vermelhas indicam cerdas primárias, linhas pretas indicam cerdas secundárias associadas às cerdas primárias.

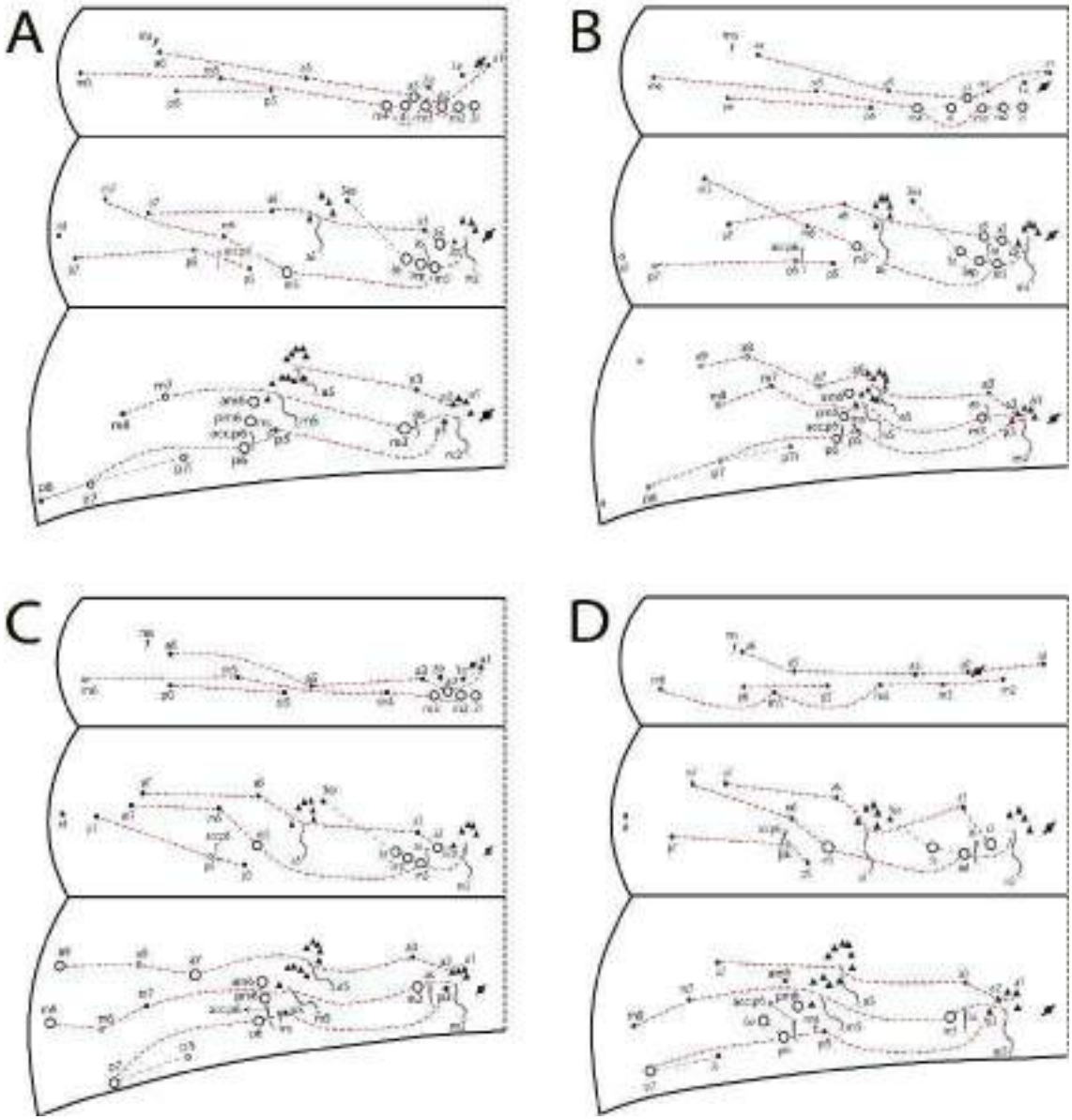

Fig. 23. Quetotaxia dorsal do Abd I–III (lado esquerdo) de Seirinae. A, *Austroseira* sp. B, *S. domestica*. C, *L. prodigus*. D, *T. raptora*. Linhas vermelhas indicam cerdas primárias, linhas pretas indicam cerdas secundárias associadas às cerdas primárias.

CAPÍTULO II

Cipola, N.G; Arbea, J.; Baquero, E.; Jordana, R.; Morais, J.W. & Bellini, B.C. 2018. **The survey of *Seira* Lubbock, 1870 (Collembola, Entomobryidae, Seirinae) from Iberian Peninsula and Canary Islands, including three new species.** Publicado na *Zootaxa*, 4458 (1): 001–066

Abstract

Here we present a survey of *Seira* fauna from Iberian Peninsula and Canary Islands, including the description of three new species from Spain: *Seira barrai* **sp. nov.**, *Seira betica* **sp. nov.** and *Seira burgersi* **sp. nov.**, the latter with unprecedented antennal morphology for *Seira*. Five species from Western Europe are redescribed and their dorsal detailed chaetotaxy is revealed for the first time: *S. domestica* (Nicolet), *S. dinizi* Gama, *S. ferrarii* Parona, *S. mantis* Zeppelini & Bellini and *S. pini* Jordana & Arbea, the first two from type locality, and the latter two based on analysis of the type material. A note on chaetal interpretation of the first abdominal segment for *Seira* is presented. An identification key to 31 species with known dorsal chaetotaxy from Western Palearctic region is also provided, including a discussion on dense macrochaetotaxy present in Palearctic and Oriental species and its reduction in species from others biogeographic regions.

Key words: Chaetotaxy, generic diagnosis, Portuguese and Spanish springtails, Seirini, taxonomy

Introduction

Seira Lubbock, 1870 is the fourth largest genus of Entomobryidae and the largest genus of Seirinae, widely distributed in the world and currently with about 200 nominal species, of which at least 35 species are reported from the Western Palearctic region (Bellinger *et al.* 1996–2018). Only seven species were recorded in Iberian Peninsula and Canary Island: *S. dollfusi* Carl, 1899, *S. domestica* (Nicolet, 1842), *S. ferrarii* Parona, 1888, *S. dinizi* Gama, 1988 (in Gama 1988a), *S. lusitanica* Gama, 1964, *S. mantis* Zeppelini & Bellini, 2006 and *S. pini* Jordana & Arbea, 1989, the last four originally described from these regions (Gama 1964, 1988a, 1988b; Jordana & Arbea 1989; Jordana *et al.* 1990; Arbea 2003; Zeppelini & Bellini 2006; Arbea & Ariza 2012).

This low richness from Western Palearctic region may be because *Seira* is predominantly an Holotropical taxon (Christiansen & Bellinger 2000). Also, concerning species from this region there is an overall lack of knowledge on detailed dorsal

chaetotaxy, which is currently the main feature to identify/describe species (Szeptycki 1979; Christiansen & Bellinger 2000; Soto-Adames 2008). For example, at least four *Seira* species from the Western Palearctic region can not be currently recognized since their original descriptions are too generic in the face of current taxonomy: *S. incerta* Handschin, 1925 (in Handschin 1925b), *S. istriana* Latzel, 1917, *S. rosei* Denis, 1925 and *S. sacchii* Parisi, 1969.

Furthermore, most Palearctic and Oriental *Seira* species differ from species from other regions by dense macrochaetotaxy (e.g. Gisin & Gama 1962; Jacquemart 1973; Jordana & Arbea 1989; Barra 2004a, 2004b, 2010; Negri *et al.* 2005; Baquero *et al.* 2014, 2015; Winkler & Dányi 2017). Therefore, the morphology of such species must be revealed to verify if these chaetotaxic patterns corroborate with their distribution, as well as help in unveiling the phylogenetic relationships within the genus and interspecific comparisons (Szeptycki 1979).

Here we present a survey of *Seira* fauna from Iberian Peninsula and Canary Islands, including three new species from Spain, redescription of five European species, and an identification key to 31 species with known dorsal chaetotaxy from Western Palearctic region.

Material and methods

Specimens were first preserved in 92% ethanol, cleared with Nesbitt's solution and then mounted on glass slides in Hoyer's medium following the procedures described by Jordana *et al.* (1997). Alive specimens were photographed in natural habitat using Fuji Finepix s5 pro camera with Nikon 55 mm f/2.8 AF Micro-Nikkor objective. Specimens in ethanol gel were photographed using a stereomicroscope (M165C) attached to a DFC420 digital camera. Photographs were digitally corrected using Application Suite V3.4.1.

Type material is deposited at the Invertebrate Collection of the Instituto Nacional de Pesquisas da Amazônia (INPA), Manaus; Collembola Collection of Department of Botany and Zoology of Federal University of Rio Grande do Norte (CC/UFRN), Natal; Entomology Collection of the Museu de Zoologia da Universidade de São Paulo (MZSP), Brazil; Facultad de Ciencias Naturales y Museo of La Plata (FCNyM-UNLP), Argentina; Natural History Museum of London (NHM), England; Museo Nacional de Ciencias

Naturales (MNCN) at Madrid, Museum of Zoology of University of Navarra (MZNA), pivate Collembola Collection of Javier Arbea (JIAP), Spain; Federation University Australia (FedUni), Ballarat, and South Australian Museum (SAM), Adelaide, Australia.

The terminology used in descriptions follows: labial chaetotaxy after Gisin's system (1967) to **a1**–**5** chaetae labels; labial papillae, maxillary palp and basolateral and basomedian labial fields after Fjellberg (1999); postlabial chaetotaxy after Chen & Christiansen (1993); clypeal chaetotaxy after Yoshii & Suhardjono (1992a); labral and subcoxae (outer side) chaetotaxy after Cipola *et al.* (2014a); unguiculus lamellae after Hüther (1986); manubrial formula after Christiansen & Bellinger (2000). The head dorsal chaetotaxy follows Jordana & Baquero (2005) adapted from Soto-Adames 2008 for the antennal (An), anterior (A), median (M), sutural (S), post-sutural (Ps), postoccipital anterior (Pa), postoccipital media (Pm), postoccipital posterior (Pp) and postoccipital external (Pe) series. The trunk dorsal chaetotaxy follows Szeptycki (1979) adapted from Soto-Adames (2008), including groups **PmA**, **PmB** and **PmC** of posterior macrochaetae on the second thoracic segment and a new chaetal interpretation for Abd I; and specialized chaetae (S-chaetae) after Zhang & Deharveng (2015). In all species the anterior chaetae collar of the Th II is omitted. Symbols used to depict the chaetotaxy are presented in Figure 1. Chaetae of uncertain homology are followed by a question mark (?). Chaetotaxy all given to one side of body only.

Abbreviations: Abd—abdominal segment, Ant—antennal segment, mac—–macrochaeta(e), mes—mesochaeta(e), mic—microchaeta(e), psp—pseudopore(s), Th—thoracic segment, ms—specialized microchaeta(e), sens—specialised ordinary chaetae, ai—antero-interna lamella, ae—antero-externa lamella, pi—postero-internal lamella, pe—postero-external lamella.

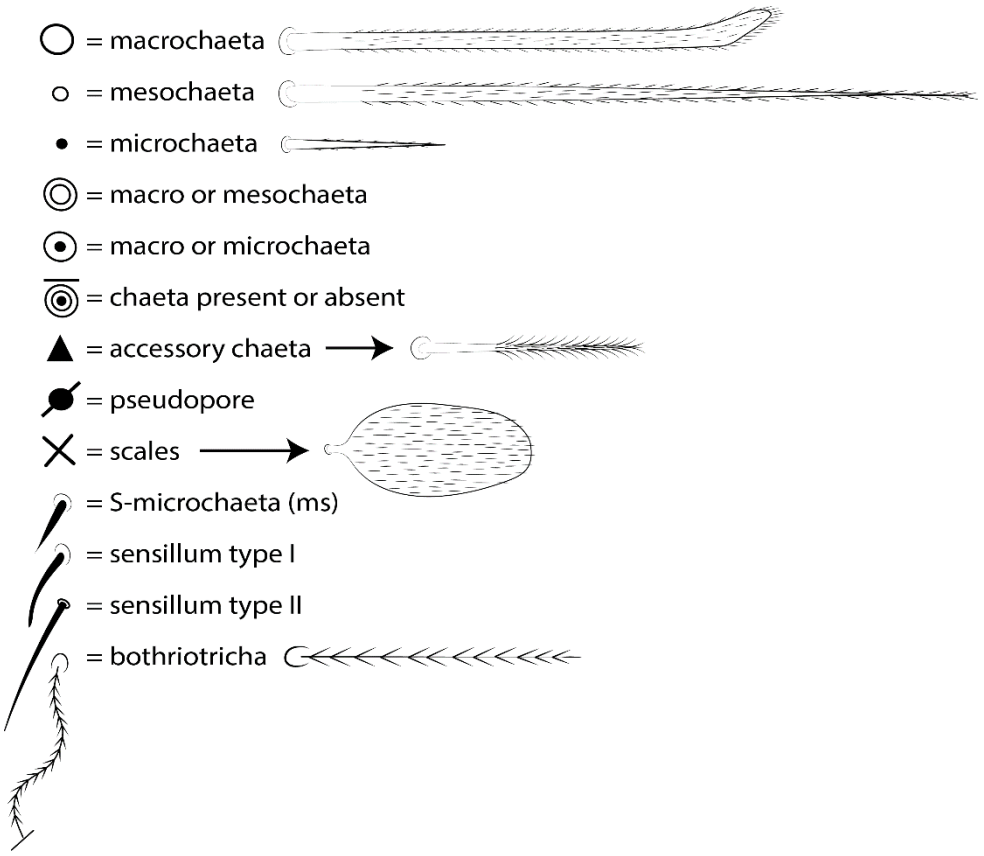

FIGURE 1. Symbols used to represent dorsal chaetotaxy of *Seira* species.

Taxonomy

Family Entomobryidae Tömösvary, 1882

Subfamily Seirinae Yosii, 1961 *sensu* Zhang & Deharveng, 2015

Genus *Seira* Lubbock, 1870

Seira Lubbock, 1870: 279

Type species: *Degeeria domestica* Nicolet, 1842: 76, pl.8, fig. 11 (orig. descr.).

Sira Tullberg, 1872: 41, synonymized by Yosii, 1959: 9

Pseudosira Schött, 1893: 10, synonymized by Yosii, 1959: 9

Mesira Scherbakov, 1898: 18, synonymized by Yosii, 1959: 9

Lepidocyrtinus Börner, 1903: 154, synonymized by Soto-Adames *et al.* 2008: 512

Drepanocyrtus Handschin, 1924: 17, synonymized by Mari Mutt & Bellinger, 1990: 10

Lepidoregia Delamare Deboutteville, 1948: 407, synonymized by Soto-Adames *et al.* 2008: 512.

Ctenocyrtinus Arlé, 1959: 171, synonymized by Christiansen & Bellinger, 2000: 39.

Afroseira Yosii, 1959: 10, synonymized by Soto-Adames *et al.* 2008: 512

Lepidokrugeria Coates, 1969: 87, synonymized by Soto-Adames *et al.* 2008: 512.

Austroseira Yoshii & Suhardjono, 1992 (in Yoshii & Suhardjono, 1992b) 23, synonymized by Soto-Adames *et al.* 2008: 512

Diagnosis of genus. Antenna shorter than body length (Figs 2–3). Scales on body heavily ciliated, oval or elongated and apically rounded (rarely truncate, pointed or irregular); mac heavily ciliated apically, strongly or lightly foot-shaped or acuminate (Figs 30A–F). Eyes 8+8 (Fig. 5F). Prelabral chaetae ciliated or smooth; Labral formula with 4 (**a1–2**), 5 (**m0–2**), 5 (**p0–2**) smooth chaetae (Figs 4A, 36C). Labral papillae present (Fig. 5D). Labial palp with five main papillae (A–E) plus one hypostomal papilla (H) with 0, 5, 0, 4, 4, 2 guard appendages, respectively; labium with five smooth proximal chaetae (p.c.) (Fig. 4B). Basolateral and basomedian labial fields with chaetae **a1**–**5** smooth (Fig. 5G). Th II–Abd V with ms and sens formula 1, 0 | 1, 0, 1, 0, 0 and 1, 1 | 0, 2, 2, +, 3, respectively; Abd II–IV bothriotrichial formula 2 (**a5**, **m2**), 3 (**a5**, **m2**, **m5**), 3 (**T2**, **T4**, **D3**); bothriotricha with accessory lance-shaped chaetae (Figs 1, 11–12, 30G–J). Males sometimes with robust spine-like mac on femur and tibiotarsus of leg I (Fig. 8E). Pretarsi with one minute smooth chaeta on anterior and posterior sides (Fig. 8F). Mucro falcate, without basal spine (Figs 4C, 35F).

Remarks. The following characters are shared by *Seira* species and are not repeated in the descriptions:

Ant I–IV with ciliate chaetae (Fig. 5A–B). Four prelabral ciliate chaetae, except in *S. burgersi* **sp. nov.** with inner smooth chaetae; labrum with chaeta **a1** thicker, **m0–1** and **p0–1** larger, except **m0** normal in *S. dinizi* and *S. ferrarii* (Figs 4A, 36C). Labial papilla E with lateral process (l.p.) apically acuminate and surpassing the base of the papilla E (Fig. 4B). Sublobal plate with three smooth chaetae (Figs 5E, 10D, 31D). Unguis inner side with two paired basal teeth, one unpaired median tooth and one unpaired apical tooth (absent in *S. barrai* **sp. nov.**), outer side with two paired lateral teeth (larger in *S. burgersi* **sp. nov.**, Fig. 40H) and one basomedian lamella apically acuminate (Figs 8F, 21F, 25E, 29E, 34E).

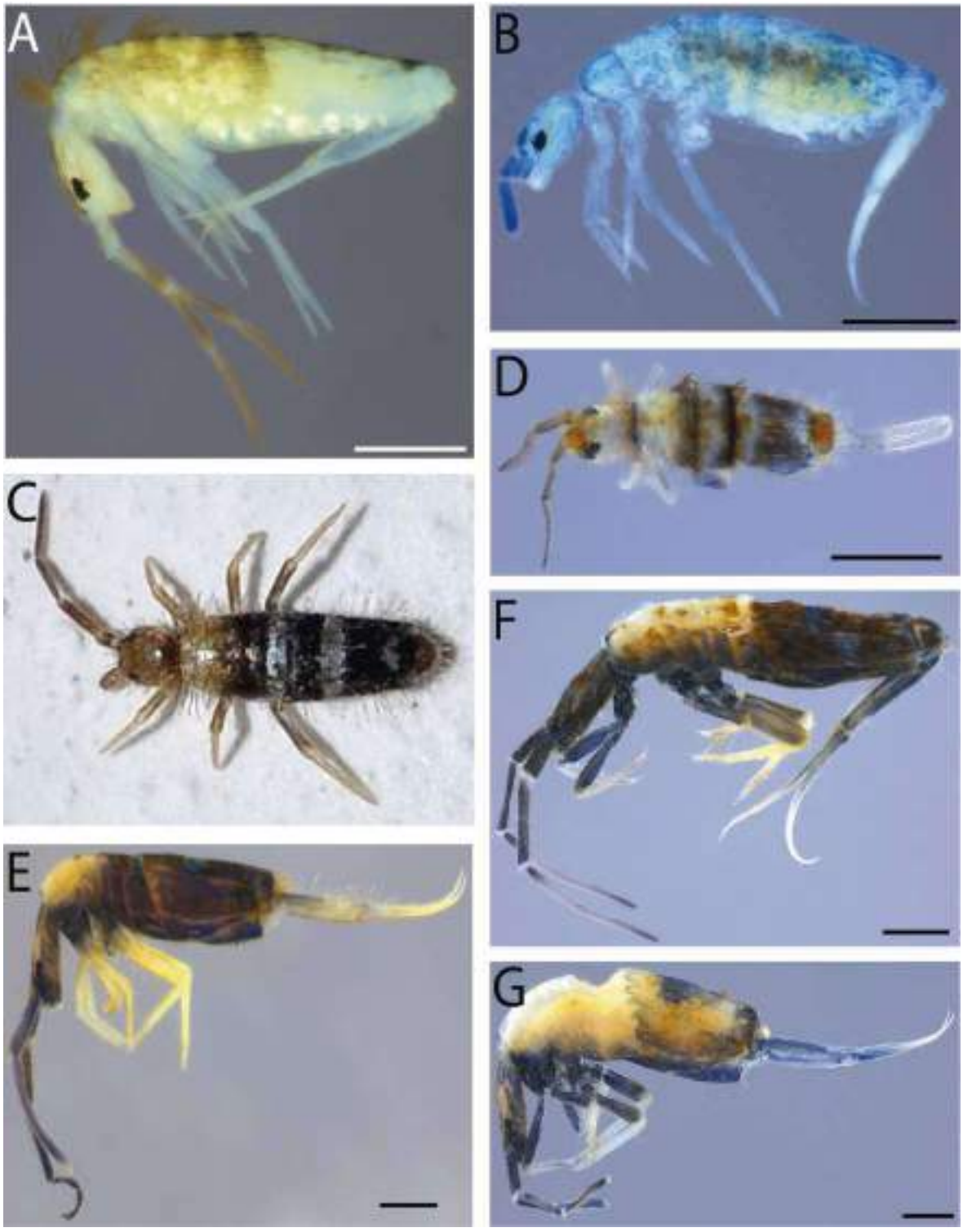

FIGURE 2A–G. *Seira* spp., habitus: **A**, *S. domestica*; **B**, *S. dinizi*; **C**–**D**, *S. ferrarii*: **C**, in natural habitat, courtesy of Francisco Rodríguez (http://www.biodiversidadvirtual.org/insecta rium/Seira-ferrarii-img750580.html), **D**, in alcohol; **E**–**G**, *S. pini*: **E**, paratype, **F**, specimen with pigmentation in legs from Monegros (Spain), **G**, specimen depigmented on Th II to Abd III and with one median spot on Abd IV from Monegros (Spain). Scale bars: 0.5mm.

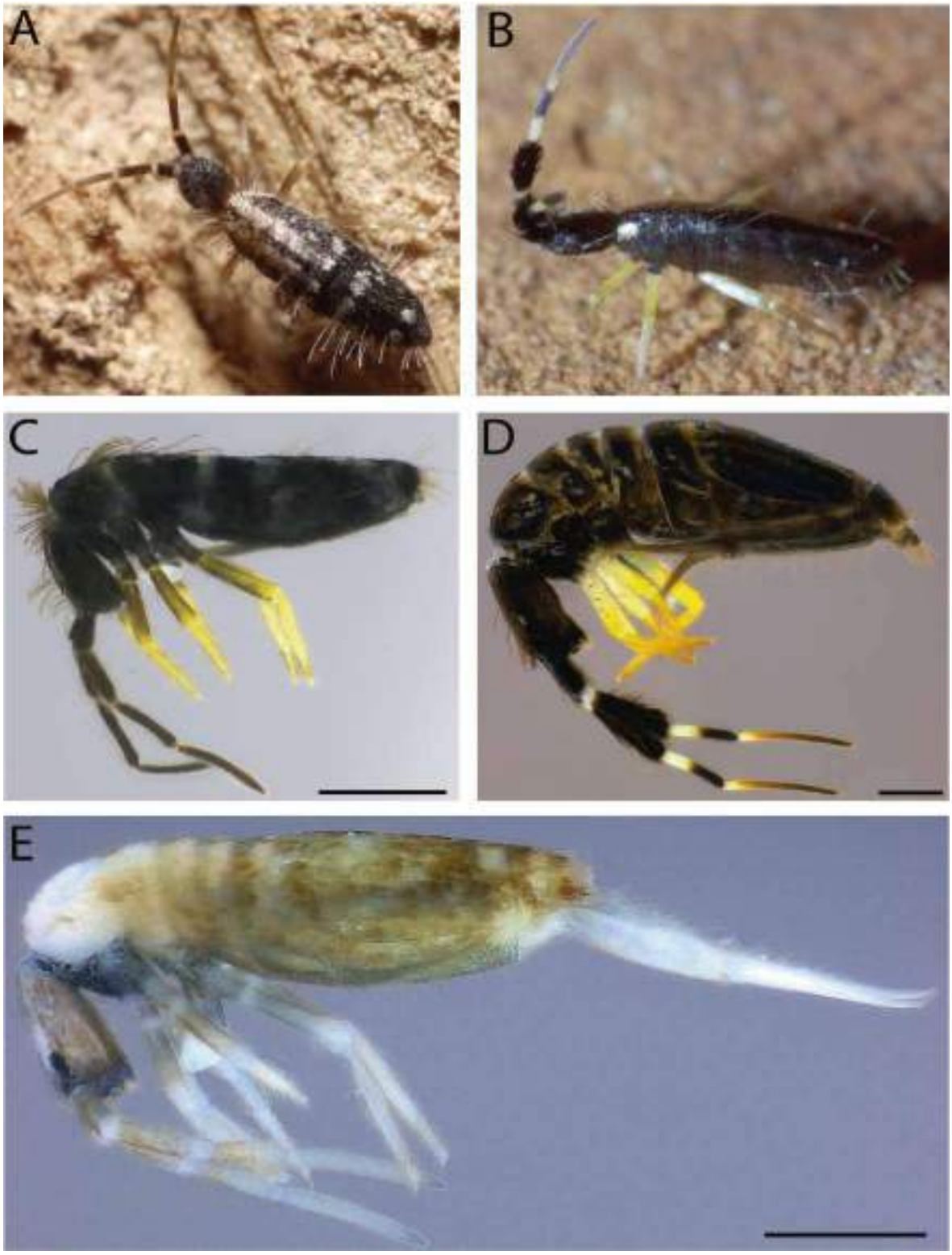

FIGURE 3A–E. *Seira* spp., habitus (lateral view, except **A** in dorsal): **A**–**B**, in natural habitat, **A**, *S. betica* **sp. nov.**, courtesy of André Burgers (http://www.biodiversidadvirtual.org/insectarium/Seira-betica-img961392.html), **B**, *S. burgersi* **sp. nov.**, courtesy of André Burgers (http://www.biodiversidadvirtual.org/insectarium/Seira-burgersi-img961393.html); **C**–**E**, preserved in alcohol: **C**, *S. barrai* **sp. nov.**, **D**, *S. burgersi* **sp. nov.**, **E**, *S. betica* **sp. nov.** Scale bars: 0.5mm.

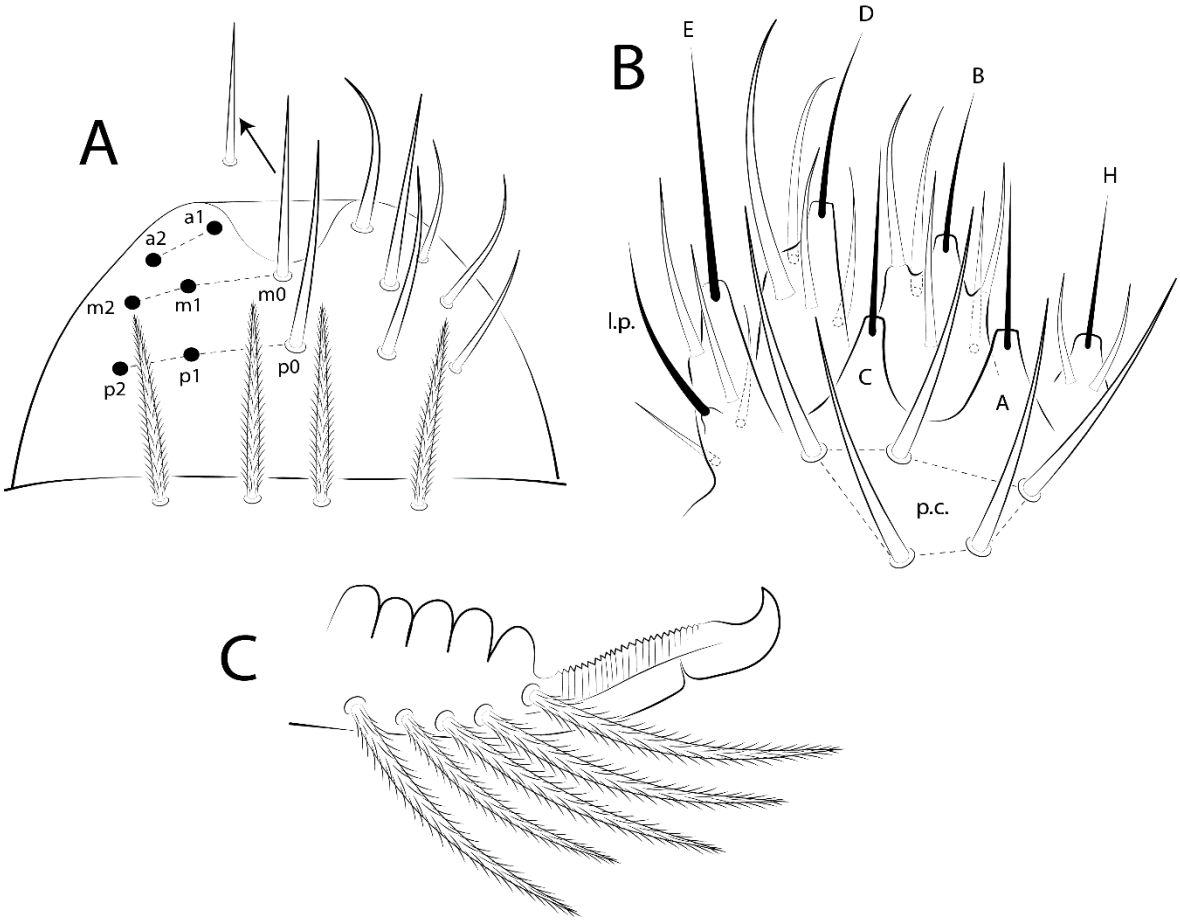

FIGURE 4A–C. Characteristics present in description of *Seira* species: **A**, prelabral and labral chaetotaxy (dorsal view), arrow indicates **m0** chaeta smaller in some species; **B**, labial palp and proximal chaetae (ventral view), "p.c." is proximal chaetae, "l.p." is lateral process of papilla E; **C**, distal dens and mucro (lateral view).

***Seira domestica* (Nicolet, 1842)**

Figs 2A, 5–9

Degeeria domestica Nicolet, 1842: 76, pl.8, fig. 11 (orig. descr.), not examined. Nicolet, 1847: 370, Suisse and France (record). *Seira domestica*; Lubbock, 1870: 279, London, England (comb. and descr.). Lubbock, 1873: 144, pl.21, fig.1 (descr.). Denis, 1938: 137, figs. 7–10, Venice, Italy (descr. as *Lepidocyrtinus gridellii*). Gisin & Gama, 1962: 789, figs 3, 4A, 5A, 6–7, Geneva, Switzerland (descr.). Jacquemart, 1973: 6, fig. 3, Petra, Jordan (chaetotaxy compared). Christiansen & Bellinger, 2000: 62, figs. 27A, 40, United States (descr.).

Diagnosis. Body with pigments on Ant II–IV (Fig. 2A); head mac **M4i**, **S4**, **Pa4** and **Pp6** absent, eyepatches with 4–5 interocular chaetae (**q** eventually absent) (Fig. 5D); labral papillae conical, outer papilla slightly smaller (Fig. 5F); Th II with 4 medio-central mac (**m1**–**1i**, **m2**–**2i**) and **PmA**–**PmC** groups with 5–7, 1–3 and 8–10 mac respectively (Fig. 6A); Th III–Abd III with 11–15, 6, 5 and 1–2 (rarely **a3** as mac) central mac, respectively (Figs 6B–E); Abd IV with 12 central and 18 lateral mac (Fig. 7A); males with one inner row of 5 mac finely ciliate on femur I and 6 proximal spine-like mac on tibiotarsus I (Fig. 8E); unguis apical tooth present; unguiculus outer edge serrated and with proximal tooth (Fig. 8E); manubrium ventrally with 2/4 subapical and 16 apical chaetae (Fig. 9B).

Examined material. 1 male and 1 female on slide (sample 1979-369/NHM): England, London, Hampstead Village (51°33'N, 00°10'W), indoors, 100 m approx., 11.x.1937, F.G.M.W.S. coll. 1 female on slide (sample 1979-369/NHM): Spain, Navarra Province, Pamplona municipality, University of Navarra (42°48'13"N, 01°39'54"W), in laboratory benchtop, 435 m, 02.xi.1976, R. Jordana coll. 1 female on slide (sample 20151001a/MZNA): University of Navarra (42°48'13"N, 01°39'54"W), in laboratory benchtop, 435 m, 30.ix.2015, E. Baquero coll. 1 male and 3 females on slide and 5 specimens in alcohol (EVA0051/INPA): Valencia Province, Devesa del Saler (39º16'08"N; 00º20'02"W), under *Pistacia* L. (Anacardiaceae) in beach dunes, 6 m, 10.vi.2004, S. Montagud and team coll. 1 male and 2 females on slide (ESA0023/JIAP), Cantabria Province, El Astillero municipality, (43º20'58"N, 03º51'49"W), in collector's house, 20 m, 14.iv.2014, J.I. Arbea coll. 4 females on slide (ECS0008/JIAP): Castellón Province, Fanzara Municipality, Cova de la Mola (39º59'30"N, 00º25'23"W), 229 m, 17.vii.2005, pitfall- trap, A. Sendra coll. 1 female on slide and 2 specimens in alcohol (EVA0010/INPA): Valencia Province, Titaguas municipality, La Rebollosa (39º49'30"N, 01º07'49"W), under *Salvia officinalis* L. (Lamiaceae), 720 m, 23.viii.1996, A.M. Monteagudo coll. 4 females and 1 juvenile on slides and 6 specimens in alcohol (CC/UFRN): Iran, Mazandaran Province, Sari city, Semeskandeh Wildlife Refuge (36°33'N, 53°09'L), 115 m, 04.xii.2015, pitfall-trap, M. Ghasemi coll. 1 specimens in alcohol (INPA), *idem*, except 07.vii.2016. 1 male on slide (SAM): Australia, New South Wales, Sidney (33º53'S, 151º12'L), living room of house of asthmatic, xi.1987, R. Baker coll. 1 female on slide (SAM): Australian Capital Territory, Canberra, Black Mountain Laboratory (33º53'S, 151º12'L), in green house, ii.1995, P. Hart coll. 1 male on slide (FedUni): Victoria, Melbourne, Melbourne University, contaminant laboratory, 2013-2014,

R. Slatyer coll. 1 female on slide (SAM): Rutherglen (36º03'S, 146º27'L), wheatfield plot 52 4b, soil core, 31.v.1994, BL ML coll. 1 male on slide (SAM): South Australia, 10km S Robe, Little Dip Conservation Park (37º10'S, 139º48'L), Erringtons Hole, mobile sand dune, litter, 04.ii.1978, P.J.G. coll. 1 female on slide (SAM): Peterborough, Comet Bore (32º11'S, 139º22'L), 90 mile in desert, 252 m, heath litter, 10.x.1977, P.J.G. coll. 1 female on slide (SAM): Adelaide, Mitcham (34º59'S, 138º37'L), by porch light, 1.7m high on wall, 06.ix.1978, Southcott coll.

Description based on the listed specimens. Total length (head + trunk) 2.64–3.79 mm; Th ratio as II: III = 1: 0.55–0.78; Abd ratio as III: IV = 1: 3.28–4.51 (n= 4). Specimens pale white with orange to bluish pigment on distal half of Ant II to apex of Ant IV; eyepatches black (Fig. 2A). Scales present on Ant I to Ant IV basally, ventral and dorsal head, thorax and abdomen dorsally, legs (except empodia), anterior collophore and manubrium and dentes ventrally.

Head. Antennae shorter than body length, antennal ratio as I: II: III: IV = 1: 1.63–1.86: 1.67–1.91: 2.28–2.86 (n=4) (Fig. 2A). Ant IV weakly annulated, with simple apical bulb and blunt sens (Fig. 5A). Ant III apical organ with two rod-like sens, 3 guard sens, several blunt sens of different sizes and two spine-like sens (Fig. 5B). Clypeal formula with 4 (**l1**–**2**), 4 (**f**), 3 (**pf0**–**1**) ciliate chaetae, **l1** acuminate, **l2** largest (Fig. 5C). Four conical labral papillae, outer papillae slightly smaller (Fig. 5D). Maxillary palp with smooth apical appendage (a.a.) and basal chaeta (b.c.) weakly ciliated, thicker and 1.14 longer than the apical (Fig. 5E). Eyes A and B larger, G smaller, with 4–5 interocular chaetae (**q**, **v**, **p**, **r**, **t**), **q** rarely absent; head dorsal chaetotaxy (Fig. 5F) with 10 ‘An’ mac (**An1, An2**–**3**), 4 ‘A’ mac (**A0**, **A2**–**3**, **A5**), 3 ‘M’ mac (**M1**–**2**, **M4**), 7 ‘S’ mac (**S0**–**3**, **S5**–**6**), 1 ‘Ps’ mac (**Ps2**), 4 ‘Pa’ mac (**Pa1**–**3**, **Pa5**), 2 ‘Pm’ mac (**Pm1**, **Pm3**), 4 ‘Pp’ mac (**Pp1**–**3**, **Pp5**), and 4 ‘Pe’ mac (**Pe2**–**4** plus **Pe3p**). Basomedian and basolateral labial fields with **M1**–**2**, **R**, **E**, **L1**–**2**, **R** smaller. Postlabial ventral chaetotaxy with about 16 ciliate chaetae, postlabial formula 4 (**G1**–**4**), 3 (**H2**–**4**), 4 (**J1**–**4**), basal chaeta (b.c.) largest (Fig. 5G).

Thorax chaetotaxy (Figs 6A–B). Th II, series ‘a’ with 4 mac (**a5ip**–**5p**); series ‘m’ with 6–7 mac (**m1i**–**1**, **m2i**–**2**, **m4i**–**4p**), **m4p** generally present; series ‘p’ with 15–21 mac (**p1i2p**–**1p**, **p2a–2ep2**, **p3i3–p3p**, **p5**), **p1i2p**, **p1ip2**, **p2a**, **p2p**, **p2ea** and **p3i3** present or absent. Th III, series ‘a’ with 6–7 mac (**a1a**–**6**), **a1a** generally as mac; series ‘m’ with 1 mac (**m6**); series ‘p’ with 7–10 mac (**p1i2**–**1p**, **p2a**–**2ea**, **p3**, **p5**–**6**), **p1i2** and **p1i** generally absent, **p2e** rarely as mic.

Abdomen chaetotaxy (Figs 6C–E, 7A–B). Abd I, series ‘a’ with 1 mac (**a3**); series ‘m’ with 5 mac (**m2i**–**4**). Abd II, series ‘a’ with 2 mac (**a2–3**); series ‘m’ with 4 mac (**m3**–**3e**, **m5**). Abd III, series ‘a’ with **a3** rarely as mac; series ‘m’ with 3 mac (**m3**, **am6**, **pm6**); series ‘p’ with 1 mac (**p6**). Abd IV with 12 central mac of series ‘A’ to ‘T’ (**A3a**–**6**, **Ae7**, **B3**–**6**, **C1**, **T1**), and 18 lateral mac of series ‘E’ to ‘Fe’ (**E2**–**4p**, **Ee7**, **Ee10**, **F1**–**3**, **Fe2**–**5**); at least 5 sens (**ps** type I and 4 type II), and posteriorly with 7 mes present. Abd V, series ‘a’ with 1 mac (**a5**); series ‘m’ with 4 mac (**m2**–**3**, **m5**–**5e**); series ‘p’ with 6 mac (**p1**, **p3**–**5**, **ap6**–**6e**).

Legs. Subcoxa I with 5 chaetae and 2 psp; subcoxa II with an anterior row of 11 chaetae and 1 anterior chaeta, posterior row of 4 chaetae, 1 anterior and 1 posterior chaetae and 5 psp; subcoxa III with one row of 10 chaetae and 2 posterior psp (Figs 8A–C). Trochanteral organ with about 20 spine-like chaetae (Fig. 8D). Unguis with median tooth larger, apical tooth smaller than basal teeth. Unguiculus with all lamellae acuminate, pe lamella serrated and with small proximal tooth, other lamellae (ai, ae, pi) smooth; ratio unguis: unguiculus = 1: 0.51 (Fig. 8F). Tibiotarsus III distally with inner smooth chaeta 1.13 larger than unguiculus; and outer tenent hair capitate, discretely ciliate, and 0.80 smaller than unguis.

Leg I of males (Fig. 8E). Femur I with one inner row of 5 finely ciliate mac of different sizes, one robust spine-like chaeta, 6 small truncate chaetae, and one proximal chaetae ciliate and apically acuminate; outer side with 3 chaetae ciliate and apically acuminate. Tibiotarsus I armed with one inner row of 6 proximal spine-like mac finely ciliate and apically acuminate or rounded, followed by 8 thicker chaetae finely ciliate; outer side with one proximal chaeta ciliate and apically acuminate.

Collophore (Fig. 9A). Anterior side with 10 ciliate chaetae, including 1 distal mac and 1 acuminate long chaeta; posterior side with 8 ciliate chaetae, of which 1 distal thicker; lateral flap with 3 smooth chaetae (one smaller posteriorly) and 16 ciliate chaetae.

Furcula (Figs 9B–C). Manubrium ventrally with formula 1, 2, 2, 2/4 (subapical), 14 (apical) ciliate chaetae and approximately 9 elongated apical scales per side; manubrium dorsally with 7 subapical ciliate chaetae; manubrial plate with 6–7 ciliate chaetae and 3 psp.

Remarks. *Seira domestica* resembles other species from the Western Palearctic region as *S. atlantica* Negri, Pellecchia & Fanciulli, 2005, *S. dagamae* Dallai, 1973, *S. deserti* Jacquemart, 1974 and *S. graeca* Ellis, 1966 by head mac **M4i**, **S4**, **Pa4** and **Pp6**

absent, Th II with 4 medio-central mac (**m1**–**1i**, **m2**–**2i**) and Abd I–IV with 6, 5, 1 and 12 central mac, respectively (Tab. 2). However, *S. domestica* differs from these species by Ant IV annulated (simple in *S. atlantica* and *S. dagamae*), four conical labral papillae (two inner in *S. atlantica*), basomedian labial field with chaeta **R** smaller than others (subequal than others in *S. atlantica*, *S. deserti* and *S. graeca*), trochanteral organ with about 20 spine-like chaetae (more in *S. atlantica* and *S. dagamae*, less in *S. deserti*), unguis with median teeth larger than basal (subequal in *S. atlantica*, *S. deserti* and *S. graeca*), and unguiculus with outer lamella serrated (smooth in *S. atlantica* and *S. dagamae*). In addition, *S. domestica* differs from these species in chaetotaxy of the Th II with 8–10 mac in **PmC** group and Abd IV with 18 lateral mac, while in these other species such chaetotaxy is reduced (less than 6 mac in **PmC** group and 13 lateral mac in Abd IV). Pigments in *S. domestica* are restricted to the antennae, while in some species it may have a distinct pattern (*S. dagamae*), with pigments in legs and abdomen parts (*S. atlantica*), diffuse (*S. graeca*) or even depigmented, except for eyepatches (*S. deserti*).

The type locality of *S. domestica* was not provided by Nicolet (1842) in the original description, but in 1847 the same author reported the presence of the species in Switzerland and France, inside houses. Nicolet lived in Switzerland, locality of many species of springtails described by him (as in Nicolet 1842, 1847). Consequently, it is accepted today by deduction that the type locality of *S. domestica* is also Switzerland. The type material of the species is lost, since it was not found in any main Swiss collection as: Musée d'Histoire Naturelle Neuchâtel (J. Litman, personal communication); and Natural History Museum of Geneva (J. Schwendinger, personal communication). Even so we could not analyze specimens from Switzerland, our description fits past descriptions of *S. domestica* dorsal chaetotaxy (excluding possible mistakes and omissions), including Gisin & Gama (1962) which was based in specimens from Geneva, Switzerland. However, this typological limitation prevents at this moment to determine some variations in populations of *S. domestica*. Gisin & Gama (1962: 792, fig. 4A) reported the presence of mac **m4i** on head of *S. domestica*, as well as Jacquemart (1973: 8, fig.4), in specimens from Jordan, but this chaeta is mic in all specimens analyzed here. Other variations observed in our specimens is **PmA** and **PmC** groups of the Th II, central mac of Th III, and one specimen (from same locality) with mac **a3** in Abd III (Figs 6A–B, E), but these may have been omitted, since these authors did not reveal variations in their descriptions.

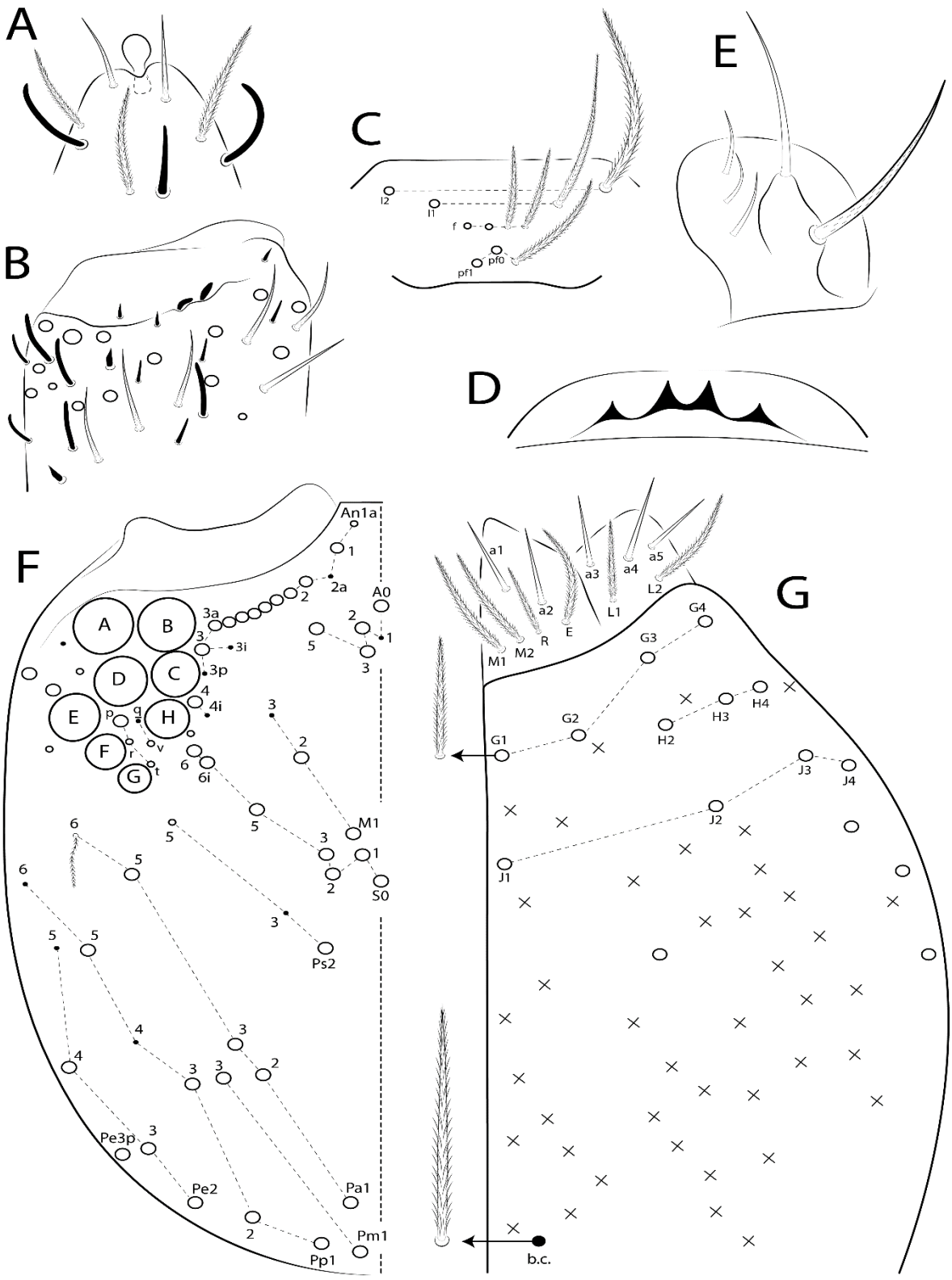

FIGURE 5A–G. *Seira domestica*: head; **A**, apex of Ant IV; **B**, Ant III apical organ; **C**, clypeal chaetotaxy; **D**, labral papillae; **E**, maxillary outer lobe; **F**, dorsal cephalic chaetotaxy (valid also for *S. ferrari*, except for interocular chaeta **q**); **G**, ventral head and basomedian and basolateral labial fields, arrows indicate normal ciliated chaetae and basal chaeta (b.c.), respectively.

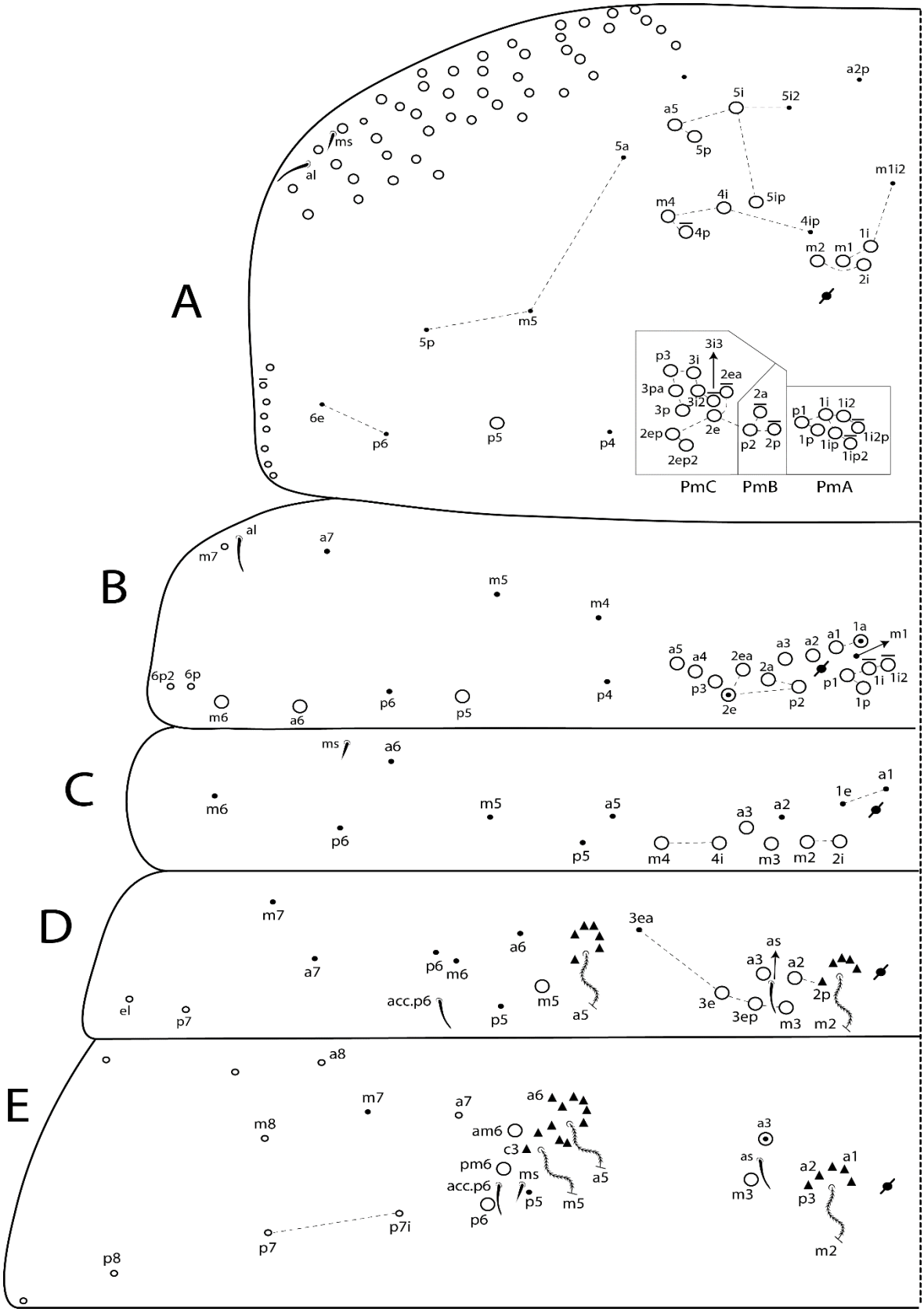

FIGURE 6A–E. *Seira domestica*: dorsal chaetotaxy; **A**, Th II; **B**, Th III; **C**, Abd I; **D**, Abd II; **E**, Abd III.

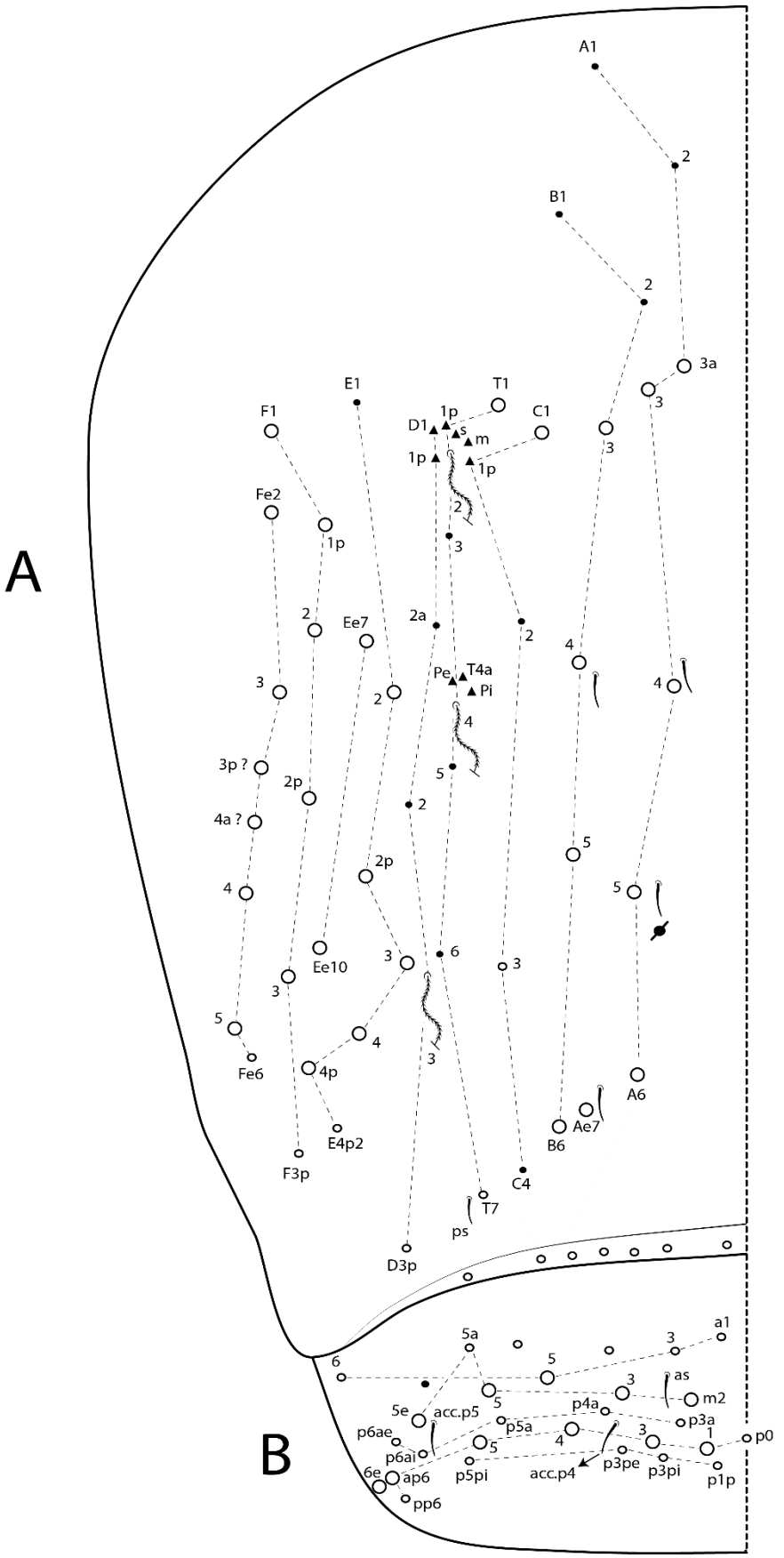

FIGURE 7A–B. *Seira domestica*: dorsal chaetotaxy; **A**, Abd IV; **B**, Abd V.

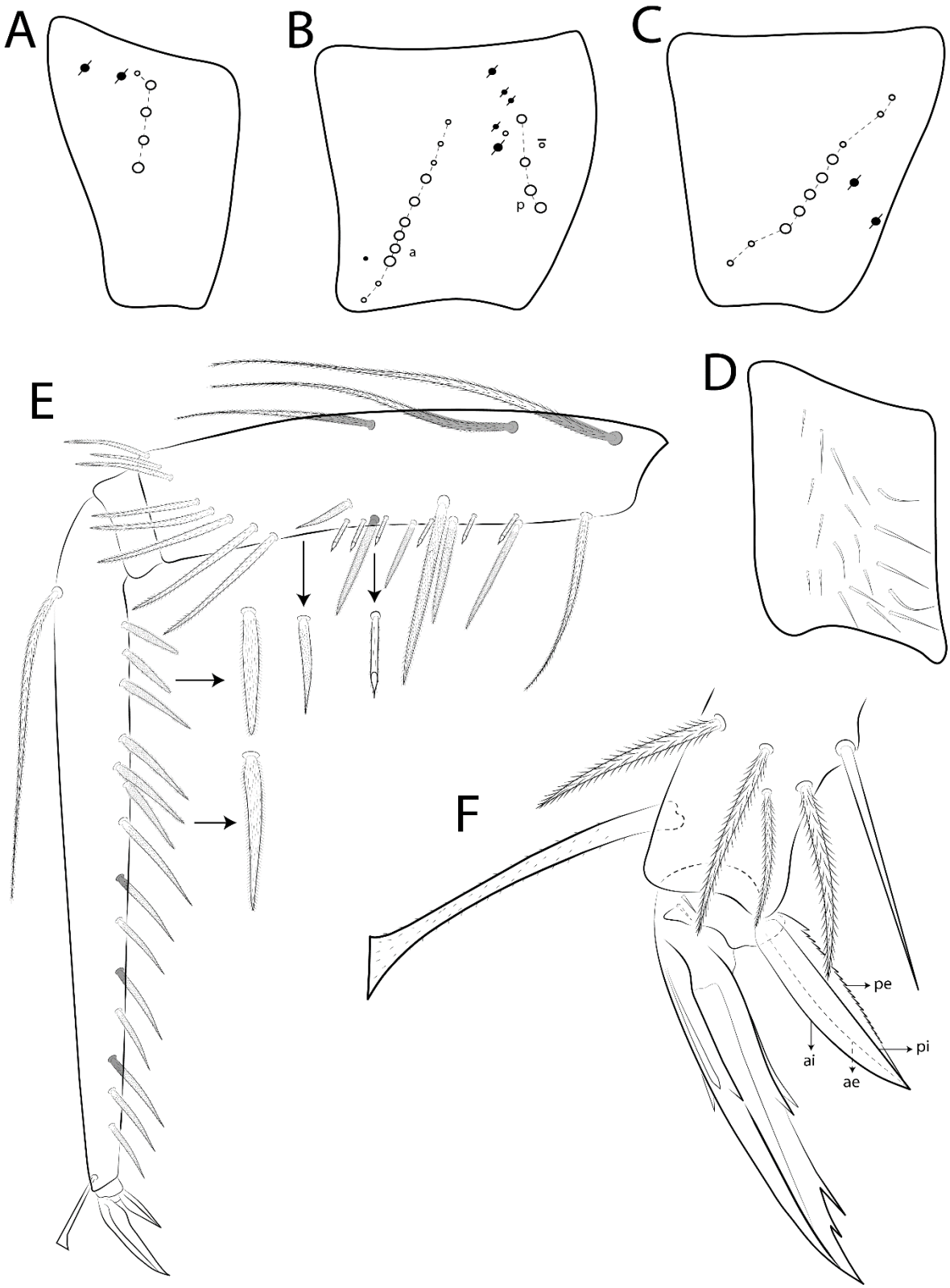

FIGURE 8A–H. *Seira domestica*: **A**, subcoxa I; **B**, subcoxa II; **C**, subcoxa III; **D**, trochanteral organ; **E**, chaetotaxy of femur and tibiotarsus I of male (anterior view), arrows indicate mac finely ciliate, small truncate chaetae, robust spine-like chaeta (in femur) and two types of tibiotarsal spine-like chaetae finely ciliate apically rounded and acuminate; **F**, distal tibiotarsus and empodial complex III (posterior view).

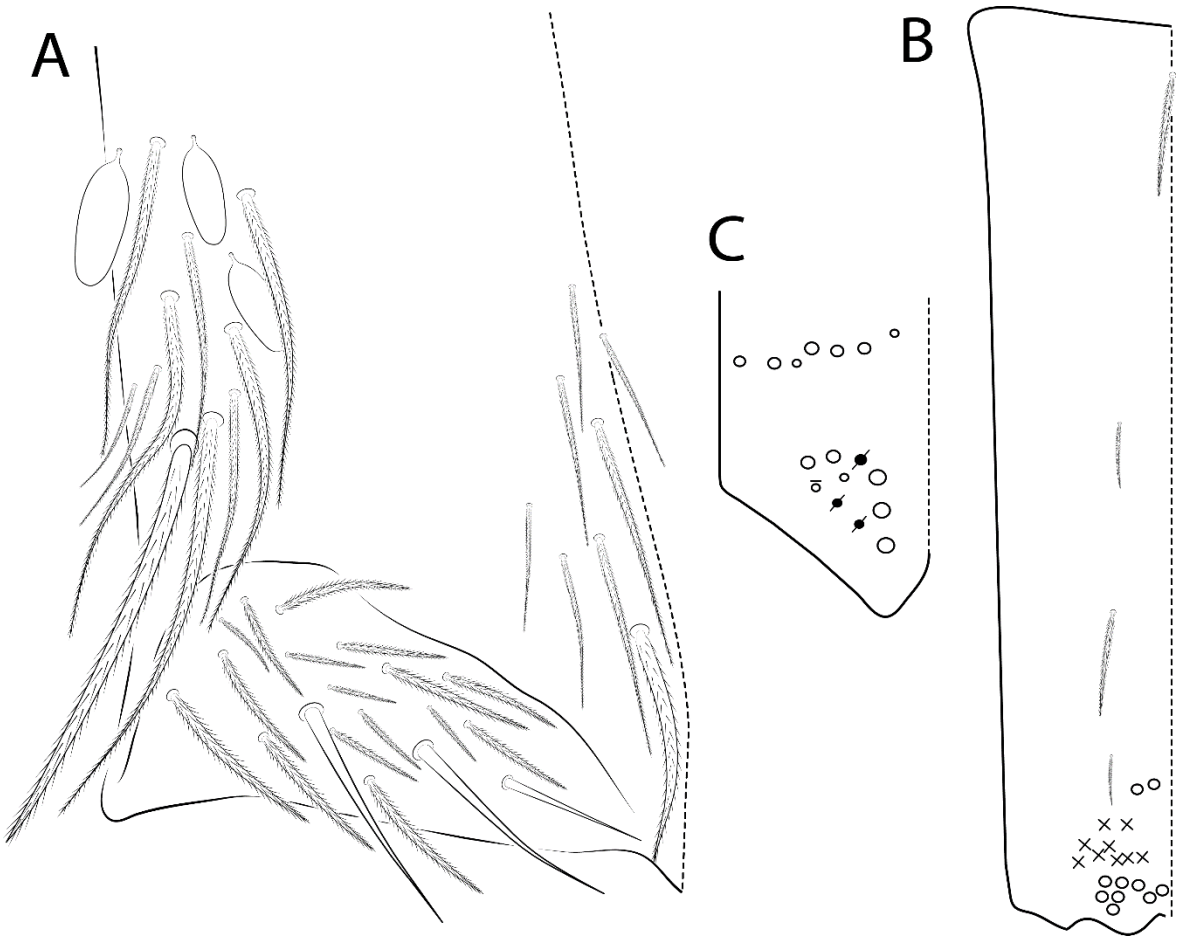

FIGURE 9A–C. *Seira domestica*: **A**, collophore chaetotaxy (lateral view); **B**, manubrium ventral chaetotaxy; **C**, manubrial plate and subapical chaetae (dorsal view).

***Seira dinizi* Gama, 1988**

Figs 2B, 10–13

Seira dinizi Gama, 1988 (in Gama 1988a): 77, fig. 1, Canary Islands, Spain (orig. descr.), not examined. Yoshii, 1990: 535, figs 1A-F, Ilha de São Miguel Island, Azores Macaronesia, Portugal (descr.). Baquero *et al.*, 2014: 1577 (compared). Cipola *et al.*, 2014a: 494 (cit.)

Diagnosis. Body bluish (Fig. 2B); head mac **M4i**, **S4**, **Pa4** and **Pp6** absent, eyepatches with 3 interocular chaetae (**q** and **r** absent) (Fig. 10E); labral papillae conical, outer papillae reduced to square projection (Fig. 10C); Th II with 4 medio-central mac (**m1**–**1i**, **m2**–**2i**) and **PmA**–**PmC** groups with 6–7, 3 and 3–5 mac respectively (Fig. 11A); Th III–Abd III with 11–14, 5, 3 and 1 central mac respectively (Figs 11B–E); Abd IV with 12–13 central and 17–19 lateral mac (Fig. 12A); unguis apical tooth present; unguiculus outer edge serrated and without proximal tooth; manubrium ventrally with 2/4 subapical and 16 apical chaetae (Fig. 13F).

Examined material. 3 males, 8 females and 18 juveniles on slides and 119 specimens in alcohol (EIC6001-2/INPA and JIAP): Canary Islands, Province of Las Palmas, Isla of Montaña Clara (29º17'35"N; 13º31'59"W), Veril, near and away from the sea to island southeast, 16 m, 17.vi.2001, pitfall-traps, B. Rodríguez coll. 1 male, 4 females and 1 juvenile on slides (EIC6005-6/JIAP): *idem*, except volcanic pit (29º17'35"N; 13º32'05"W), 256m, x.2001. 1 juvenile on slide (EIC4376/JIAP): El Hierro Island, Frontera municipality (27º45'14"N; 18º00'34"W), near Cave, 141 m, 06.x.2000, P. Oromí coll.

Description based on the listed specimens. Total length (head + trunk) of specimens 1.88–2.00 mm (n=3). Specimens pale white with blue pigment heavily on Ant I–IV and diffuse on head, trunk and legs; eyepatches black (Fig. 2B). Scales present on Ant I to basal half of Ant III, ventral and dorsal head, thorax and abdomen dorsally, legs (except empodia), and manubrium and dentes ventrally. Collophore without scales (Fig. 13E).

Head. Antennae shorter than body length, antennal ratio as I: II: III: IV = 1: 1.84–1.9: 1.96–2.01: 2.16–2.71 (n=2). Ant IV not annulated, with simple apical bulb and blunt sens. Ant III apical organ with two rod-like sens, 3 guard sens and several blunt sens of

different sizes (Fig. 10A). Clypeal formula with 4 (**l1**–**2**), 3 (**f**), 3 (**pf0**–**1**) ciliate chaetae, **l1** acuminate, **l2** largest, and 2 frontal smaller (Fig. 10B). Two inner labral papillae conical, outer papillae reduced to square projections (Fig. 10C). Maxillary palp with smooth apical appendage (a.a.) and basal chaeta (b.c.) weakly ciliated, thicker and 1.44 longer than apical (Fig. 10D). Eye A larger, H smaller, with 3 interocular chaetae (**v**, **p**, **t**); head dorsal chaetotaxy (Fig. 10E) with 6 'An' mac (**An1**, **An2**–**3**), 3–4 'A' mac (**A0**, **A2**–**3**, and **A5**, rarely as mic), 3 'M' mac (**M1**–**2**, **M4**), 7 'S' mac (**S0**–**3**, **S5–6**), 1 'Ps' mac (**Ps2**), 4 'Pa' mac (**Pa1**–**3**, **Pa5**), 2 'Pm' mac (**Pm1**, **Pm3**), 4 'Pp' mac (**Pp1**–**3**, **Pp5**), and 2 'Pe' mac (**Pe2**–**3**). Basomedian and basolateral labial fields with **M1**–**2**, **R**, **E**, **L1**–**2**, **M1** and **R** smaller. Postlabial ventral chaetotaxy with about 17 ciliate chaetae, postlabial formula 4 (**G1**–**4**), 3 (**H2**–**4**), 4 (**J1**–**4**), **J2** and one proximal smaller; basal chaeta absent (Fig. 10F).

Thorax chaetotaxy (Figs 11A–B). Th II, series 'a' with 4 mac (**a5i**–**5p** and one unnamed anteriorly); series 'm' with 7 mac (**m1i**–**1**, **m2i**–**2**, **m4i**–**4p**); series 'p' with 13–16 mac (**p1i2p**–**1p**, **p2a**–**2ep2**, **p3**, **p5**), **p1i2p** and **p2e** rarely absent, **p2ep2** generally as mac. Th III, series 'a' with 4–6 mac (**a1i**–**5**), **a1** generally as mac and **a5** present or absent; series 'm' without mac; series 'p' with 9–10 mac (**p1i**–**1p**, **p2a**–**2ea**, **p3**, **p5**–**6**), **p2e** generally as mac. Th ratio as II: III = 1: 0.61–0.77 (n= 3).

Abdomen chaetotaxy (Figs 11C–E, 12A–B). Abd I, series 'a' without mac; series 'm' with 5 mac (**m2i**–**4**). Abd II, series 'a' with 1 mac (**a2**); series 'm' with 3 mac (**m3**–**3e**, **m5**). Abd III, series 'm' with 2 mac (**m3**, **pm6**); series 'p' with 2 mac (**p6**, **p7i**). Abd IV with 12–13 central mac of series 'A' to 'T' (**A3**–**6**, **Ae7**, **B3**–**6**, **C1**, **C4**, **T1**, **T7**), **T7** as mac or mes, and 17–19 lateral mac of series 'D' to 'Fe' (**D3p**, **E2**–**4p**, **F1**–**3p**, **Fe2**–**6**), **F3p** and **Fe6** as mac or mes; at least 3 sens (**as?** and **ps** type I and one type II), and posteriorly with 6 mes present. Abd V, series 'a' with 1 mac (**a5**); series 'm' with 4 mac (**m2**–**3**, **m5**–**5e**); series 'pa' with 2 mac (**p3a**, **p6ai**); series 'p' with 6 mac (**p0**–**1**, **p3**–**5**, **ap6**). Abd ratio as III: IV = 1: 2.55–3.57 (n= 3). Female genital plate with two pairs (superior and inferior) of small smooth chaetae (Fig. 13H).

Legs. Subcoxa I with 3 chaetae and 2 psp; subcoxa II with an anterior row of 10 chaetae, posterior row of 3 chaetae and 3 psp; subcoxa III with one row of 9 chaetae, 1 anterior chaeta and 2 posterior psp (Figs 13A–C). Trochanteral organ with about 15 spine-like chaetae (Fig. 13D). Unguis with median and apical teeth with the same length, basal teeth smaller. Unguiculus with all lamellae acuminate, pe lamella serrated and without proximal tooth, other lamellae (ai, ae, pi) smooth; ratio unguis: unguiculus = 1: 0.59.

Tibiotarsus III distally with inner smooth chaeta 1.08 larger than unguiculus; and outer tenent hair capitate, discretely ciliate, same length as unguis.

Collophore (Fig. 13E). Anterior side with 12 ciliate chaetae, including 2 distal mac, 1 apically acuminate chaeta; posterior side with 1 thicker ciliate chaeta; lateral flap with 1 smooth chaeta and 12 ciliate chaetae.

Furcula (Figs 13F–G). Manubrium ventrally with formula 1, 2, 2, 2/4 (subapical), 16 (apical) ciliate chaetae and approximately 4 elongated apical scales per side; manubrium dorsally with 5 subapical ciliate chaetae; manubrial plate with 4 ciliate chaetae and 3 psp.

Remarks. In the original description of *Seira dinizi* the species was found in most of the Canary Islands and the characteristics reported were only the dorsal coloration and macrochaetotaxy pattern (Gama 1988a). The specimens analyzed here from Isla de Montaña Clara and El Hierro corroborate with the characteristics of the original description and for this reason justify the redescription.

Gama (1988a) compared *S. dinizi* with *S. ferrarii* because of shared apparent reduction in dorsal macrochaetotaxy, but *S. dinizi* differs more clearly from this species by body color with diffuse bluish pigment (with stripes on trunk of *S. ferrarii*), Th II without mac **a5ip** (present in *S. ferrarii*), Th II with 2 lateral mac (4 in *S. ferrarii*) and Abd I–II without mac **a3** and **m3ep** (present in *S. ferrarii*). Particularly, *S. dinizi* is more similar to *Seira dori* Gruia, Poliakov & Broza, 2000 from Israel and *S. taeniata* (*sensu* Yoshii, 1990) from Cape Verde, Macaronesia, by head macrochaetotaxy reduced, Th II with 4 medio-central mac, Abd II–III with 3 and 1 central mac, respectively; and Abd IV with 12 central mac (at least in *S. dori*). However, *S. dinizi* differs from these species by Th II **PmA** and **PmC** groups with 6–7 and 3–5 mac, respectively (5 and 6 in *S. dori*, 5 and 5 in *S. taeniata*); by the number of Th III with up to 14 central mac in *S. dinizi* (**p1i** and **p1p** present), while there are 12 central mac in *S. dori* (**p1i** and **p1p** absent) and only 8 in *S. taeniata*, respectively; and by the number of Abd I with 5 central mac in *S. dinizi* and 4 in *S. taeniata*. Other characteristics that differentiate *S. dinizi* from the mentioned species include the bluish body colour pattern (restricted to Abd III in *S. dori*); unguiculus with outer lamella serrated and without basal tooth, while this lamella is smooth in *S. dori* and *S. taeniata* and the basal tooth is present in *S. dori*. Other comparisons among species are presented in Tables 1 and 2.

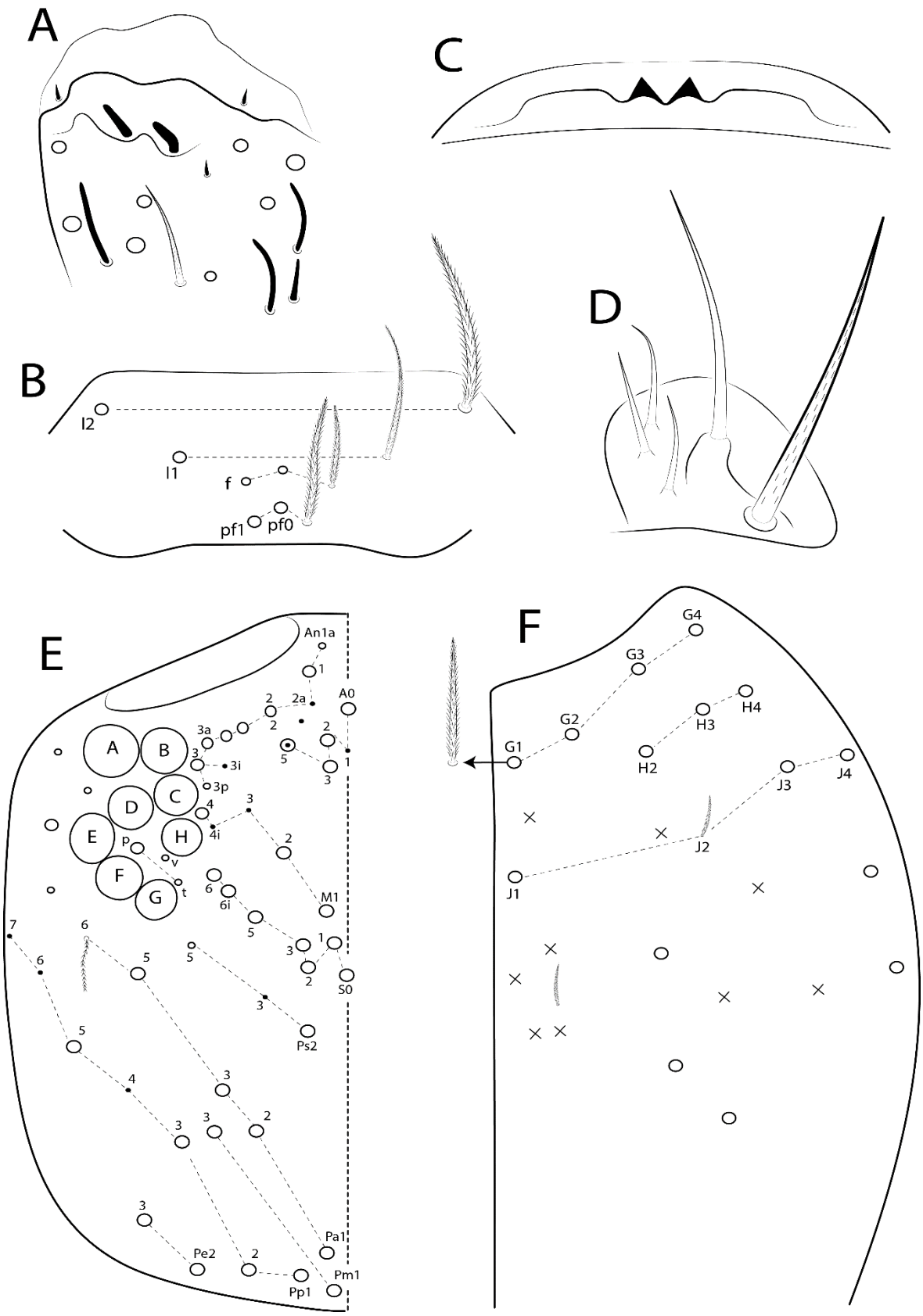

FIGURE 10A–F. *Seira dinizi*: head; **A**, Ant III apical organ; **B**, clypeal chaetotaxy; **C**, labral papillae; **D**, maxillary outer lobe; **E**, dorsal cephalic chaetotaxy; **F**, postlabial ventral head, arrow indicates normal ciliated chaetae.

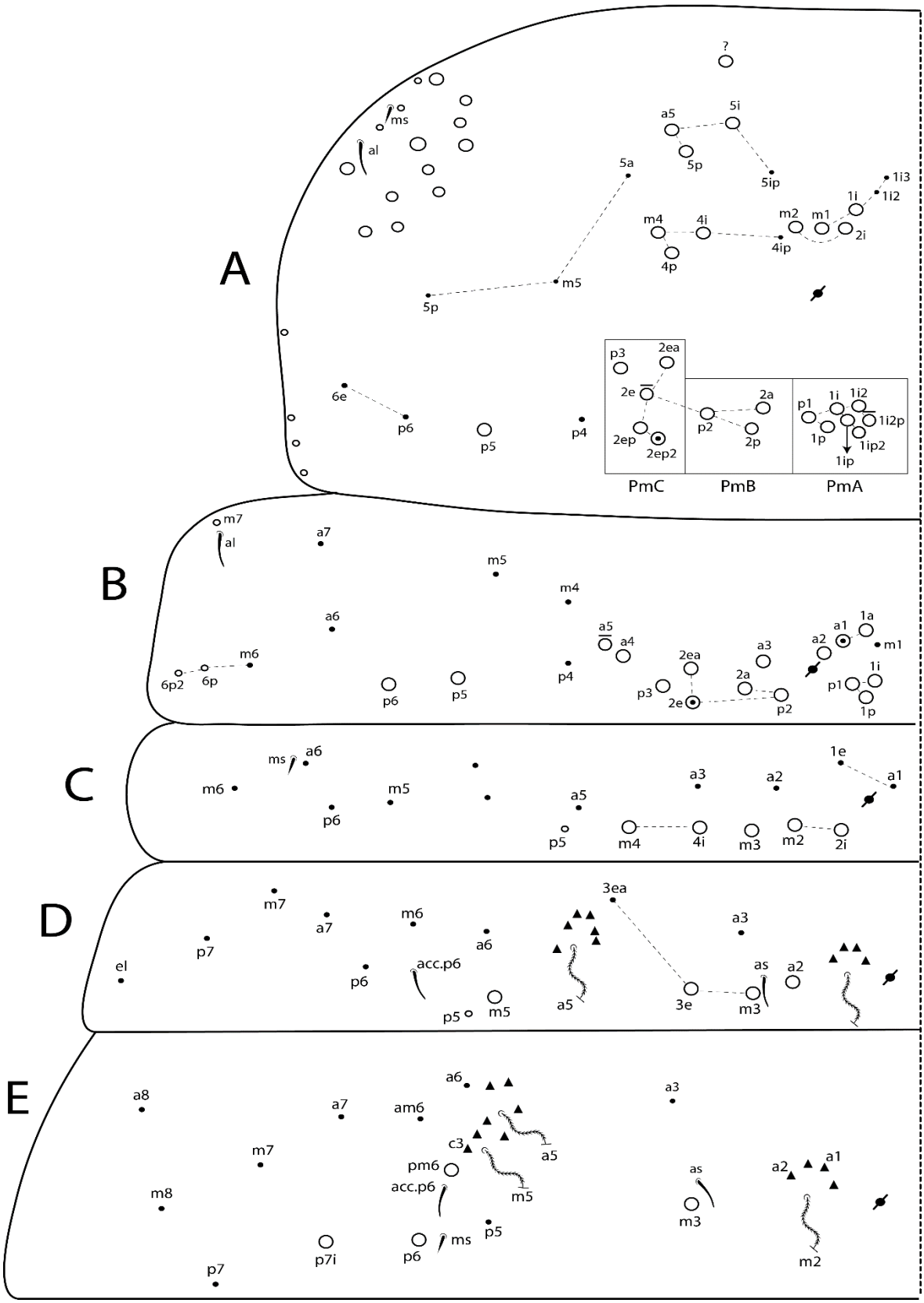

FIGURE 11A–E. *Seira dinizi*: dorsal chaetotaxy; **A**, Th II; **B**, Th III; **C**, Abd I; **D**, Abd II; **E**, Abd III.

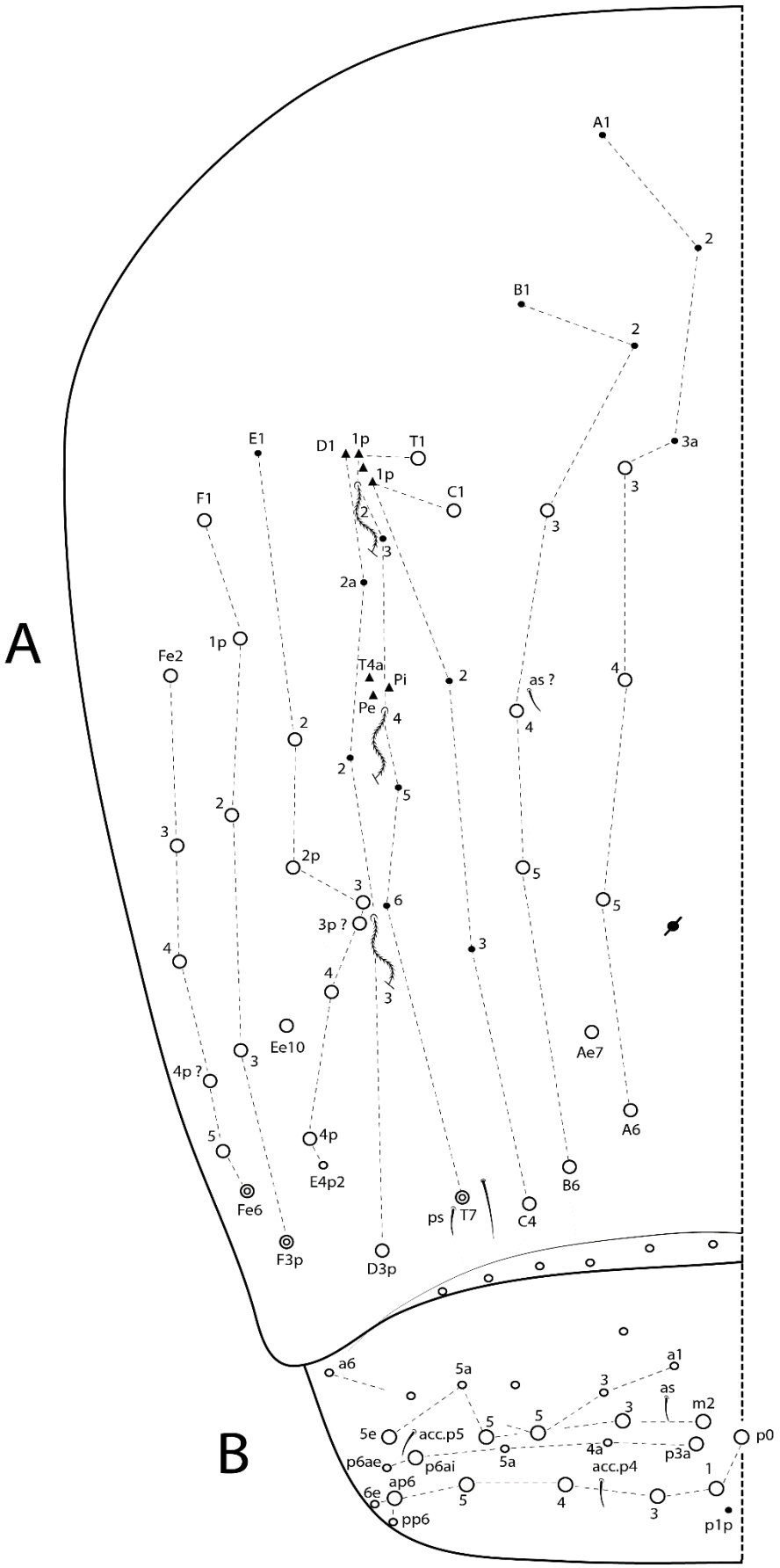

FIGURE 12A–B. *Seira dinizi*: dorsal chaetotaxy; **A**, Abd IV; **B**, Abd V.

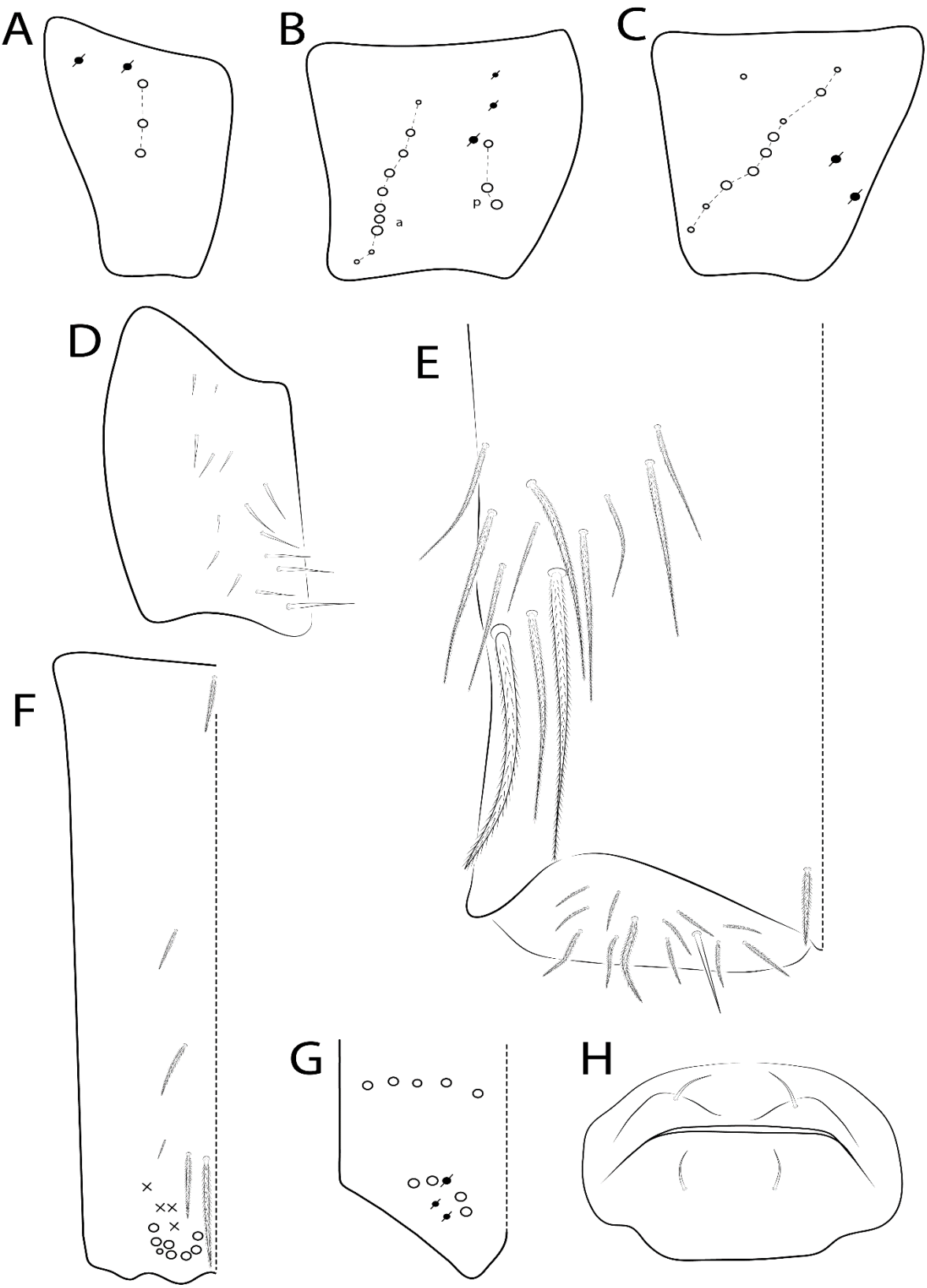

FIGURE 13A–H. *Seira dinizi*: **A**, subcoxa I; **B**, subcoxa II; **C**, subcoxa III; **D**, trochanteral organ; **E**, collophore chaetotaxy (lateral view); **F**, manubrium ventral chaetotaxy; **G**, manubrial plate and subapical chaetae (dorsal view); **H**, female genital plate.

***Seira ferrarii* Parona, 1888**

Figs 2C–D, 14–17

Seira ferrarii Parona, 1888: 9, fig. 7, Genova, Italy (orig. descr.), not examined.

Yosii 1959: 20, fig. 13, Madrid, Spain (descr.). Dallai & Ferrari, 1971: 132, figs 1–4, Italy and Bulgaria (descr.). Dallai, 1973: 520, fig. 10, Lipari Islands, Italy (descr.). Jacquemart & Jacques, 1980: 9, figs 3–5, Tunisie and Algéria (descr.). Barra, 2004b: 400, figs 1–13, Socotra Island, Yemen (descr.)

Diagnosis. Body with blue pigment on anterior and posterior margins of Th II to Abd III, all Abd IV, femora II–III and manubrium (Figs 2C–D); head mac **M4i**, **S4**, **Pa4** and **Pp6** absent, eyepatches with 4 interocular chaetae (**q** absent) (Fig. 5F); labral papillae conical, outer papillae reduced on large pointed projections (Fig. 14C); Th II with 4 medio-central mac (**m1**–**1i**, **m2**–**2i**) and **PmA**–**PmC** groups with 5–6, 3 and 4–5 mac respectively (Fig. 15A); Th III–Abd III with 14, 6, 4 and 1 central mac respectively (Figs 15B–E); Abd IV with 12 central and 13 lateral mac (Fig. 16A); unguis apical tooth present; unguiculus outer edge serrated and without proximal tooth; manubrium ventrally with 2/4 subapical and 14–16 apical chaetae (Fig. 17F).

Examined material. 5 females on slides and 2 specimens in alcohol (EAL0055-6/INPA and JIAP): Spain, Alméria Province, Adra municipality (36º46'33"N; 03º06'43"W), in mountain, 566m, 9-22.x.2015, light-trap , F. Rodríguez coll. 1 female on slide (EGE0041/JIAP): Gerona Province, Lloret of Mar (41º41'15"N; 02º49'04"E), in beach, 4 m, 14.iv.2015, pitfall-traps, E. Ariza coll. 1 female on slide (EGE0047/JIAP): *idem*, except "Tossa de Mar" (41º43'19"N; 02º56'19"E), in beach "Menuda", 3 m. 1 female on slide (FCNyM-UNLP): Argentina, Bahía Blanca, 23.v.1963, E Bianco coll.

Description based on the listed specimens. Total length (head + trunk) of specimens 1.43–1.92 mm (n=4). Alive specimens with Ant I–IV, head, Th II, Abd V, leg I, and tibiotarsus II–III brownish; Th III to Abd IV dark, with one silvery transversal band on Abd III and IV (Fig. 2C). Fixed specimens pale white with dark blue pigment on Ant I–IV, anterior and posterior margins of Th II to Abd III, all Abd IV, femora II–III and manubrium; eyepatches black (Fig. 2D). Scales present on Ant I to apex of Ant II, ventral

and dorsal head, thorax and abdomen dorsally, legs (except empodia), and manubrium and dentes ventrally. Collophore without scales (Fig. 17E).

Head. Antennae shorter than body length, antennal ratio as I: II: III: IV = 1: 1.61–2.08: 1.81–2.08: 2.48–2.83 (n=4) (Figs 2C–D). Ant IV not annulated, with apical bulb apically bilobed and blunt sens (as in Fig. 26A). Ant III apical organ with two rod-like sens, 3 guard sens and 4 blunt sens of different sizes (Fig. 14A). Clypeal formula with 4 (**l1**–**2**), 4 (**f**), 3 (**pf0**–**1**) ciliate chaetae, **l1** acuminate, **l2** largest, and 2 frontal smaller (Fig. 14B). Two inner labral papillae conical, outer papillae reduced to large pointed projections (Fig. 14C). Maxillary palp with smooth apical appendage (a.a.) and basal chaeta (b.c.) weakly ciliate, thicker, and 1.16 longer than the apical. Eyes A, B and C slightly larger, F and G slightly smaller, with 4 interocular chaetae (**v**, **p**, **r**, **t**); head dorsal chaetotaxy as in *S. domestica* (Fig. 5F) but with interocular chaeta **q** always absent. Basomedian and basolateral labial fields with **M1**–**2**, **R**, **E**, **L1**–**2**, **R** subequal to the others. Postlabial ventral chaetotaxy with about 15 ciliate chaetae, postlabial formula 4 (**G1**–**4**), 2 (**H3**–**4**), 4 (**J1**–**4**), **J2** smaller, basal chaeta (b.c.) largest (Fig. 14D).

Thorax chaetotaxy (Figs 15A–B). Th II, series ‘a’ with 4 mac (**a5ip**–**5p**); series ‘m’ with 7 mac (**m1i**–**1**, **m2i**–**2**, **m4i**–**4p**); series ‘p’ with 13–15 mac (**p1i2**–**1p**, **p2a**–**2ep2**, **p3**, **p5**), **p1i2** generally as mac, **p2ep2** rarely absent. Th III, series ‘a’ with 7 mac (**a1i**–**6**); series ‘m’ with 1 mac (**m6**); series ‘p’ with 10 mac (**p1i**–**1p**, **p2a**–**2ea**, **p3**, **p5**–**6**). Th ratio as II: III = 1: 0.55–0.74 (n= 4).

Abdomen chaetotaxy (Figs 15C–E, 16A–B). Abd I, series ‘a’ with 1 mac (**a3**); series ‘m’ with 5 mac (**m2i**–**4**). Abd II, series ‘a’ with 1 mac (**a2**); series ‘m’ with 4 mac (**m3**–**3e**, **m5**). Abd III, series ‘m’ with 3 mac (**m3**, **am6**, **pm6**); series ‘p’ with 1 mac (**p6**). Abd IV with 12 central mac of series ‘A’ to ‘T’ (**A3a**–**6**, **Ae7**, **B3**–**6**, **C1**, **T1**), and 13 lateral mac of series ‘E’ to ‘Fe’ (**E2**–**3**, **E4p**, **Ee10**, **F1**–**3**, **Fe2**–**5**); at least 4 sens (**ps** type I and 3 type II), and posteriorly with 6 mes and 1 mic present. Abd V, series ‘a’ with 1 mac (**a5**); series ‘m’ with 4 mac (**m2**–**3**, **m5**–**5e**); series ‘p’ with 5 mac (**p1**, **p3**–**5**, **ap6**). Abd ratio as III: IV = 1: 3.41–4.16.

Legs. Subcoxa I with 3 chaetae and 2 psp; subcoxa II with an anterior row of 8–9 chaetae, posterior row of 3 chaetae and 3 psp; subcoxa III with one row of 8 chaetae and 2 posterior psp (Figs 17A–C). Trochanteral organ with about 12–15 spine-like chaetae (Fig. 17D). Unguis with median and apical teeth with the same length, basal teeth smaller. Unguiculus with all lamellae acuminate, pe lamella serrated and without proximal tooth,

other lamellae (ai, ae, pi) smooth; ratio unguis: unguiculus = 1: 0.56. Tibiotarsus III distally with inner smooth chaeta 0.88 smaller than unguiculus; and outer tenent hair capitate, discretely ciliate, and 0.88 smaller than unguis.

Collophore (Fig. 17E). Anterior side with 10 ciliate chaetae, including 1 distal mac and 3 apically acuminate chaetae; posterior side with 3 ciliate chaetae, of which 2 distal thickest; lateral flap with 3 smooth chaetae (one small posteriorly) and 9 ciliate chaetae.

Furcula (Figs 17F–G). Manubrium ventrally with formula 1, 2, 2, 2/4 (subapical), 14–16 (apical) ciliate chaetae (2 smaller or normal) and al least 3 elongated apical scales per side; manubrium dorsally with 7 subapical ciliate chaetae; manubrial plate with 4–5 ciliate chaetae and 3 psp.

Remarks. In *S. ferrarii* the observed variations in chaetotaxy were in PmA (**p1i2**) and PmC (**p2ep2**) groups of Th II (Fig. 15A). The absence of mac **p2ep2** probably is common in the species, since 4 mac in **PmC** group were observed by Jacquemart & Jacques (1980) in specimens from Tunisie and Algeria, and by Yosii (1959) in specimens from Spain. However, Jacquemart & Jacques (1980) reported one extra mac in **PmA** group, and Yosii (1959) only 5 mac on Abd I (**m4** absent), therefore this should be investigated to know if it signs as a population variation or to another closed related species. More comparisons concerning *S. ferrarii* see remarks on *S. dinizi* and Tables 1 and 2.

One specimen identified as *Seira ferruginea* Rapoport & Izarra, 1962 from Argentina (FCNyM-UNLP) corresponds to *S. ferrarii*, therefore this is the first record of the species from the New World (probably introduced).

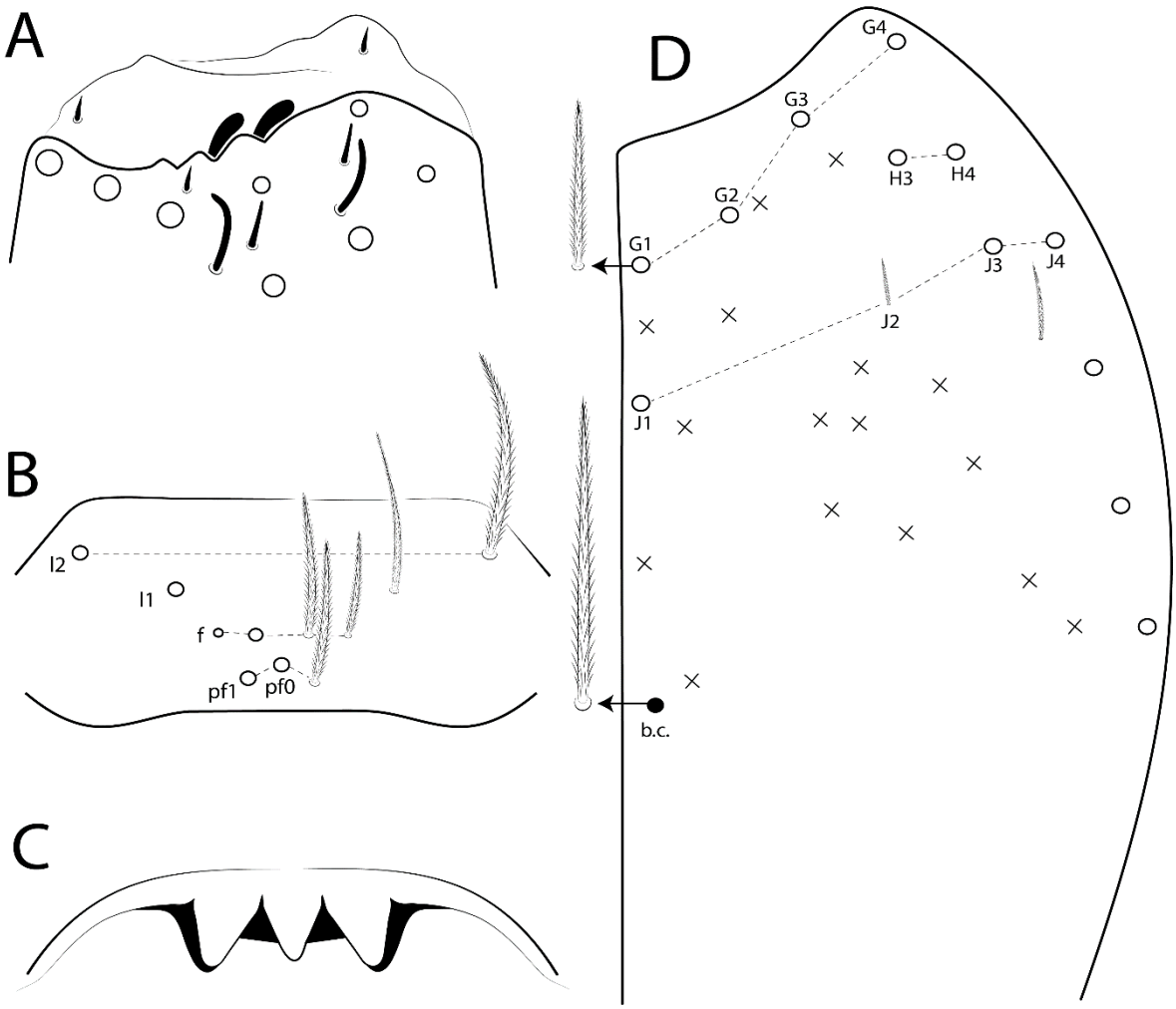

FIGURE 14A–F. *Seira ferrarii*: head; **A**, Ant III apical organ; **B**, clypeal chaetotaxy; **C**, labral papillae; **D**, postlabial ventral head, arrows indicate normal ciliated chaetae and basal chaeta (b.c.), respectively.

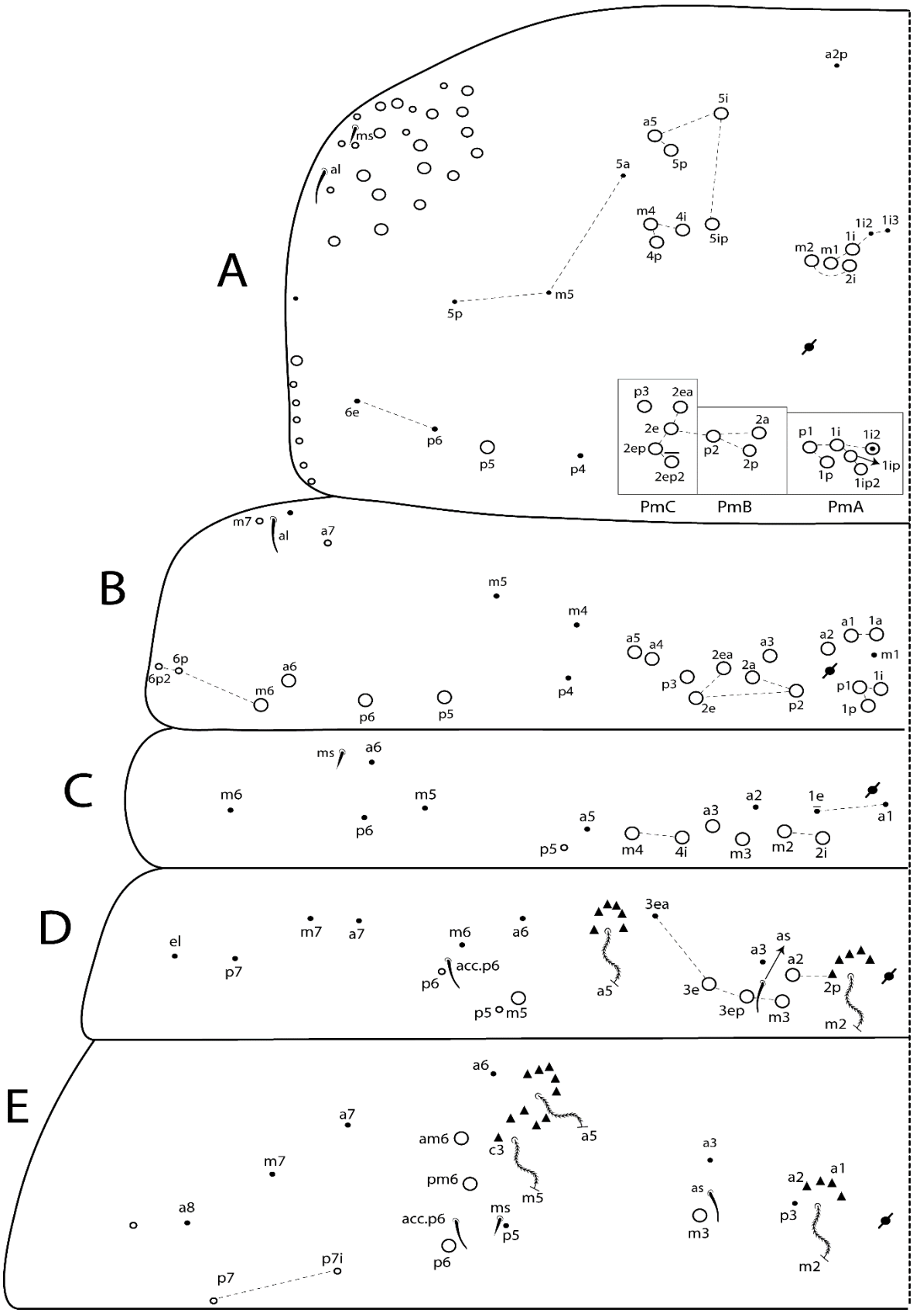

FIGURE 15A–E. *Seira ferrarii*: dorsal chaetotaxy; **A**, Th II; **B**, Th III; **C**, Abd I; **D**, Abd II; **E**, Abd III.

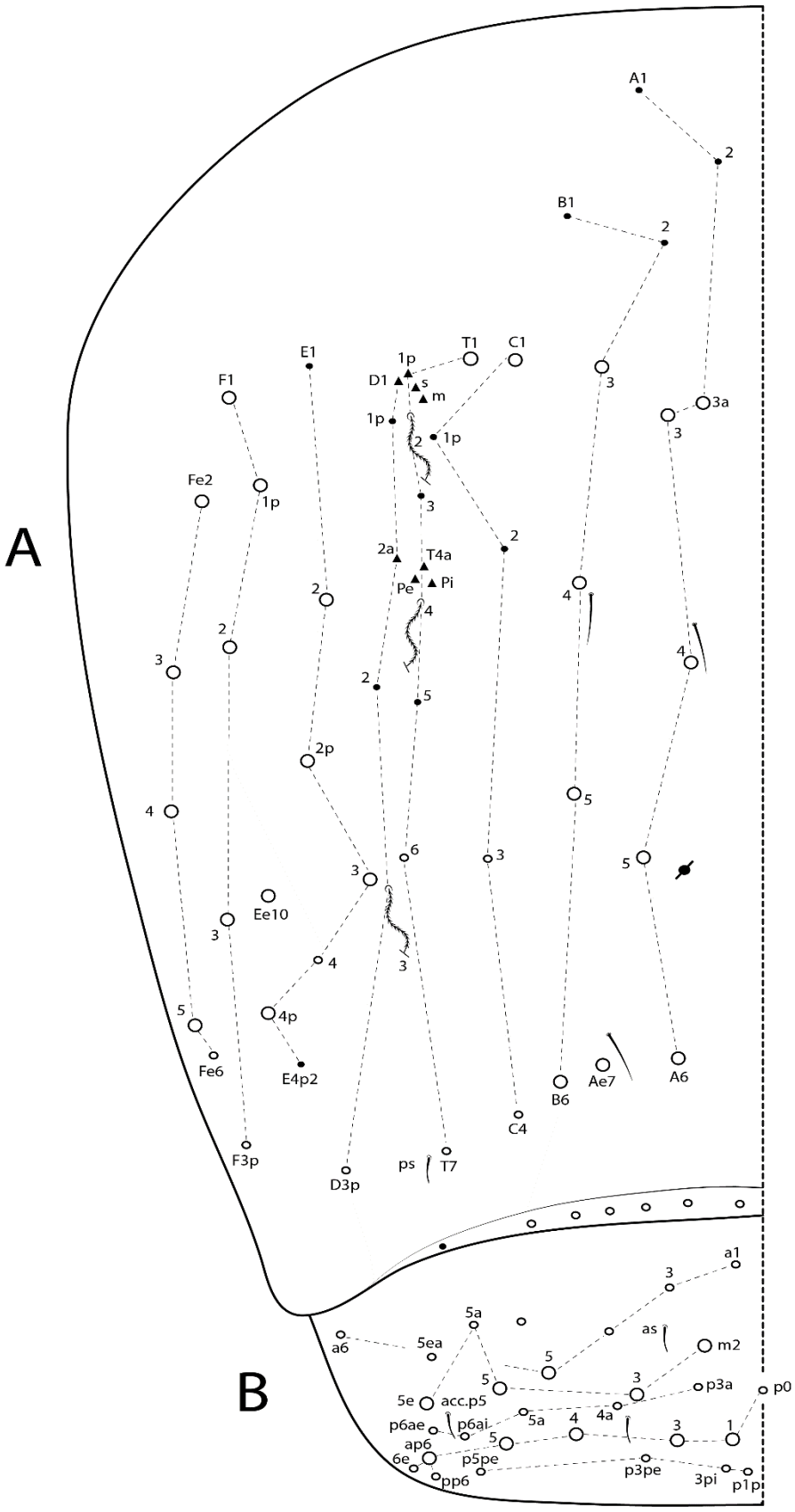

FIGURE 16A–B. *Seira ferrarii*: dorsal chaetotaxy; **A**, Abd IV; **B**, Abd V.

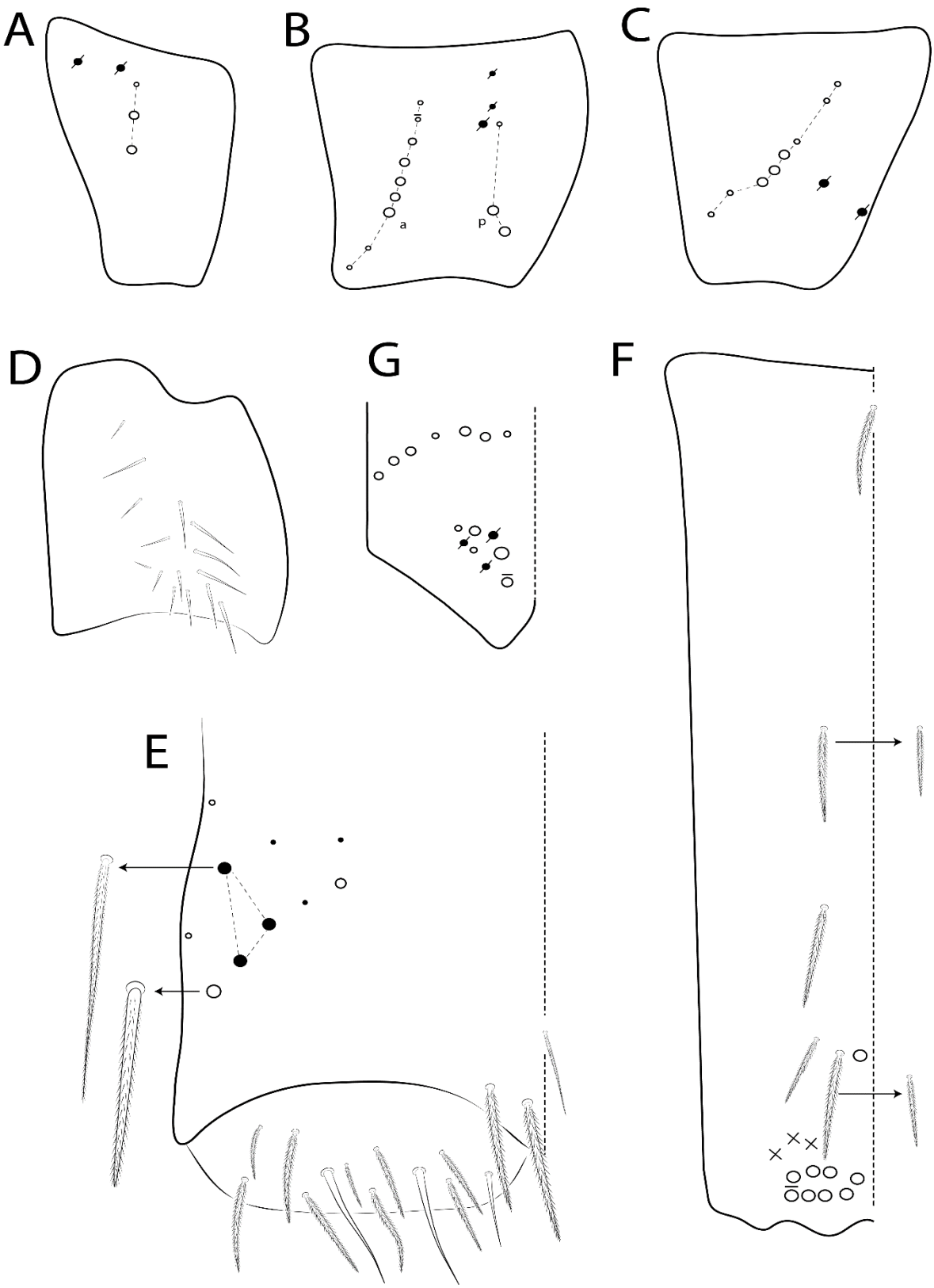

FIGURE 17A–G. *Seira ferrarii*: **A**, subcoxa I; **B**, subcoxa II; **C**, subcoxa III; **D**, trochanteral organ; **E**, collophore chaetotaxy (lateral view); **F**, manubrium ventral chaetotaxy; **G**, manubrial plate and subapical chaetae (dorsal view).

***Seira mantis* Zeppelini & Bellini, 2006**

Figs 18–21

Seira mantis Zeppelini & Bellini, 2006: 28, figs 8b, 10-16, Canary Islands, Spain (orig. descr.). Bellini & Zeppelini (2008): 725 (compared). Bellini *et al*. (2009): 38, fig. 1C-D (cit.) Palacios-Vargas & Castaño-Meneses (2009): 961 (cit.). Barra (2010): 586, 592 (compared). Bellini & Zeppelini (2011): 549 (compared). Zeppelini & Lima (2012): 42-43 (compared).

Diagnosis. Head mac **M4i**, **S4**, **Pa4** and **Pp6** absent, eyepatches with 4 interocular chaetae (**q** absent) (Fig. 18A); inner labral papillae conical, outer papillae reduced; Th II with 4 medio-central mac (**m1**–**1i**, **m2**–**2i**) and **PmA**–**PmC** groups with 6, 3 and 5 mac, respectively (Fig. 19A); Th III–Abd III with 14, 6, 4 and 1 central mac, respectively (Figs 19 B–E); Abd IV with 12 central and 14 lateral mac (Fig. 20A); males with one inner row of 9 spine-like mac on femur I and 15 proximal baster-shaped chaetae on tibiotarsus I (Fig. 21E); unguis apical tooth present (Fig. 21F); unguiculus outer edge smooth (Fig. 21F); manubrium ventrally with 2/4 subapical and 18 apical chaetae (Fig. 21G).

Examined type material. Holotype male on slides (N°0055/ MZSP): Spain, Canary Islands, Fuerteventura, La Oliva (28°36'N; 13°55'W), 220 m, 13.v.1974. A. Machado coll. Paratypes on slides (N°0054/MZSP): 1 male and 1 females, same data as holotype, except Barranco del Pesenescal, 7-iv-1988, A. Fjellberg coll. Paratypes on slides (N°0054/MZSP): 2 females, same data as holotype, except 8 Km south Corralejo (28°38'N; 13°51'W), 140 m, 8-iv-1988, A. Fjellberg coll.

Redescription. Total length (head + trunk) of holotype 2.16 mm. Specimens on slides, unknown body color pattern; eyepatches black. Scales present on Ant I to basal half of Ant III, ventral and dorsal head, thorax and abdomen dorsally, legs (except empodia), dorsal and ventral manubrium and dentes ventrally. Collophore chaetotaxy unclear.

Head. Antennae shorter than body length, antennal ratio of holotype as I: II: III: IV = 1: 1.65: 1.54: 2.20. Ant IV annulated on apical three quarters, with apical bulb apically bilobed, but is not well visible. Ant III apical organ and clypeus unclear. Two inner labral papillae conical, outer papillae reduced. Maxillary palp with smooth apical appendage (a.a.) and basal chaeta (b.c.) weakly ciliated, thicker and 1.02 longer than the apical. Eyes A and B larger, G slightly smaller, with 4 interocular chaetae (**v**, **p**, **r**, **t**); head dorsal

chaetotaxy (Fig. 18A) with 10 ‘An’ mac (**An1**, **An2**–**3**), 4 ‘A’ mac (**A0**, **A2**–**3**, **A5**), 3 ‘M’ mac (**M1**–**2**, **M4**), 7 ‘S’ mac (**S0**–**3**, **S5**–**6**), 1 ‘Ps’ mac (**Ps2**), 4 ‘Pa’ mac (**Pa1**–**3**, **Pa5**), 2 ‘Pm’ mac (**Pm1**, **Pm3**), 4 ‘Pp’ mac (**Pp1**–**3**, **Pp5**), and 3 ‘Pe’ mac (**Pe3**–**4** plus **Pe3p**). Basomedian and basolateral labial fields with **M1**–**2**, **R** (smaller), **E**, **L1**–**2**. Postlabial ventral chaetotaxy with about 13 ciliate chaetae, postlabial formula 4 (**G1**–**4**), 3 (**H2**–**4**), 3 (**J1**, **J3**–**4**), **J2** absent, and one basal chaeta (b.c.) largest (Fig. 18B).

Thorax chaetotaxy (Figs 19A–B). Th II, series ‘a’ with 4 mac (**a5ip**–**5p**); series ‘m’ with 7 mac (**m1i**–**1**, **m2i**–**2**, **m4i**–**4p**); series ‘p’ with 15 mac (**p1i2**–**1p**, **p2a**–**2ep2**, **p3**, **p5**). Th III, series ‘a’ with 7 mac (**a1i**–**6**); series ‘m’ with 2 mac (**m6**–**7**); series ‘p’ with 10 mac (**p1i**–**1p**, **p2a**–**2ea**, **p3**, **p5**–**6**). Th ratio of holotype as II: III = 1: 0.54.

Abdomen chaetotaxy (Figs 19C–E, 20A–B). Abd I, series ‘a’ with 1 mac (**a3**); series ‘m’ with 5 mac (**m2i**–**4**). Abd II, series ‘a’ with 1 mac (**a2**); series ‘m’ with 4 mac (**m3**–**3e**, **m5**). Abd III, series ‘m’ with 3 mac (**m3**, **am6**, **pm6**); series ‘p’ with 1 mac (**p6**). Abd IV with 12 central mac of series ‘A’ to ‘T’ (**A3a**–**6**, **Ae7**, **B3**–**6**, **C1**, **T1**), and 14 lateral mac of series ‘E’ to ‘Fe’ (**E2**–**4p**, **Ee7**, **Ee10**, **F1**–**3**, **Fe2**–**6**); at least 4 sens (**ps** type I and 1 type II), and posteriorly with 5 mes present. Abd V, series ‘a’ with 1 mac (**a5**); series ‘m’ with 4 mac (**m2**–**3**, **m5**–**5e**); series ‘pa’ with 1 mac (**p6ai**); series ‘p’ with 5 mac (**p1**, **p3**–**5**, **ap6**). Abd ratio of holotype as III: IV = 1: 4.59.

Legs. Subcoxa I of males with one row of 4 modificated mac finely ciliate, females with 4 regular chaetae, both with 2 psp; subcoxa II with an anterior row of 9 chaetae, posterior row of 4 chaetae, 1 anterior chaeta and 4 psp; subcoxa III with one row of 7 chaetae and 2 posterior psp (Figs 19A–C). Trochanteral organ with about 30 spine-like chaetae (Fig. 19D). Unguis with median and apical teeth the same length, basal teeth smaller. Unguiculus with all lamellae acuminate and smooth, no tooth; ratio unguis: unguiculus = 1: 0.57 (Fig. 19F). Tibiotarsus III distally with inner smooth chaeta 1.38 larger than unguiculus; outer tenent hair capitate, discretely ciliate, and 0.64 smaller than unguis.

Leg I of males (Fig. 19E). Femur I with one inner row of 9 spine-like mac finely ciliate and apically rounded, 1 mac finely ciliate and apically acuminate and 1 proximal normal ciliate chaeta. Tibiotarsus I armed with three inner rows with 18 proximal short or elongated baster-shaped chaetae finely ciliate, followed by 4 thicker finely ciliate chaetae.

Furcula (Fig. 19G). Manubrium ventrally with formula 1, 2, 2, 2 (smaller)/4 (subapical), 18 (apical) ciliate chaetae; manubrial plate unclear.

Remarks. In the original description *S. mantis* was not compared with most species from the Western Palearctic region with similar chaetotaxy. *Seira mantis* is most similar to *S. uwei* Barra, 2010 by head mac **M4i**, **S4** and **Pa4** absent, basomedian labial field with chaeta **R** smaller, Th II with 4 medio-central mac (**m1**–**1i**, **m2**–**2i**) and 5 mac in **PmC** group, Th III–Abd IV with 14, 6, 4, 1 and 12 central mac, respectively; and anterior legs of males with spine-like chaetae (see Tabs 1–2). However, *S. mantis* differs from this species by Th II with 6 mac in **PmA** group (up to 8 in *S. uwei*), Abd IV with 14 lateral mac (13 in *S. uwei*), Ant IV annulated (normal in *S. uwei*), unguiculus without basal tooth (present in *S. uwei*), and manubrium ventrally with 18 apical chaetae (16 in *S. uwei*). *Seira mantis* differs also from this species by male legs I with 15 baster-shaped chaetae on tibiotarsus, while *S. uwei* has 20 spine-like chaetae.

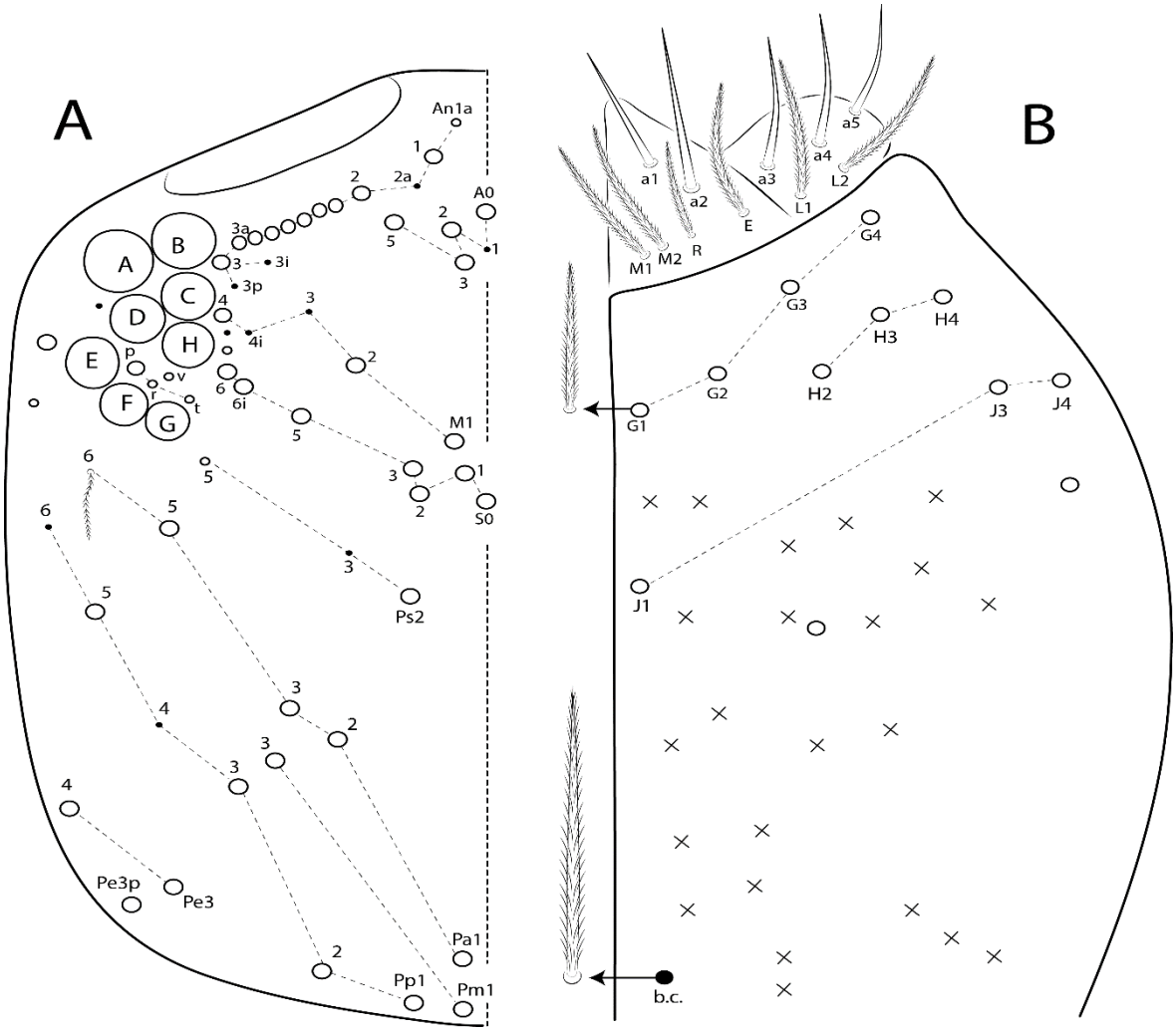

FIGURE 18A–B. *Seira mantis*: head; **A**, dorsal cephalic chaetotaxy; **B**, ventral head and basomedian and basolateral labial fields, arrows indicate normal ciliated chaetae and basal chaeta (b.c.) respectively.

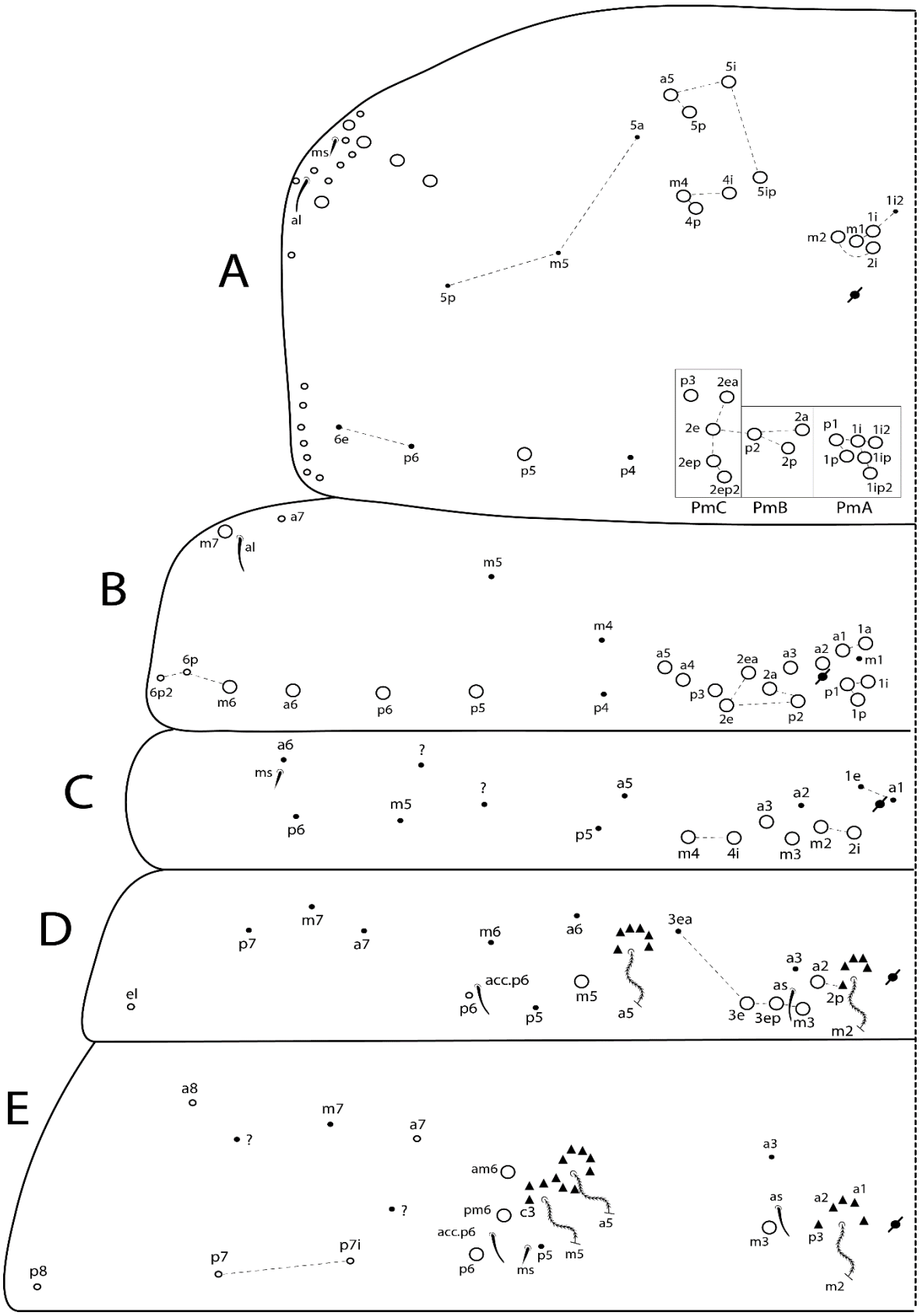

FIGURE 19A–E. *Seira mantis*: dorsal chaetotaxy; **A**, Th II; **B**, Th III; **C**, Abd I; **D**, Abd II; **E**, Abd III.

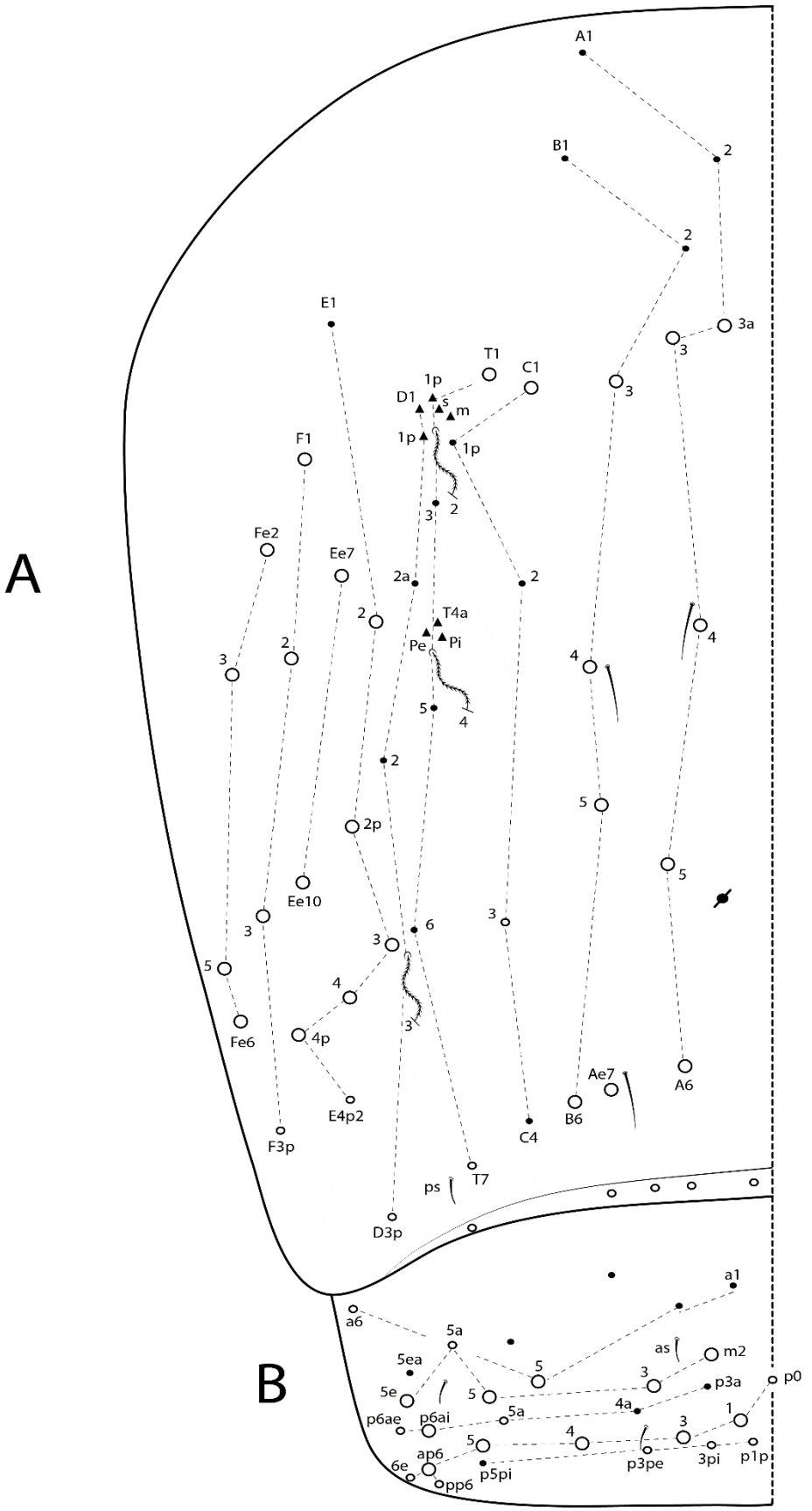

FIGURE 20A–B. *Seira mantis*: dorsal chaetotaxy; **A**, Abd IV; **B**, Abd V.

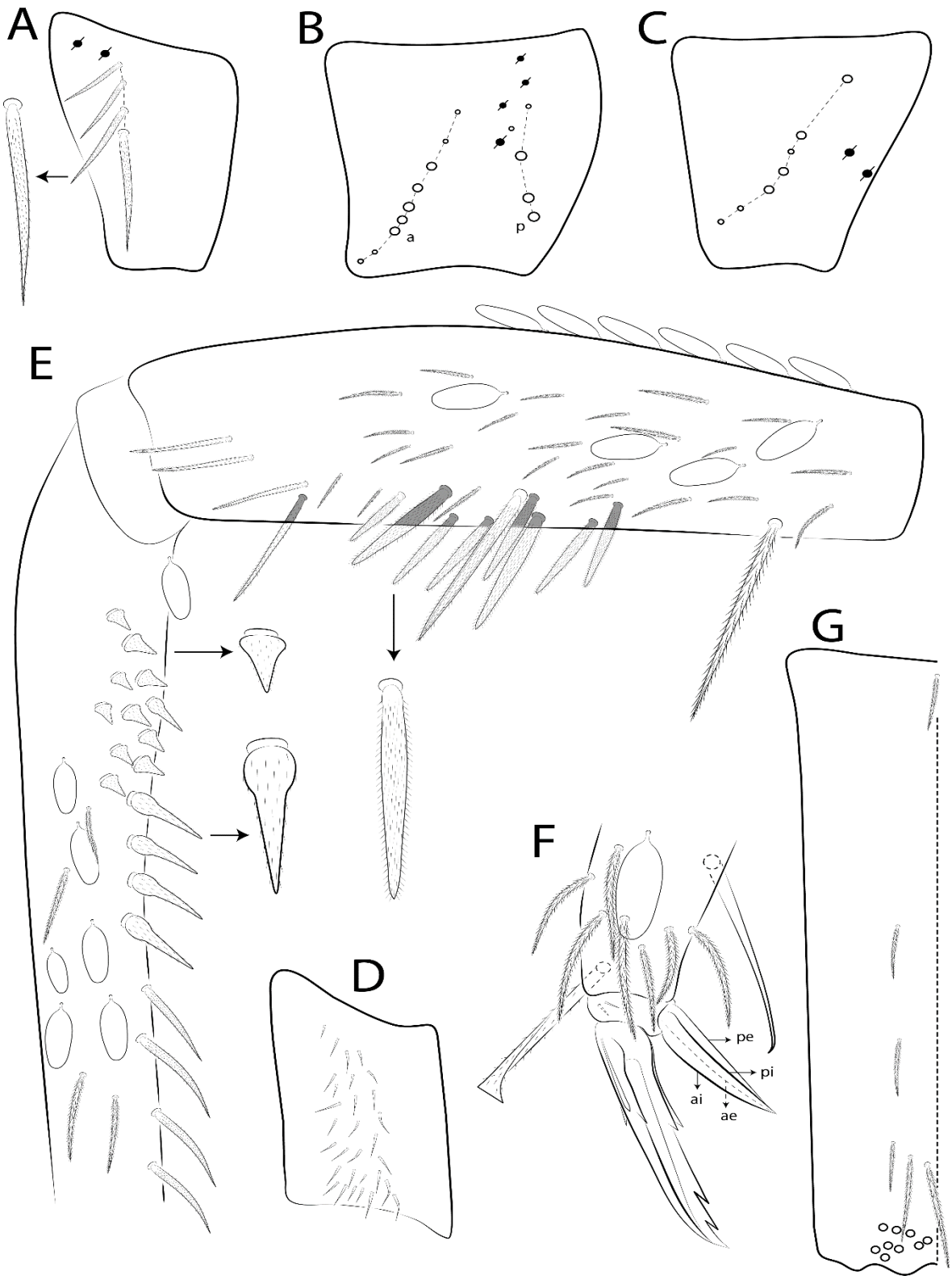

FIGURE 21A–G. *Seira mantis*: **A**, subcoxa I, arrow indicates mac finely ciliate and apically acuminate in males; **B**, subcoxa II; **C**, subcoxa III; **D**, trochanteral organ; **E**, chaetotaxy of femur and tibiotarsus I of male (anterior view), arrows indicate mac finely ciliate and apically blunt (in femur) and two types of tibiotarsal spines; **F**, distal tibiotarsus and empodial complex III (posterior view); **G**, manubrium ventral chaetotaxy.

***Seira pini* Jordana & Arbea, 1989**

Figs 2E–G, 22–25

Seira pini Jordana & Arbea, 1989: 87–91, figs 1–2, Olaberri (Navarra), Spain (orig. descr.), holotype female on slide (MZNA), examined.

Diagnosis. Body all dark violet, except head to Th III, legs and dentes, sometimes with pigmentation to the femora, or even depigmented trunk (Figs 2E–G); head mac **M4i**, **S4**, **Pa4** and **Pp6** present, eyepatches with 3 interocular chaetae (**q** and **r** absent) (Fig. 22D); labral papillae pointed, outer papillae smaller (Fig. 22C); Th II with 8–13 medio-central mac (**m1**–**2 complex**) and **PmA**–**PmC** groups with 11–14, 3 and 10–13 mac respectively (Fig. 23A); Th III–Abd III with 16–18, 9–10, 5 and 1 central mac respectively (Figs 23B–E); Abd IV with 16–17 central and 22 lateral mac (Fig. 24A); unguis apical tooth present (Fig. 25E); unguiculus outer edge smooth and with proximal tooth (Fig. 25E); manubrium ventrally with 0/2 subapical and 16–18 apical chaetae (Fig. 25G).

Examined type material. Paratypes: 2 males and 1 female in alcohol mounted on slides (IBPT-7/MZNA) mounted from paratypes in alcohol: Spain, Navarra Province, Olaberri municipality, Valle de Lónguida (42°48'19.6"N; 01°23'39.1"W), forest of *Pinus nigra* (Pinaceae), 644 m, 21.v.1986, pitfall-traps.

Other examined material. 1 male on slide (EJA0007/JIAP): Spain, Province Jaén, Linarejos municipality, Sierra de Cazorla (37º51'27"N; 03º00'00"W), 1000 m, 06.xii.2002, M. Baena coll. 1 male on slide (EJA0029/JIAP): Province Jaén, Jabalcuz municipality (37º40'25"N; 03º54'26"W), 1614 m, 16.iii.2005, A. Castro coll. 1 male and 8 females on slides and 41 in alcohol (EZA3152/INPA and MZNA): Province Zaragoza, Monegros region, Pina de Ebro municipality, Retuerta de Pina (41º29'20"N 0º25'33"W), in *Ononis tridentata* L. (Fabaceae), 350 m, 10.v.1991, pitfall-trap, J. Blasco coll. 1 juvenile on slide (EZA2472/JIAP): *idem*, except 41º23'16"N; 00º25'42"W, 380 m, 10.xi.1990. 1 male, 2 females and 1 juvenile on slides (EZA6104/JIAP): *idem*, except 41º25'53"N; 00º22'01"W, 400 m, 10.vii.1994. 1 female on slide (EAL0037/JIAP): Province Almería, Parque Natural Cabo de Gata-Nijar (36º40'59"N; 02º12'59"W), in rambla del Corralete, 39 m, 10.vi.2004, pitfall-trap, A. Aguirre and eq. coll. 1 male on slide (EAL0007/JIAP): *idem*, except in around Torregarcía beach, 25.ii.2005.

Redescription. Total length (head + trunk) of specimens 2.94–3.60 mm (n=4), holotype 3.60 mm. Type specimens pale yellowish to white with dark violet pigment on all body, except central dorsum of head to Th III, trochantera to empodia and dentes distally; eyepatches black (Fig. 2E). Scales present on Ant I to basal half of Ant III, ventral and dorsal head, thorax and abdomen dorsally, legs (except empodia), anterior collophore, dorsal and ventral manubrium and dentes ventrally.

Head. Antennae shorter than body length, antennal ratio as I: II: III: IV = 1: 1.25–1.39: 1.44–1.87: 2.75–3.43 (n=4), holotype 1: 1.25: 1.70: 2.75 (Fig. 2E). Ant IV annulated, with simple apical bulb retractile and blunt sens. Ant III apical organ with two rod-like sens, 3 guard sens and several blunt sens of different sizes (Fig. 22A). Clypeal formula with 4 (**l1**–**2**), 7 (**f**), 3 (**pf0**–**1**) ciliate chaetae, **l1** acuminate, **l2** largest, and 3 frontal smaller (Fig. 22B). Four conical labral papillae, outer papillae smaller (Fig. 22C). Maxillary palp with smooth apical appendage (a.a.) and basal chaeta (b.c.) weakly ciliated, thicker and 1.17 longer than apical. Eyes A, B and C larger, G and H smaller, with 3 interocular chaetae (**v**, **p**, **t**); head dorsal chaetotaxy (Fig. 22D) with 8–10 'An' mac (**An1**, **An2**–**3**), 4 'A' mac (**A0**, **A2**–**3**, **A5**), 4 'M' mac (**M1**–**2**, **M4i**–**4**), 8 'S' mac (**S0**–**6**), 1 'Ps' mac (**Ps2**), 5 'Pa' mac (**Pa1**–**5**), 2 'Pm' mac (**Pm1**, **Pm3**), 5 'Pp' mac (**Pp1**–**3**, **Pp5**–**6**), and 3 'Pe' mac (**Pe2**–**3** plus **Pe3p**). Basomedian and basolateral labial fields with **M1**–**2**, **R** (smaller), **E**, **L1**–**2**. Postlabial ventral chaetotaxy with about 16–17 ciliate chaetae, postlabial formula 4–5 (**G1**–**4**), 4 (**H2**–**4**), 4 (**J1**–**4**), **X3?** present or absent, basal chaeta absent (Fig. 22E).

Thorax chaetotaxy (Figs 23A–B). Th II, series 'a' with 4 mac (**a5ip**–**5p**); series 'm' with 11–16 mac (**m1**–**2 complex**, **m4i**–**4p**), five inner mac present or absent; series 'p' with 25–31 mac (**p1ip5**–**p1p5p**, **p2a**–**p2ep2**, **p3i4**–**p3p3, p5**), **p1ip4** and **p1p6** present or absent, **p1ip5** generally mac. Th III, series 'a' with 7 mac (**a1i**–**6**); series 'm' with 1 mac (**m6**); series 'p' with 12–14 mac (**p1ip2**–**1p**, **p2a3**–**2ea**, **p3**, **p5**–**6**), **p1i3** and **p2a3** present or absent. Th ratio as II: III = 1: 0.32–0.59 (n= 4), holotype 1: 0.45.

Abdomen chaetotaxy (Figs 23C–E, 24A–B). Abd I, series 'a' with 4–5 mac (**a1**–**3**), **a1** generally as mic; series 'm' with 5 mac (**m2i**–**4**), **m6** mic absent. Abd II, series 'a' with 2 mac (**a2**–**3**); series 'm' with 4 mac (**m3**–**3e**, **m5**). Abd III, series 'm' with 3 mac (**m3**, **am6**, **pm6**); series 'p' with 1 mac (**p6**). Abd IV with 16–17 central mac of series 'A' to 'T' (**A3a**–**6**, **Ae7**, **B1**–**6**, **Be2**–**3**,**C1**, **C4**, **T1**), **A3a** can be displaced and **Be3** present or absent; and 22 lateral mac of series 'E' to 'Fe' (**E2**–**4p**, **Ee7**, **Ee10**, **F1**–**3**, **Fe2**–**5** and four of uncertain homology); at least 3 sens (**ps** type I and 2 type II), and posteriorly with 7 mes

present. Abd V, series ‘a’ with 1 mac (**a5**); series ‘m’ with 4 mac (**m2**–**3**, **m5**–**5e**); series ‘p’ with 6 mac (**p1**, **p3**–**5**, **ap6**, **pp6**). Abd ratio as III: IV = 1: 3.50–5.72 (n= 4), holotype 1: 4.77. Male genital plate circinate with 6+7 (one unpaired posterior) and 3+3 small inner smooth chaetae (Fig. 25I).

Legs. Subcoxa I with 3 chaetae and 2 psp; subcoxa II with an anterior row of 9 chaetae, posterior row of 7 chaetae, 1 anterior chaeta and 4 psp; subcoxa III with one row of 11 chaetae, 3 anterior chaetae and 2 posterior psp (Figs 25A–C). Trochanteral organ with about 44 spine-like chaetae (Fig. 25D). Unguis with median and apical teeth with the same length, basal teeth smaller. Unguiculus with all lamellae acuminate, pe lamella with small proximal tooth, other lamellae (ai, ae, pi) smooth; ratio unguis: unguiculus = 1: 0.63 (Fig. 25E). Tibiotarsus III distally with inner smooth chaeta 0.61 smaller than unguiculus; and outer tenent hair capitate, discretely ciliate, and 0.81 smaller than unguis.

Collophore (Fig. 25F). Anterior side with 16 ciliate chaetae, including 3 distal mac, 1 apically acuminate and 1 basal spine-like chaeta finely ciliate; posterior side with 14 ciliate chaetae, 2 distal thickest and 5 thinnest; lateral flap with 3 smooth chaetae (one small posteriorlly) and about 33 ciliate chaetae.

Furcula (Figs 25G–H). Manubrium ventrally with formula 0, 0, 0, 0/2 (subapical), 16–18 (apical) ciliate chaetae and approximately 19 elongated apical scales per side; manubrium dorsally with 6 subapical ciliate chaetae; manubrial plate with 9 ciliate chaetae and 3 psp.

Remarks. *Seira pini* is most similar to *S. squamoornata* (Scherbakov, 1898), *S. saxatilis* Gisin & Gama, 1962 and *S. lusitanica* Gama, 1964 by dense macrochaetotaxy of head with mac **M4i**, **S4**, **Pa4** present, Th II with about 10 medio-central mac (**m1**–**2 complex**) and **PmA** and **PmC** groups with 11–13 and 10–13 mac, respectively; and Th III–Abd IV with at least 16, 9, 5, 1 and 16 central mac, respectively (Tab. 2). However, *S. pini* differs from these species by head with mac **Pp6** present (absent in other species), Th II with up to 13 medio-central mac (10 in *S. squamoornata* and *S. lusitanica*, 11 in *S. saxatilis*) and **PmA** and **PmC** groups with up to 14 and 13 mac respectively (12 or less **PmA** mac in *S. squamoornata* and *S. lusitanica*, and less than **PmC** 11 mac in others species); Th III with 16–18 central mac (15 in *S. saxatilis*, 24 in *S. lusitanica*), and Abd IV with up to 17 central mac (16 in *S. lusitanica* and *S. saxatilis*). Other comparisons among species are presented in Tables 1 and 2.

Seira pini may have different color patterns in populations (Figs 2E–G). Specimens of Monegros (Zaragoza) are similar to the species of the type locality, except for the pigmentation of the trochanters and femora and the dorsal rearrangement that extends until Abd III. Species from this same population may still have total dorsal depigmentation of Th II to Abd III, and partially of Abd IV, remaining in the latter case a central spot of dark pigment.

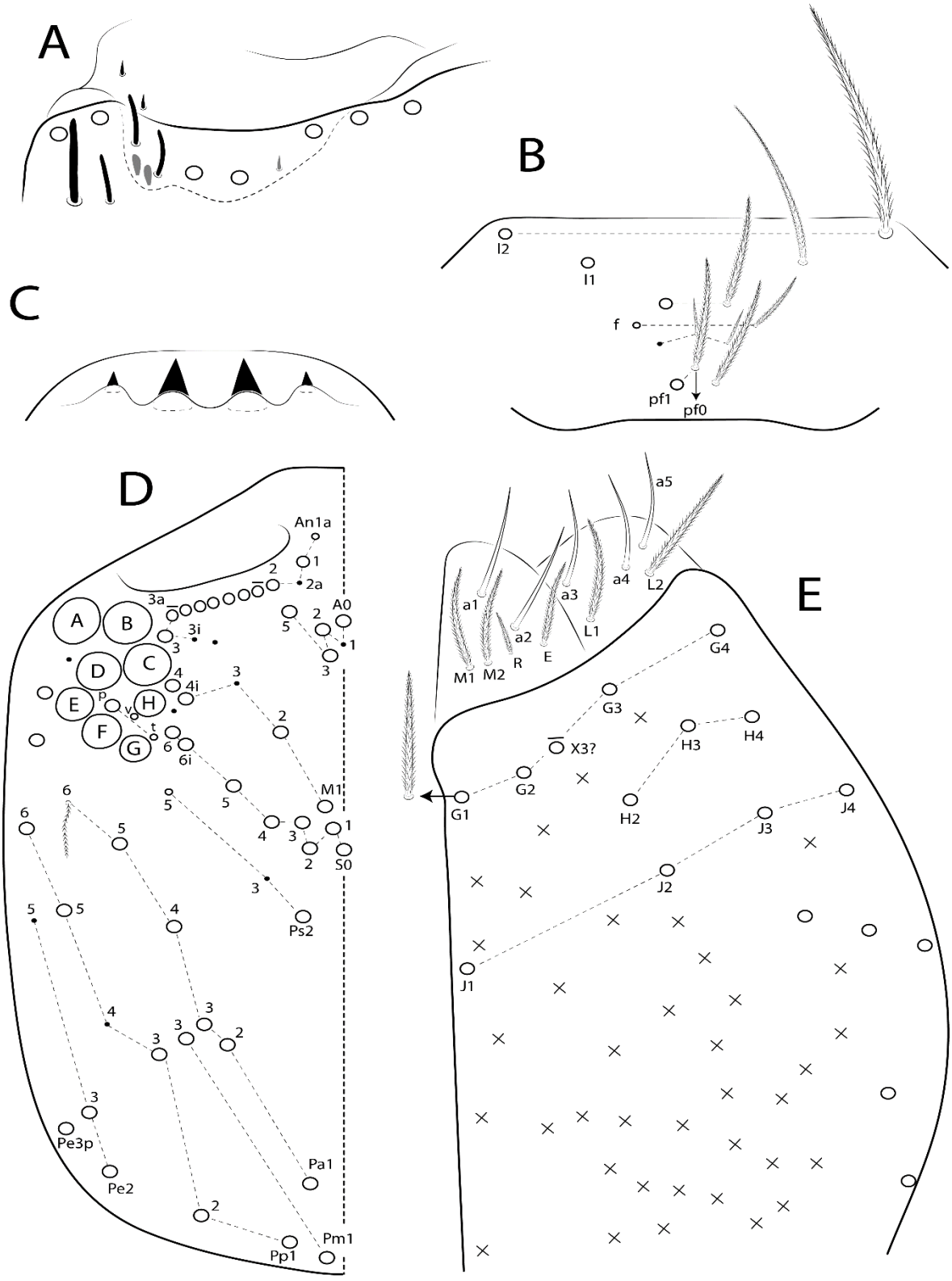

FIGURE 22A–E. *Seira pini*: head; **A**, Ant III apical organ; **B**, clypeal chaetotaxy; **C**, labral papillae; **D**, dorsal cephalic chaetotaxy; **E**, ventral head and basomedian and basolateral labial fields, arrow indicates normal ciliated chaetae.

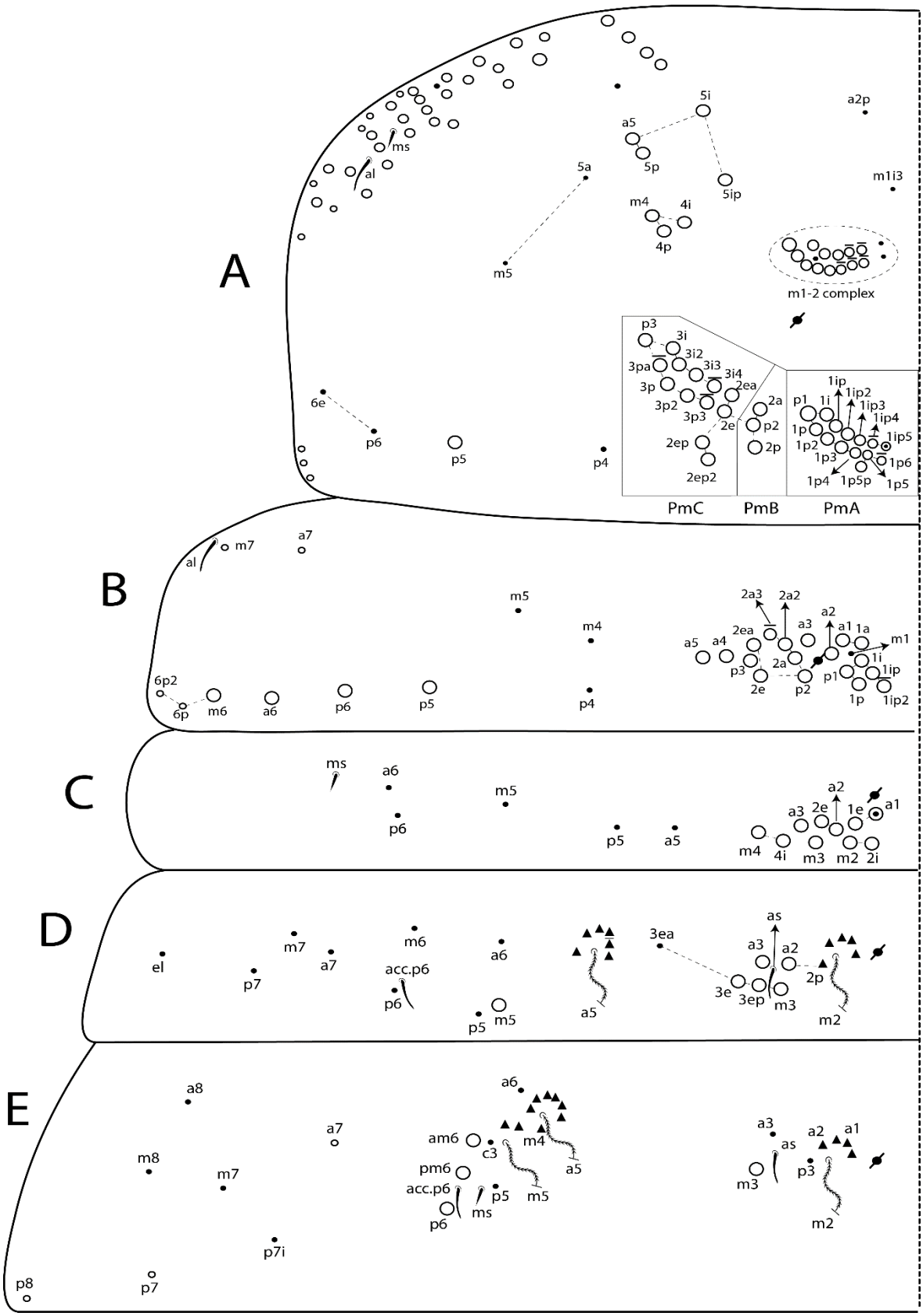

FIGURE 23A–E. *Seira pini*: dorsal chaetotaxy; **A**, Th II; **B**, Th III; **C**, Abd I; **D**, Abd II; **E**, Abd III.

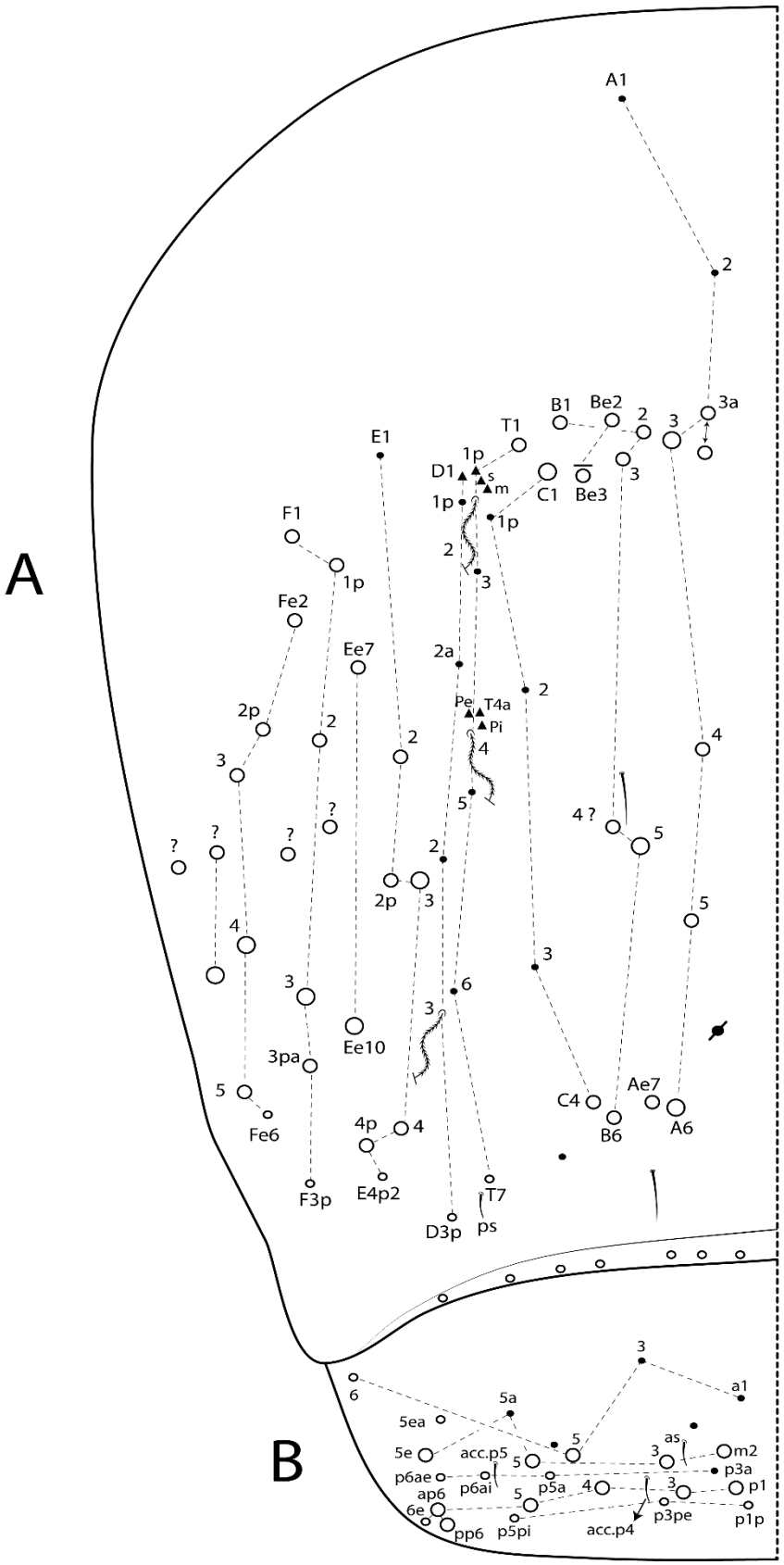

FIGURE 24A–B. *Seira pini*: dorsal chaetotaxy; **A**, Abd IV; **B**, Abd V.

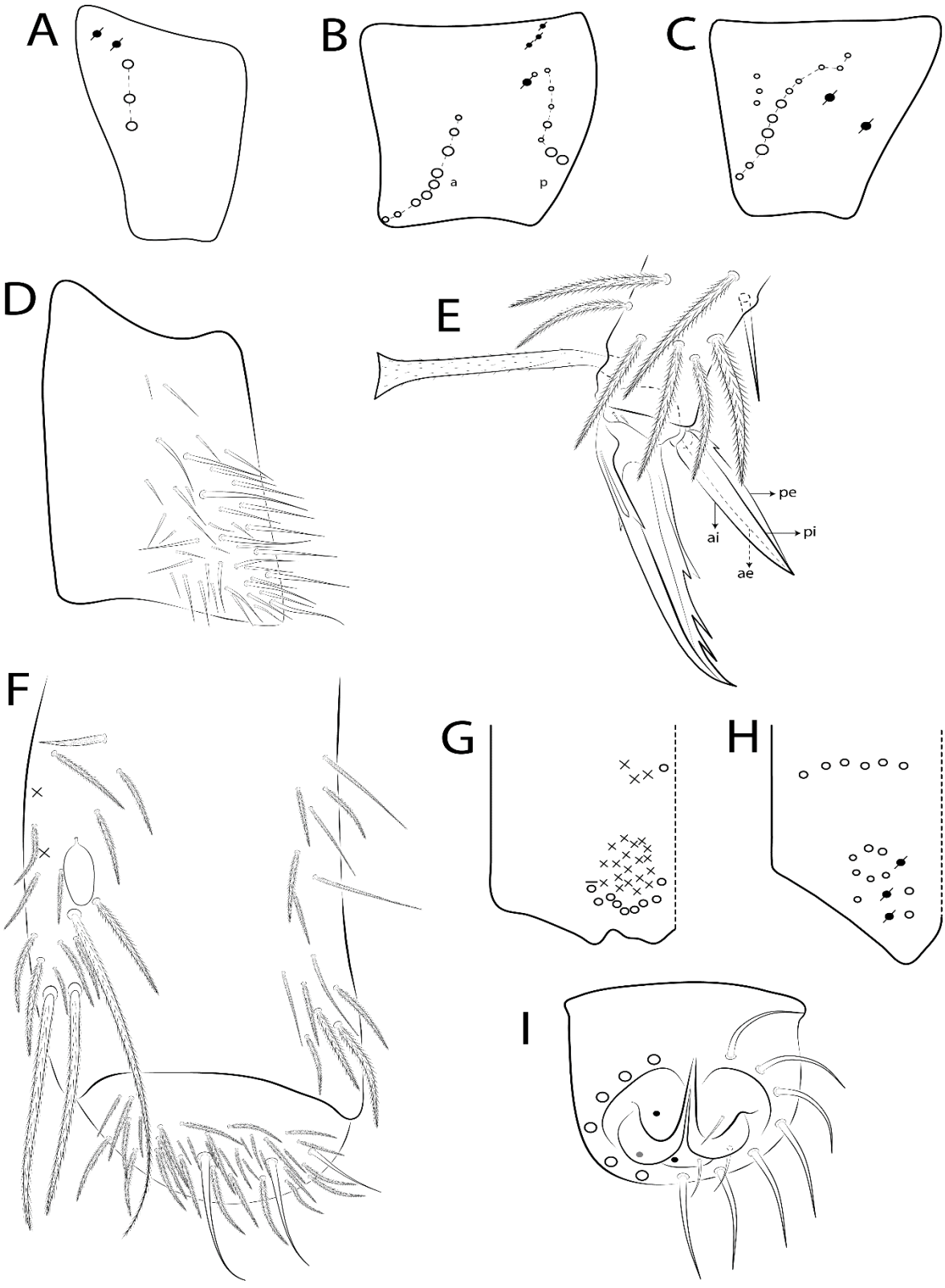

FIGURE 25A–I. *Seira pini*: **A**, subcoxa I; **B**, subcoxa II; **C**, subcoxa III; **D**, trochanteral organ; **E**, distal tibiotarsus and empodial complex III (posterior view); **F**, collophore chaetotaxy (lateral view); **G**, manubrium ventral chaetotaxy; **H**, manubrial plate and subapical chaetae (dorsal view); **I**, male genital plate.

***Seira barrai* sp. nov. Cipola & Baquero**

Figs 3C, 26–29

Diagnosis. Body black with legs yellowish (Fig. 3C); head mac **M4i**, **S4**, **Pa4** and **Pp6** absent, eyepatches with 3 interocular chaetae (**q** and **r** absent) (Fig. 26E); labral papillae conical, outer papillae smaller (Fig. 26D); Th II with 4 medio-central mac (**m1**–**1i**, **m2**–**2i**) and **PmA**–**PmC** groups with 6–7, 2–3 and 5 mac (Fig. 27A); Th III–Abd III with 14, 6, 4 and 1 central mac, respectively (Figs 27B–E); Abd IV with 11–12 central and 13–14 lateral mac (Fig. 28A); unguis apical tooth absent (Fig. 29E); unguiculus outer edge serrated and with proximal tooth (Fig. 29E); manubrium ventrally with 0/2 subapical and 14–16 apical chaetae (Fig. 29G).

Type material. Holotype female on slide (20141218-e/MZNA): Spain, Navarra Province, Viana municipality, Embalse de Las Cañas (42°29'20.3"N; 02°24'13.6"W), on *Suaeda vera* (Amaranthaceae), 383 m, 18.xii.2014, E. Baquero coll. Paratypes on slides (MZNA): 1 female and 1 juvenile, same data as holotype.

Description. Total length (head + trunk) of adult specimens 2.14–2.16 mm (n=2), holotype 2.16 mm. Specimens completely black, except for trochanters and femora slightly depigmented and tibiotarsi yellow; eyepatches black (Fig. 3C). Scales present on Ant I to basal third of Ant III, ventral and dorsal head, thorax and abdomen dorsally, legs (except empodia), anterior collophore, and manubrium and dentes ventrally.

Head. Antennae shorter than body length, antennal ratio as I: II: III: IV = 1: 1.59–1.72: 1.78–1.82: 2.27–2.82 (n=3), holotype 1: 1.60: 1.78: 2.34 (Fig. 3C). Ant IV annulated, with apical bulb apically bilobed and blunt sens (Fig. 26A). Ant III apical organ with two rod-like sens, 3 guard sens and several blunt sens of different sizes (Fig. 26B). Clypeal formula with 4 (**l1**–**2**), 2 (**f**), 5 (**pf0**–**2**) ciliate chaetae, **l1** acuminate, **l2** largest, **pf2** smaller and spine-like (Fig. 26C). Four conical labral papillae, outer papillae smaller (Fig. 26D). Maxillary palp with smooth apical appendage (a.a.) and basal chaeta (b.c.) weakly ciliated, thicker and 1.03 longer than apical. Eyes A and B larger, G and H smaller, with 3 interocular chaetae (**v**, **p**, **t**); head dorsal chaetotaxy (Fig. 26E) with 9 'An' mac (**An1, An2**–**3**), 4 'A' mac (**A0**, **A2**–**3**, **A5**), 3 'M' mac (**M1**–**2**, **M4**), 7 'S' mac (**S0**–**3**, **S5**–**6**), 1 'Ps' mac (**Ps2**), 4 'Pa' mac (**Pa1**–**3**, **Pa5**), 2 'Pm' mac (**Pm1**, **Pm3**), 4 'Pp' mac (**Pp1**–**3**, **Pp5**), and 3 'Pe' mac (**Pe2**–**3** plus **Pe3p**). Basomedian and basolateral labial fields with **M1**–**2**, **R**, **E**, **L1**–**2**, **M1**, **R** smaller. Postlabial ventral chaetotaxy with about 15 ciliate

chaetae, postlabial formula 4 (**G1**–**4**), 3 (**H2**–**4**), 4 (**J1**–**4**), **J2** reduced, basal chaeta (b.c.) largest (Fig. 26F).

Thorax chaetotaxy (Figs 27A–B). Th II, series 'a' with 4 mac (**a5ip**–**5p**); series 'm' with 7 mac (**m1i**–**1**, **m2i**–**2**, **m4i**–**4p**); series 'p' with 14–16 mac (**p1i2p**–**1p**, **p2a–2ep2**, **p3**, **p5**), **p1ip** present or absent, **p2a** as mac or mic. Th III, series 'a' with 7 mac (**a1i**–**6**); series 'm' with 1 mac (**m6**); series 'p' with 10 mac (**p1i**–**1p**, **p2a**–**2ea**, **p3**, **p5**–**6**). Th ratio as II: III = 1: 0.55–0.72 (n= 3), holotype 1: 0.72.

Abdomen chaetotaxy (Figs 27C–E, 28A–B). Abd I, series 'a' with 1 mac (**a3**); series 'm' with 5 mac (**m2i**–**4**). Abd II, series 'a' with 1 mac (**a2**); series 'm' with 4 mac (**m3**–**3e**, **m5**). Abd III, series 'm' with 3 mac (**m3**, **am6**, **pm6**); series 'p' with 1 mac (**p6**). Abd IV with 11–12 central mac of series 'A' to 'T' (**A3a**–**6**, **Ae7**, **B3**–**6**, **C1**, **T1**), **A3a** as mac or mic, and 13–14 lateral mac of series 'E' to 'Fe' (**E2**–**4p**, **Ee7**, **Ee10**, **F1**–**3**, **Fe2**–**5**), **E2p** as mac or mic; at least 5 sens (**ps** type I and 4 type II), and posteriorly with 6 mes and 1 mic present. Abd V, series 'a' with 1 mac (**a5**); series 'm' with 4 mac (**m2**–**3**, **m5**–**5e**); series 'p' with 5 mac (**p1**, **p3**–**5**, **ap6**). Abd ratio as III: IV = 1: 3.21–5.07 (n= 3), holotype 1: 3.21.

Legs. Subcoxa I with 4 chaetae and 2 psp; subcoxa II with an anterior row of 10 chaetae and 1 anterior chaeta, posterior row of 4 chaetae and 5 psp; subcoxa III with one row of 9 chaetae and 2 posterior psp (Figs 29 A–C). Trochanteral organ with about 20 spine-like chaetae (Fig. 29D). Unguis with basal and median teeth with the same length, apical tooth absent. Unguiculus with all lamellae acuminate, pe lamella serrated and with small proximal tooth, other lamellae (ai, ae, pi) smooth; ratio unguis: unguiculus = 1: 0.53 (Fig. 29E). Tibiotarsus III distally with inner smooth chaeta 1.10 larger than unguiculus; outer tenent hair capitate, discretely ciliate, and 0.93 smaller than unguis.

Collophore (Fig. 29F). Anterior side with 10 ciliate chaetae, including 2 distal mac and 1 large acuminate long chaetae; posterior side with 5 ciliate chaetae, 1 distal thickest; lateral flap with 3 smooth chaetae (one small posteriorly) and 12 ciliate chaetae.

Furcula (Figs 29G–H). Manubrium ventrally with formula 1, 0, 0, 0/2 (subapical), 14–16 (apical) ciliate chaetae and approximately 11 elongated apical scales per side; manubrium dorsally with 7 subapical ciliate chaetae; manubrial plate with 5–6 ciliate chaetae and 4 psp.

Etymology. The species was named after Dr. Jean-Auguste Barra (Louis Pasteur University, France), researcher of *Seira*.

Remarks. *Seira barrai* **sp. nov.** is most similar to *S. maroccana* Negri, Pellecchia & Fanciulli, 2005 and *S. vanderheydeni* Jacquemart, 1974, both from Northern Africa, in head mac **M4i**, **S4**, **Pa4** absent, Th II with 4 medio-central mac (**m1**–**1i**, **m2**–**2i**) and 5 mac in **PmC** group, Th III-Abd III with 14, 6, 4 and 1 central mac, respectively; and Abd IV with about 11 central mac (Tab. 2). However, *S. barrai* **sp. nov.** differs from these species by chaetotaxy of the Th II with up to 7 mac (generally) in **PmA** group (6 in *S. maroccana* and *S. vanderheydeni*), and 13–14 lateral mac in Abd IV (12 in *S. maroccana*). *Seira barrai* **sp. nov.** differs also by Ant IV with apical bulb apically bilobed (simple in *S. maroccana*), unguis without apical tooth (present in the other species), unguiculus with outer lamella serrated and with proximal tooth (outer lamella smooth and without tooth in *S. maroccana*), and manubrium ventrally with 0/2 subapical and 14–16 apical chaetae (0/4 and 12, respectively, in *S. maroccana*) (see Tabs 1 and 2). *Seira barrai* **sp. nov.** also differs from these species by body black with legs yellowish, while *S. vanderheydeni* is depigmented (except eyepatches) and *S. maroccana* has transverse white strips on Abd I–II, and anterior and posterior Abd IV. This color pattern of *S. barrai* **sp. nov.** is similar to *S. pallidipes* Reuter, 1895, but the new species differs from this last by reduction of dorsal macrochaetotaxy (see Winkler & Dányi 2017, and remarks of *S. burgersi* **sp. nov.**). Other morphological differences among the compared species are presented in Tables 1 and 2.

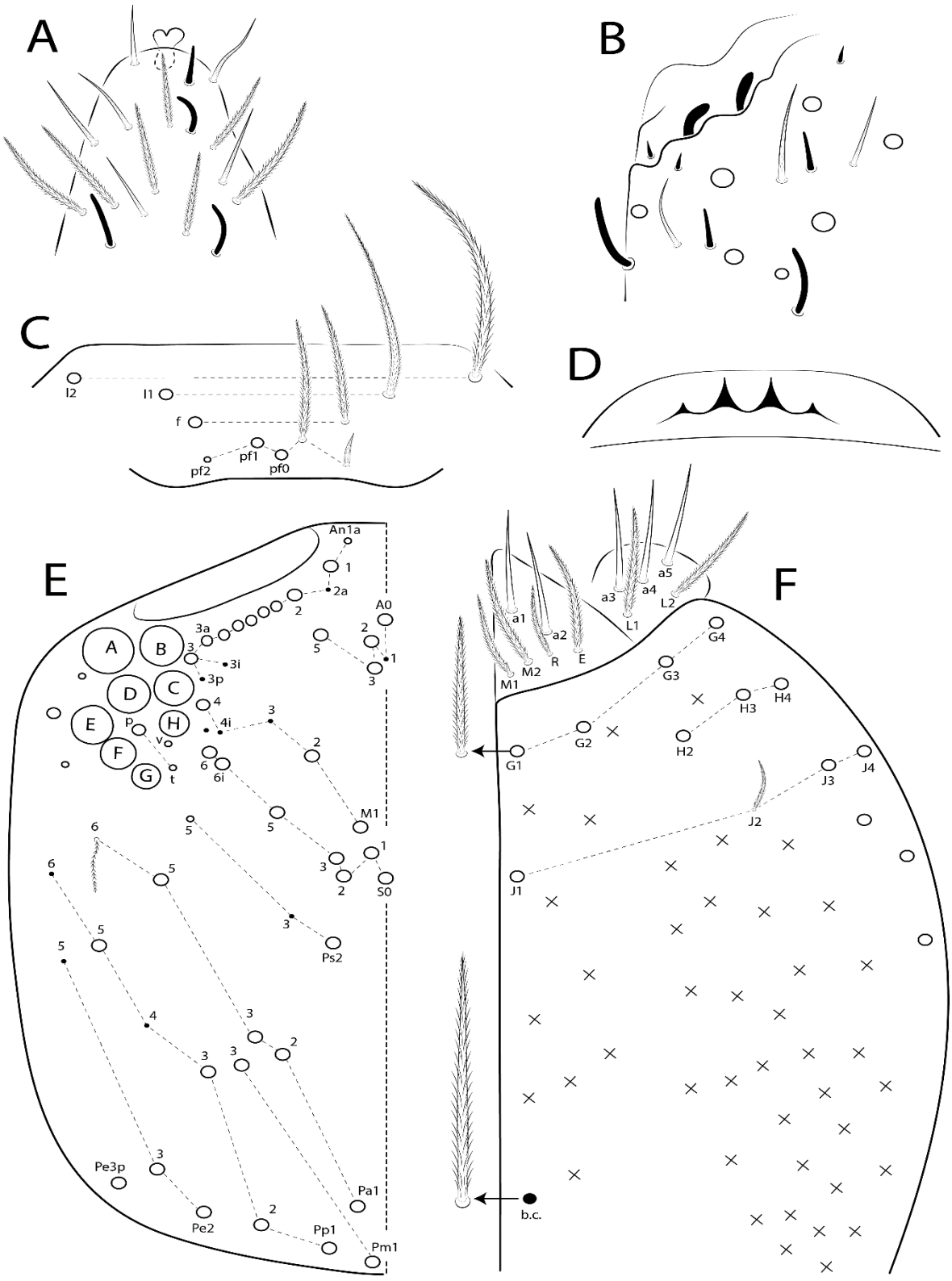

FIGURE 26A–F. *Seira barrai* **sp. nov.**: head; **A**, apex of Ant IV; **B**, Ant III apical organ; **C**, clypeal chaetotaxy; **D**, labral papillae; **E**, dorsal cephalic chaetotaxy; **F**, ventral head and basomedian and basolateral labial fields, arrows indicate normal ciliated chaetae and basal chaeta (b.c.), respectively.

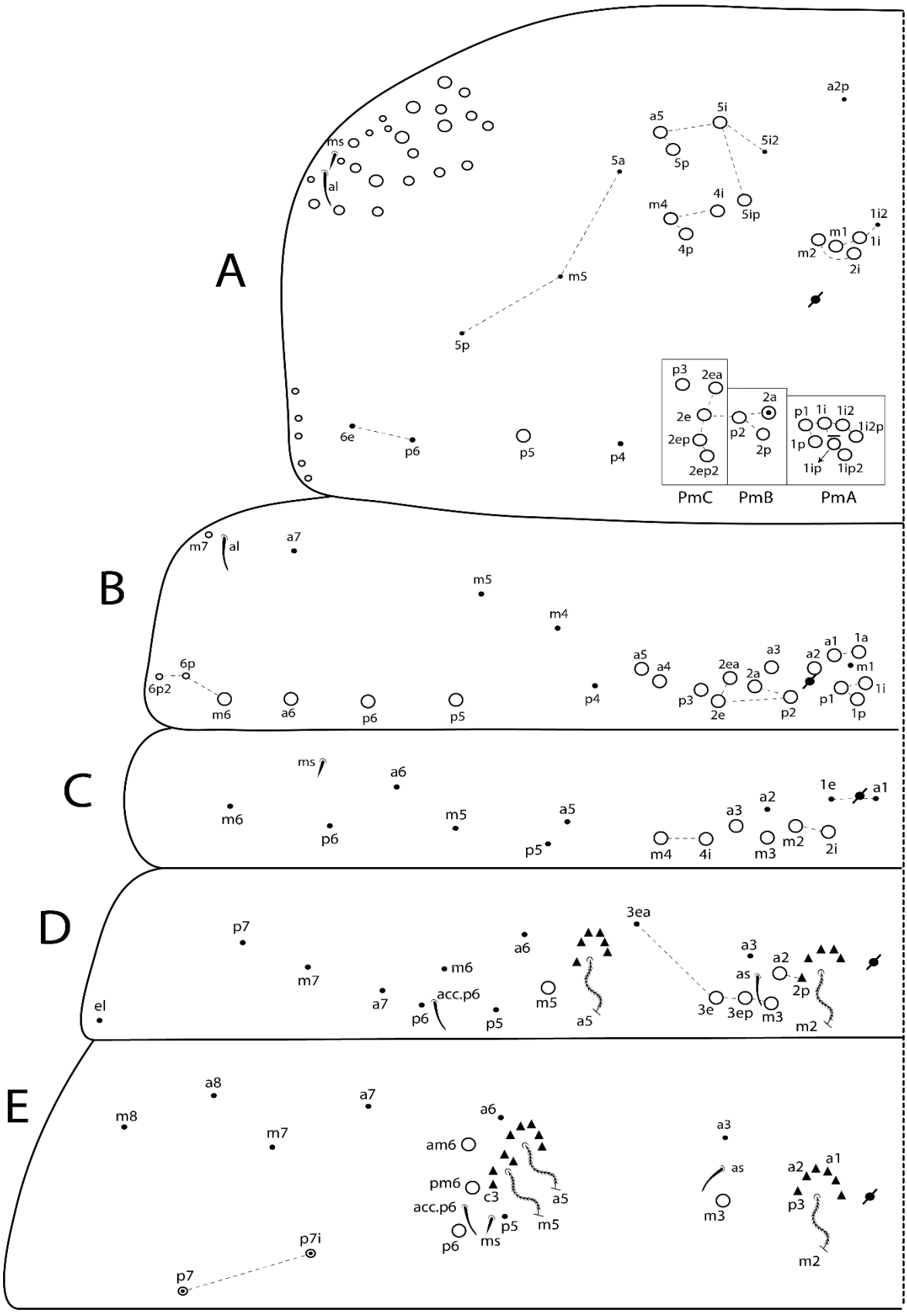

FIGURE 27A–E. *Seira barrai* **sp. nov.**: dorsal chaetotaxy; **A**, Th II; **B**, Th III; **C**, Abd I; **D**, Abd II; **E**, Abd III.

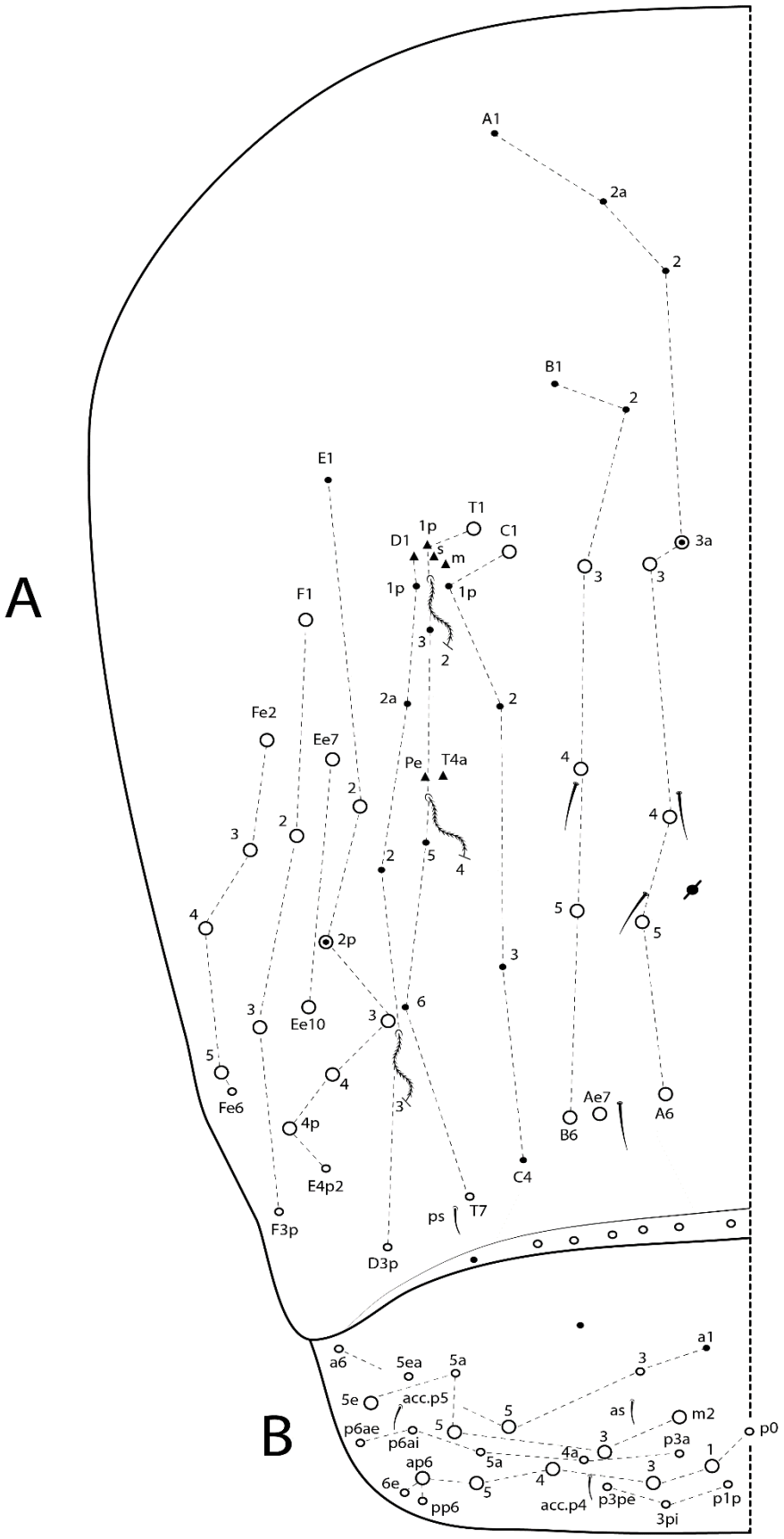

FIGURE 28A–B. *Seira barrai* **sp. nov.**: dorsal chaetotaxy; **A**, Abd IV; **B**, Abd V.

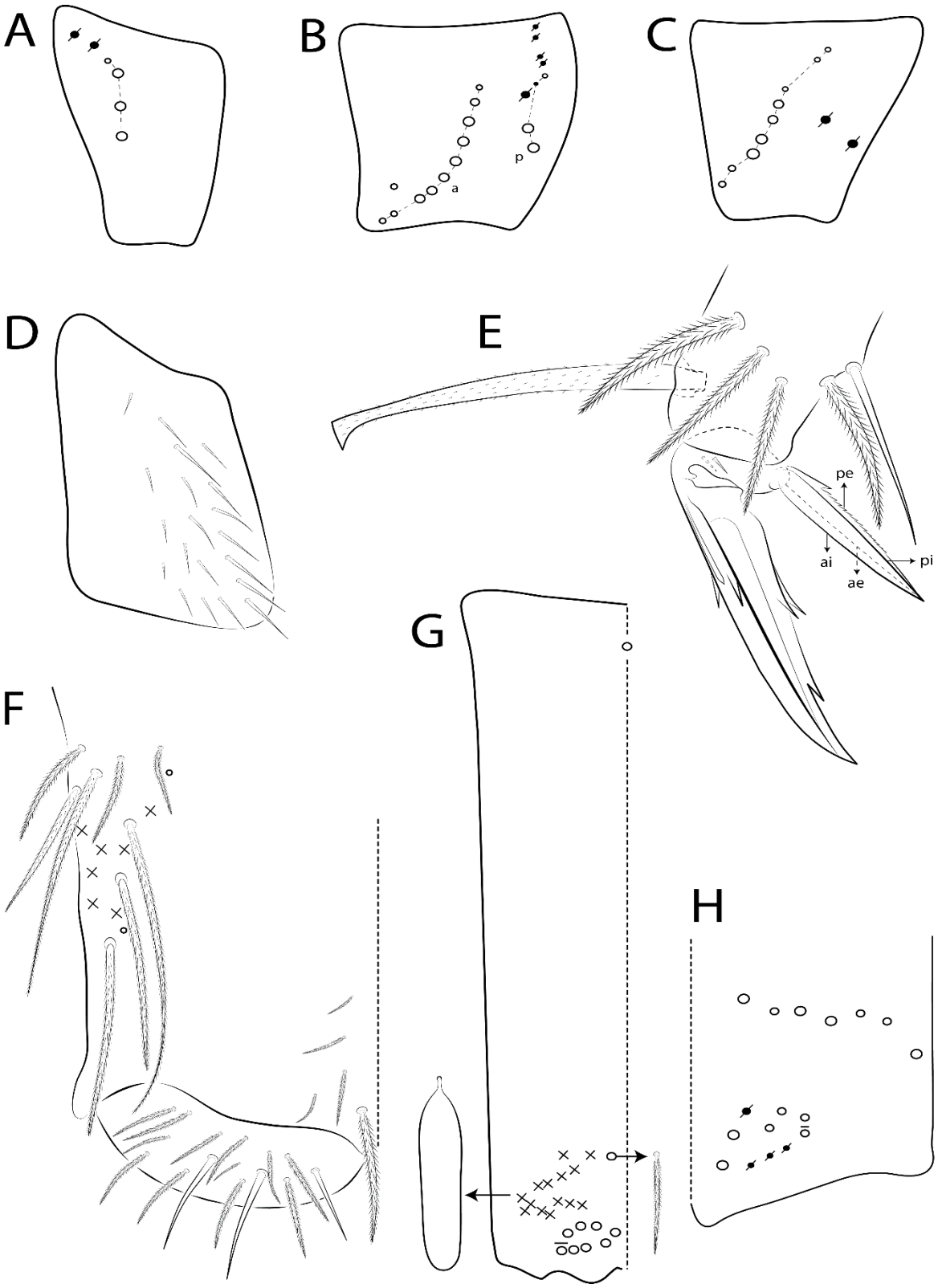

FIGURE 29A–H. *Seira barrai* **sp. nov.**: **A**, subcoxa I; **B**, subcoxa II; **C**, subcoxa III; **D**, trochanteral organ; **E**, distal tibiotarsus and empodial complex III (posterior view); **F**, collophore chaetotaxy (lateral view); **G**, manubrium ventral chaetotaxy, arrows indicate elongated apical scales and supapical ciliate chaeta, respectively; **H**, manubrial plate and subapical chaetae (dorsal view).

***Seira betica* sp. nov. Cipola & Arbea**

Figs 3A, E, 30–34

Diagnosis. Body with two longitudinal bands on Th II–Abd II, and Abd III–IV with irregular transverse spots or restricted on head and thorax laterally when preserved in alcohol (Figs 3A, E); head mac **M4i**, **S4**, **Pa4** and **Pp6** absent, eyepatches with 4 interocular chaetae (**q** absent) (Fig. 31E); labral papillae conical, outer papillae reduced to conical projections (Fig. 31C); Th II with 5 medio-central mac (**m1**–**1i2**, **m2**–**2i**) and **PmA**–**PmC** groups with 7–9, 3 and 6 mac respectively (Fig. 32A); Th III–Abd III with 15–17, 6, 5 and 1–2 (rarely **a3** as mac) central mac, respectively (Figs 32B–E); Abd IV with 14 central mac, 16–17 lateral mac and about 10 psp anteriorly (Fig. 33A); unguis apical tooth present (Fig. 34E); unguiculus outer edge serrated and with proximal tooth (Fig. 34E); manubrium ventrally with 2/2 subapical and 14–20 apical chaetae (Fig. 34G).

Type material. Holotype female on slide (EHL0005/MNCN): Spain, Huelva Province, Minas de Riotinto municipality (37º39'11"N; 06º37'10"W), on wood, 445 m, 11.x.2015, A. Burgers coll. Paratypes on slides (INPA and MNCN): 3 females and 2 specimens in alcohol, same data as holotype.

Other material. 2 females and 1 juvenile on slides (EAL0001/JIAP), Spain, Almería province, Vera municipality, Playa de Vera (37º12'09"N; 01º48'42"W), back of the beach, 1 m, 27.ix.2005, pitfall trap, J.I. Arbea coll.

Description. Total length (head + trunk) of adult specimens 2.79–3.44 mm (n=4), holotype 2.89 mm. Alive specimens with Ant III–IV and legs brownish, Ant I–II, head and body black (formed by scales) with two dorsal white longitudinal bands (formed by scales) that extend from Th II to Abd II, plus irregular transverse spots on Abd III and two spots on Abd IV (Fig. 3A). Specimens in alcohol pale white with dark blue pigment on apex of Ant IV, anterior head, Th I, coxae to basal half of femora, collophore, and Abd I–IV laterally; eyepatches black (Fig. 3E). Scales present on Ant I to basal half of Ant III, ventral and dorsal head, thorax and abdomen dorsally, legs (except empodia), anterior collophore, and manubrium and dentes ventrally (Figs 30A–D, I–J).

Head. Antennae shorter than body length, antennal ratio as I: II: III: IV = 1: 1.60–1.78: 1.57–1.99: 2.38–2.95 (n=4), holotype 1: 1.69: 1.80: 2.72 (Fig. 3A, E). Ant IV annulated, with simple apical bulb retractile and blunt sens. Ant III apical organ with two rod-like sens, 3 guard sens, one atypical rounded bulb and several blunt sens of different

sizes (Fig. 31A). Clypeal formula with 4 (**l1**–**2**), 4 (**f**), 3 (**pf0**–**1**) ciliate chaetae, **l1** acuminate, **l2** largest, and 2 outer frontal smaller (Fig. 31B). Two inner labral papillae conical, outer papillae reduced to conical projections (Fig. 31C). Maxillary palp with smooth apical appendage (a.a.) and basal chaeta (b.c.) weakly ciliated, thicker and 1.08 longer than apical (Fig. 31D). Eyes A and B larger, G smaller, with 4 interocular chaetae (**v**, **p**, **r**, **t**); head dorsal chaetotaxy (Fig. 31E) with 10 'An' mac (**An1**, **An2**–**3**), 4 'A' mac (**A0**, **A2**–**3**, **A5**), 3 'M' mac (**M1**–**2**, **M4**), 7 'S' mac (**S0**–**3**, **S5**–**6**), 1 'Ps' mac (**Ps2**, rarely as mic), 4 'Pa' mac (**Pa1**–**3**, **Pa5**), 2 'Pm' mac (**Pm1**, **Pm3**), 4 'Pp' mac (**Pp1**–**3**, **Pp5**), and 4 'Pe' mac (**Pe2**–**4** plus **Pe3p**). Basomedian and basolateral labial fields with **M1**–**2**, **R** (smaller), **E**, **L1**–**2**. Postlabial ventral chaetotaxy with about 17 ciliate chaetae, postlabial formula 4 (**G1**–**4**), 3 (**H2**–**4**), 4 (**J1**–**4**), basal chaeta (b.c.) largest (Fig. 31F).

Thorax chaetotaxy (Figs 32A–B). Th II, series 'a' with 4 mac (**a5ip**–**5p**); series 'm' with 8 mac (**m1i2**–**2**, **m4i**–**4p**); series 'p' with 17–19 mac (**p1i2p2**–**1p**, **p2a–2ep2**, **p3**–**3p**, **p5**), **p1i2p2** and **p1ip2p** present or absent. Th III, series 'a' with 7 mac (**a1i**–**6**); series 'm' with 1 mac (**m6**); series 'p' with 11–13 mac (**p1ip2**–**1p2**, **p2a**–**2ea**, **p3**, **p5**–**6**), **p1ip** and **p1ip2** present or absent. Th ratio as II: III = 1: 0.49–0.61 (n= 4), holotype 1: 0.49.

Abdomen chaetotaxy (Figs 32C–E, 33A–B). Abd I, series 'a' with 1 mac (**a3**); series 'm' with 5 mac (**m2i**–**4**). Abd II, series 'a' with 2 mac (**a2**–**3**); series 'm' with 4 mac (**m3**–**3e**, **m5**). Abd III, series 'a' with **a3** rarely as mac; series 'm' with 3 mac (**m3**, **am6**, **pm6**); series 'p' with 1 mac (**p6**). Abd IV with 14 central mac of series 'A' to 'T' (**A3a**–**6**, **Ae7**, **B1**–**6**, **C1**, **T1**), and 16–17 lateral mac of series 'E' to 'Fe' (**E2**–**4p**, **Ee7**, **Ee10**, **F1**–**3**, **Fe2**–**5** and one unnamed as mac or mic); 10 psp (atypical) anteriorly, at least 5 sens (**as** and **ps** type I and 3 type II), and posteriorly with 7 mes present. Abd V, series 'a' with 1 mac (**a5**); series 'm' with 4 mac (**m2**–**3**, **m5**–**5e**); series 'p' with 7 mac (**p1**, **p3**–**5**, **ap6–6e**, **pp6**); series 'pp' with 2 mac (**p1p**, **p3pe**). Abd ratio as III: IV = 1: 4.40–5.43 (n= 4), holotype 1: 4.98.

Legs. Subcoxa I with 5 chaetae and 3–4 psp; subcoxa II with an anterior row of 10 chaetae, posterior row with 7 chaetae, 2 anterior chaetae and 7 psp; subcoxa III with one row of 10 chaetae and 2 posterior psp (Figs 34A–C). Trochanteral organ with about 36 spine-like chaetae (Fig. 34D). Unguis with basal and median teeth with the same length, apical tooth smaller. Unguiculus with all lamellae acuminate, pe lamella serrated and with small proximal tooth, other lamellae (ai, ae, pi) smooth; ratio unguis: unguiculus = 1: 0.49

(Fig. 34E). Tibiotarsus III distally with inner smooth chaeta 1.15 larger than unguiculus; and outer tenent hair capitate, discretely ciliate, and 0.81 smaller than unguis.

Collophore (Fig. 34F). Anterior side with 17 ciliate chaetae, including 1 distal mac and 3 large acuminate long chaetae; posterior side with 8 ciliate chaetae, of which one distal thickest; lateral flap with 3 smooth chaetae (one smaller posteriorly) and 15 ciliate chaetae.

Furcula (Figs 34G–H). Manubrium ventrally with formula 1, 0, 0, 2/2 (subapical), 14–20 (apical) ciliate chaetae and approximately 22 elongated apical scales per side; manubrium dorsally with 7 subapical ciliate chaetae, manubrial plate with 6 ciliate chaetaeand 4 psp.

Etymology. The species is named after the Betica Region (approximately corresponds to modern Andalucia) where it has been found.

Remarks. *Seira betica* **sp. nov.** resembles *S. dagamae* Dallai, 1973 and *S. stachi* Loksa, 1990 by color pattern of body on two longitudinal white bands on Th II–Abd II, Abd IV with irregular transverse spots, and most dorsal macrochaetotaxy pattern (at least of *S. dagamae*). However, *S. betica* **sp. nov.** differs from *S. dagamae* by Th II with 5 medio-central mac (4 in *S. dagamae*) and **PmA** and **PmC** groups with 7–9 and 6 mac, respectively (7 and 5 in *S. dagamae*); Th III with 7–9 mac inner to psp (6 in *S. dagamae*); and Abd IV with mac **B1**–**2** (absent in *S. dagamae*). *Seira betica* **sp. nov.** differs at this time from *S. stachi* more clearly by unguiculus outer edge serrated (smooth in *S. stachi*). The original description of *S. stachi* does not present the dorsal macrochaetotaxy, as well as several other characteristics, which makes difficult to compare the species (see Loksa 1990: 274). In addition, in the description of unguis 3 internal teeth are reported (proximal, median and apical), probably wrongly, since the proximal tooth is always paired in *Seira* (Christiansen & Bellinger 2000; Barra 2004a, 2004b; Bellini *et al.* 2010; Cipola *et al.* 2014a, 2014b; Godeiro & Bellini 2014, 2015), therefore this can not be used to compare the species. The presence of a subapical rounded bulb on Ant III (Fig. 31A) and anterolateral psp in Abd IV (Fig. 33A) of *S. betica* **sp. nov.** are exclusive features registered here for the first time in *Seira*, which can help distinguish this species from other related taxa.

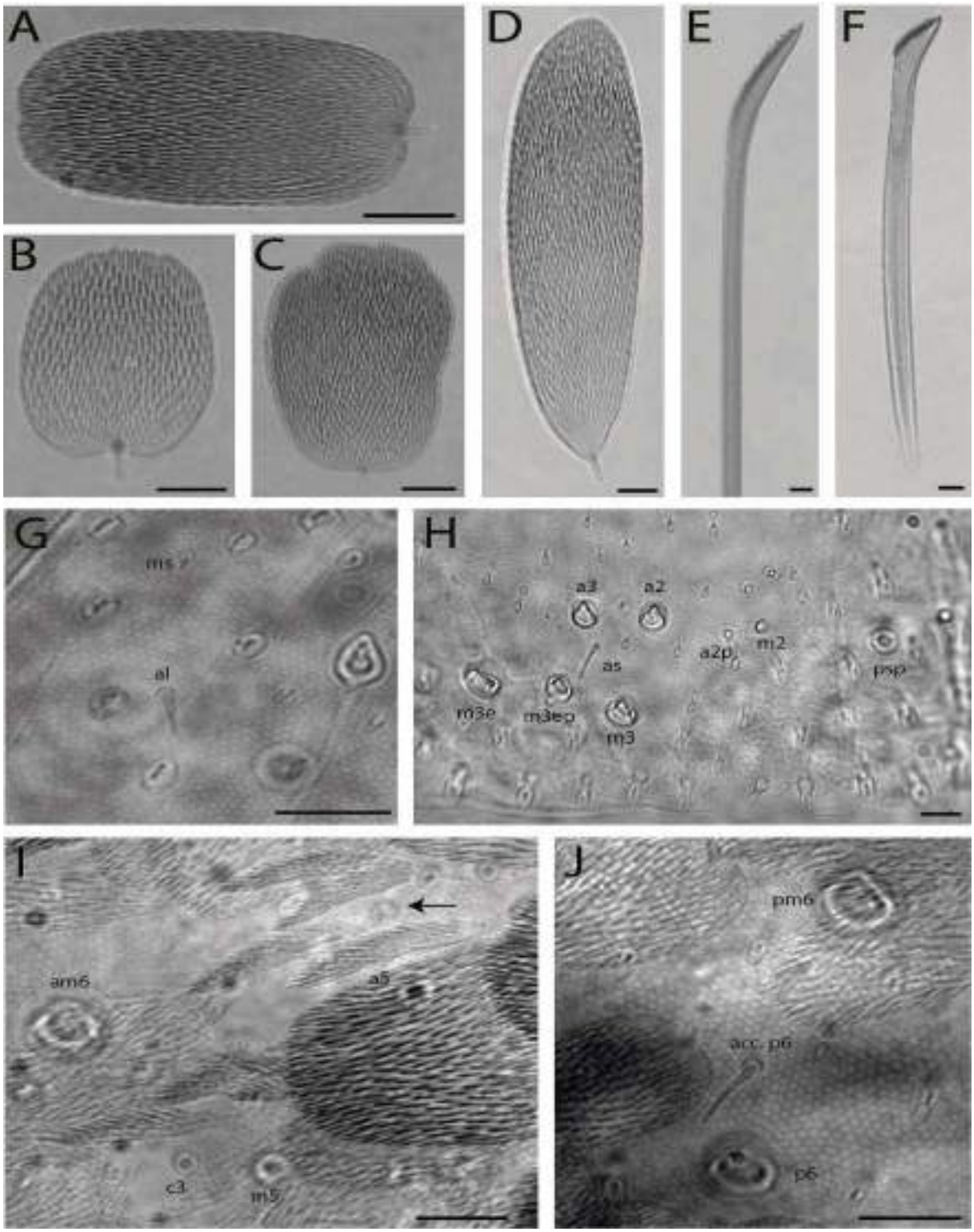

FIGURE 30A–J. *Seira betica* **sp. nov.**, different shapes of scales and tergal chaetae; **A**–**D**, scales: **A**, rounded, **B**, truncate, **C**, irregular, **D**, elongated; **E**–**F**, macrochaetae apically foot-shaped: **E** strongly projected, **F**, lightly projected; **G**–**J**, tergal chaetotaxy (left side): **G**, Th II, 'al' is anterolateral sens and 'ms' specialized microchaeta; **H**, Abd II medially, **a2**–**3** and **m3**–**3e** are mac, **as** anterosubmedial sens, **a2p** accessory chaeta of bothriotricum, **m2** bothriotricum, psp pseudopore; **I–J**, Abd III laterally: **I**, anteriorly, **J**, posteriorly, **am6**, **pm6** and **p6** are mac, **a5** and **m5** bothriotricha, **c3** mic, **acc.p6** accessory sens of **p6** chaeta, arrow indicates accessory chaeta of bothriotricha. Scale bars: 10 µm.

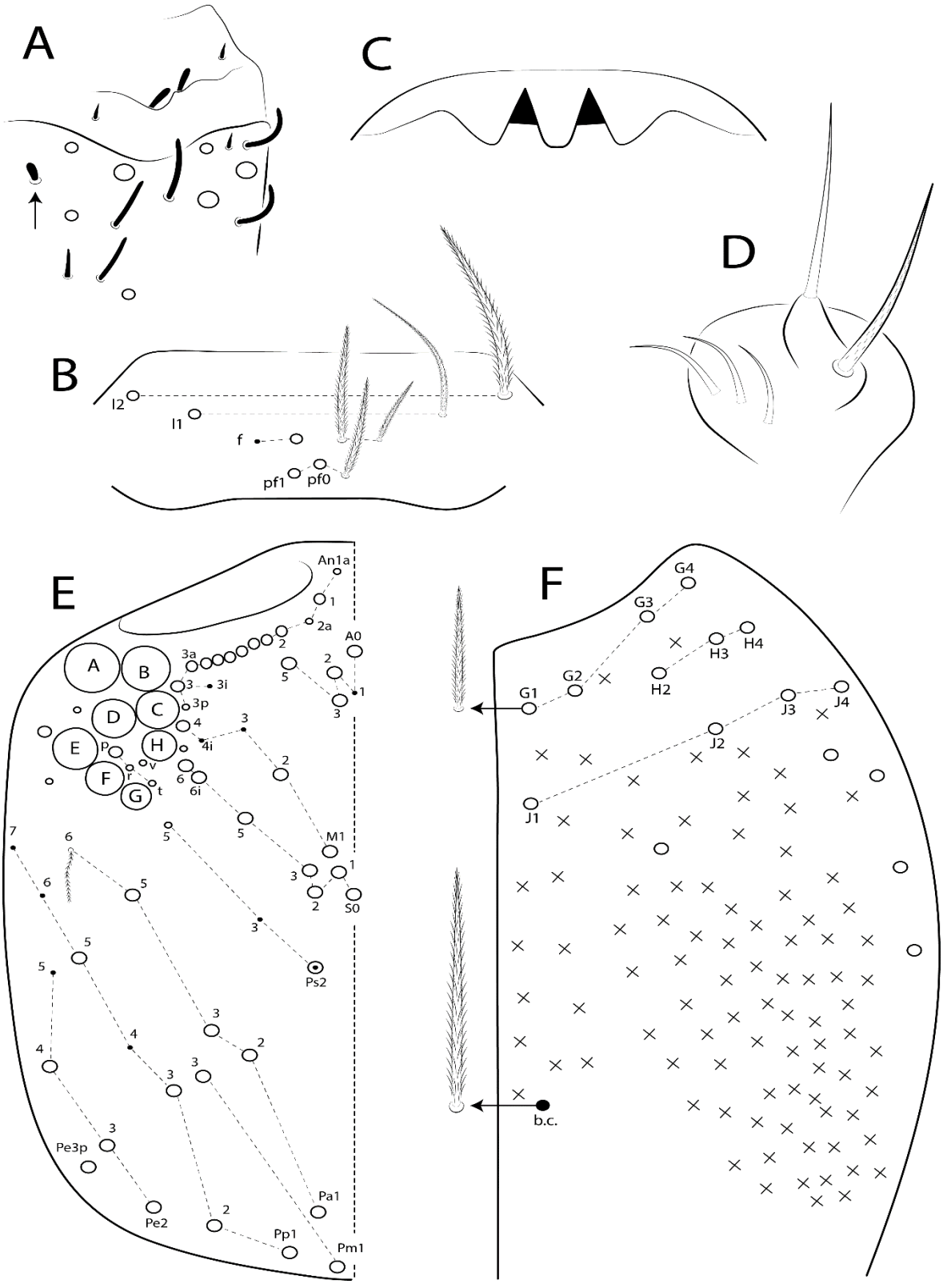

FIGURE 31A–F. *Seira betica* **sp. nov.**: head; **A**, Ant III apical organ; **B**, clypeal chaetotaxy; **C**, labral papillae; **D**, maxillary outer lobe; **E**, dorsal cephalic chaetotaxy; **F**, postlabial ventral head, arrows indicate normal ciliated chaetae and basal chaeta (b.c.), respectively.

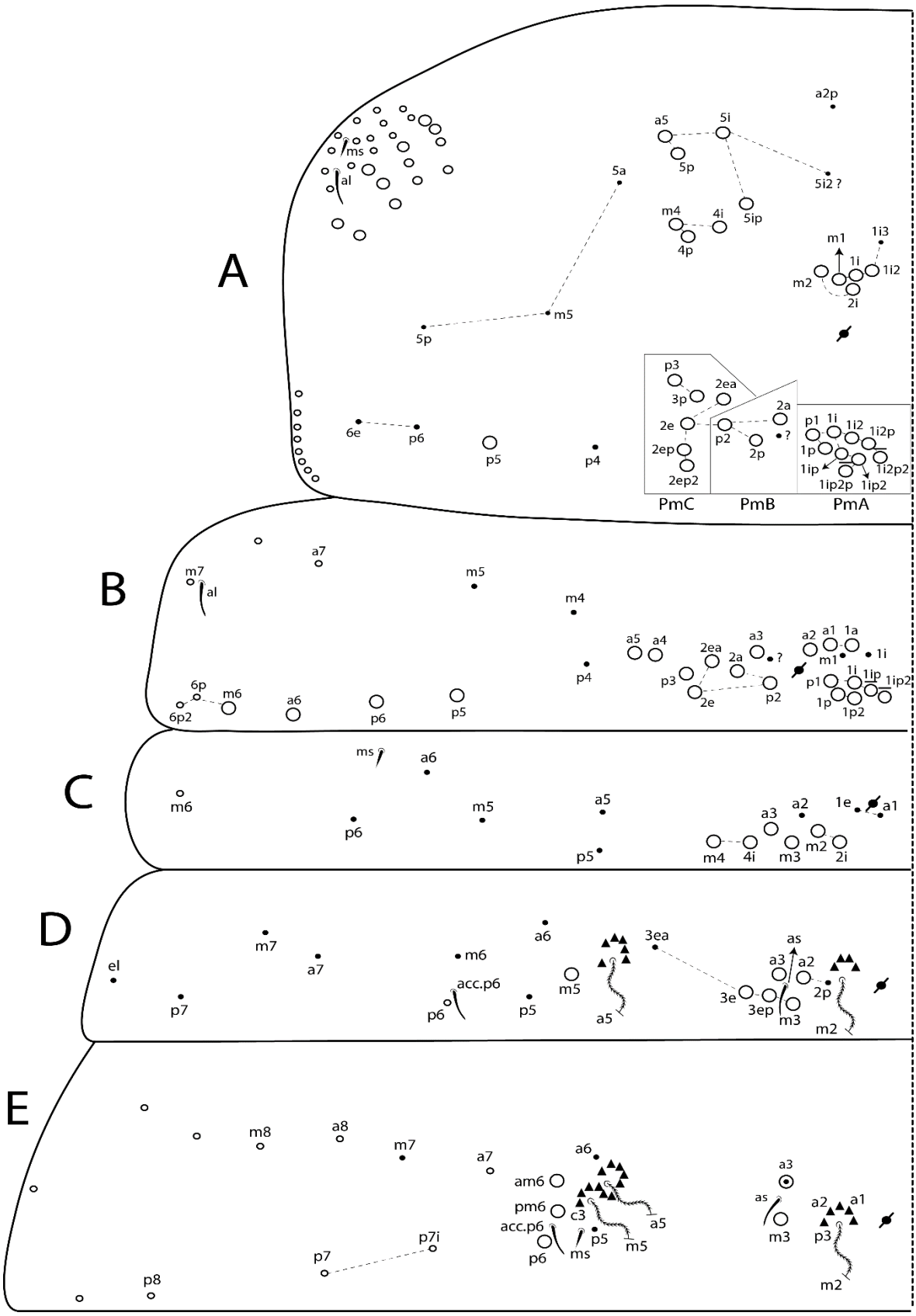

FIGURE 32A–E. *Seira betica* **sp. nov.**: dorsal chaetotaxy; **A**, Th II; **B**, Th III; **C**, Abd I; **D**, Abd II; **E**, Abd III.

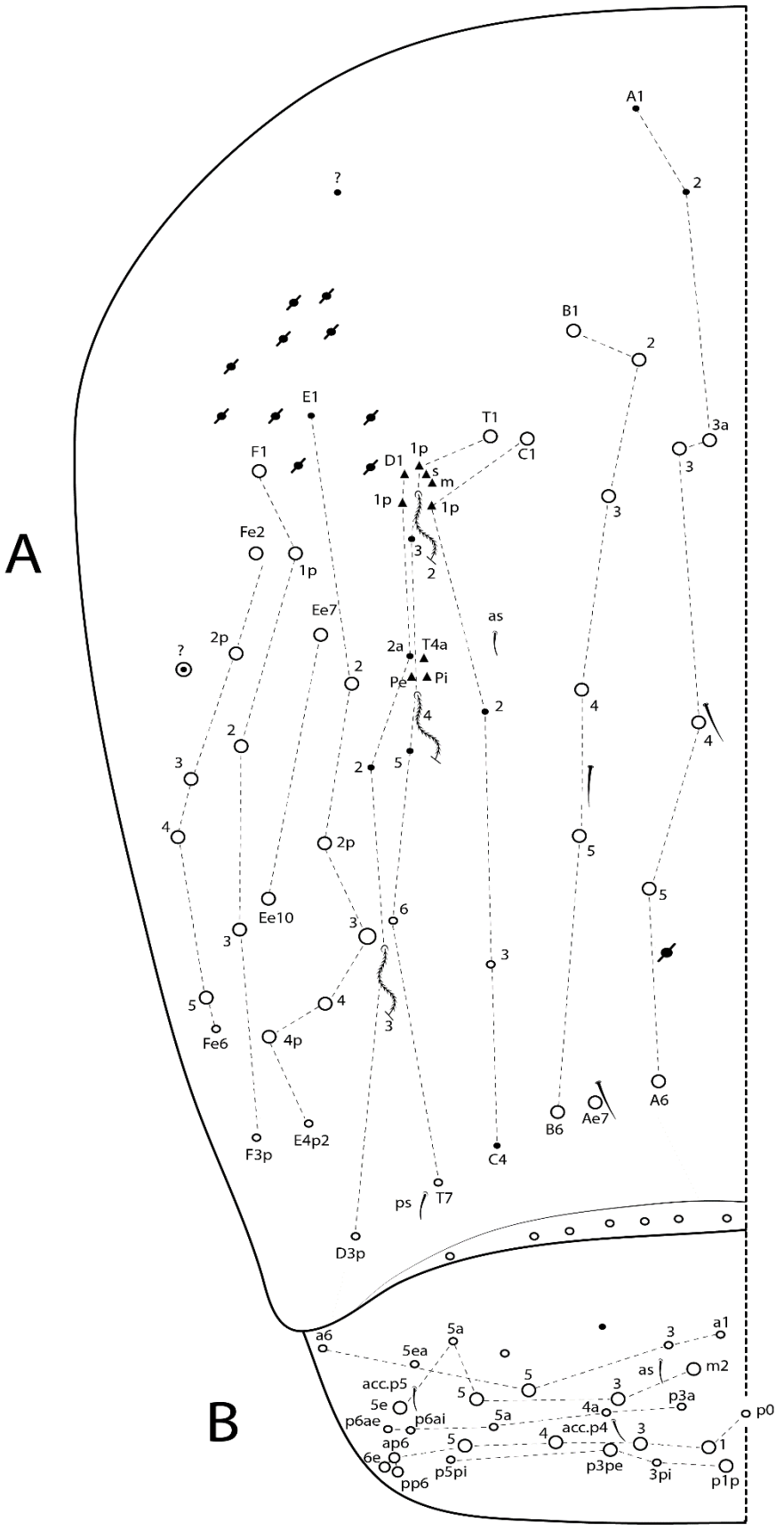

FIGURE 33A–B. *Seira betica* **sp. nov.**: dorsal chaetotaxy; **A**, Abd IV; **B**, Abd V.

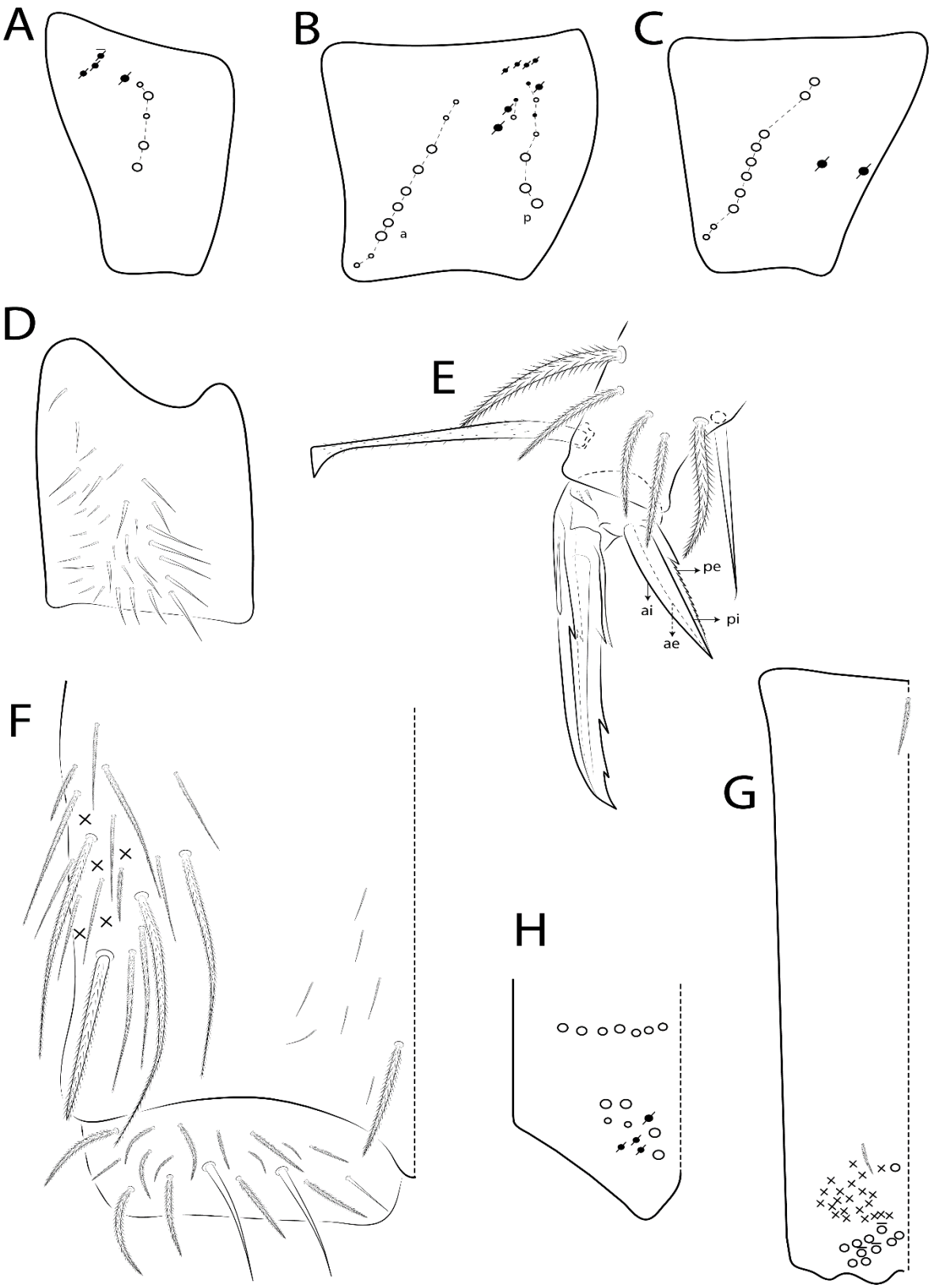

FIGURE 34A–H. *Seira betica* **sp. nov.**: **A**, subcoxa I; **B**, subcoxa II; **C**, subcoxa III; **D**, trochanteral organ; **E**, distal tibiotarsus and empodial complex III (posterior view); **F**, collophore chaetotaxy (lateral view); **G**, manubrium ventral chaetotaxy; **H**, manubrial plate and subapical chaetae (dorsal view).

***Seira burgersi* sp. nov. Cipola & Arbea**

Figs 3B, D, 35–41

Diagnosis. Body black with legs yellowish (Figs 3B, D); Ant I–II enlarged and with scales spiral-shaped (Figs 35A–D); head mac **M4i**, **S4** and **Pa4** present, **Pp6** absent, eyepatches with 3–4 interocular chaetae (**q** absent, **r** eventually absent) (Fig. 36E); prelabral inner chaetae smooth (Fig. 36C); labral papillae large and rounded (Fig. 36D); Th II with 7–11 medio-central mac (**m1**–**2 complex**) and **PmA**–**PmC** groups with 9–12, 3, 7–8 mac, respectively (Fig. 37A); Th III–Abd III with 13–17, 8–9, 5 and 1 central mac, respectively, plus several psp laterally on these segments (Figs 37B–E); Abd IV with 17–18 central and 22 lateral mac (Fig. 38A); tibiotarsi with about 18 robust inner mac finely ciliate and apically acuminate (Figs 39C–E, 40G); unguis apical tooth present (Fig. 40H); unguiculus outer edge discretely serrated distally and with one small proximal tooth (Fig. 40H); manubrium ventrally with 0/4 subapical and 20 apical chaetae (Fig. 41B).

Type material. Holotype female on slide (EHL0004/MNCN): Spain, Huelva province, Minas de Riotinto municipality (37º39'11"N, 06º37'10"W), under stones, 445m, 18.iii.2014, A. Burgers coll. Paratypes on slides (MNCN), 2 females, same data as holotype. Paratypes on slides (INPA): 3 females and 3 specimens in alcohol: El Campillo (37º40'57.08"N, 6º36'25.99"W), under stones, 358 m, 19.04.2017, A. Burgers leg.

Description. Total length (head + trunk) of adult specimens 3.83–5.56 mm (n=4), holotype 5.56 mm. Alive specimens completely black, except Ant II-IV base depigmented, and trochanters to unguis lightly yellow (Fig. 3B). Specimens in alcohol with similar color pattern, but dark purple pigments on body; eyepatches black (Fig. 3D). Scales present on Ant I to two basal third of Ant III, ventral and dorsal head, thorax and abdomen dorsally, legs (except empodia), anterior collophore, dorsal and ventral manubrium and dentes ventrally (Figs 39C–E, 41A). Ant I–II densely covered by scales heavily ciliated, elongated in spiral-shape with rounded or truncate apex (Fig. 35A, C–D).

Head. Antennae shorter than body length, antennal ratio as I: II: III: IV = 1: 1.60–1.76: 1.20–1.25: 1.81–2.16 (n=3), holotype 1: 1.76: 1.25: 2.16 (Figs 3B, D, 35B). Ant IV annulated, with apically bilobed apical bulb retractile and blunt sens (Fig. 36A). Ant III apical organ with two rod-like sens, 3 guard sens, and several blunt sens of different sizes (Fig. 36B). Ant I–II enlarged (Figs 35A–B). Clypeal formula with 4 (**l1**–**2**), 3 (**f**), 9 (**pf0**–**2**) ciliate chaetae, **l1** acuminate, **l2** largest, and 2 prefrontal smaller (Fig. 36C). Four labral

papillae large and rounded (Fig. 36D). Maxillary palp with smooth apical appendage (a.a.) and basal chaeta (b.c.) weakly ciliated, thicker and 0.88 smaller than apical. Eyes A and B larger, G and H smaller, with 3–4 interocular chaetae (**v**, **p**, **r**, **t**), **r** eventually absent; head dorsal chaetotaxy (Fig. 36E) with 10–12 'An' mac (**An1**, **An2**–**3**), 4 'A' mac (**A0**, **A2**–**3**, **A5**), 4 'M' mac (**M1**–**2**, **M4i**–**4**), 8 'S' mac (**S0**–**6**), 1 'Ps' mac (**Ps2**), 5 'Pa' mac (**Pa1**–**5**), 2 'Pm' mac (**Pm1**, **Pm3**), 4 'Pp' mac (**Pp1**–**3**, **Pp5**), and 4 'Pe' mac (**Pe2**–**4** plus **Pe3p**). Basomedian and basolateral labial fields with **M1**–**2**, **R** (smaller), **E**, **L1**–**2**. Postlabial ventral chaetotaxy with about 18 ciliate chaetae, postlabial formula 4 (**G1**–**4**), 3 (**H2**–**4**), 4 (**J1**–**4**), basal chaeta (b.c.) largest (Fig. 36F).

Thorax chaetotaxy (Figs 37A–B). Th II, series 'a' with 4–5 mac (**a5ip**–**5p** and one unnamed rarely present); series 'm' with 11–14 mac (**m1**–**2 complex**, **m4i**–**4p**), 4 mac present or absent; series 'p' with 20–24 mac (**p1ip4**–**1p4p**, **p2a**–**2ep2**, **p3i2**–**3p**, **p5**), **p1ip4** and **p3i** as mac or mic, **p1p5** and **p1p4p** eventually absent. Th III, series 'a' with 6–7 mac (**a1i**–**6**), **a2** rarely absent; series 'm' with 1–2 mac (**m1**, **m6**), **m1** generally as mic; series 'p' with 10–12 mac (**p1ip**–**1p**, **p2a2**–**2ea**, **p3**, **p5**–**6**), **p1ip** and **p2ea** mac rarely absent; 2 extra central and 10 lateral psp present. Th ratio as II: III = 1: 0.53–0.59 (n=4), holotype 1: 0.59.

Abdomen chaetotaxy (Figs 35E, 37C–E, 38A–B). Abd I, series 'a' with 4 mac (**a1i**–**3**); series 'm' with 4–5 mac (**m2i**–**4**), **m4i** rarely absent, and 11 lateral psp present. Abd II, series 'a' with 2 mac (**a2–3**); series 'm' with 4 mac (**m3**–**3e**, **m5**), and 3 lateral psp present. Abd III, series 'm' with 3 mac (**m3**, **am6**, **pm6**); series 'p' with 1 mac (**p6**), and 12 lateral psp. Abd IV with 17–18 central mac of series 'A' to 'T' (**A3a**–**6**, **Ae7**, **B1**–**6**, **C1**, **C4**, **T1** and one unnamed present or absent), and 22 lateral mac of series 'E' to 'Fe' (**E2**–**4p**, **Ee7**, **Ee10**, **F1**–**3**, **Fe2**–**5** and five of uncertain homology); at least 4 sens (**as?** and **ps** type I and 2 type II), and posteriorly with 7 mes present. Abd V, series 'a' with 1 mac (**a5**); series 'm' with 4 mac (**m2**–**3**, **m5**–**5e**); series 'p' with 5 mac (**p1**, **p3**–**5**, **ap6**); one extra sens next to **acc.p4** sens rarely present. Abd ratio as III: IV = 1: 3.97–5.33 (n=4), holotype 1: 4.88.

Legs. Subcoxa I with 6 chaetae and 2 psp; subcoxa II with an anterior row of 9 chaetae, posterior row with 7 chaetae, 2 posterior chaetae and 8 psp; subcoxa III with one row of 12 chaetae, 5 anterior chaetae in a row and 2 posterior psp (Figs 40A–C). Trochanter I–II inner side with 9 and 11 spine-like chaetae, respectively, surrounded by ciliate chaetae (Figs 39A–B; 40D–E). Trochanteral organ with about 64 spine-like chaetae (Fig. 40F). Tibiotarsi inner side armed by 18 robust mac finely ciliate and apically

acuminate, outer side with one basal largest and one acuminate and elongated chaeta (Figs 39C–E, 40G). Unguis with basal and median teeth with the same length, apical tooth smaller. Unguiculus with all lamellae acuminate, pe lamella serrated distally and with small proximal tooth, other lamellae (ai, ae, pi) smooth; ratio unguis: unguiculus = 1: 0.52 (Fig. 40H). Tibiotarsus III distally with inner smooth chaeta 1.11 larger than unguiculus; and outer tenent hair capitate, discretely ciliate, and 0.78 smaller than unguis.

Collophore (Fig. 41A). Anterior side with 14 ciliate chaetae, including 2 distal mac and 3 proximal long acuminate chaetae; posterior side with 20 ciliate chaetae, of which 2 distal thickest; lateral flap with 3 smooth chaetae (one small posteriorly) and about 29 ciliate chaetae.

Furcula (Figs 41B–C). Manubrium ventrally with formula 1, 0, 0, 0/ 4 (subapical), 20 (apical) ciliate chaetae and approximately 23 elongated apical scales per side; manubrium dorsally with 6 subapical ciliate chaetae; manubrial plate with 8–9 ciliate chaetae and 3 psp.

Etymology. The species was named after André Burgers, who collected the specimens.

Remarks. In general, *S. burgersi* **sp. nov.** is similar to *S. pallidipes* by body black with legs yellowish and overall dorsal macrochaetotaxy, head with mac **M4i**, **S4** and **Pa4**, and Abd I–III with 9, 5 and 1 central mac respectively. However, *S. burgersi* **sp. nov.** differs from this species by Th II with up to 11 medio-central mac (up to 10 in *S. pallidipes*) and 7–8 mac in **PmC** group (9 in *S. pallidipes*); Th III with up to 17 central mac (15 in *S. pallidipes*), and Abd IV with 22 lateral mac (19 in *S. pallidipes*). Other features that differ *S. burgersi* **sp. nov.** from *S. pallidipes* are prelabral inner chaetae smooth (ciliate in *S. pallidipes*), collophore with 14 anterior and 20 posterior chaetae (9 and 12 in *S. pallidipes*), and manubrium with formula 1, 0, 0, 0/ 4 (subapical), 20 (apical) ciliate chaetae (0, 0, 2, 2/4, 18 in *S. pallidipes*).

The Ant I–II enlarged with scales elongated in spiral-shaped present in *S. burgersi* **sp. nov.** (Figs 3B, D, 35A–D) is an unprecedented characteristic recorded in the genus (probably autapomorphic), as well as in Entomobryoidea, since somehow similar characteristics were observed only in some species of *Dicranocentroides* Imms (1912) (Paronellidae) (Kim *et al.* 1999; Hazra & Mandal 2015). Species like *S. meyerae* (Coates, 1969) **comb. nov.**, *S. pectinifera* Jacquemart, 1980 (in 1980b) and *S. timiae* Jacquemart, 1980 (in 1980c) also have modified scales in antennae and dorsal macrochaetotaxy smilar

to *S. burgersi* **sp. nov.**, and for that reason these species are closely related. However, in these species (except *S. burgersi* **sp. nov.**) the antennal scales have different morphologies (non-spiral) and are associated with modified chaetae (branched in *S. pectinifera* and spine-like in *S. meyerae* **comb. nov.** and *S. timiae*), plus the dorsal macrochaetotaxy is clearly less dense when compared to the new species**.** *Seira burgersi* **sp. nov.** also differs from these species by another exclusive characteristic, the presence of numerous lateral psp on Th II–Abd III (Figs 37B–E).

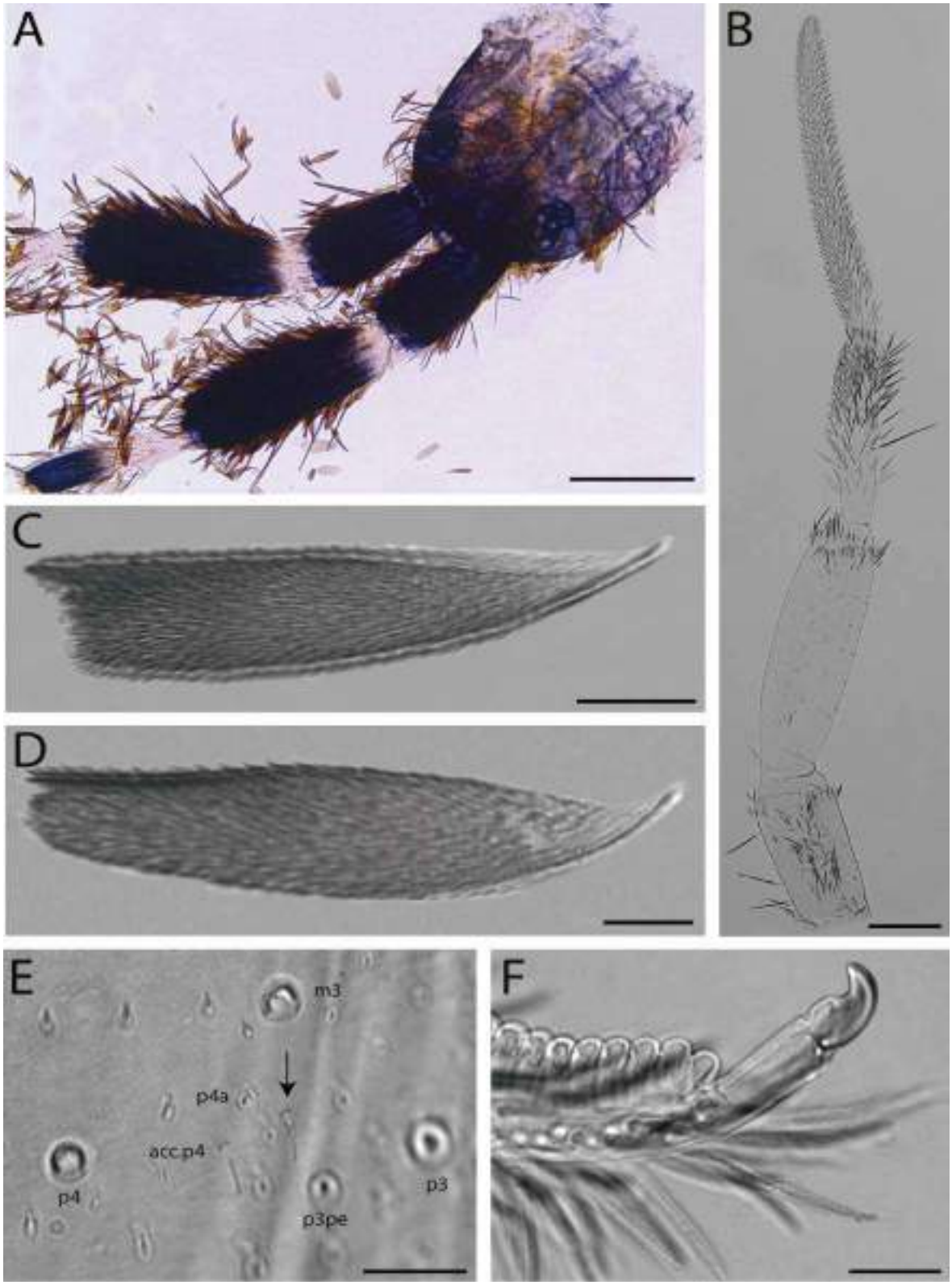

FIGURE 35A–F. *Seira burgersi* **sp. nov.**; **A**, head and antennae from Ant I to basal half of Ant III (dorsal view); **B**, Ant I–IV segments (dorsal view); **C**–**D**, differentiated scales of the Ant I–II: **C**, apically truncate, **D**, apically rounded; **E**, dorsal chaetotaxy of Abd V (left side), arrow indicates extra sens; **F**, distal dens and mucro (lateral view). Scale bars: **A**–**B**, 200 µm; **C**–**F**, 20 µm.

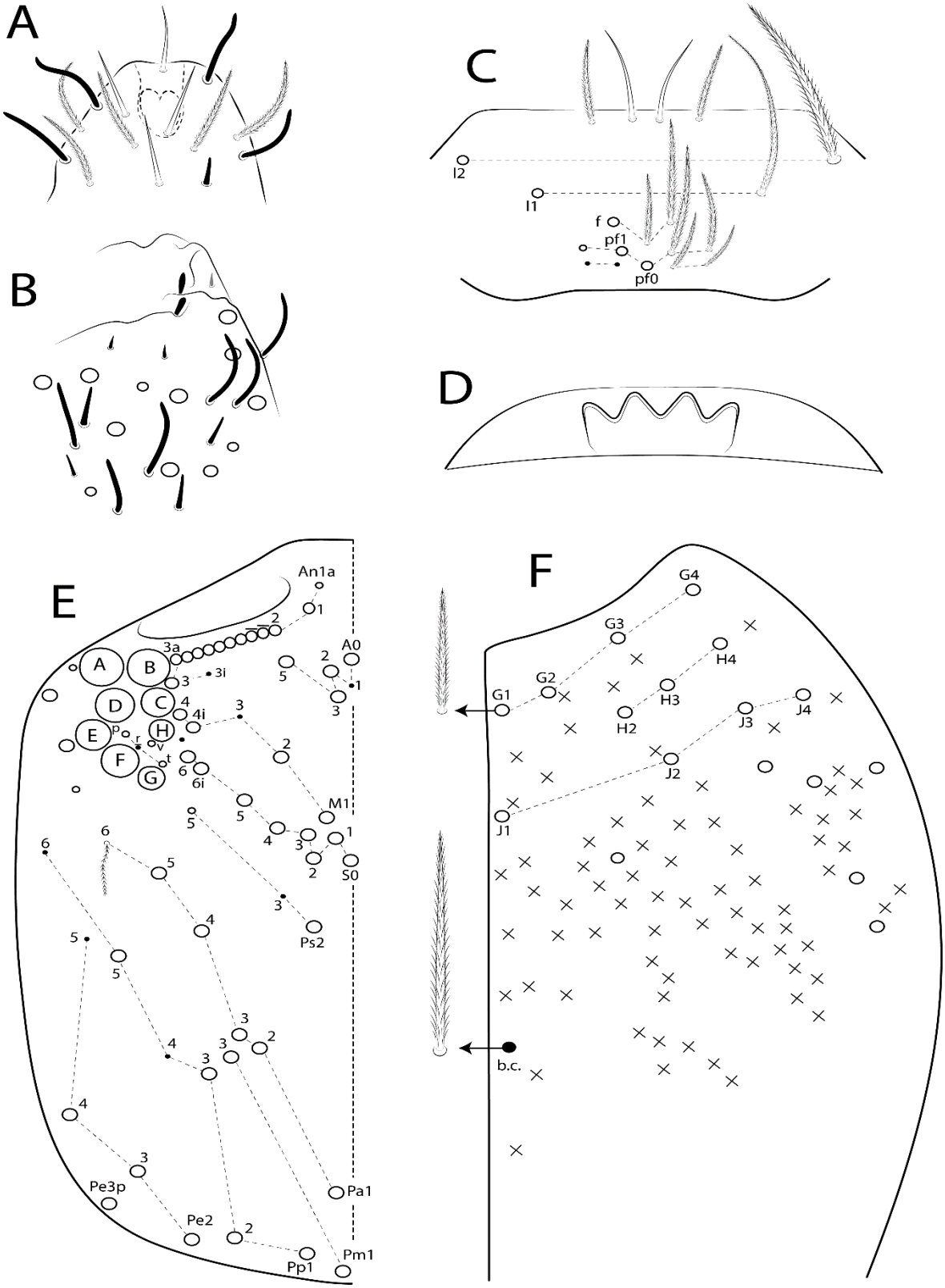

FIGURE 36A–F. *Seira burgersi* **sp. nov.**: head; **A**, apex of Ant IV; **B**, Ant III apical organ; **C**, clypeal chaetotaxy; **D**, labral papillae; **E**, dorsal cephalic chaetotaxy; **F**, postlabial ventral head, arrows indicate normal ciliated chaetae and basal chaeta (b.c.), respectively.

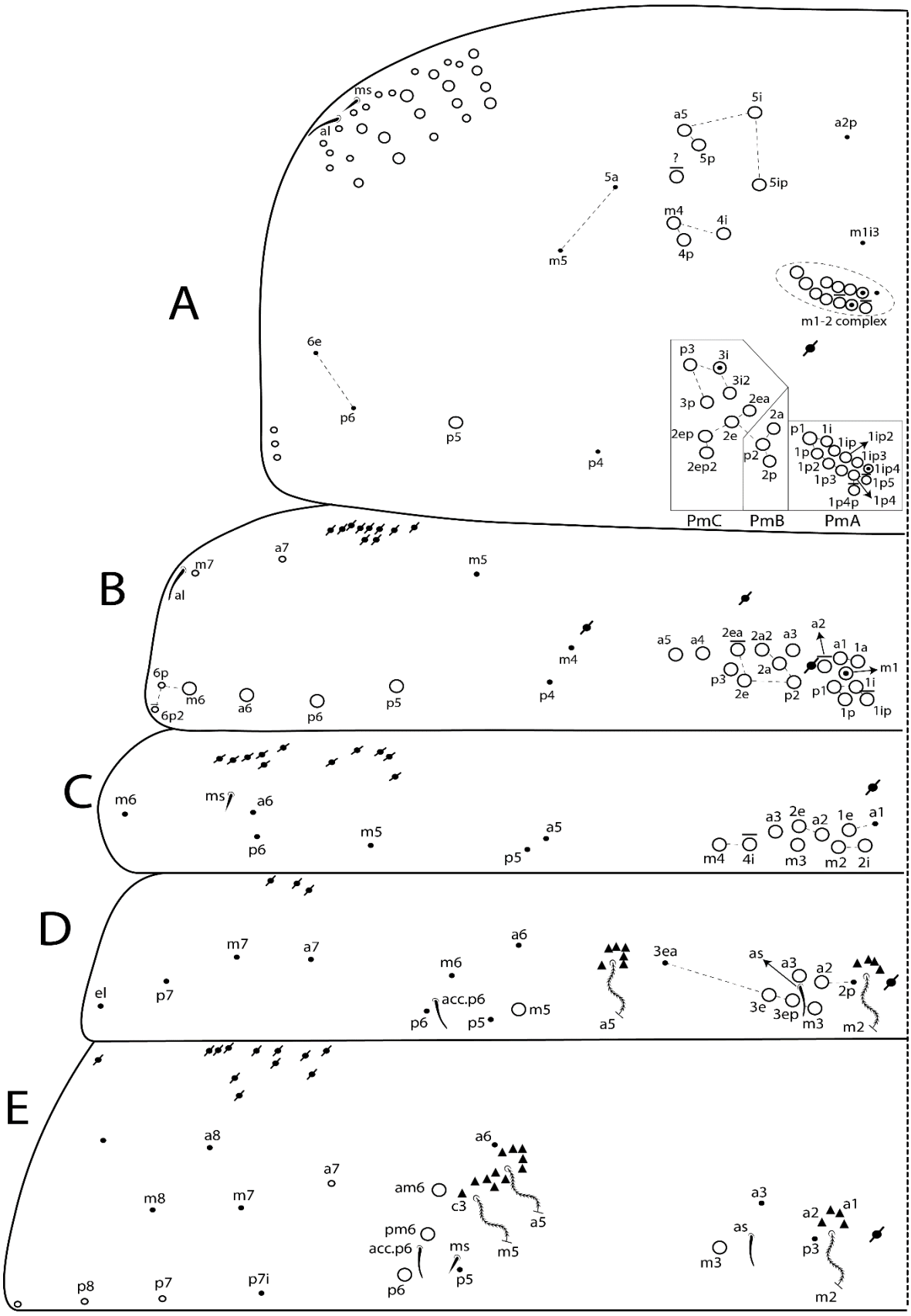

FIGURE 37A–E. *Seira burgersi* **sp. nov.**: dorsal chaetotaxy; **A**, Th II; **B**, Th III; **C**, Abd I; **D**, Abd II; **E**, Abd III.

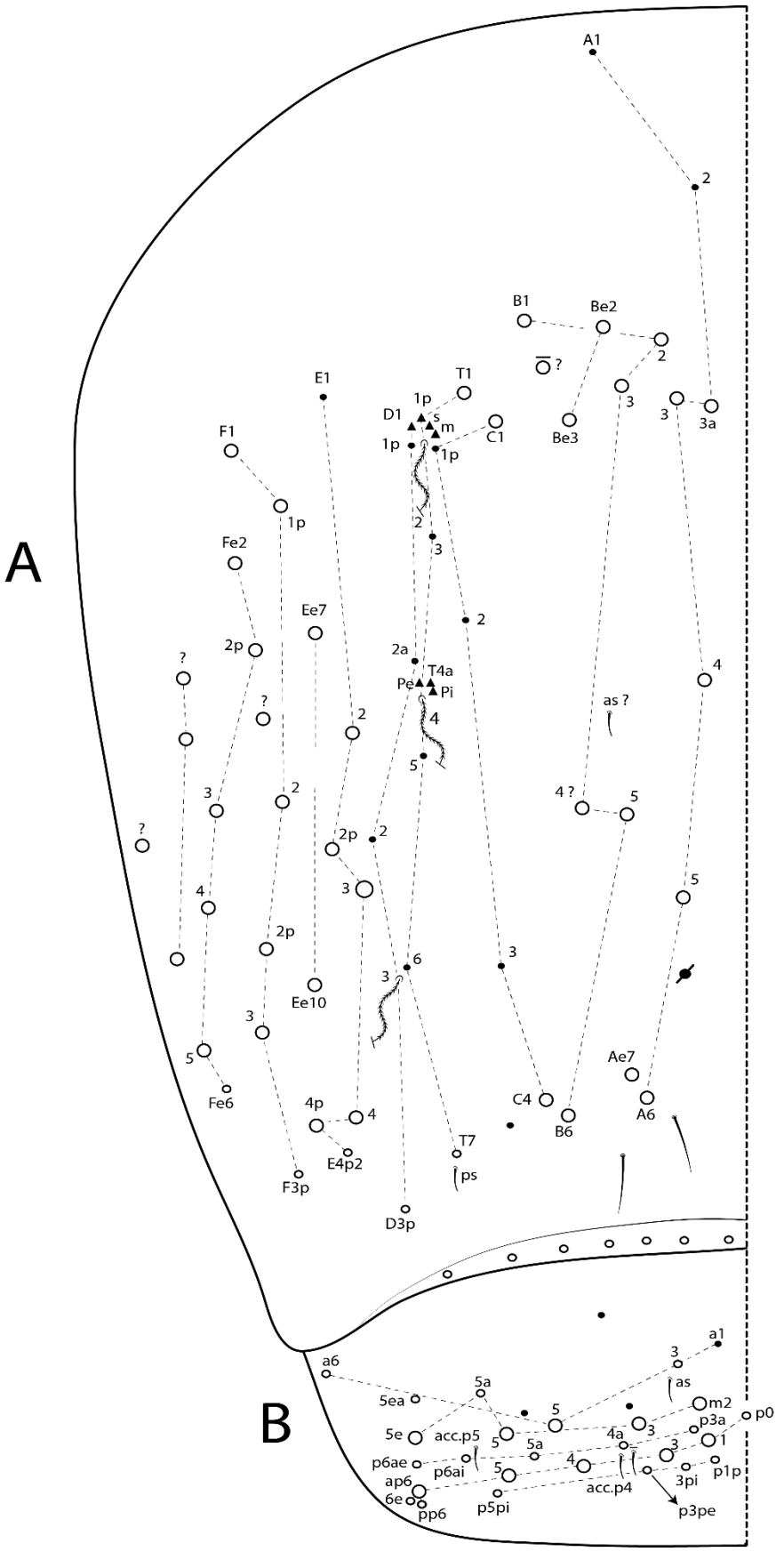

FIGURE 38A–B. *Seira burgersi* **sp. nov.**: dorsal chaetotaxy; **A**, Abd IV; **B**, Abd V.

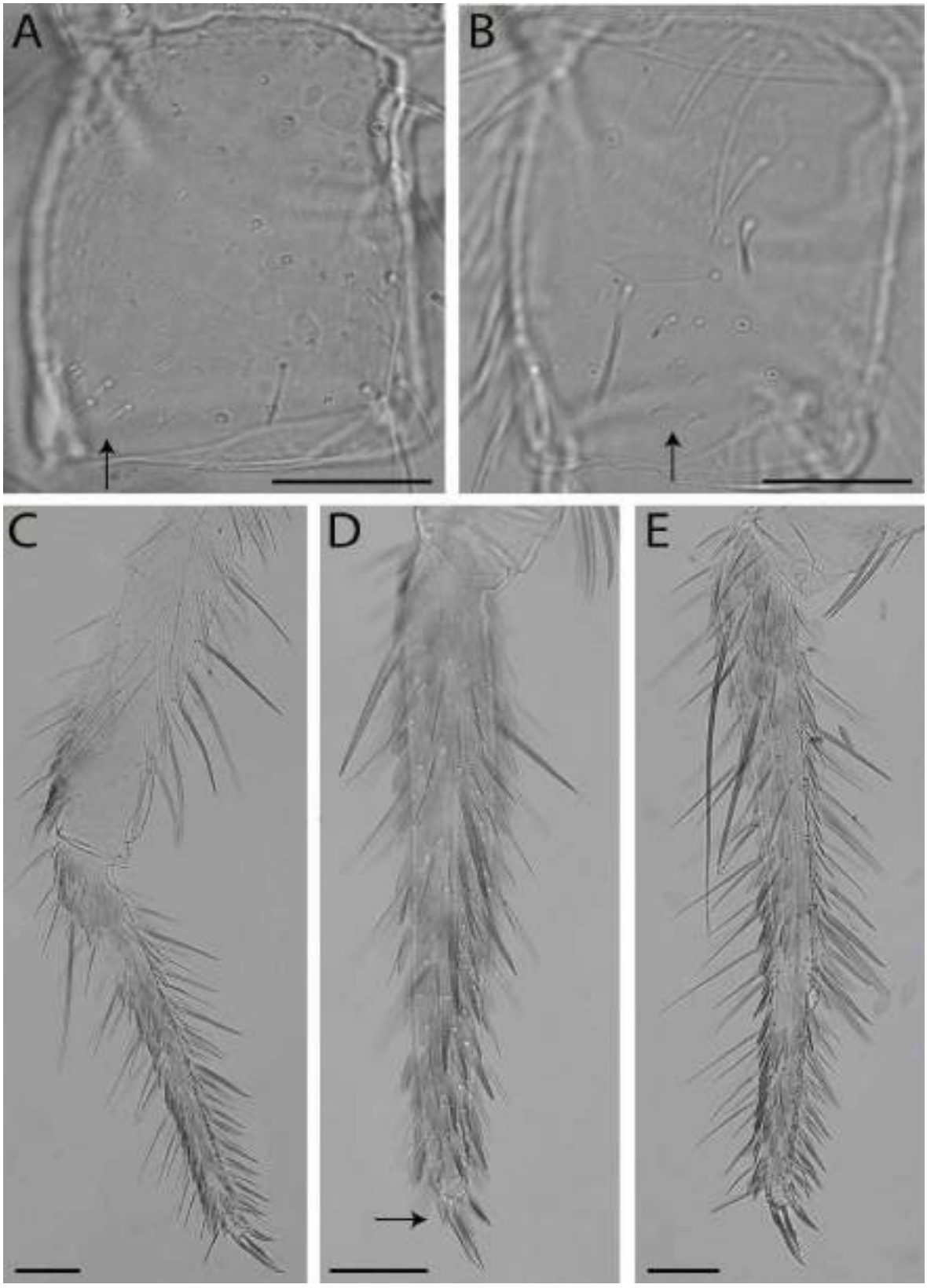

FIGURE 39A–E. *Seira burgersi* **sp. nov.**: legs chaetotaxy; **A**, trochanter I (inner view); **B**, trochanter II (inner view), arrows indicate spine-like chaetae; **C**, femur and tibiotarsus I (posterior view); **D**, tibiotarsus II (inner view), arrow indicates large outer teeth; **E**, tibiotarsus III (anterior view). Scale bars: **A**–**B**, 50 µm; **C**–**E**, 100 µm.

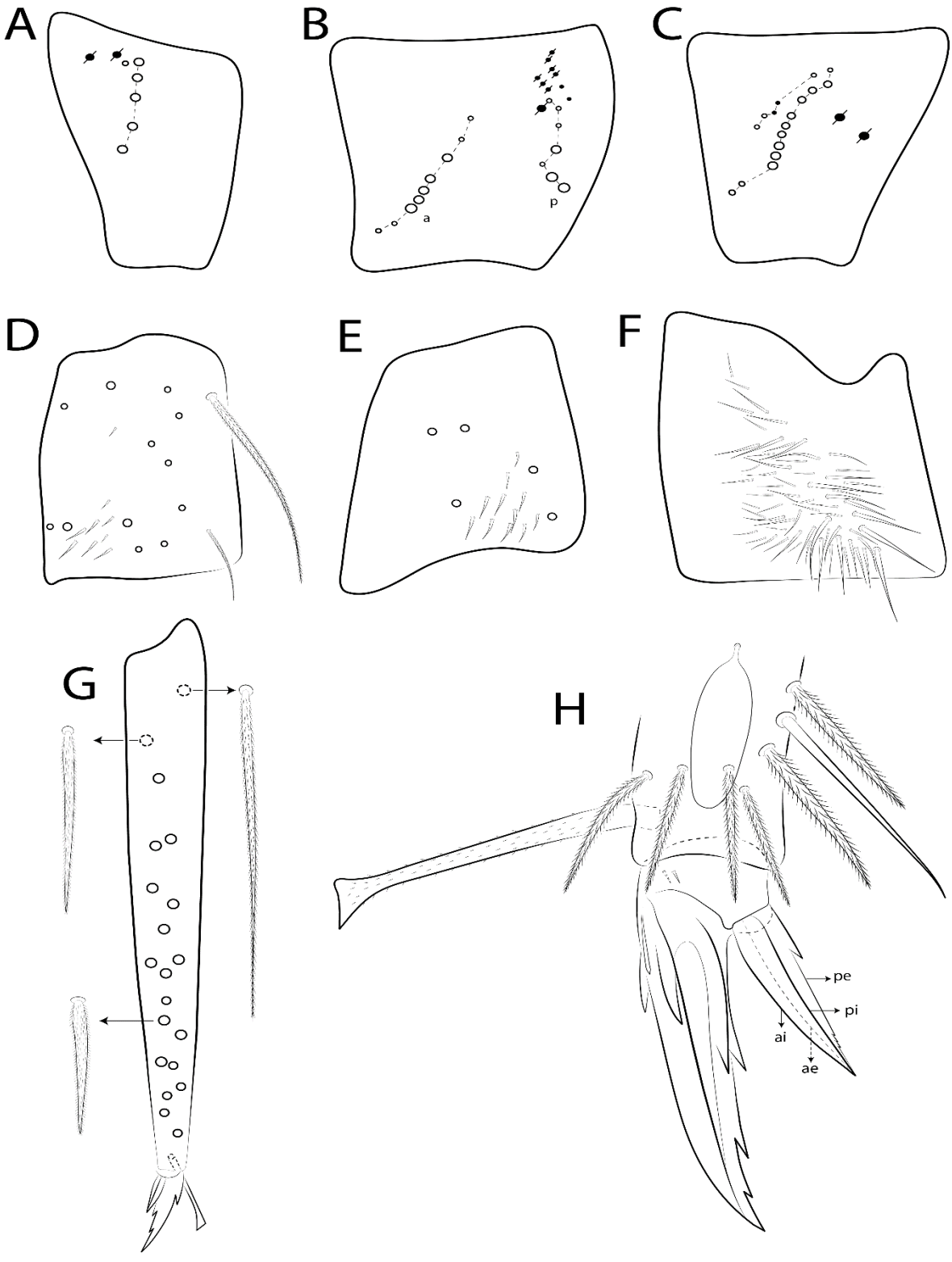

FIGURE 40A–H. *Seira burgersi* **sp. nov.**: **A**, subcoxa I; **B**, subcoxa II; **C**, subcoxa III; **D**, trochanter I chaetotaxy (inner side); **E**, trochanter I chaetotaxy (inner side); **F**, trochanteral organ; **G**, tibiotarsus II chaetotaxy (inner side), arrows indicate inner mac finely ciliate and apically acuminate and two types of outer ciliate chaetae, elongated and acuminate, respectively; **H**, distal tibiotarsus and empodial complex III (posterior view).

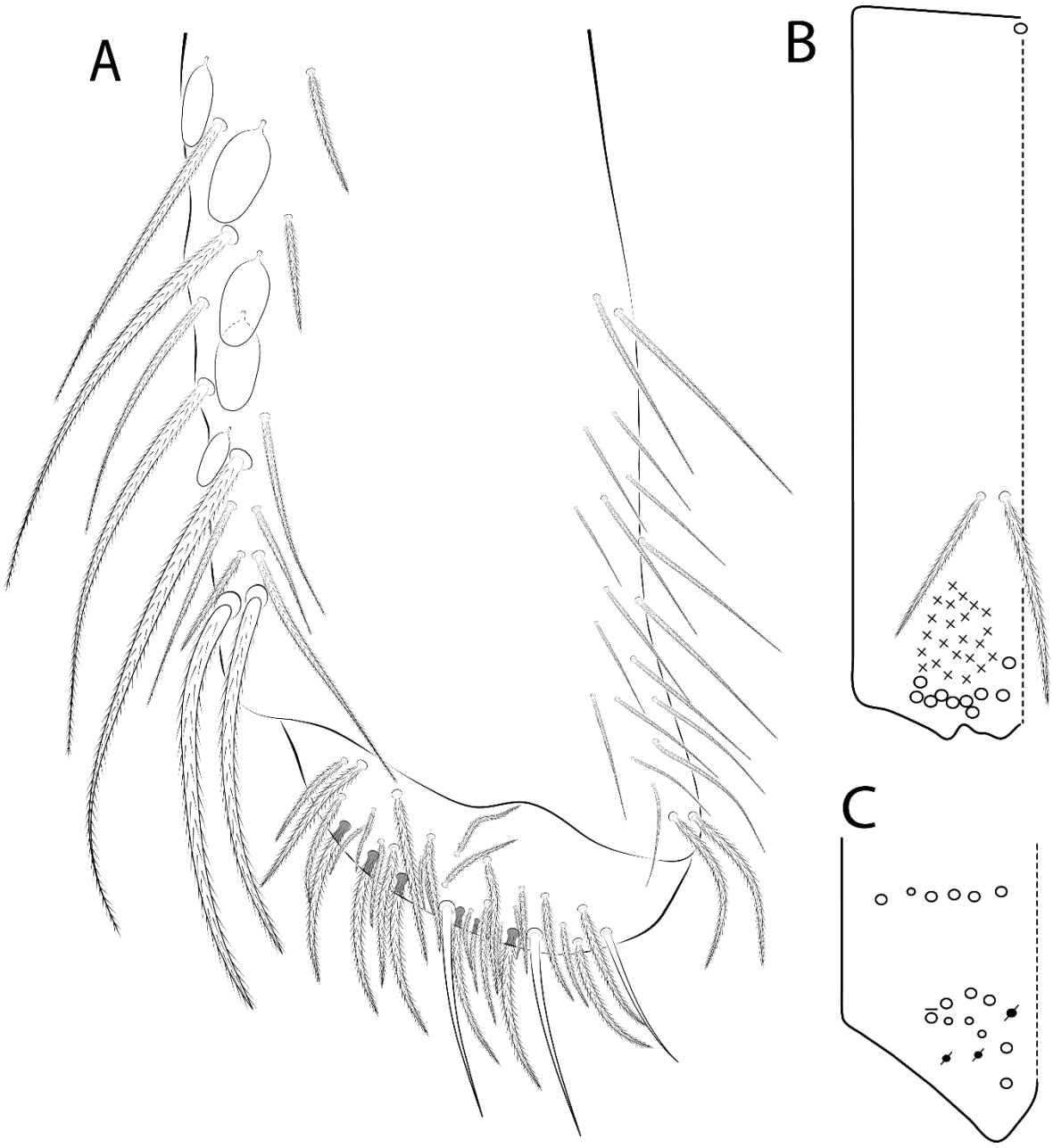

FIGURE 41A–C. *Seira burgersi* **sp. nov.**: **A**, collophore chaetotaxy (lateral view); **B**, manubrium ventral chaetotaxy; **C**, manubrial plate and subapical chaetae (dorsal view).

***Seira meyerae* (Coates, 1969) comb. nov.**

Lepidokrugeria meyerae Coates, 1969: 87-89, figs 1-6, Letaba river, Kruger National Park, South Africa (orig. descr.), not examined.

Remarks. *Lepidokrugeria* was previously synonymized with *Seira* by Soto-Adames *et al.* (2008), but this taxonomic act was not considered by Bellinger *et al.* (1996–2018), who included *Lepidokrugeria* in Lepidocyrtinae Wahlgren. Thus, *Seira meyerae* **comb. nov.** is herein transferred to *Seira* since it presents typical characteristics of the genus, especially overall dorsal macrochaetaxy pattern and mucro falcate.

New chaetal interpretation for Abd I

Establishing the homology of some chaetae depends on their relative position and changes in morphology during the postembryonic development, although some tergal fields may be polymorphic or misinterpreted (as showed in Szeptycki 1979 and Soto-Adames 2008). In Abd I, Soto-Adames (2008) observed in all stages of *Seira dowlingi* (Wray, 1953) that **a1** mic is internally to pseudopore, **a2** is between and above **m2** and **m3**, and **a1e** (not **a1a**) and **m4i** arise as secondary chaetae (as Fig. 11C). In the same work, **a1** (called as **a1a**), **a2**, **m2** and **m3** chaetae remain in the same positions in other species (see Soto-Adames 2008: 18). Therefore, **a1** is mic in all these species, as in *Seira* in general, while the extra chaeta internally to **m2** is actually **m2i** (Figs 6C, 11C, 23C, 37C), since it is present and must be homologous to what is seen in the same position in other Entomobryidae (Szeptycki 1979). Consequently, **a1** is rarely present as mac only in *S. pini* (Fig. 23C), while **a1e**, **a2** and **a2e** also rarely occur as mac in the genus, as seen in few species from Western Palearctic region (e.g. *S. dollfusi*, *S. lusitanica*, *S. pallidipes*, *S. saxatilis*, *S. squamoornata* and *S. burgersi* **sp. nov.**, Fig. 37C).

TABLE 1. Overall morphological comparison among *Seira* species with known morphology from Western Palearctic region.

Characters	Ant IV	Ant IV	Labral	Basomedian labial field		Head groove	Trochanteral	Male leg I	Unguis	Unguiculus		Collophore	Ventral manubrium	
Species	annulated	apical bulb	papillae	M1 chaeta*	R chaeta*	basal chaeta	organ	dimorphism	teeth ratio	outer tooth	outer edge	anterior chaetae	subapical	apical
S. atlantica [31]	–	simple	2 conical	subequal	subequal	long	33	?	B=M>A	+	smooth	17	0 / 4	14
S. barrai **sp. nov.** [35]	+	bilobed	4 conical	smaller	smaller	long	20	–	B=M	+	serrated	10	0 / 2	14–16
S. betica **sp. nov.** [35]	+	simple ret.	2 conical	subequal	smaller	long	36	–	B=M>A	+	serrated	18	2 / 2	14–20
S. burgersi **sp. nov.** [35]	+	bilobed ret.	4 rounded	subequal	smaller	long	64	–	B=M>A	+	serrated	14	2 / 2	20
S. dagamae [17]	–	?	?	?	?	?	36	+	M=A>B	+	smooth	?	?	?
S. deserti [19, 32]	?	simple	?	subequal	subequal	?	11–12	?	B=M>A	+	serrated	11–13	2 / 4	16
S. domestica [1-2,11, 18, 28, 35]	+	simple	4 conical	subequal	smaller	long	20	+	M>B>A	+	serrated	10	2 / 4	16
S. dollfusi [6, 8, 11, 18]	+	?	?	?	?	?	?	?	M=A>B	–	serrated	?	?	?
S. dori [29]	–	?	?	?	?	?	9	?	M>B=A	–	smooth	9–11	?	?
S. dinizi [23, 26, 35]	–	simple	2 conical	smaller	smaller	–	15	–	M=A>B	–	serrated	12	2 / 4	16
S. elisae [22]	–	simple	?	?	?	?	11	?	B>M	–	smooth	?	?	?
S. ferrarii [3, 16-17, 30, 35]	–	bilobed	4 conical	subequal	subequal	long	12–15	–	M=A>B	–	serrated	10–13	2 / 4	14–16
S. graeca [13, 20]	+	simple	4 conical	subequal	subequal	+	20	?	B=M>A	+	serrated	?	?	?
S. lusitanica [12, 18]	?	?	?	?	?	?	?	–	M=A>B	+	serrated	?	?	?
S. mantis [33, 35]	+	bilobed	4 conical	subequal	smaller	long	30	+	M=A>B	–	smooth	?	2 / 4	18
S. maroccana [31]	?	simple	2 conical	subequal	subequal	smaller	14	?	B=M>A	–	smooth	7	0 / 4	12
S. pallidipes [4, 15, 34]	+	bilobed	2 conical	subequal	smaller	–	26–38	–	B=M>A	+/–	smooth/serrated	9	2 / 4	19
S. pini [24, 35]	+	simple ret.	4 conical	subequal	smaller	–	44	?	M=A>B	+	smooth	15	0 / 2	16–18

S. saxatilis [11, 18]	+	?	?	?	?	?	?	?	M=A>B	–	serrated	?	?	?
S. squamoornata [5, 9-10, 18]	?	?	?	?	?	?	?	+	B=M>A	–	smooth	?	?	?
S. sacchii [14, 17]	?	?	?	?	?	?	?	?	M=A>B	+	smooth	?	?	?
S. stachi [27]	?	?	?	?	?	?	?	?	B=M>A	–	smooth	?	?	?
S. taeniata [7, 26]	+	bilobed	4 conical	?	?	?	?	?	M>B=A	+	smooth	?	?	?
S. tongiorgii [25]	?	?	?	?	?	?	?	?	B=M=A	–	smooth	?	?	?
S. tigridica [21]	?	?	4 conical	subequal	subequal	?	?	?	M=A>B	–	smooth	?	?	?
S. uwei [32]	–	?	?	subequal	smaller	+	21–32	+	B=M>A	+	smooth	15–22	? / 4	16

Notes: (ret.) retractile; (B) basal teeth; (M) median tooth; (A) apical tooth; (+) present; (–) absent; (?) unknown; (*) refers to chaeta size in relation to other chaetae of posterior row (**M2**, **E**, **L1–2**). Reference: [(1)]Nicolet 1842; [(2)]Lubbock 1870; [(3)]Parona 1888; [(4)]Reuter 1895; [(5)]Scherbakov 1898; [(6)]Carl 1899; [(7)]Handschin 1925a, [(8)]1925b ; [(9)]Stach 1955; [(10)]Altner 1960; [(11)]Gisin & Gama 1962; [(12)] Gama 1964; [(13)]Ellis 1966; [(14)]Parisi 1969; [(15)]Loksa & Bogojević 1970; [(16)]Dallai & Ferrari 1971; [(17)]Dallai 1973; [(18)]Jacquemart 1973; [(19)]Jacquemart 1974; [(20)]Ellis 1976; [(21)]Rusek 1981; [(22)]Gers & Deharveng 1985; [(23)] Gama 1988a; [(24)]Jordana & Arbea 1989; [(25)]Tosi & Parisi 1990; [(26)]Yoshii 1990; [(27)]Loksa 1990; [(28)]Christiansen & Bellinger 2000; [(29)]Gruia *et al.* 2000; [(30)]Barra 2004b; [(31)]Negri *et al.* 2005; [(32)]Barra 2010; [(33)]Zeppelini & Bellini 2006; [(34)]Winkler & Dányi 2017; [(35)]Present study.

TABLE 2. Dorsal chaetotaxy comparison among *Seira* species with known dorsal chaetotaxy from Western Palearctic region.

Chaetotaxy	Head mac						Th II			Th III	Abd I	Abd II	Abd III mac		Abd IV mac	
Species	M4i	S4	Ps2	Pa4	Pp5	Pp6	m1–2 complex	'PmA'	'PmC'	mac	mac	mac	central	lateral	central	lateral
S. agadesi [8]	–	–	+	–	–	?	4	6	5	14	6	4	1	?	12	?
S. algira [8]	–	–	–	–	+	?	3	2	4	6	2	4	1	?	9	?
S. atlantica [19]	–	–	+	–	–	–	4	6–11	5	15	6	5	1	3	12	13
S. barrai **sp. nov.** [23]	–	–	+	–	+	–	4	6–7	5	14	6	4	1	3	11–12	13–14
S. betica **sp. nov.** [23]	–	–	+/–*	–	+	–	5	7–9	6	15–17	6	5	1–2*	3	14	16–17
S. burgersi **sp. nov.** [23]	+	+	+	+	+	–	7–11	9–12	7–8	13–17	8–9	5	1	3	17–18	22
S. dagamae [6]	–	–	+	–	+	–	4	7	5	14	6	5	1	3	12	8?
S. debruyni [8]	–	–	+	–	–	?	4	6	5	14	6	4	1	?	12	?
S. deserti [8, 21]	–	–	+	–	+	–	4	6	5	14	6	5	1	3	12	14
S. domestica [1, 7, 16, 23]	–	–	+	–	+	–	4	5–7	8–10	11*–15	6	5	1–2*	3	12	18
S. dollfusi [1, 7]	+	+	+	+	+	–	10	10	9	15	9	5	1	?	15	?
S. dori [17]	?	–	+	–	+	?	4	5	6	12	5	3	1	?	12	?
S. dinizi [12, 15, 23]	–	–	+	–	+	–	4	6–7	3*–5	11*–14	5	3	1	3	12–13	17–19
S. elisae [11]	–	–	+	–	+	–	4	5	5	11	5	4	1	?	13	?
S. ferrarii [5-6, 18, 23]	–	–	+	–	+	–	4	5–6	4–5	14	6	4	1	3	12	13
S. graeca [3, 9]	–	–	+	–	+	–	4	7	5	14	6	5	1	3	12	10
S. insalahi [8]	–	+	–	–	+	?	6	7	6	11	5	5	1	?	8	?
S. lusitanica [2, 7]	+	+	+	+	+	–	10	14	11	24	9	5	1	?	16	?

S. mantis [20, 23]	–	–	+	–	+	–	4	6	5	14	6	4	1	3	12	14
S. maroccana [19]	–	–	+	–	+	–	4	6	5	14	6	4	1	3	11	12
S. nigeri [8]	–	–	+	–	+	?	4	6	5	14	6	4	1	?	12	?
S. pallidipes [4, 22]	+	+	+	+	+	–	7–10	9–12	8–9	15	9	5	1	3	14–17	19
S. pini [13, 23]	+	+	+	+	+	+	8–13	11–14	10–13	16–18	9–10*	5	1	3	16–17	22
S. punica [8]	–	–	+	–	–	?	4	8	5	14	6	4	1	?	12	?
S. saxatilis [1, 7]	+	+	+	+	+	–	11	11	10	15	9	5	1	?	16	?
S. squamoornata [7]	+	+	+	+	+	–	10	12	9	16	9	5	1	?	17	?
S. taeniata [15]	–	–	–	–	+	–	4	5	5	8	4	3	?	?	?	?
S. tongiorgii [14]	–	–	+	–	+	–	4	6	5	16	6	4	1	2	11	11
S. tigridica [10]	–	–	+	–	+	?	4	6	5	14	6	4	1	3	14	11
S. uwei [21]	–	–	+	–	+	–	4	5–8	5	14	6	4	1	3	12	13
S. vanderheydeni [8]	–	–	+	–	+	?	4	6	5	14	6	4	1	?	11	?

Notes: (*) rare condition; (+) present; (–) absent; (?) unknown. Only central mac were considered on Th III to Abd II. Reference: [1]Gisin & Gama 1962; [2] Gama 1964; [3]Ellis 1966; [4]Loksa & Bogojevic 1970; [5]Dallai & Ferrari 1971; [6]Dallai 1973; [7]Jacquemart 1973; [8]Jacquemart 1974; [9]Ellis 1976; [10]Rusek 1981; [11]Gers & Deharveng 1985; [12] Gama 1988a; [13]Jordana & Arbea 1989; [14]Tosi & Parisi 1990; [15]Yoshii 1990; [16]Christiansen & Bellinger 2000; [17]Gruia *et al.* 2000; [18]Barra 2004b; [19]Negri *et al.* 2005; [20]Zeppelini & Bellini 2006; [21]Barra 2010; [22]Winkler & Dányi 2017; [23]Present study.

Key to *Seira* species with known dorsal chaetotaxy from the Western Palearctic region*

1 Abd II with 3 central mac (Fig. 11D) … 2
- Abd II with 4 or 5 central mac (Figs 6D, 15D) … 4

2 Head mac **Ps2** present (Fig. 10E); Th III with 11–14 central mac (Fig. 11B); Abd I with 5 central mac (Fig. 11C) … 3
- Head mac **Ps2** absent; Th III with 8 central mac; Abd I with 4 central mac … *S. taeniata* (Handschin, 1925) in Handschin, 1925a *sensu* Yoshii, 1990

3 Body all bluish (Fig. 2B); Th II with 5–3(rarely) mac in **PmC** group (Fig. 11A); unguiculus with outer lamella serrated (Fig. 8F) … *S. dinizi* Gama, 1988 in Gama, 1988a
- Body with one transverse strip of dark blue on Abd III; Th II with 6 mac in **PmC** group; unguiculus with outer lamella smooth (Fig. 21F) … *S. dori* Gruia, Poliakov & Broza, 2000

4 Abd II with 4 central mac, mac **a3** absent (Fig. 15D) … 5
- Abd II with 5 central mac, mac **a3** present (Fig. 6D) … 18

5 Abd I with 5 or less central mac (Fig. 11C) … 6
- Abd I with 6 central mac (Fig. 6C) … 7

6 Head mac **Ps2** absent; Th II with 3 medio-central mac; Abd I with 2 central mac … *S. algira* Jacquemart, 1974
- Head mac **Ps2** present (Fig. 5F); Th II with 4 medio-central (**m1**–**1i**, **m2**–**2i**) mac (Fig. 11A); Abd I with 5 central mac (Fig. 11C) … *S. elisae* Gers & Deharveng, 1985

7 Head mac **Pp5** absent … 8
- Head mac **Pp5** present (Fig. 5F) … 10

8 Head with 7 mac in sutural series, **S6i** mac present (Fig. 5A); Th II with 7 antero-lateral mac (Fig. 6A) … 9

- Head with 6 mac in sutural series, **S6i** mac absent; Th II with 8 antero-lateral mac … *S. debruyni* Jacquemart, 1974

9 Head with interocellar mac and **Pa5** mac present; Th II with 6 mac in **PmA** group (Fig. 19A) … *S. agadesi* Jacquemart, 1974
- Head lacking interocellar and **Pa5** mac absent; Th II with 8 mac in **PmA** group … *S. punica* Jacquemart, 1974

10 Th III with 14 central mac (Fig. 11B) … 11
- Th III with 16 central mac … *S. tongiorgii* Tosi & Parisi, 1990

11 Body depigmented or with a different colour pattern; unguis apical tooth present (Fig. 21F) …12
- Body black with legs yellowish (Fig. 3C); unguis apical tooth absent (Fig. 29E) … *S. barrai* **sp. nov.** Cipola & Baquero

12 Abd IV with 4–5 antero-central and 3 postero-central mac (Fig. 20A) … 13
- Abd IV with 6 antero-central and 4 postero-central mac … *S. tigridica* Rusek, 1981

13 Abd IV with 4 antero-central mac (Fig. 12A) … 14
- Abd IV with 5 antero-central mac (Fig. 16A) … 15

14 Body colour with distinct pattern, one transverse strip on Abd I–II, and anterior and posterior Abd IV ... *S. maroccana* Negri, Pellecchia & Fanciulli, 2005
- Body depigmented … S. *vanderheydeni* Jacquemart, 1974

15 Males with femur and tibiotarsi of leg I with spine-like chaetae (Fig. 21E) … 16
- Males without modified chaetae in legs … 17

16 Ant IV annulated; unguis with median tooth larger than basal and apical (Fig. 21F); manubrium ventrally with 18 apical chaetae (Fig. 21G) … *S. mantis* Zeppelini & Bellini, 2006

- Ant IV normal; unguis with basal and median tooth subequal, both larger than apical; manubrium ventrally with 16 apical chaetae … *S. uwei* Barra, 2010

17(15) Body with blue pigment on anterior and posterior margins of Th II to Abd III, all Abd IV and appendages (Fig. 2C–D); … *S. ferrarii* Parona, 1888
- Body depigmented … *S. nigeri* Jacquemart, 1974

18 Head mac **M4i** and **Pa4** present (Fig. 22D); Th II with 7 or more medio-central (**m1**–**2 complex**) mac (Fig. 37A); Abd I with 8–10 central mac (Fig. 37C) … 19
- Head mac **M4i** and **Pa4** absent (Fig. 31E); Th II with 6 or less medio-central (**m1**–**2 complex**) mac (Fig. 32A); Abd I with 6 or less central mac (Fig. 32C) … 25

19 Ant I–II normal, without modifications … 20
- Ant I–II enlarged and with scales elongated in spiral-shaped (Figs 35A–D) … *S. burgersi* **sp. nov.** Cipola & Arbea

20 Th III with 18 or less central mac (Fig. 23B) … 21
- Th III with 24 central mac … *S. lusitanica* Gama, 1964

21 Th III with 15 central mac … 22
- Th III with 16 or more central mac (Fig. 23B) … 24

22 Th II with 8–9 mac in **PmC** group … 23
- Th II with 10 mac in **PmC** group … *S. saxatilis* Gisin & Gama, 1962

23 Body color with distinct pattern, general with longitudinal strip on Th II to Abd I and transverse strips on Abd III–IV; Abd IV with 7 antero-central mac … *S. dollfusi* Carl, 1899
- Body dark blue, appendages yellowish; Abd IV with 7–9 antero-central mac … *S. pallidipes* Reuter, 1895

24(21) Head mac **Pp6** present (Fig. 22D); Th II with 11–13 mac in **PmC** group (Fig. 23A) … *S. pini* Jordana & Arbea, 1989

- Head mac **Pp6** absent; Th II with 9 mac in **PmC** group … *S. squamoornata* (Scherbakov, 1898)

25 Th II with 5 or less medio-central (**m1**–**2 complex**) mac (Figs 27A, 32A); Abd I with 6 central mac (Fig. 27C) … 26
- Th II with 6 medio-central (**m1**–**2 complex**) mac; Abd I with 5 central mac (Fig. 11C) … *S. insalahi* Jacquemart, 1974

26 Th II with 4 medio-central mac (Fig. 6A); Abd IV with 12 central mac (**B1**–**2** absent) (Fig. 7A) … 27
- Th II with 5 medio-central mac (Fig. 32A); Abd IV with 14 central mac (**B1**–**2** present) (Fig. 33A) … *S. betica* **sp. nov.** Cipola & Arbea

27 Th II with 5 mac in **PmC** group (Fig. 19A) … 28
- Th II with 8–10 mac in **PmC** group, generally 9 (Fig. 6A) … *S. domestica* (Nicolet, 1842)

28 Ant IV annulated; trochanteral organ with 20 or less spine-like chaetae; unguiculus with outer lamella serrated (Fig. 8F) … 29
- Ant IV normal; trochanteral organ with more than 30 spine-like chaetae; unguiculus with outer lamella smooth (Fig. 21F) … 30

29 Body color pale, without distinct pattern, pigments restrict to Ant I–IV, part of head and legs (except tibiotarsi); Th III with 15 central mac, **p1ip** present … *S. atlantica* Negri, Pellecchia & Fanciulli, 2005
- Body with two longitudinal strips on Th II to Abd I and other transversal strip on Abd III; Th III with 14 central mac, **p1ip** absent (Fig. 27B) … *S. dagamae* Dallai, 1973

30 Th II with 10 antero-lateral mac (**a5** and **m4** complex) and 6 mac in **PmA** group (Fig. 19A) … *S. deserti* Jacquemart, 1974
- Th II with 7 antero-lateral mac (**a5** and **m4** complex) and 7 mac in **PmA** group (Fig. 27A) … *S. graeca* Ellis, 1966

* Species not included in the key by lack of morphological characters: *S. incerta*, *S. istriana*, *S. rosei*, *S. sacchii* and *S. stachi*.

Discussion

To date, no phylogenetic studies have been conducted to verify the relationships among *Seira* species from different biogeographical regions, so the origins and phylogenetical signal of distinct patterns of dorsal macrochaetotaxy remains unknown. However, it is notable that dense macrochaetotaxy is present mostly in species from Western Palearctic region (e.g. Tab. 2), North Afrotropical region (Jacquemart 1980a–c, e), Middle East (Barra 2004a & b; Barra & van Harten 2009), Oriental (Baquero *et al.* 2014, 2015), and part of the Oceanic region (Mari Mutt 1987; Yoshii & Suhardjono 1992a), while species from the New World, Australian and Ethiopian regions generally present reduced dorsal chaetotaxy (Jacquemart 1980d; Yoshii & Greenslade 1994; Christiansen & Bellinger 2000; Soto-Adames 2008; Bellini *et al.* 2010; Cipola *et al.* 2014a, 2014b; Godeiro & Bellini 2014, 2015). These differences were observed in 37 species from the Old World (Jacquemart 1974), but due to inconsistencies in chaetal homologies, the species groups proposed fall into disuse. The dense macrochaetotaxy shared by Western Palearctic species include at least 7 mac (**S0**–**3**, **S5**–**6**) in sutural series of the head, plus one post-sutural mac (**Ps2**), and posterior region almost always with 4 postsutural mac (**Pa2**–**3**, **Pm3** and **Pp3**) (Fig. 5F). Species as *S. insalahi* Jacquemart, 1974 from Algeria and *S. faironi* Jacquemart, 1974 from North of Nigeria present head postoccipital region devoid of four mac (**Pa2**–**3**, **Pm3**, **Pp3**), and the latter species has also reduction of sutural mac (**S0**–**1**, **S5**) plus numerous anterior mac on Th II (see Jacquemart 1974). These characteristics are typical of *Lepidocyrtinus* Börner, 1903 from Africa (personal observation) and Brazil (Godeiro & Bellini 2014, 2015), and for this reason both *S. insalahi* and *S. faironi* should be further investigated to understand if they really belong to *Seira* s. str. Such chaetotaxy can be assigned to *Seira* s. str. but it is rare, apparently only recorded to *S. annulata* (Handschin, 1927) (in Christiansen & Bellinger 2000) and *Seira caerucinerea* Cipola & Bellini, 2014 (see Cipola *et al.* 2014a).

Species like *S. dollfusi*, *S. lusitanica*, *S. pallidipes*, *S. pini*, *S. saxatilis*, *S. squamoornata* and *S. burgersi* **sp. nov.** share a Th II to Abd II dorsal macrochaetotaxy

mostly polychaetotic, and probably are close related (Tab. 2); such group is herein called "*squamoornata*-group". In these species the head has three extra mac (**M4i**, **S4** and **Pa4**), Th II with 7 or more medio-central mac (**m1**–**2 complex**) and at least 9 and 8 mac in **PmA** and **PmC** groups, respectively, while in Th III there are at least 15 central mac (which can go up to 24 mac in *S. lusitanica*). Also, such species share Abd I with 6–10 (**a1**–**3** plus extranumerary mac), Abd II with 5 (**a3** present) central mac, and Abd IV with up to 10 antero-central mac (**B1**–**2**, **Be1**–**2**, **T1** as mac) (e.g. Fig. 24A, 38A).

Few Palearctic and Oriental species have reduction of macrochaetotaxy, as mac **Ps2** absent on head of *S. algira* and *S. taeniata* (*sensu* Yoshii 1990), Abd I with 5 or less central mac (probably **a2**–**3** absent) and Abd II without mac **a3** as in *S. algira*, *S. dinizi*, *S. dori*, *S. taeniata* (Tab. 2), *S. indra* (Imms, 1912), *S. indica* (Ritter, 1911) and *S. lateralis* Yosii 1966 (see Yosii & Ashraf 1965). This reduction suggests that these species are probably more related to species from central Africa (Jacquemart 1980a, 1980b, 1980c, 1980e) or another Pantropical region (Jacquemart 1980d; Christiansen & Bellinger 2000). Outside Palearctic and Oriental regions such dorsal chaetae on head and Abd I and II are present atypically in four American species: *Seira manukio* Soto-Adames, Bernard & Wynne, 2015 (in Bernard *et al.* 2015) (except Abd I–II), *S. mexicana* Folsom, 1898 (except **Ps2** in head), *S. reinhardi* (Mills, 1931) and *S. dubia* Christiansen & Bellinger, 1980, the last two from United States (see Christiansen & Bellinger 2000; Bernard *et al.* 2015). In the original description of *Seira ferruginea* (as well as after Christiansen & Bellinger 2000) in Abd II was mistakenly presented bearing 5 central mac, but in reality there are only 3 of them (**a2**, **m3**, **m3e**) as observed in syntypes (5472/FCNyM-UNLP).

These differences on macrotergal morphology in species will certainly aid in the separation of groups in future, when added to other characteristics. Among them, the presence of spines on anterior legs is relatively rare in *Seira*, seen in *S. domestica*, *S. dagamae*, *S. squamoornata*, *S. mantis* and *S. uwei*, all from the Western Palearctic region, plus *S. polysperes* from Yémen (Denis 1938; Selga 1957; Gisin & Gama 1962; Altner 1960; Dallai 1973; Zeppelini & Bellini 2006; Barra 2010). In most species the chaetotaxy of male legs are unknown (Tab. 1), so when this feature is revealed, it will certainly help to separate some species (e.g. in *Tyrannoseira* Bellini & Zeppelini, 2011).

In addition to the great need to revise most *Seira* species, the material is often not available or is in poor condition, and consequently the morphology can not be revealed. Some examples of this problem include the type material of *S. dinizi*, *S. lusitanica* and *S.*

arenaria Gama, 1966 (synonym of *S. ferrarii*), plus specimes of *S. dollfusi*, which could not be analyzed here due to diffilculties in loan from the Museu da Ciência da Universidade de Coimbra (Portugal).

Thus, at the moment the formation of species groups or the splitting of *Seira* requires a comprehensive phylogenetic investigation to reveal the possible natural groups within Seirinae as well as the morphological characters that can support any monophyly.

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https://doi.org/10.1111/zsc.12100

CAPÍTULO III

Cipola, N.G; Morais, J.W. & Bellini, B.C. 2018. **Three new species of *Seira* Lubbock (Collembola, Entomobryidae, Seirinae) from Madagascar with *Lepidocyrtus*-like habitus.** No prelo: *Zootaxa*, 2018.

Abstract

Here three new species of *Seira* from Madagascar are described and illustrated, all with *Lepidocyrtus*-like habitus: *Seira lepidochaetosa* **sp. nov.**, *Seira semicaerulea* **sp. nov.** and *Seira metafemurata* **sp. nov.** These species are similar to each other by short antennae, truncate unguiculus, and overall reduction of dorsal macrochaetae, but can be distinguished from each other by color patterns and chaetotaxic elements. An identification key for these three species is also provided, including a discussion on truncate unguiculus on *Seira* species with dense and reduced macrochaetotaxy.

Key words: African Islands, idiochaetotaxy, springtails, Seirini, taxonomy.

Introduction

The Collembola fauna from Madagascar is represented by a little more than 100 species, of which 76 endemic (Thibaud 2008). However, the fauna of Seirinae Yosii, 1961 (*sensu* Zhang & Deharveng, 2015) from Madagascar is still mostly unexplored, with only two species reported: *Seira voeltzkowi* (Börner, 1907) and *Seira pallida* Börner, 1907 (Bellinger *et al*. 2018), plus a doubtful record of *Seira pseudocoerulea* (Denis, 1924), which was originally described from Ethiopia but lacks reliable features for identification (Denis 1929). Another potential record is *Seira delamarei* Jacquemart, 1980 (in 1980a) from Seychelles, which so far was not confirmed to inhabit Madagascar (Zhang *et al.* 2009).

These data indicate that the Seirinae fauna from Madagascar represents less than 2% of the total of 212 world species (Bellinger *et al*. 2018; Cipola *et al*. 2018). Although the African continent holds a high richness of *Seira*, with more than 70 described/recorded species (Bellinger *et al.* 2018), most studies were usually limited to the continent (as Yosii 1959; Coates 1968; Jacquemart 1974, 1980a, 1980b, 1980c, 1980d), leaving a large gap of knowledge in other adjacent African islands.

Here three new species of *Seira* from Madagascar are described and illustrated, including a comparison and identification key for them, as well as a discussion on truncate unguiculus on *Seira* species with idiochaetotaxy.

Material and methods

Specimens were preserved in 92% ethanol, clarified with Nesbitt's solution (HCl + C2H3Cl3O2 + distilled water), and latter mounted on glass slides in Hoyer's medium following the procedures described by Jordana *et al.* (1997). Specimens in ethanol gel were photographed using a stereomicroscope (M165C) attached to a DFC420 digital camera with a dome as presented in Kawada & Buffington (2016). Photographs were digitally corrected using Application Suite V3.4.1. Map of species locality were made after Shorthouse (2010). Type material is deposited at the Invertebrate Collection of the California Academy of Sciences (CAS), USA; and Instituto Nacional de Pesquisas da Amazônia (INPA), Manaus.

The terminology used in descriptions follows: labial chaetotaxy after Gisin's system (1967) labels to **a1**–**5** chaetae; labial papillae, maxillay palp and basolateral and basomedian labial fields after Fjellberg (1999); postlabial chaetotaxy after Chen & Christiansen (1993); clypeal chaetotaxy after Yoshii & Suhardjono (1992); labral and subcoxae (outer side) chaetotaxy after Cipola *et al.* (2014a); unguiculus lamellae after Hüther (1986); manubrial formula after Christiansen & Bellinger (2000); dorsal chaetotaxy of head after Jordana & Baquero (2005) and body after Szeptycki (1979), both with additions of Soto-Adames (2008); and specialized chaetae (S-chaetae) after Zhang & Deharveng (2015). Symbols used to depict the chaetotaxy are presented in figure 1. Chaetotaxy all given by the left side of body only.

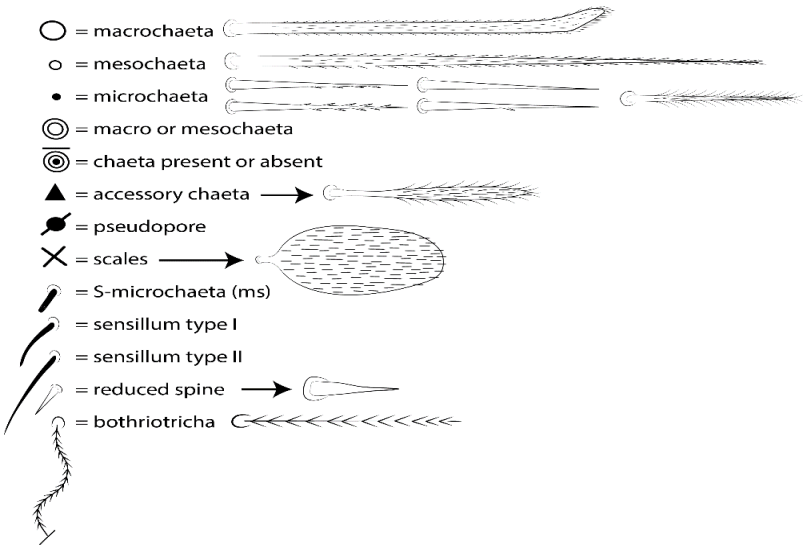

FIGURE 1. Symbols used to dorsal chaetotaxy description of *Seira* species.

Abbreviations: Abd—abdominal segment, Ant—antennal segment, mac—macrochaeta(e), mes—mesochaeta(e), mic—microchaeta(e), psp—pseudopore(s), Th—thoracic segment, ms—specialized microchaeta(e), sens—specialised ordinary chaetae, ai—antero-interna lamella, ae—antero-externa lamella, pi—postero-internal lamella, pe—postero-external lamella.

Taxonomy

Family Entomobryidae Schäffer, 1896 *sensu* Hemming, 1957
Subfamily Seirinae Yosii, 1961 *sensu* Zhang & Deharveng, 2015
Genus *Seira* Lubbock, 1870

The following characters are shared by *Seira* species and are not repeated in the descriptions:

Scales heavily ciliate, oval or elongated and apically rounded (rarely truncate, pointed or irregular) present on body; mac heavily ciliate apically, strongly or lightly foot-shaped or acuminate; smooth mic apically ramificate or simple (Fig. 1).

Habitus *Lepidocyrtus*-like with projected Th. II anterior hood; antennae shorter than the trunk length (Figs 2, 7, 12), Ant I–IV with several blunt sens of different sizes plus ciliate chaetae. Eyes 8+8 (Figs 3E, 8B. 13C). Four prelabral ciliate chaetae; labral formula with 4 (**a1–2**), 5 (**m0–2**), 5 (**p0–2**) smooth chaetae, **a1** thicker, **p0–1** larger. Labial palp with five main papillae (A–E) plus one hypostomal papilla (H) with 0, 5, 0, 4, 4, 2 guard appendages, respectively; labium with five smooth proximal chaetae. Basolateral and basomedian labial fields with chaetae **a1**–**5** smooth, **M1**–**2**, **E**, **L1**–**2** ciliate, **r** reduced. Sublobal plate with tree smooth chaetae.

Th II–Abd V with ms and sens formula 1, 0| 1, 0, 1, 0, 0 and 1, 1 | 0, 2, 2, +, 3, respectively (Figs 4–5); Abd II–IV bothriotrichal formula 2 (**a5**, **m2**), 3 (**a5**, **m2**, **m5**), 3 (**T2**, **T4**, **D3**) (Figs 4D, 5A–B); bothriotricha with accessory lance-shaped chaetae (Fig. 1).

Pretarsi with one minute smooth chaeta on anterior and posterior side; ungues inner side with 4 teeth, 2 paired basal teeth, 1 unpaired median and 1 unpaired apical; outer side with 2 paired lateral teeth and one median lamella apically pointed (Figs 11E–F, 16E).

Mucro falcate, without basal spine.

***Seira lepidochaetosa* sp. nov. Cipola & Bellini**

Figs 2–6, 17

Diagnosis. Body with violet pigments on Th II anteriorly (Fig. 2); clypeal chaetae **l1**–**2** apically acuminate; outer labral papillae smaller than inner; labial papilla E with lateral process pointed (Figs 3B–D); dorsal head with **A5** and **M1** mac, **S3** as mic; postlabial chaetae **G2**–**3** normal (Figs 3E–F); Th III–Abd II with 11, 0, 0 and 3 central mac, respectively; Abd IV with 8 central mac and 15–16 lateral mac, without mes group (Figs 4, 5B); unguiculus truncate; collophore anteriorly with 7 proximal spine-like chaetae, posteriorly with 4 spines and lacking smooth chaetae; manubrium ventrally with 2/2 subapical chaetae; manubrial plate without blunt chaetae (Figs 6E–G).

Type Material. Holotype female in slide (54926/CAS): Madagascar, Toliara Province, Atsimo-Andrefana Region, Ambohimahavelona village, 23°26.45'S, 43°53.98'E (Fig. 17), dry forest, 45 m, 16-27.vii.2010, Malaise-trap, M Irwin & R Harin'Hala coll. Paratype in slide (54926/CAS): 1 female, same data as holotype. Paratypes in slides (54922/CAS): 3 females, same data as holotype, except 01-08.iv.2009. Paratypes in slides (059/INPA): 2 females and 2 specimens in alcohol, same data as holotype, except 01.ix-03.x.2010. Paratypes in alcohol (54914/CAS): 2 specimens, same data as holotype, except 10-13.vi.2010. Paratypes in alcohol (54923/CAS): 7 specimens, same data as holotype, except 29.v-02.vi.2010.

Description. Total length (head + trunk) of specimens 2.21–2.88 mm (n=4), holotype 2.88 mm. Specimens pale white with dark violet pigments on anterior head, anterior to lateral edges of Th II, one latero-distal spot on Abd IV and distal half of femur III; and light pigments on Ant II–IV, Abd III laterally, Abd V, and femur II distally; eyepatches black (Fig. 2). Scales present from Ant I to one basal third of Ant III, all head, thorax and abdomen, legs (except empodia), anterior collophore, both side of the manubrium and dentes ventrally.

Head. Ratio antennae: trunk = 1: 1.72–1.82 (n=3), holotype 1: 1.82; antennal segments ratio as I: II: III: IV = 1: 1.32–1.50: 1.16–1.45: 1.75–2.15, holotype 1: 1.32: 1.28: 1.75. Ant IV not annulated, with apical bulb apically bilobed. Ant III distally with 1 apical sensory rod alongated and 1 rounded plus 3 guard sens (Fig. 3A). Clypeal formula with 4

(**l1**–**2**), 2 (**f**), 3 (**pf0**–**1**) ciliate chaetae, **l1**–**2** larger and apically acuminate, frontal chaetae gently smaller (Fig. 3B). Four labral papillae apically pointed, outer papillae smaller (Fig. 3C). Labial papilla E with lateral process (**l.p.**) apically pointed and exceeding the base of the papilla (Fig. 3D). Maxillary palp with smooth apical appendage (a.a.) and basal chaeta (b.c.) weakly ciliated, thicker and 1.09 longer than the apical. Eyes A and B larger, G and H smaller, with 5 interocular chaetae (**q**, **v**, **p**, **r**, **t**); head dorsal chaetotaxy (Fig. 3E) with 11 'An' (**An1a**–**3**, **An2a** mic present), 4 'A' (**A4** mic present), 2 'M' (**M1**, **M4**), 1 'S' mac (**S6**), and 1 'Pa' (**Pa5**) mac. Ventral chaetotaxy with about 14 ciliate chaetae, postlabial formula 4, 2 (**H2** absent), 4 chaetae; basal chaeta (**b.c.**) largest (Fig. 3F).

Thorax chaetotaxy (Figs 4A–B). Th II **a**, **m** and **p** series with 4 (**a5i2**–**5p**), 4 (**m1**, **m2**–**2i**, **m4**) and 3 (**p1**–**3**) mac, respectively; apex distally with numerous mic and scales interspersed. Th III **a**, **m** and **p** series with 0, 1 (**m6**) and 0 mac, respectively; **p2ea** mic absent. Ratio Th II: III = 2.90–2.65: 1 (n=3), holotype 2.90: 1.

Abdomen chaetotaxy (Figs 4C–D, 5A–C). Abd I without mac, **a**, **m** and **p** series with 5 (**a1**–**3**, **a5**–**6**), 5 (**m2**–**6**) and 2 (**p5**–**6**) mic, respectively, **m4i** absent. Abd II **a**, **m** and **p** series with 1 (**a2**), 3 (**m3**–**3e**, **m5**) and 0 mac, respectively, **a2p** and **m3ep** mic present. Abd III **a**, **m** and **p** series with 0, 3 (**m3**, **am6**, **pm6**) and 1 (**p6**) mac, respectively, **a2** and **p3** as accessory mic. Abd IV with 8 central mac of **A**–**T** series (**A3**–**5**, **B3**–**6**, **C1**) and 15–16 lateral mac of **E**–**Fe** series (**E2**–**4p**, **Ee10**, **F1**–**3**, **Fe1**–**5**); 7 sens (**ps** type I, others type II) and 8 posterior mes present. Abd V **a**, **m** and **p** series with 1 (**a5**), 4 (**m2**–**3**, **m5**–**5e**) and 5 (**p1**, **p3**–**6**) mac, respectively. Ratio Abd III: IV = 1: 2.65–4.41 (n= 3), holotype 1: 4.41.

Legs. Subcoxa I with 5 chaetae and 2 psp; subcoxa II with an anterior row of 11 chaetae, posterior row of 5–7 chaetae and 4 psp; subcoxa III with one row of 11 chaetae and 2 posterior psp (Figs 6A–C). Trochanteral organ with about 33 spine-like chaetae (Fig. 6D). Tibiotarsus III generally subdivided on distal two thirds. Unguis with basal and median teeth with the same length, apical tooth smaller. Unguiculus with **ai** lamellae truncate, others acuminate, all lamellae smooth (**ai**, **ae**, **pi**, **pe**); ratio unguis: unguiculus = 1: 0.55. Tibiotarsus III distally with one inner smooth chaeta 1.32 larger than unguiculus; tenent hair capitate, finely ciliate, and 0.80 smaller than unguis outer edge (as Figs 11E–F).

Collophore (Fig. 6E). Anterior side with 15 chaetae, basally 7 spine-like chaetae, 1 thin mic, 2 inner mic and 2 long ciliate chaetae apically acuminate, distally with 2 mac and 1 long ciliate chaetae apically acuminate; posterior side with 7 chaetae, 4 reduced spine-like mic and 3 ciliate chaetae; lateral flap with 2 smooth and 17 ciliate chaetae.

Furcula (Figs 6F–G). Manubrium ventrally with formula 1, 2, 2, 2/2 (subapical), 16–18 (apical) ciliate chaetae and approximately 17 elongated apical scales per side; manubrial plate with 8 ciliate chaetae of different sizes and 3 psp. Furcula lacking blunt chaetae.

Etymology. Refers to the similarity with the genus *Lepidocyrtus* Bourlet, 1839 in the habitus and reduction of macrochaetae (Fig. 2).

FIGURE 2. *Seira lepidochaetosa* **sp. nov.**: habitus of specimen fixed in alcohol (lateral view). Scale bar: 0.5 mm.

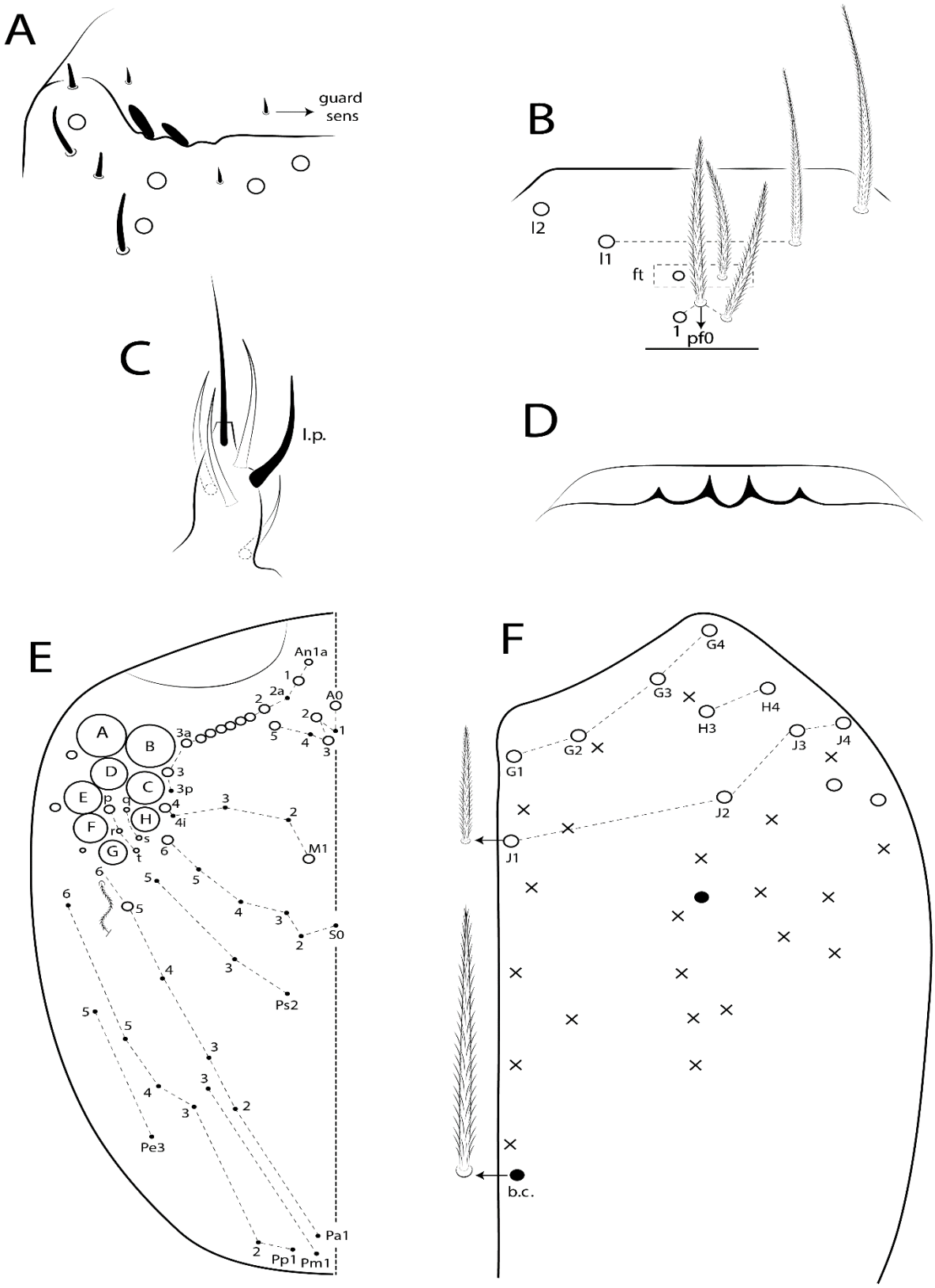

FIGURE 3A–E. *Seira lepidochaetosa* **sp. nov.**: head; **A**, Ant III apical organ (lateral view); **B**, clypeal chaetotaxy; **C**, labial papilla E (right side), **l.p.** is lateral process; **D**, labral papillae; **E**, dorsal cephalic chaetotaxy; **F**, postlabial and cephalic groove chaetotaxy (right side), **b.c.** is basal chaeta.

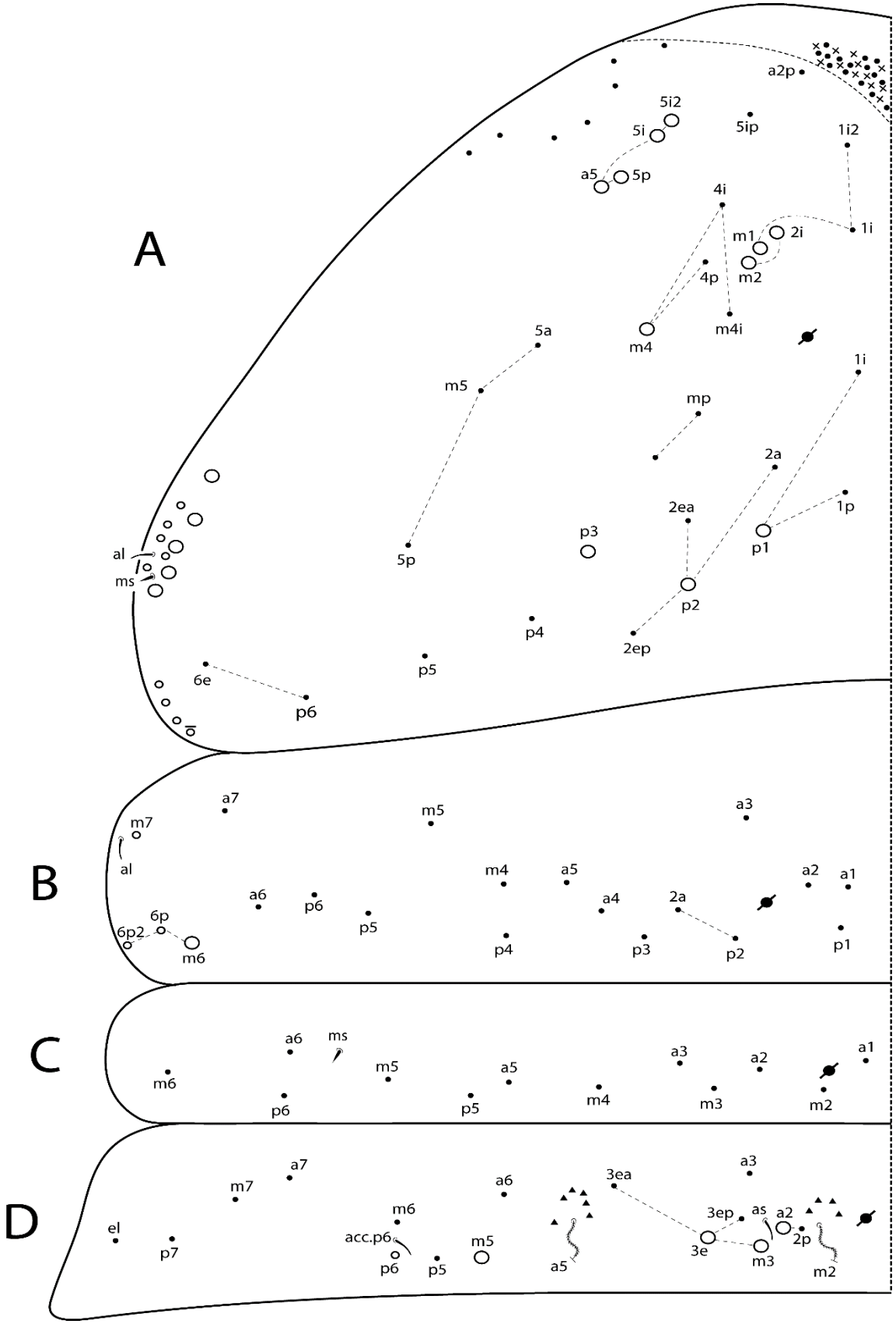

FIGURE 4A–D. *Seira lepidochaetosa* **sp. nov.**: dorsal chaetotaxy; **A**, Th II; **B**, Th III; **C**, Abd I; **D**, Abd II.

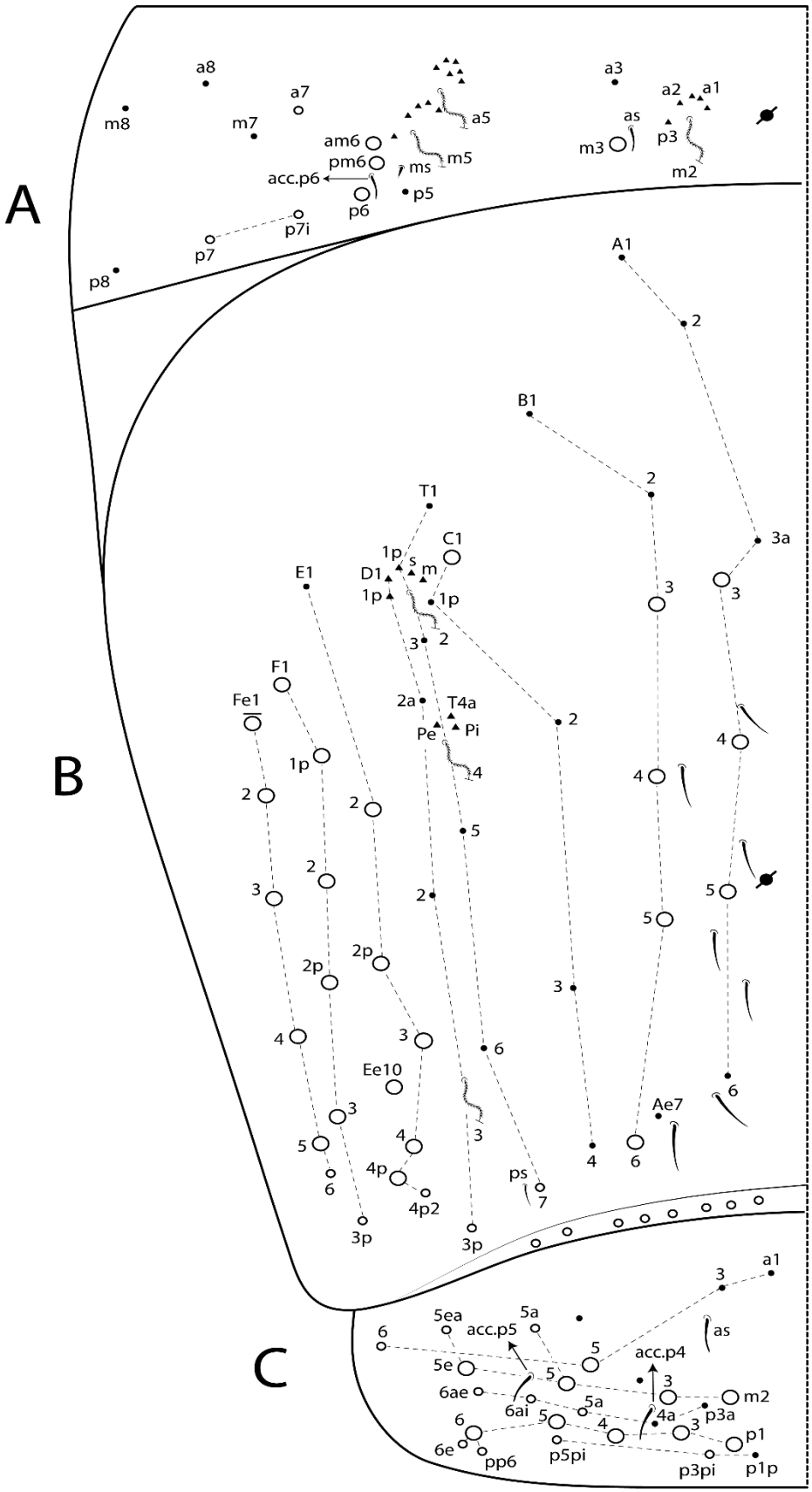

FIGURE 5A–C. *Seira lepidochaetosa* **sp. nov.**: dorsal chaetotaxy; **A**, Abd III; **B**, Abd IV; **C**, Abd V.

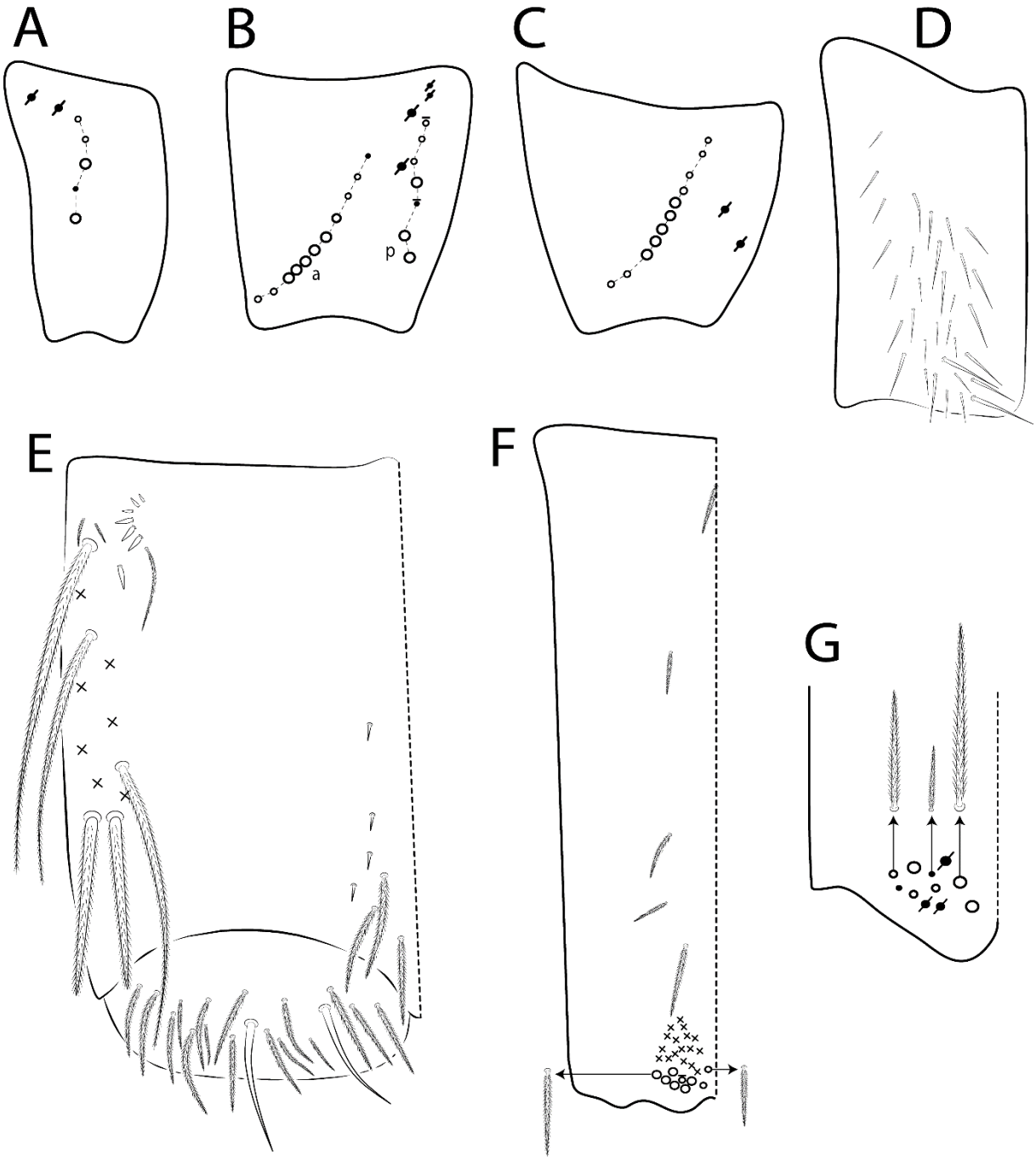

FIGURE 6A–G. *Seira lepidochaetosa* **sp. nov.**: **A**, subcoxa I; **B**, subcoxa II; **C**, subcoxa III; **D**, trochanteral organ; **E**, collophore chaetotaxy (lateral view); **F**, manubrium ventral chaetotaxy; **H**, manubrial plate (dorsal view).

***Seira semicaerulea* sp. nov. Cipola & Bellini**

Figs 7–11, 17

Diagnosis. Body with irregular dark pigments on Th III–Abd IV (Fig. 7); clypeal chaetae **l2** not acuminate; outer labral papillae subequal to inner; labial papilla E with lateral process finger-shaped (Fig. 8A); dorsal head with **S3** mac, **A5** and **M1** as mic; postlabial chaetae **G2**–**3** thin and smaller than **G1** and **G4** (Figs 8B–C); Th III–Abd II with 11, 2, 0 and 3 central mac, respectively; Abd IV with 8 central mac and 13 lateral mac, without mes group (Figs 9, 10B); unguiculus truncate; collophore anteriorly with 7 proximal spine-like chaetae, posteriorly with 3 spines lacking smooth chaetae; manubrium ventrally with 2/4 subapical chaetae; manubrial plate without blunt chaetae (Figs 11E–H).

Type Material. Holotype female in slide (54361/CAS): Madagascar, Fianarantsoa Province, Haute Matsiatra Region, Ambalavao municipality, Anja Community Reserve, 22°43.23'S, 46°15.47'E (Fig. 17), isleberg vegetation, 1097 m, 12-18.vi.2012, Malaise-trap, M Irwin & R Harin'Hala coll. Paratypes in slide (54361/CAS): 2 males and 2 females, same data as holotype. Paratype in slide (061/INPA): 1 male, same data as holotype, except 17-24.i.2013.

Description. Total length (head + trunk) of specimens 1.94–2.90 mm (n=4), holotype 2.90 mm. Specimens pale white, females with navy blue speckled pigment on Th II to Abd III, in males such segments weakly pigmented or depigmented, both sexes with pigments on all Abd IV, and distal half of femur III; Ant III–IV orange or depigmented; eyepatches black (Figs 7A–B). Scales present from Ant I to two basal thirds of Ant III, all head, thorax and abdomen, legs (except empodia), anterior collophore, both side of the manubrium and dentes ventrally.

Head. Ratio antennae: trunk = 1: 1.77–1.96 (n=4), holotype 1: 1.96; antennal segments ratio as I: II: III: IV = 1: 1.44–1.61: 1.52–1.76: 1.93–2.51, holotype 1: 1.48: 1.57: 1.93. Ant IV not annulated, with apical bulb apically bilobed. Ant III distally with 2 apical sensory rods alongated plus 3 guard sens. Clypeal formula with 4 (**l1**–**2**), 2 (**f**), 3 (**pf0**–**1**) ciliate chaetae, **l1**–**2** larger, **l1** apically acuminate, frontal chaetae gently smaller. Four labral papillae apically pointed and subequal. Labial papilla E with lateral process (l.p.) finger-shaped and exceeding the base of the papilla (Fig. 8A). Maxillary palp with smooth

apical appendage (a.a.) and basal chaeta (b.c.) weakly ciliated, thicker and 1.34 longer than the apical. Eyes A and B larger, G and H smaller, with 5 interocular chaetae (**q**, **v**, **p**, **r**, **t**); head dorsal chaetotaxy (Fig. 8B) with 10 'An' (**An1a**–**3**, **An2a** mic present), 3 'A' (**A4** mic absent), 1 'M' (**M4**), 2 'S' mac (**S3**, **S6**), and 1 'Pa' (**Pa5**) mac. Ventral chaetotaxy with about 14 ciliate chaetae, postlabial formula 4, 2 (**H2** absent), 4 chaetae, **G2**–**3** thin and smaller; basal chaeta (**b.c.**) largest (Fig. 8C).

Thorax chaetotaxy (Figs 9A–B). Th II **a**, **m** and **p** series with 4 (**a5i2**–**5p**), 4 (**m1**, **m2**–**2i**, **m4**) and 3 (**p1**–**3**) mac, respectively; apex distally with numerous mic and scales interspersed. Th III **a**, **m** and **p** series with 0, 1 (**m6**) and 2 (**p2**–**3**) mac, respectively; **p2ea** mic present. Ratio Th II: III = 1.97–1.80: 1 (n=4), holotype 1.97: 1.

Abdomen chaetotaxy (Figs 9C–D, 10A–C). Abd I without mac, **a**, **m** and **p** series with 5 (**a1**–**3**, **a5**–**6**), 5 (**m2**–**6**) and 2 (**p5**–**6**) mic, respectively, **m4i** absent. Abd II **a**, **m** and **p** series with 1 (**a2**), 3 (**m3**–**3e**, **m5**) and 0 mac, respectively, **m3ep** mic present, **a2p** absent. Abd III **a**, **m** and **p** series with 0–1 (**a7**), 3 (**m3**, **am6**, **pm6**) and 1–2 (**p6**–**7**) mac, respectively, **p3** mic present, **a2** absent. Abd IV with 8 central mac of **A**–**T** series (**A3**–**5**, **B3**–**6**, **C1**, as in Fig. 5B) and 13 lateral mac of **E**–**Fe** series (**E2**–**3**, **E4p**, **Ee10**, **F1**–**3**, **Fe3**–**5**); 7 sens (**ps** type I, others type II) and 8 posterior mes present. Abd V **a**, **m** and **p** series with 1 (**a5**), 4 (**m2**–**3**, **m5**–**5e**) and 5 (**p1**, **p3**–**6**) mac, respectively. Ratio Abd III: IV = 1: 3.47–4.87 (n=4), holotype 1: 3.72.

Legs. Subcoxa I with 5 chaetae and 2 psp; subcoxa II with an anterior row of 11 chaetae, posterior row of 4 chaetae and 2 psp; subcoxa III with one row of 11 chaetae and 2 posterior psp (Figs 11A–C). Trochanteral organ with about 39 spine-like chaetae (Fig. 11D). Tibiotarsus III generally subdivided on distal two thirds. Unguis with basal and median teeth with the same length, apical tooth minute and sometimes absent. Unguiculus with **ai** lamellae truncate, others acuminate, all lamellae smooth (**ai**, **ae**, **pi**, **pe**); ratio unguis: unguiculus = 1: 0.58. Tibiotarsus III distally with one inner smooth chaeta 1.29 larger than unguiculus; tenent hair capitate, finely ciliate, and 0.88 smaller than unguis outer edge (Figs 11E–F).

Collophore (Fig. 11G). Anterior side with 15 chaetae, basally 7 spine-like chaetae, 1 thin mic, 2 inner mic and 2 long ciliate chaetae apically acuminate, distally with 2 mac and 1 long ciliate chaetae apically acuminate (as in Fig. 6E); posterior side with 4 chaetae, 3 reduced spine-like mic and 1 ciliate chaeta; lateral flap with 5 smooth and 14 ciliate chaetae.

Furcula (Fig. 11H). Manubrium ventrally with formula 1, 2, 2, 2/4 (subapical), 18 (apical) ciliate chaetae and approximately 18 elongated apical scales per side; manubrial plate with 8 ciliate chaetae of different sizes and 3 psp (as in Fig. 6G). Furcula lacking blunt chaetae.

Etymology. Refers to the irregular blue color over the body of the new species (from Latin: *semi* – half and *caeruleo* – bluish) (Figs 7A–B).

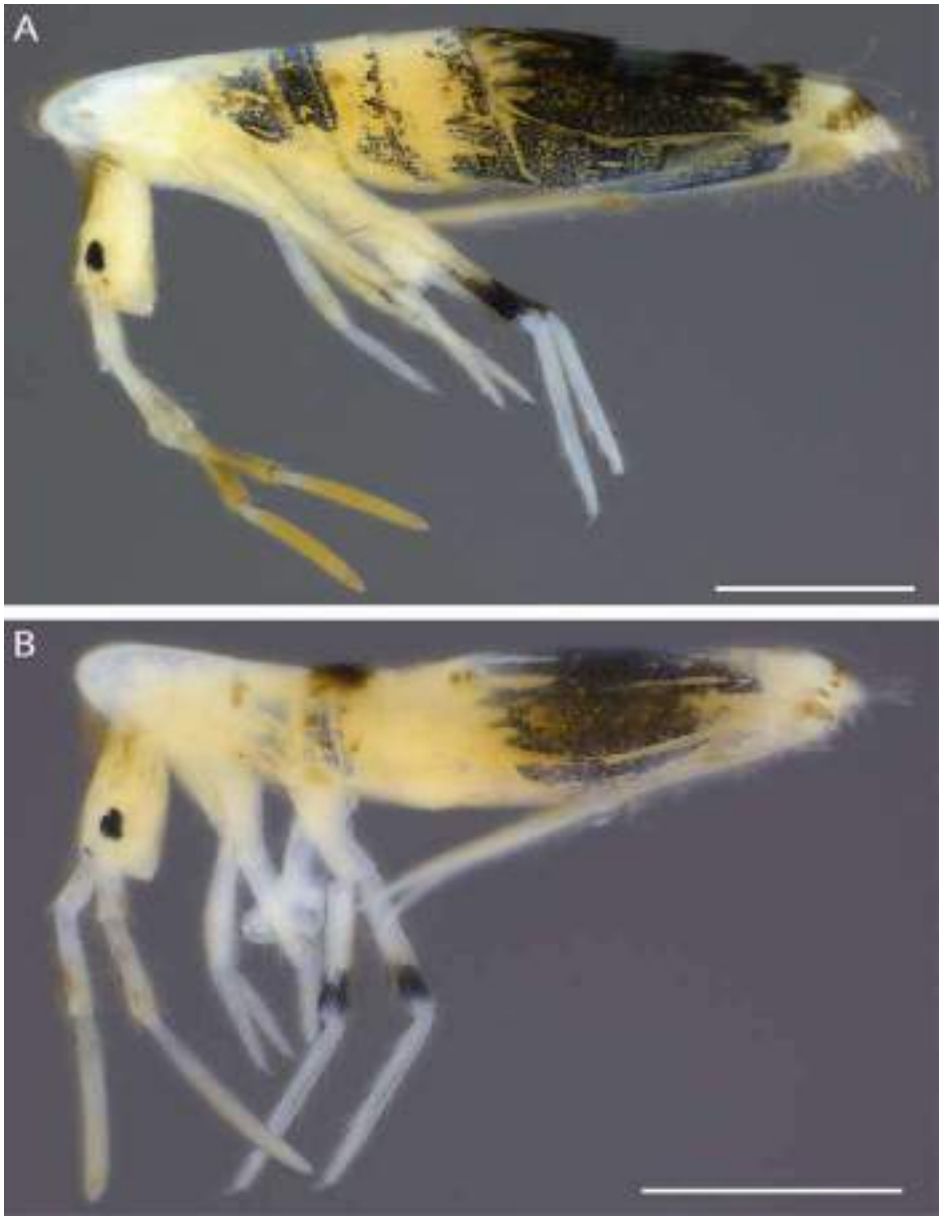

FIGURE 7A–B. *Seira semicaerulea* **sp. nov.**: habitus of specimens fixed in alcohol (lateral view); **A**, female; **B**, male. Scale bar: 0.5 mm.

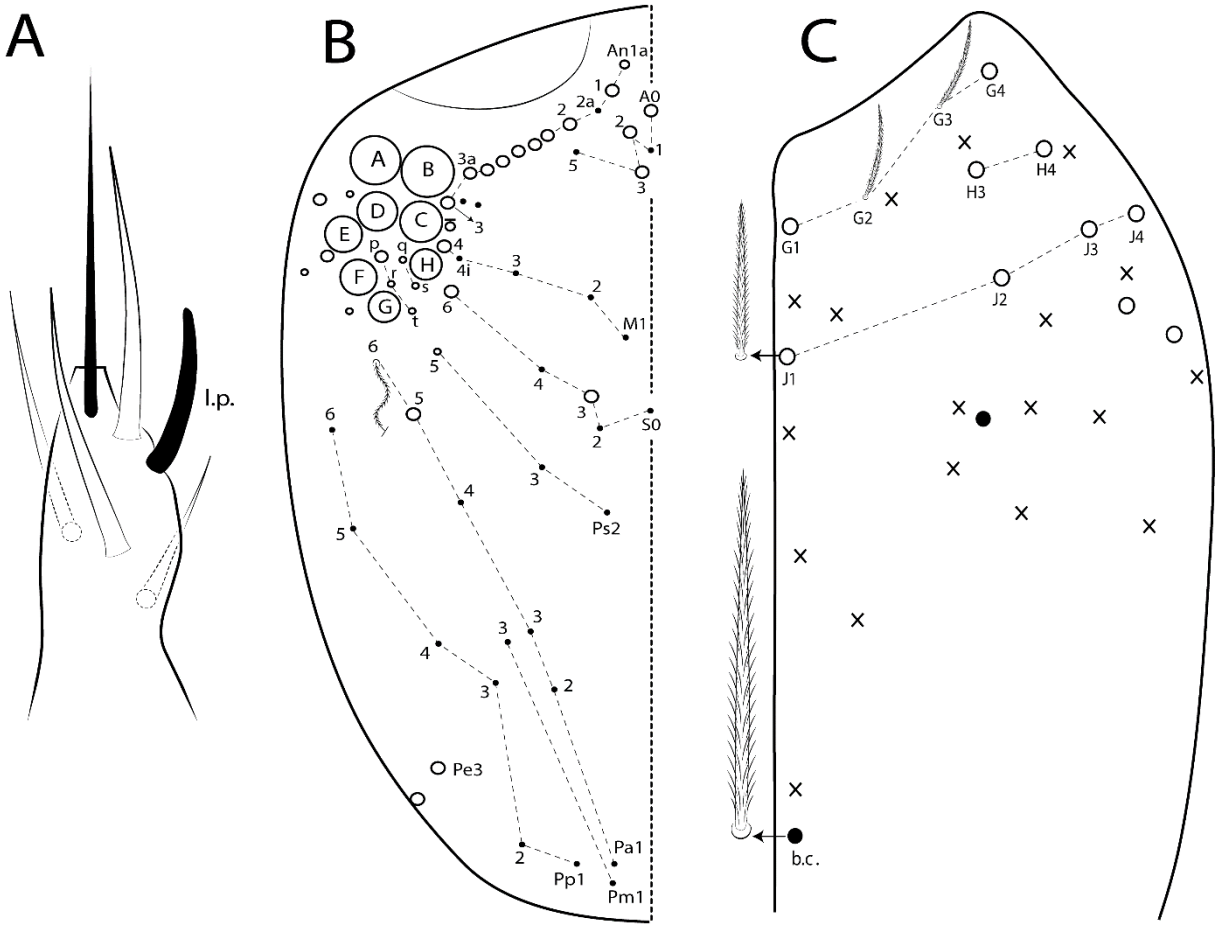

FIGURE 8A–C. *Seira semicaerulea* **sp. nov.**: head; **A**, labial papilla E (right side), **l.p.** is lateral process; **B**, dorsal cephalic chaetotaxy; **C**, postlabial and cephalic groove chaetotaxy (right side), **b.c.** is basal chaeta.

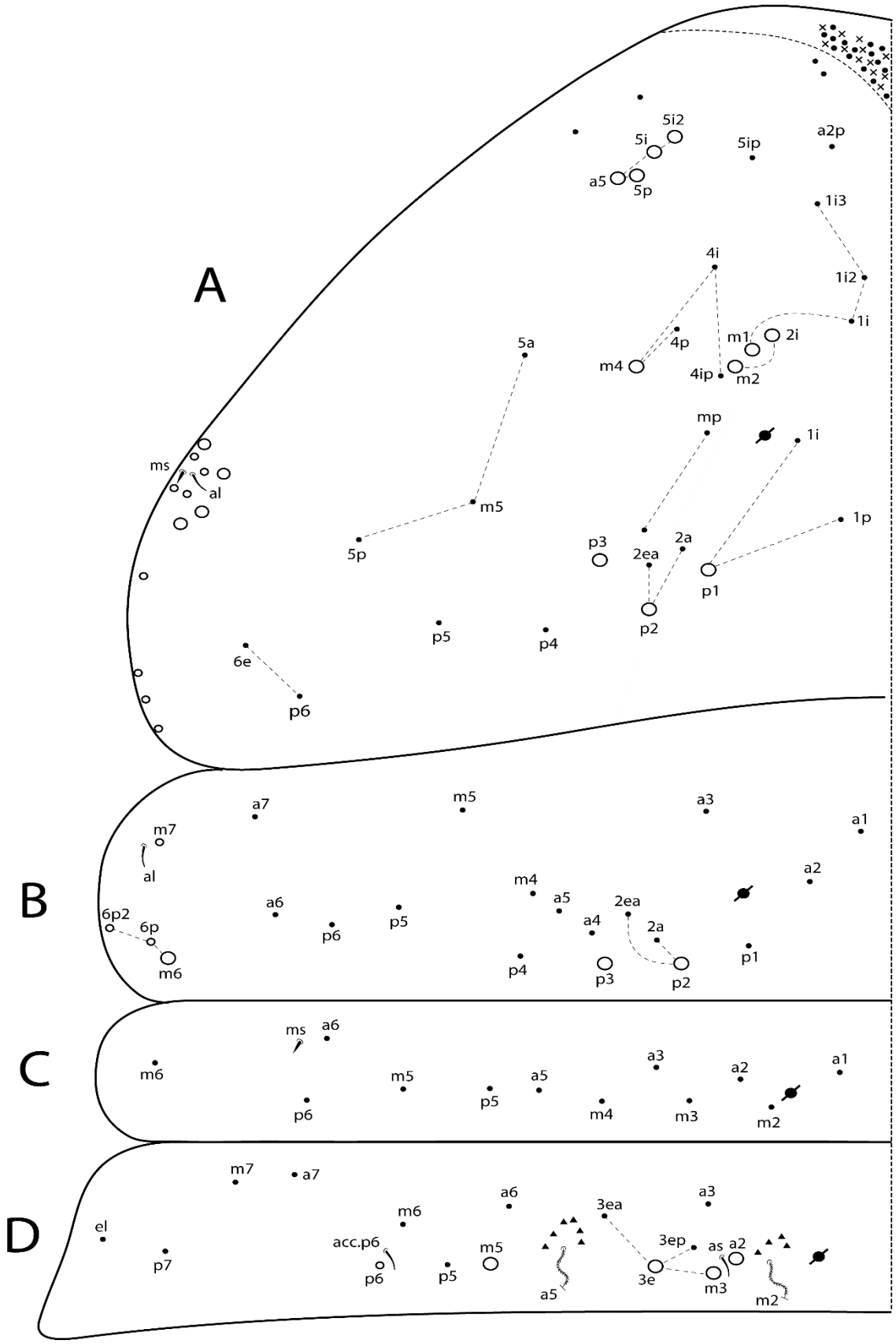

FIGURE 9A–D. *Seira semicaerulea* **sp. nov.**: dorsal chaetotaxy; **A**, Th II; **B**, Th III; **C**, Abd I; **D**, Abd II.

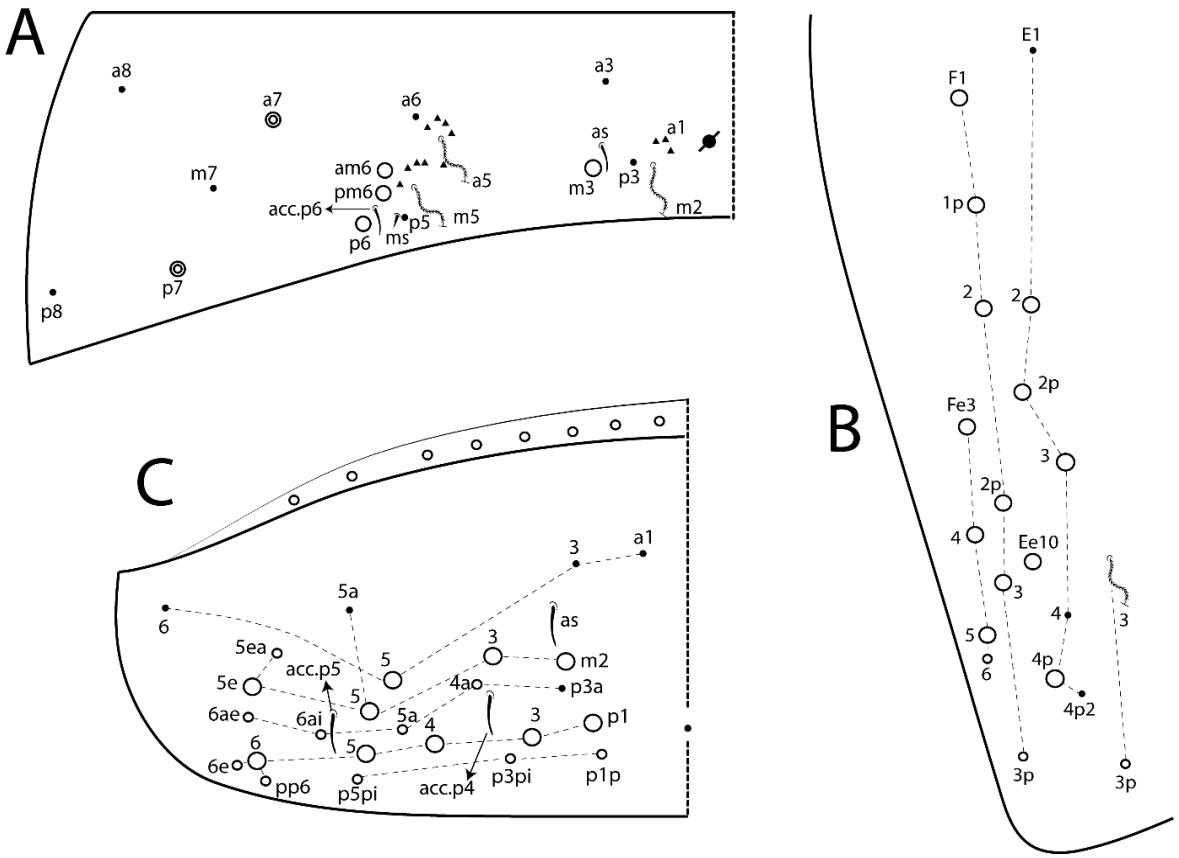

FIGURE 10A–C. *Seira semicaerulea* **sp. nov.**: dorsal chaetotaxy; **A**, Abd III; **B**, Abd IV laterally; **C**, Abd V.

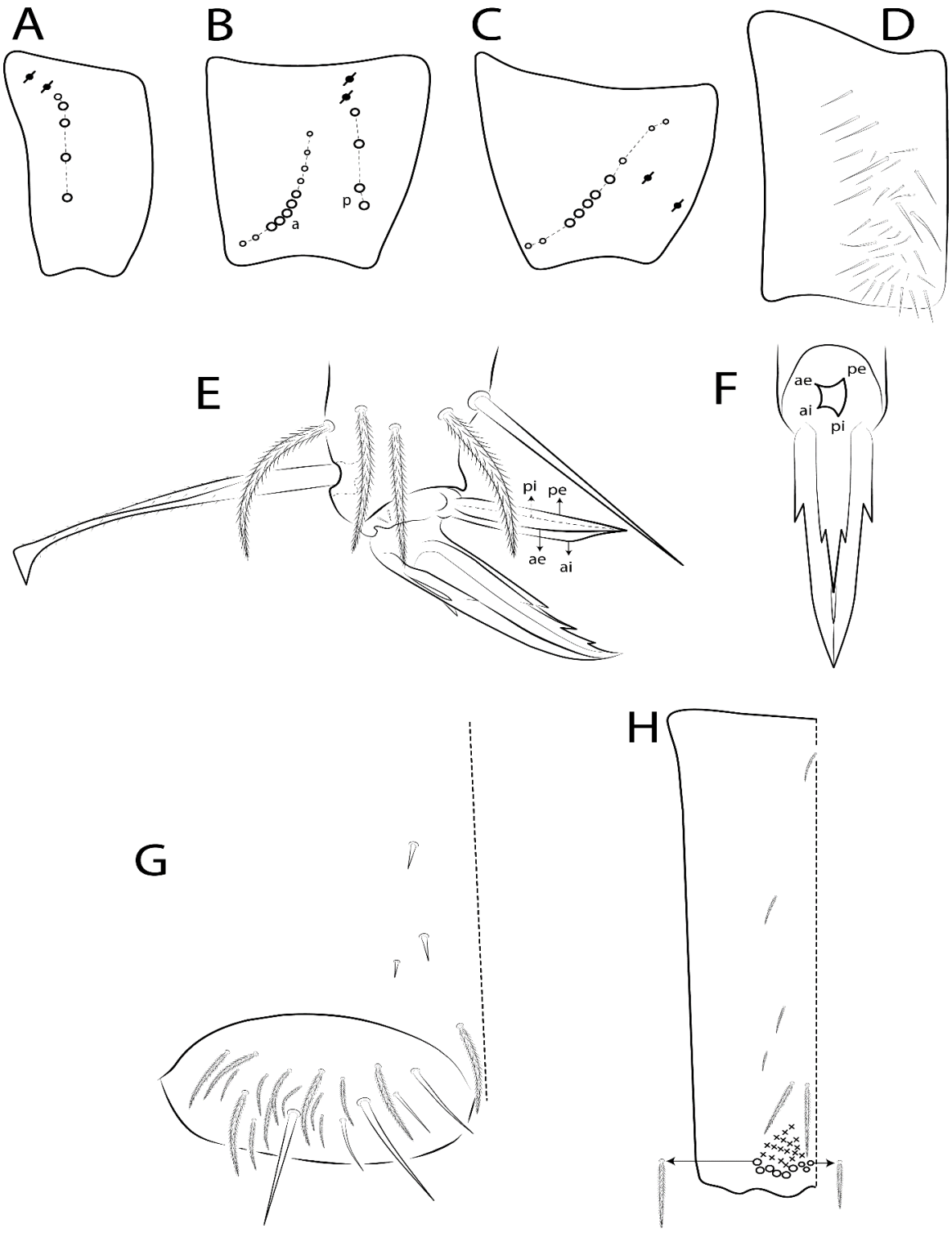

FIGURE 11A–G. *Seira semicaerulea* **sp. nov.**: **A**, subcoxa I; **B**, subcoxa II; **C**, subcoxa III; **D**, trochanteral organ; **E**, distal tibiotarsus and empodial complex III (anterior view); **F**, empodial complex III, inner view of ungues, distal view of unguiculus; **G**, collophore posterior chaetotaxy and lateral flap (lateral view); **H**, manubrium ventral chaetotaxy.

***Seira metafemurata* sp. nov. Cipola & Bellini**

Figs 12–17

Diagnosis. Body with dark blue pigments on femur III distally (Fig. 12); clypeal chaetae **l1**–**2** apically acuminate (Fig. 13B); outer labral papillae subequal to inner; labial papilla E with lateral process finger-shaped; dorsal head with **M1** and **S3** mac, **A5** as mic (Fig. 13C); chaetae **G2**–**3** postlabial thin and smaller than **G1** and **G4** (as in Fig. 8C); Th III–Abd II with 5–6, 1, 0 and 3 central mac, respectively; Abd IV with 7 central mac and 15 lateral mac, plus one group of 14 mes (Figs 14, 15B); unguiculus truncate; collophore anteriorly with 5 proximal spine-like chaetae, posteriorly with 4 spines plus 1 smooth chaeta; manubrium ventrally with 2/4 subapical chaetae; manubrial plate with 4 blunt chaetae (Figs 16E–H).

Type Material. Holotype female on slide (54128/CAS): Madagascar, Toamasina, Réserve Nationale Intégrale Betampona, 17°54'58"S, 049°12'07"E (Fig. 17), Rainforest, 550 m, 24.iv-04.v.2008, Malaise trap, BL Fisher coll. 4 paratypes on slides (54128/CAS): 1 male and 3 females, same data as holotype. 6 paratypes in alcohol (54153, 56/CAS), same data as holotype, except 03-10.viii.2008, 28.ix-05.x.2008. 6 paratypes in alcohol (062/INPA), same data as holotype, except 24-31.viii.2008.

Additional material: 4 females in slides (54107/CAS): Madagascar, Toamasina, Moramanga, Mantadia National Park, Corridor Forestier Analamay-Mantadia, 18°45'39"S, 048°22'17"E (Fig. 17), Rainforest, 1044 m, 23-28.xi.2012, Malaise trap, BL Fisher coll. 1 specimen in alcohol (54107/CAS): *idem*, except 18°45'23"S, 048°25'19"E, 1036 m, 02-09.xii.2012.

Description. Total length (head + trunk) of specimens 2.10–2.43 mm (n=4), holotype 2.42 mm. Specimens pale white with dark blue pigments on anterior head and femur III distally; vestigial pigmentation on Ant I–IV distally; eyepatches black (Fig. 12). Scales present from Ant I to basal halfs of Ant III, all head, thorax and abdomen, legs (except empodia), anterior collophore, both side of the manubrium and dentes ventrally.

Head. Ratio antennae: trunk = 1: 2.73–4.10 (n=3), holotype 1: 2.73; antennal segments ratio as I: II: III: IV = 1: 1.22–1.46: 1.58–1.66: 1.80–2.27, holotype 1: 1.42: 1.58:

1.80. Ant IV not annulated, with apical bulb apically bilobed. Ant III distally with 2 apical sensory rods alongated plus 3 guard sens (Fig. 13A). Clypeal formula with 4 (**l1**–**2**), 2 (**f**), 3 (**pf0**–**1**) ciliate chaetae, **l1**–**2** larger and apically acuminate, frontal chaetae gently smaller (Fig. 13B). Four labral papillae apically pointed and subequal. Labial papilla E with lateral process (l.p.) finger-shaped and exceeding the base of the papilla (as Fig. 8A). Maxillary palp with smooth apical appendage (a.a.) and basal chaeta (b.c.) weakly ciliated, thicker and 1.20 larger than the apical. Eyes A and B larger, G and H smaller, with 5 interocular chaetae (**q**, **v**, **p**, **r**, **t**); head dorsal chaetotaxy (Fig. 13C) with 10 'An' (**An1a**–**3**, **An2a** mic present), 3 'A' (**A4** mic present), 2 'M' (**M1**, **M4**), 1 'S' mac (**S3**), and 1 'Pa' (**Pa5**) mac. Ventral chaetotaxy with about 14 ciliate chaetae, postlabial formula 4, 2 (**H2** absent), 4 chaetae, **G2**–**3** thin and smaller; basal chaeta (b.c.) largest (as Fig. 8C).

Thorax chaetotaxy (Figs 14A–B). Th II **a**, **m** and **p** series with 3–4 (**a5i2**–**5p**), 4 (**m1**, **m2**) and 0 mac, respectively; apex distally with numerous mic and scales interspersed. Th III **a**, **m** and **p** series with 0, 1 (**m6**) and 1 (**p2**) mac, respectively; **p2ea** mic absent. Ratio Th II: III = 2.32–1.67: 1 (n=4), holotype 1.74: 1.

Abdomen chaetotaxy (Figs 14C–D, 15A–B). Abd I without mac, **a**, **m** and **p** series with 5 (**a1**–**3**, **a5**–**6**), 5 (**m2**–**6**) and 2 (**p5**–**6**) mic, respectively, **m4i** absent. Abd II **a**, **m** and **p** series with 1 (**a2**), 3 (**m3**–**3e**, **m5**) and 0 mac, respectively, **m3ep** mic present, **a2p** absent. Abd III **a**, **m** and **p** series with 1 (**a7**), 3 (**m3**, **am6**, **pm6**) and 3 (**p6**, **p7**–**7i**) mac, respectively, **a2** as accessory chaeta, **p3** absent. Abd IV with 7 central mac of **A**–**T** series (**A3**–**5**, **B4**–**6**, **C1**) and 15 lateral mac of **E**–**Fe** series (**E2**–**4p**, **Ee10**, **F1**–**3**, **Fe1**–**5**), plus one group of 14 mes; 3 sens (**ps** type I, others type II) and 8 posterior mes present. Abd V **a**, **m** and **p** series with 1 (**a5**), 4 (**m2**–**3**, **m5**–**5e**) and 5 (**p1**, **p3**–**6**) mac, respectively. Ratio Abd III: IV = 1: 3.35–4.75 (n=4), holotype 1: 4.75.

Legs. Subcoxa I with 5 chaetae and 2 psp; subcoxa II with an anterior row of 12 chaetae, posterior row of 5 chaetae and 3 psp; subcoxa III with one row of 11 chaetae and 2 posterior psp (Figs 16A–C). Trochanteral organ with about 31 spine-like chaetae (Fig. 16D). Tibiotarsus III normal, not subdivided. Unguis with basal and median teeth with the same length, apical tooth minute and sometimes absent. Unguiculus with **ai** lamellae truncate, others acuminate, all lamellae smooth (**ai**, **ae**, **pi**, **pe**); ratio unguis: unguiculus = 1: 0.62. Tibiotarsus III distally with one inner smooth chaeta 1.25 larger than unguiculus; tenent hair capitate, finely ciliate, and 1.28 larger than unguis outer edge (Fig. 16E).

Collophore (Fig. 16F). Anterior side with 11 chaetae, basally 5 spine-like chaetae, 1 thin mic ciliate, 3 long ciliate chaetae apically acuminate and 2 distal mac; posterior side with 6 chaetae, 4 reduced spine-like mic, 1 ciliate chaetae and 1 smooth chaetae; lateral flap with 5 smooth and 15 ciliate chaetae.

Furcula (Figs 16G–H). Manubrium ventrally with formula 1, 2, 2, 2/4 (subapical), 16–18 (apical) ciliate chaetae and approximately 15 elongated apical scales per side; manubrial plate with 4 blunt ciliate chaetae apically bullet-like, 4–5 ciliate chaetae of different sizes and 3 psp. Dorsal dens lacking blunt chaetae.

Etymology. Refers to restricted pigmentson femur III of the new species (Fig. 12).

FIGURE 12A. *Seira metafemurata* **sp. nov.**: habitus of specimen fixed in alcohol (lateral view). Scale bar: 0.5 mm.

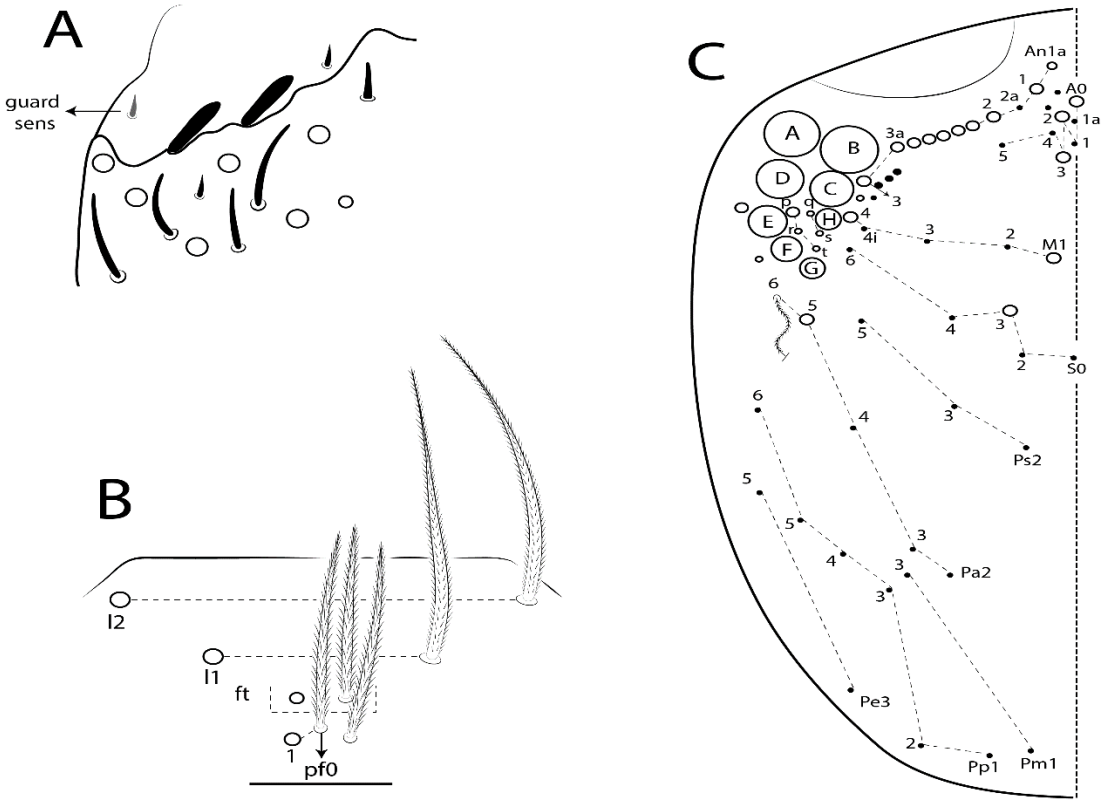

FIGURE 13A–C. *Seira metafemurata* **sp. nov.**: head; **A**, Ant III apical organ (lateral view); **B**, clypeal chaetotaxy; **C**, dorsal cephalic chaetotaxy.

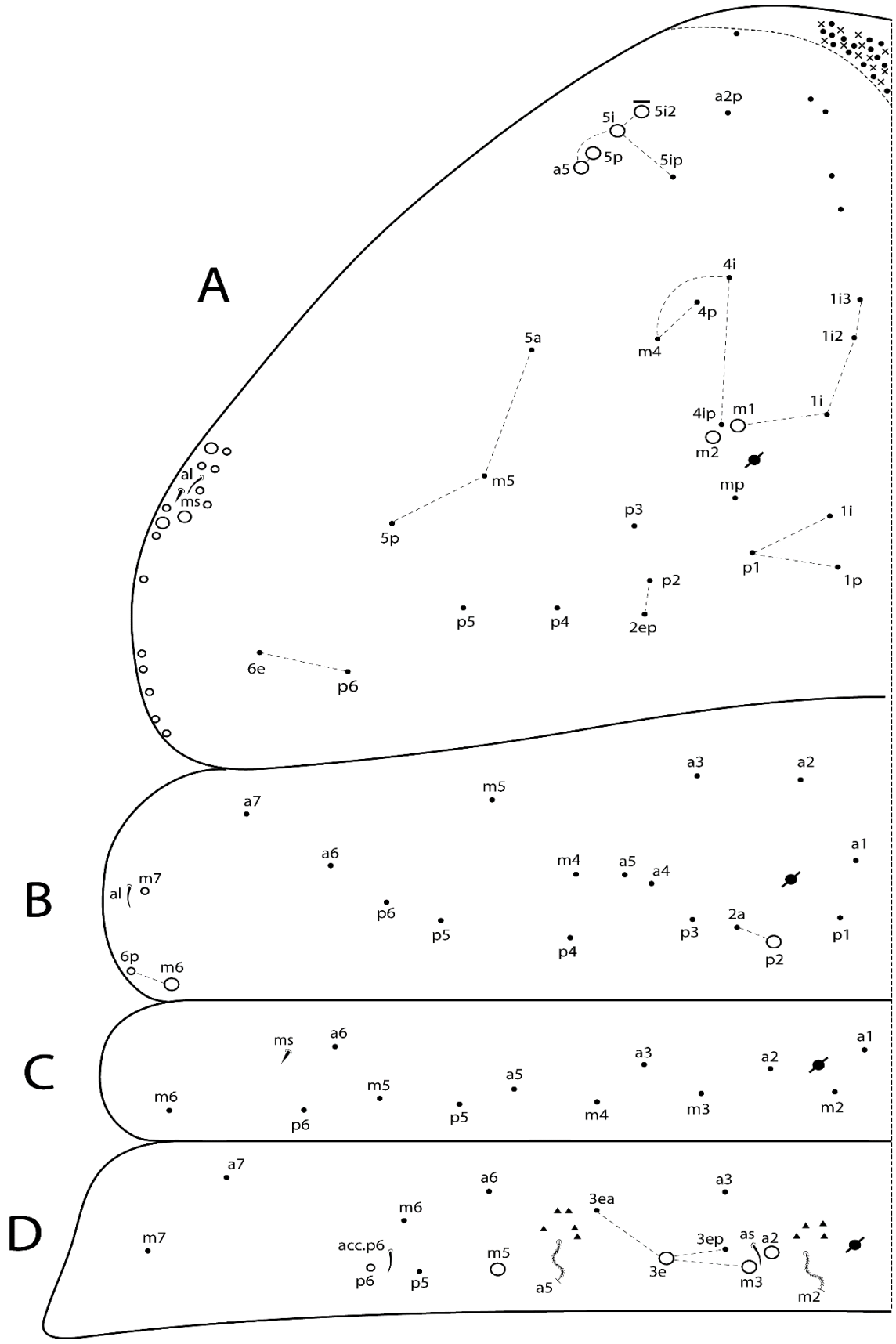

FIGURE 14A–D. *Seira metafemurata* **sp. nov.**: dorsal chaetotaxy; **A**, Th II; **B**, Th III; **C**, Abd I; **D**, Abd II.

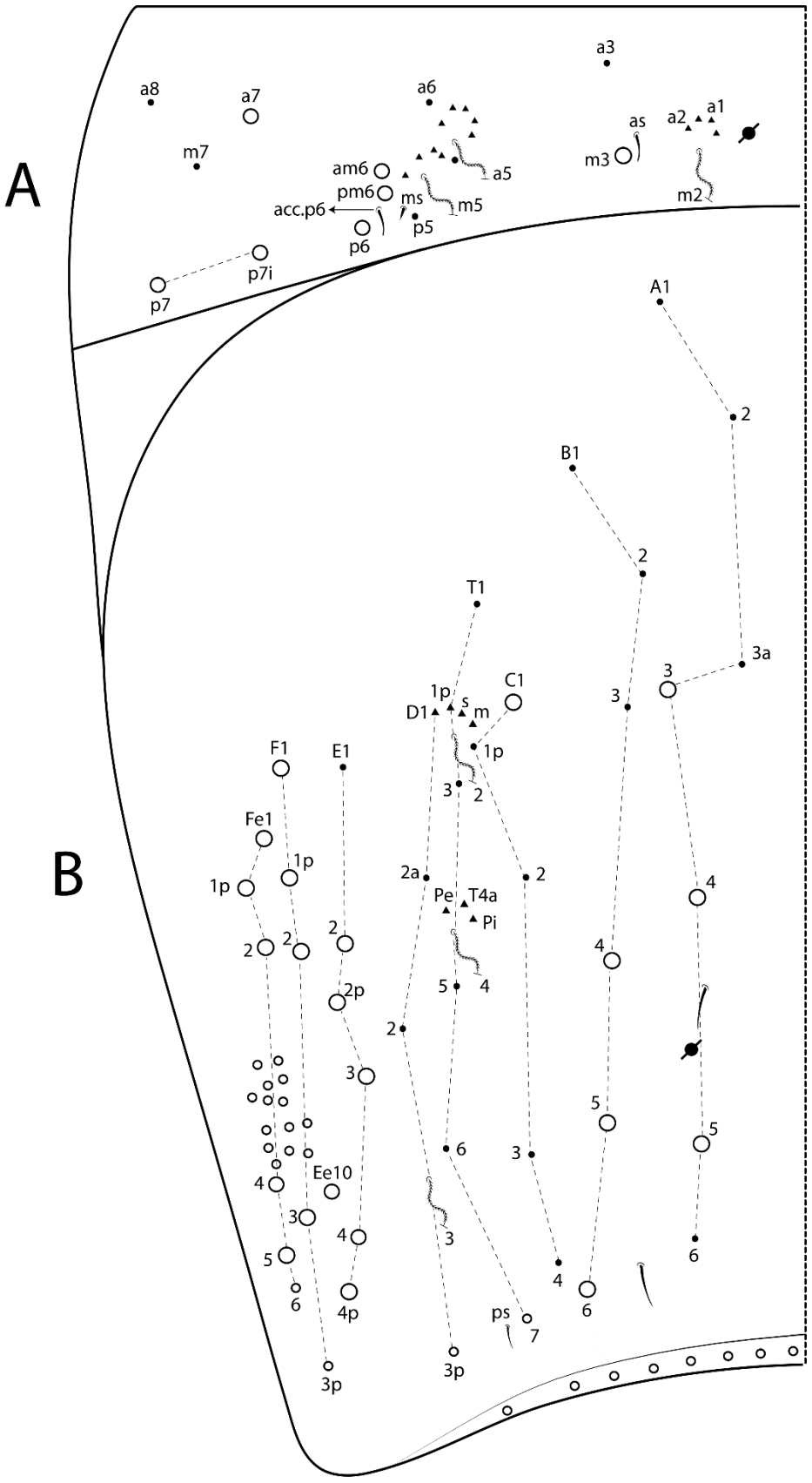

FIGURE 15A–B. *Seira metafemurata* **sp. nov.**: dorsal chaetotaxy; **A**, Abd III; **B**, Abd IV.

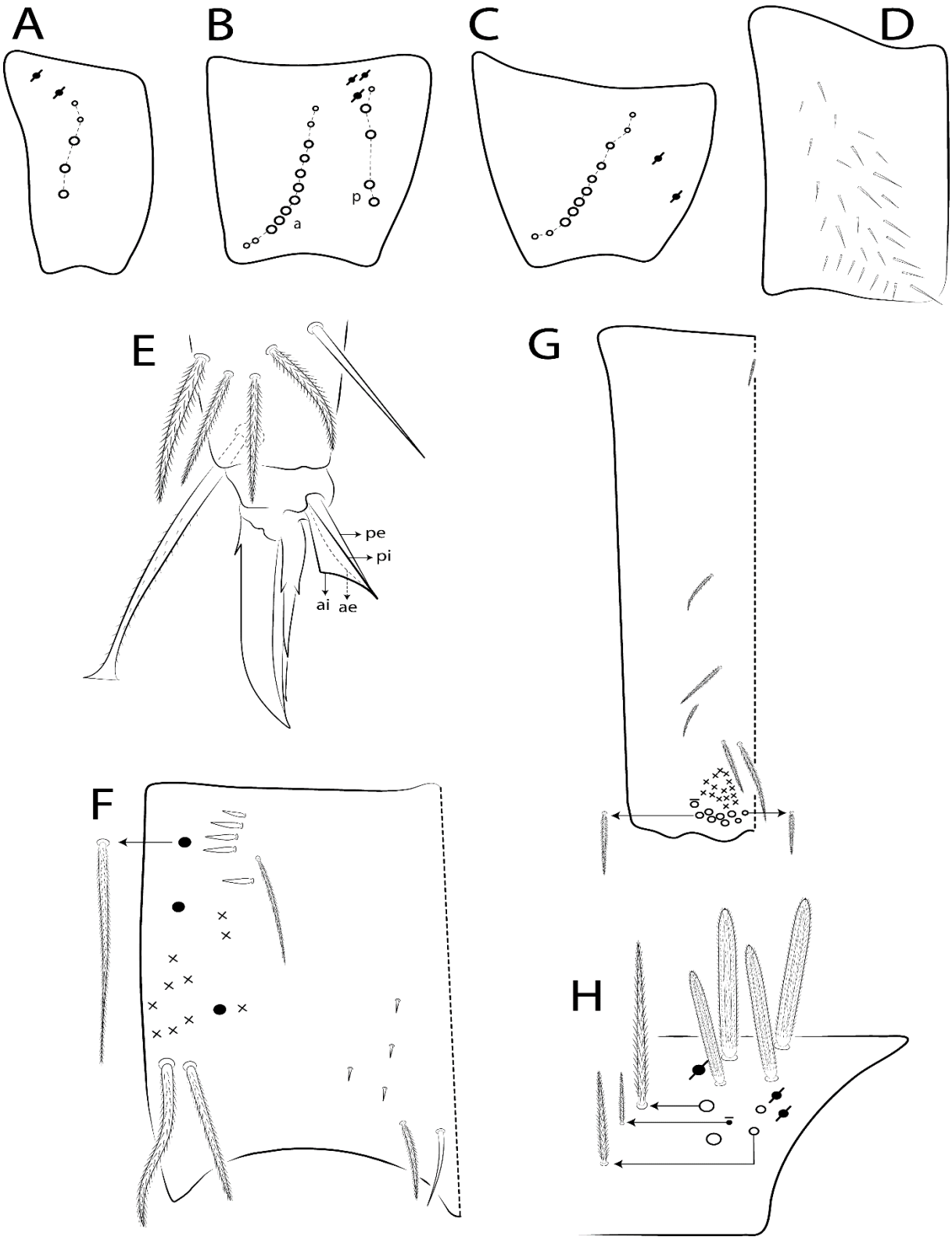

FIGURE 16A–H. *Seira metafemurata* **sp. nov.**: **A**, subcoxa I; **B**, subcoxa II; **C**, subcoxa III; **D**, trochanteral organ; **E**, distal tibiotarsus and empodial complex III (inner-posterior view); **F**, collophore chaetotaxy (lateral view), lateral flap ommited; **G**, manubrium ventral chaetotaxy; **H**, manubrial plate (dorsal view).

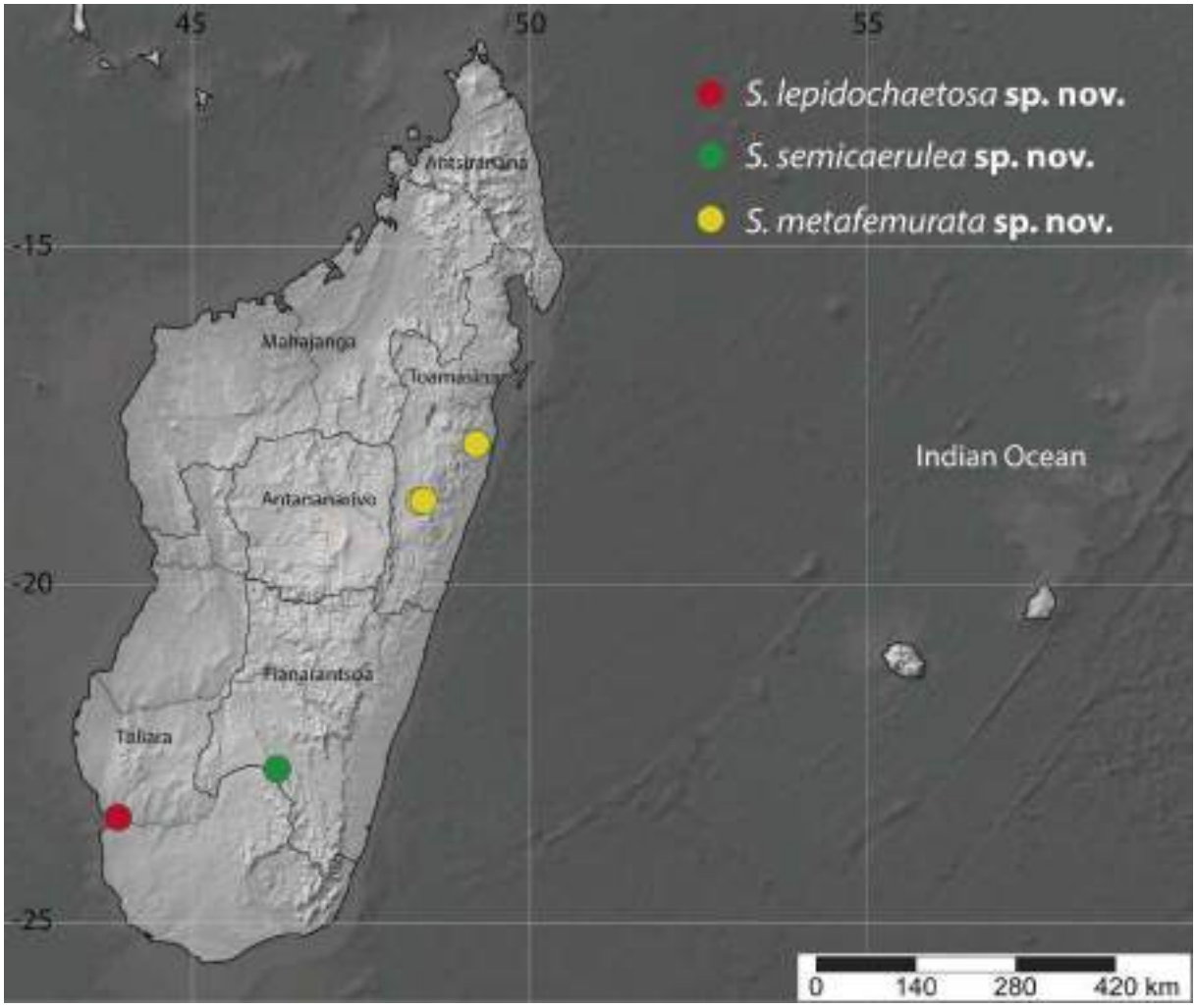

FIGURE 17. Records of the new species of *Seira* from Madagascar.

Remarks. The three new species described here are similar in habitus to *Lepidocyrtus* species, including: short antennae, Th. II with anterior hood, truncate unguiculus, and reduction of dorsal macrochaetotaxy, as head without posterior mac (**Pa**, **Pm** and **Pp** series), Th II–III respectively with up 11 and 2 central mac, Abd I devoid of mac, and Abd II with 3 central mac. In the other hand, these species differ from each other by very distinct color patterns (Figs 2, 7, 12), clypeal chaetae **l1**–**2** apically acuminate (only **l1** in *S. semicaerulea* **sp. nov.**), lateral process of papilla E finger-shaped (pointed in *S. lepidochaetosa* **sp. nov.**), chaetae **G2**–**3** postlabial thin and smaller than **G1** and **G4** (all similar in *S. lepidochaetosa* **sp. nov.**), and manubrial plate with blunt chaetae only in *S. metafemurata* **sp. nov.** (Fig. 16H).

Among the new described species, the head chaetotaxy differ by mac **A5** and **M1** present and **S3** absent in *S. lepidochaetosa* **sp. nov.**, while in *S. semicaerulea* **sp. nov.** and

S. metafemurata **sp. nov.** is opposite, except by **M1** mac in this last species (Figs 3E, 8B, 13C). In addition, *S. semicaerulea* **sp. nov.** has 2 posterior mac of **Pe** series (absent in *S. lepidochaetosa* **sp. nov.** and *S. metafemurata* **sp. nov.**). In Th II chaetotaxy they differ by presence of 5–6 central mac in *S. metafemurata* **sp. nov.** (11 in *S. lepidochaetosa* **sp. nov.** and *S. semicaerulea* **sp. nov.**), while in Th III there are 0, 1 and 2 central mac respectively in *S. lepidochaetosa* **sp. nov.**, *S. metafemurata* **sp. nov.** and *S. semicaerulea* **sp. nov.** (Figs 4A–B, 9A–B, 14A–B). Finally, the Abd IV chaetotaxy in *S. metafemurata* **sp. nov.** differs by 7 central mac (**B3** absent), and laterally with one group of about 14 mes beetewn **E**–**Fe** series (Fig. 15B), while in *S. lepidochaetosa* **sp. nov.** and *S. semicaerulea* **sp. nov.** there are 8 central mac (**B3** present) and laterally both lack this mes group (Figs 5B, 10B).

Key to *Seira* species from Madagascar with truncate unguiculus

1 Body pale with dark blue pigments on femur III distally (Fig. 12); Th II with series **m** and **p** with 2 (**m1**–**2**) and 0 mac, respectively (Fig. 14A); Abd IV with 7 central mac (**B3** absent), and laterally with one group of about 14 mes beetewn **E**–**Fe** series (Fig. 15B); manubrial plate with 4 blunt chaetae (Fig. 16H) … *S. metafemurata* **sp. nov.**

- Body with diferent pigments pattern (Figs 2, 7); Th II with series **m** and **p** with 4 (**m1**, **m2**–**2i**, **m4**) and 3 (**p1**–**3** present) mac, respectively (Figs 4A, 9A); Abd IV with 8 central mac (**B3** present), and laterally lacking mes group (Figs 5B, 10B); manubrial plate with all chaetae pointed, without modifications (Fig. 6G) … 2

2 Body with violet pigments on Th II anteriorly (Fig. 2); dorsal head with **A5** and **M1** mac, **S3** as mic (Fig. 3E); Th III devoid of central mac (Fig. 4B) … *S. lepidochaetosa* **sp. nov.**

- Body with irregular dark pigments on Th III to Abd IV (Fig. 7); dorsal head with **A5** and **M1** mic, **S3** as mac (Fig. 8B); Th III with 2 (**p2** and **p3**) central mac (Fig. 9B) … *S. semicaerulea* **sp. nov.**

TABLE 1. Comparison (per side) among three new species of *Seira* from Madagascar with truncate unguiculus and Abd I–III with 0, 3 and 1 central mac, respectively.

Characteristics		**Species of *Seira***		
		lepidochaetosa **sp. nov.**	*semicaerulea* **sp. nov.**	*metafemurata* **sp. nov.**
Clypeal **l2** chaeta		acuminate	normal	acuminate
Postlabial	G2	normal	smaller	smaller
chaetae	G3	normal	smaller	smaller
Process lateral of labial papilla E		pointed	finger-like	finger-like
Head dorsal	A4	m	–	m
chaetotaxy	A5	M	M	m
	M1	M	m	M
	S3	m	M	M
	S5	m	–	–
	S6	M	M	m
	Pe3	m	M	m
Th II mac	m2i	M	M	m
	m4	M	M	m
	p1	M	M	m
	p2	M	M	m
	p3	M	M	m
Th III mac	p2	m	M	M
	p3	m	M	m
Abd IV mac	central	8	8	7
	lateral	15–16	13	15
lateral mes group		–	–	14
Subcoxa I		5	5	5
Subcoxa II	a row	11	11	12
	p row	5–7, 4psp	4, 2psp	5, 3psp
Subcoxa III		11	10	11
Metatrocanteral organ		33	39	31
Collophore	anterior	7sp	7sp	5sp
chaetotaxy	posterior	4sp, 3C	3sp, 1C	4sp, 1C, 1S
	lateral flap	2S, 16C	4S, 14C	5S, 15C
Subapical chaetae of Ventral manubrium		2	4	4
Blunt chaetae on manubrial plate		–	–	4

Symbols used to represent the morphological characteristics: (C) ciliated chaeta; (S) smooth chaeta; (M) mac; (m) mic; (psp) pseudoporus; (–) absent.

Discussion

The dense or reduced macrochaetotaxy present in some *Seira* species from different regions of the world was discussed in Cipola *et al.* (2018). Independently, is common sense that the unguiculus shape in Seirinae generally has all lamellae acuminate (Christiansen & Bellinger 2000; Cipola *et al.* 2014a, 2014b, 2018). The truncate unguiculus is present in species with dense macrochaetotaxy, as *Seira nicoya* Christiansen & Bellinger, 1988 from Mexico. However, the discovery of these three new species herein described from Madagascar reveals that truncate unguiculus can also be present in species with reduced macrochaetotaxy. Since the overall morphology of *S. nicoya* is remarkably different from the new species (*S. nicoya* lacks the Th II hood, presents posterior mac on head, Th II with at least central 20 mac, Th III with 7 central mac, and 4 central mac on Abd I), truncate unguiculi may have arisen among the Seirinae more than once, and prevent us to group species within *Seira* based in such morphology.

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CAPÍTULO IV

Cipola, N.G; Morais, J.W.; Godeiro, N.N. & Bellini, B.C. 2018. **Taxonomic revision of *Tyrannoseira* Bellini & Zeppelini, 2011 (Collembola, Entomobryidae, Seirinae).** Submetido na *Zootaxa*, 2018.

Abstract

Herein *Tyranonoseira* is revised and new diagnostic characters to the genus and its species are proposed. The genus is now characterized by specific chaetotaxic pattern of head, lacking **M2**, **S1**, **S4**, **S5** macrochaetae; Th II to Abd IV with 21–27, 7, 0, 3, 1 and 8–10 central macrochaetae, respectively; and anterior legs of males with modified chaetae. The five species of the genus are redescribed based in type material: *T. raptora* Zeppelini & Bellini, *T. bicolorcornuta* Bellini & Zeppelini, *T. diabolica* Bellini & Godeiro, *T. gladiata* Zeppelini & Lima and *T. sex* Bellini & Zeppelini, including an identification key and comparation for the species. The patterns of dorsal chaetotaxy are remarkably similar among all species, therefore characters omitted in the original descriptions such as chaetotaxy of the clypeus, labral papillae, collophore chaetae and manubrial formula are now also used to better distinguish species. A discussion is made between *Seira* and *Tyrannoseira* based in dorsal chaetotaxy and modified chaetae on anterior legs of males.

Key words: chaetotaxy, neotropical springtails, Seirini, semiarid landscapes, taxonomy.

Introduction

Seirinae Yosii, 1961 (*sensu* Zhang & Deharveng 2015) is a subfamily of Entomobryidae Tömösvary, 1882 with 212 valid species currently divided in only two genera, *Seira* Lubbock, 1870, which corresponds to 98% of the species (Bellinger *et al.* 2018; Cipola *et al.* 2018), and *Tyrannoseira* Bellini & Zeppelini, 2011 with only five endemic species from Brazilian northeastern region, four of them from semiarid landscapes (Zeppelini & Bellini 2006; Bellini *et al.* 2009; Bellini & Zeppelini 2011; Bellini & Godeiro 2012; Zeppelini & Lima 2012). The Seirinae are epiedaphic springtails well distributed among the Holotropical Kingdom, with few species recorded from temperate regions (Christiansen & Bellinger 2000; Bellini & Zeppelini 2011; Bellinger *et al.* 2018).

Tyrannoseira resembles *Seira* by body with heavily ciliated scales, S-chaetae pattern of trunk, fourth abdominal segment with three bothriotricha and mucro falcate without basal spines (Cipola *et al.* 2014a, 2014b, 2018; Zhang *et al.* 2015). However, *Tyrannoseira* differs from *Seira* mostly by the combination of the first abdominal segment devoided of macrochaetae plus anterior legs of males with modified chaetae in spines

(Bellini & Zeppelini 2011; Zeppelini & Lima 2012). These characteristics can also be present (but not combined) in some species of *Seira* (as presented in Jacquemart 1980a, 1980b; Arlé & Guimarães 1981; Christiansen & Bellinger 2000; Barra 2004; Godeiro & Bellini 2013) and therefore the diagnosis of the *Tyrannoseira* can be dubious.

In the original descriptions of the species there are also mistakes of chaetal interpretation typical of Seirinae, besides chaetotaxy nomenclature and intraspecific variations. Also in such descriptions some morphological characteristics of taxonomic value were omitted (Zeppelini & Bellini 2006; Bellini *et al.* 2009; Bellini & Zeppelini 2011; Bellini & Godeiro 2012; Zeppelini & Lima 2012). Such lack of details turns harder to compare the species among them and with other Entomobryidae, or even describe new taxa in the light of modern taxonomy. So, in this paper the genus *Tyrannoseira* is revised and a new diagnosis is provided, including new chaetotaxic characteristics. All five species are detailed redescribed and an identification key is provided. In the end, a brief discussion about the differences between *Seira* and *Tyrannoseira* is presented.

Material and methods

Specimens preserved in ethanol (70% or more) were cleared with Nesbitt's solution and then mounted on glass slides in Hoyer's medium following the procedures described by Jordana *et al.* (1997). Specimens in ethanol gel were photographed using a stereomicroscope (M165C) attached to a DFC420 digital camera with a dome as presented in Kawada & Buffington (2016). Photographs were digitally corrected using Application Suite V3.4.1. For images in scanning electron microscopy (SEM), specimens were transferred to absolute ethanol and then to reach the critical point, after sputter-coated with gold using the equipments BAL-TEC CPD 030 and BAL-TEC SPD 050, respectively. The images were made in a scanning electron microscope LEO VP 435. Map of species locality were made after Shorthouse (2010). Type material is deposited at the Museum of Zoology of the University of São Paulo (MZUSP), National Museum of Rio de Janeiro (MNRJ), Collembola Collection of Centro de Biociências of Federal University of Rio Grande do Norte (CC/UFRN). Additional material is deposited at the Invertebrate Collection of the Instituto Nacional de Pesquisas da Amazônia (INPA), Brazil.

The terminology used in descriptions follows mainly: labial papillae, maxillary palp and basolateral and basomedian labial fields after Fjellberg (1999), named with Gisin's

system (1967) to **a1**–**5** chaetae labels; postlabial chaetotaxy after Chen & Christiansen (1993) and Cipola *et al.* (2018); clypeal chaetotaxy after Yoshii & Suhardjono (1992); labral and subcoxae (outer side) chaetotaxy after Cipola *et al.* (2014a); unguiculus lamellae after Hüther (1986); and manubrial formula after Christiansen & Bellinger (2000). Head dorsal chaetotaxy follows Jordana & Baquero (2005) adapted from Soto-Adames (2008), and trunk dorsal chaetotaxy follows Szeptycki (1979) adapted from Soto-Adames (2008), including groups **PmA**, **PmB** and **PmC** of posterior macrochaetae on second thoracic segment; and specialized chaetae (S-chaetae) after Zhang & Deharveng (2015). Chaetae morphology and symbols used in chaetotaxy schemes are presented in Figures 2, 7A–B. Chaetotaxy all given to one side of body.

Abbreviations: Abd—abdominal segment, Ant—antennal segment, mac—macrochaeta(e), mes—mesochaeta(e), mic—microchaeta(e), psp—pseudopore(s), Th—thoracic segment, ms—specialized microchaeta(e), sens—specialised ordinary chaeta(e), ai—antero-interna lamella, ae—antero-externa lamella, pi—postero-interna lamella, pe—postero-externa lamella.

Taxonomy

Family Entomobryidae Schäffer, 1896 *sensu* Hemming, 1957

Subfamily Seirinae Yosii, 1961 *sensu* Zhang & Deharveng, 2015

Genus *Tyrannoseira* Bellini & Zeppelini, 2011

Type species. *Seira raptora* Zeppelini & Bellini, 2006

Diagnosis of genus. Scales heavily ciliate, oval or elongated and apically rounded (rarely truncate, pointed or irregular), present on appendices, head, Th and Abd (Figs 1, 2A, 3A, 4A, 6F–G, 7). Tergal mac finely ciliate and apically foot-shaped, and smooth mic apically ramificate or not (Figs 1, 2B, D–J, 3A, 7). Eyes 8+8 per side (Figs 3A, 8C). Head dorsal macrochaetotaxy lacking **M2**, **M4i**, **S1**, **S4**, **S5**, **Ps2** and **Pa4** mac; 1 subantennal and 1 post-ocellar bothriotricha present (Figs 3A, E, 4A, 8C). Four labral papillae (Figs 4B, 8E). Basolateral and basomedian labial fields with chaetae **a1–5** smooth, **M1**–**2**, **E**, **L1**–**2** ciliate, **r**

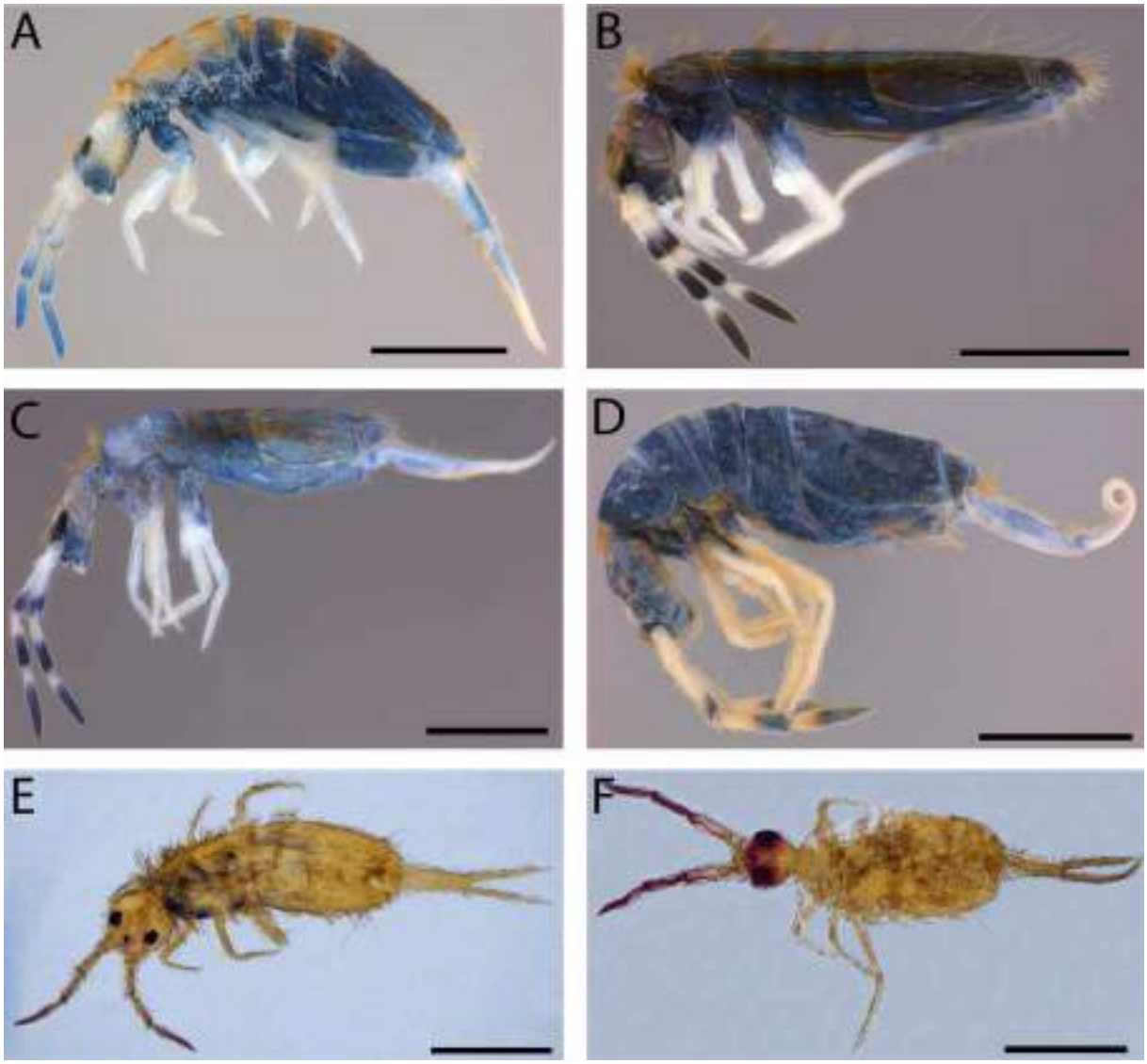

FIGURE 1A–F. *Tyrannoseira* spp., habitus in lateral view; **A**–**C**, specimens preserved in alcohol: **A**, *T. raptora* (male); **B**, *T. bicolorcornuta* (female) with typical color pattern; **C**, *T. bicolorcornuta* (female) with color pattern slightly depigmented; **D**, specimen dried in critical point of *T. bicolorcornuta* (female); **E**–**F**, specimens fixed in slides: **E**, *T. diabolica* (female); **F**, *T. sex* (male). Scale bars: 0.5mm.

reduced (Figs 4A and C, 9C). Th II with 3–4 medio-median mac (**m1**, **m1i**, **m2**, **m2i**) and 2–3 medio-lateral mac (**m4**, **m4i**, **m4p**); groups **PmA**–**PmC** with 4 –5, 2–3 and 3–5 mac, respectively (Figs 10A, 15A, 30A). Th III with at least 7 central mac (**a2**, **a4**–**5**, **p1**–**3**), **a6** mac or mic (Figs 10B, 15B, 20B). Abd I only with mic (Fig. 10C). Abd II with 3 central mac (**a2**, **m3**, **m3e**), **m3ep** absent (Fig. 10D). Abd III with 1 central (**m3**) and 3 lateral mac (**pm6**, **p6** and **p6e** exclusively) lateral to the bothriotricha, **am6** as mic (Fig. 10E). Abd IV with at least 8 central mac (**A3**, **A5**, **B3**–**6**, **C1**, **T1**), **A3a**, **B1** and **B2** as mac or mic (Figs 11A, 16A, 21A, 31A). Th II–Abd V with ms and sens formula 1, 0| 1, 0, 1, 0, 0 and 1, 1 | 0,

2, 2, +, 3, respectively (Figs 10–11). Abd II–IV bothriotrichal formula 2 (**a5**, **m2**), 3 (**a5**, **m2**, **m5**), 3 (**T2**, **T4**, **D3**) (Figs 10–11). Abdominal bothriotricha with accessory chaetae heavily ciliate (Figs 2E, 7). Legs I of males internally with 1 trochanteral spine finely ciliate, femur strongly enlarged and with one subdistal group of spines heavily ciliate, and tibiotarsus I armed with an inner row of proximal spines finely ciliate (Figs 5A–C, 12E–F). Collophore anteriorly with proximal smooth spine-like chaetae, posteriorly with distal spines (Figs 6B, 13A). Male genital plate circinate and with smooth chaetae (Figs 6C, 13B). Mucro falcate, without basal spine (Fig. 6E).

Morphological definition of Tyrannoseira

The following characters are shared by *Tyrannoseira* species and are not repeated in the descriptions:

Dorsal chaetae and structure

Bothriotricha (Figs 3A, E, 7A, 8C, 10D–E, 11A). Thin and densely ciliate by elongated cilia, short on head (1 subantennal and 1 post-ocellar) and elongated on Abd II–IV.

Bothriotrichal accessory chaeta (Figs 2I, 7A, 10D–E, 11A). Heavily ciliate on distal two thirds or more, with fringed aspect and present on Abd II–IV.

Mac (Figs 2B, 3A, 7A). Finely ciliate and apically foot-shaped mac presents on dorsal head and Th II to Abd V.

Mes (Figs 1A–C, 7A). Heavily ciliate and apically acuminate present on body, generally in Abd IV.

Mic (Figs 2D–J, 7A, 8C, 10–11). Smooth, apically acuminate and with similar sizes among different regions of the body, but with different shapes: simple, with 1 median ramification, with 4 unilateral ramifications, or with 7 or more bilateral ramifications; present on head and AMP series of Th II to Abd V.

Ordinary sens (Figs 2C, J–K, 7A, 10–11). Smooth and apically rounded with similar sizes present on Th II–III (**al**), Abd II–III (**as**, **acc.p6**), Abd IV (**as**, **ps**) and Abd IV (**as**, **acc.p4**, **acc.p5**) .

Psp (Figs 2L, 7A, 10–11). Small, circular, smooth concavity with a narrow opening in the edges present centrally on Th II to Abd IV plus coxae and manubrial plates.

Specialized microchaetae – **ms** (Figs 2C, H, 7A, 10–11). Small, smooth and distally striate with rounded apex present on Th II, Abd I and III.

Scales (Figs 2A, 3A, 4A, 5A–B, 6F–G, 7A). Heavily ciliate with short interrupted cilia, generally oval or elongated and apically rounded (rarely truncate, pointed or irregular). The cilia are toothpick-shaped and abruptly acuminate at apex. Scales present on Ant I–III, both sides of head, dorsal and lateral trunk, all legs (except pretarsus), anterior collophore and furcula ventrally to lateral margin.

Antennal chaetae

Antennal segments with at least 8 types of chaetae, as shown in Fig. 7B; **a**–**f** as sens, **g**–**h** as ciliate chaetae:

Type **a**. Pair of rods or clubs apical organ present laterally on Ant III.

Type **b**. Smooth, elongated and slightly apically acuminate present on Ant II–IV (Fig. 3D).

Type **c**. Smooth, somehow short and finger-shaped present densely on Ant I–IV (Figs 3C–D).

Type **d**. Smooth, short and finger-shaped present densely on Ant I–IV (Figs 3C–D).

Type **e**. Three guard sens smooth and spiny-like surrounding apical organ of Ant III (Fig. 3D).

Type **f**. Striated and rounded subapical modified sens of Ant III (Fig. 3D).

Type **g**. Weakly ciliate present on Ant I–IV (Fig. 3D).

Type **h**. Heavily ciliate present on Ant I–IV (Fig. 3D).

Head.

Antennae shorter than trunk length; Ant IV longer or subequal to Ant II–III, Ant I smaller (Fig. 1); Ant IV not annulated but wrinkly, with bilobed apical bulb distally (Figs 3B–C, 8A). Eyes oval and 8+8 per side and with 5 interocular chaetae (**q**, **s**, **p**, **r**, **t**) (Figs 3A, 8C). Series of dorsal macrochaetotaxy (Fig. 8C) with 6–9 ‘An’ (**An1a**–**3**), 4 ‘A’ (**A0**, **A2**–**3**, **A5**), 2 ‘M’ (**M1**, **M4**), 4 ‘S’ (**S0**, **S2**–**3**, **S6**), 4 ‘Pa’ (**Pa1**–**3**, **Pa5**), 2 ‘Pm’ (**Pm1**, **Pm3**), 4 ‘Pp’ (**Pp1**– **3**, **Pp5**) and at least 1 ‘Pe’ (**Pe3**); microchaetotaxy with 1 ‘An’ (**An2a**), 1–2 ‘A’ (**A1**, **A4**), 3 ‘M’ (**M2**–**4i**), 1‘S’ (**S5**), 2 ‘Ps’ (**Ps2**– **3**), 1 ‘Pa’ (**Pa4**), 2 ‘Pp’ (**Pp4**, **Pp6**) and 1–2 ‘Pe’ (**Pe5**–**6**); chaetae **S1** and **S4** absent. Four prelabral ciliate chaetae of subequal size; labral formula with 4 (**a1–2**), 5 (**m0–2**), 5 (**p0–2**) smooth chaetae, **a1** apically rounded, **p0–1** larger, others subequal (Figs 4A, 8D). Inner labral papillae with 1 main filament bifurcate distally each, outer papillae with 1 main filament acuminate or reduced each (Figs 4A–B, 8E, 14D). Labial palp with five main papillae (A–E) plus one hypostomal papilla (H) with

0, 5, 0, 4, 4, 2 guard appendages, respectively, lateral process (**l.p.**) apically acuminate and surpassing the base of apical appendage (Figs 4D, 9B). Labium with five smooth proximal chaetae (**p.c.**) (Figs 4D, 9B). Basolateral and basomedian labial fields with chaetae **a1–5** smooth, **M1**–**2**, **E**, **L1**–**2** ciliate, **r** spine-like reduced and smooth (Figs 4A and C, 9C). Maxillary palp with apical appendage (**a.a.**) and basal chaeta (**b.c.**) gently ciliate and subequal in size; sublobal plate internally with 3 smooth main appendages, externally with 1 minute smooth appendage (Figs 4A, 9A).

Thorax chaetotaxy (Figs 10A–B, 15 A–B, 20 A–B, 25 A–B, 30 A–B). Th II with 21–28 main mac (**a4i**, **a4+**, **a5ip**–**5p, m1**–**1i**, **m2**–**2i**, **m4i**–**4p**, **p1ip2**–**1p**, **p2a**–**2p**, **p2ea2**–**2ep**) and 10 main mic (**a2p**, **a5ip**, **m1i2**, **m4ip**, **m5a**–**5p**, **p4**, **p6**–**6e**), **m1i** present or absent, **m4p** rarely as mic, **p1ip2** rarely as mac, **p1i2**, **p1ip**, **p2p**, **p2ea** and **p2ea2** (present or absent) as mac or mic. Th III with 8–11 mac (**a2**, **a4**–**6**, **m6**–**6p**, **m7**, **p1**, **p2**–**2a**, **p3**) and 8–10 mic (**a1a**–**1**, **a3**, **a6**–**7**, **m4**–**5**, **p1i**, **p4**–**6**), **a6** as mac or mi, **a3** rarely as mac and **p1i** present or absent.

Abdomen chaetotaxy (Figs 10C–E, 11A–B, 15C–E, 16A–B, 20C–E, 21A–B, 25C–E, 26A–B, 30C–E, 31A–B). Abd I with 12 mic (**a1**–**3**, **a5**–**6**, **m2**–**6**, **p5**–**6**). Abd II with 4 mac (**a2**, **m3**, **m3e**, **m5**), 1 mes (**p6**), 8–10 mic (**a2p**, **a3**, **a6**–**7**, **m3ea**, **m6**–**7**, **p5**, **p7**, **el**), and bothriotricha **a5** and **m2** with 5–7 and 3–4 accessory chaetae respectively, **a2p** rarely present, **p7** and **el** rarely as mes. Abd III with 5 mac (**m3**, **pm6**, **p6**, **p6e**, **p7**), 6–10 mic (**a3**, **a7**, **a8**, **m7**, **m8**, **p3**, **am6**, **p5**, **p7i**), bothriotrichum **m2** with 4 accessory chaetae and bothriotricha **a5** and **m5** with 10–11 accessory chaetae between them, **a8** and **m8** present or absent, **p7i** mes or mic rarely absent, **p8** rarely present, **p3** as accessory chaeta or mic, present or absent. Abd IV with 21–29 mac (**A3a**–**3**, **A5**, **B1**–**6**, **C1**, **T1**, **T7**, **D3p**, **E2**–**4p**, **Ee10**, **F1**–**3p**, **Fe2**–**6**), about 15 mic (**A1**–**2**, **A4**, **A6**, **Ae7**, **C1p**–**4**, **T3**, **T5**–**6**, **D2a**–**2**, **E1**), bothriotricha **T2** and **T4** with 4–5 (**s**, **m**, **T1p**, **D1**–**1p**) and 3 (**T4a**, **Pi**, **Pe**) accessory chaetae, respectively; **A3a**, **B1**, **B2**, **T6**, **Ee10** and **F1p** as mac or mic, **D3p** and **F3p** as mes or mic, **C1p** rarely present, **m** present or absent; posteriorly with 4–5 mes. Abd V with 9–14 mac (**a5**, **m2**, **m3**, **m5**, **m5e**, **p1**, **p3**–**6e**, **p3pi**, **p5a**, **p6ai**) and 10–16 mes or mic (**a1**, **a3**, **a6**, **m5a**, **m5ea**, **p3a**–**6ae**, **p1p**–**5pe**, **pp6**); **a5** as mac, mes or mic, **p5a**, **p6ai** and **p3pe** as mac or mes, **p4a**, **p5ae**, **p5pi**, **p5pe**, **p6e** and **pp6** present or absent.

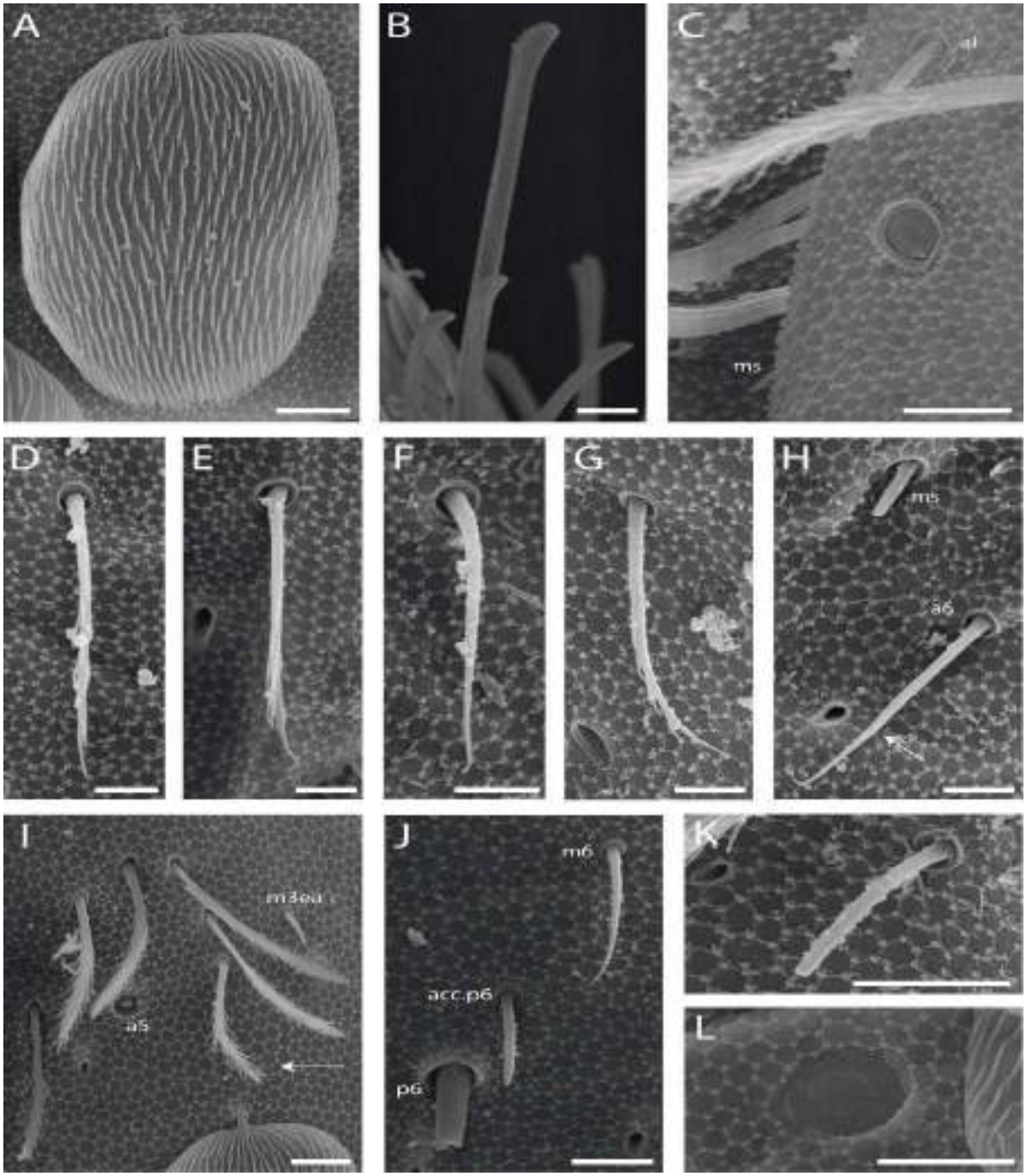

FIGURE 2A–L. *Tyrannoseira bicolorcornuta*: tergal chaetotaxy elements (left side); **A**, scales heavily ciliate with misaligned short interrupted cilia; **B**, tergal mac finely ciliated and apically foot-shaped; **C**, Th II laterally, **al** is anterolateral sens and **ms** specialized microchaeta; **D**–**G**, different types of tergal mic: **D**, mic (**p6**) with at least 9 ramifications of Th II; **E**, mic (**p6e**) with at least 7 ramifications of Th II; **F**, mic (**a6**) smooth of Th III; **G**, mic (**A4**) with 4 unilateral ramifications of Abd IV; **H**, Abd I laterally, **a6** mic with 1 median ramification (in arrow) and **ms** specialized microchaeta; **I–J**, Abd II laterally: **I**, bothriotrichal complex, **a5** bothriotrichum and **m3ea** small smooth mic, arrow indicates accessory chaeta heavily ciliate; **J**, lateral chaetotaxy, **m6** smooth mic, **p6** mes and **acc.p6** accessory sens of **p6** chaeta; **K**, anterosubmedial sens (**as**) of Abd V; **L**, psp of Abd III. Scale bars: **A**, **C**, **I**–**L** (0.004 mm), **D**–**H** (0.002 mm), **B** (0.01 mm).

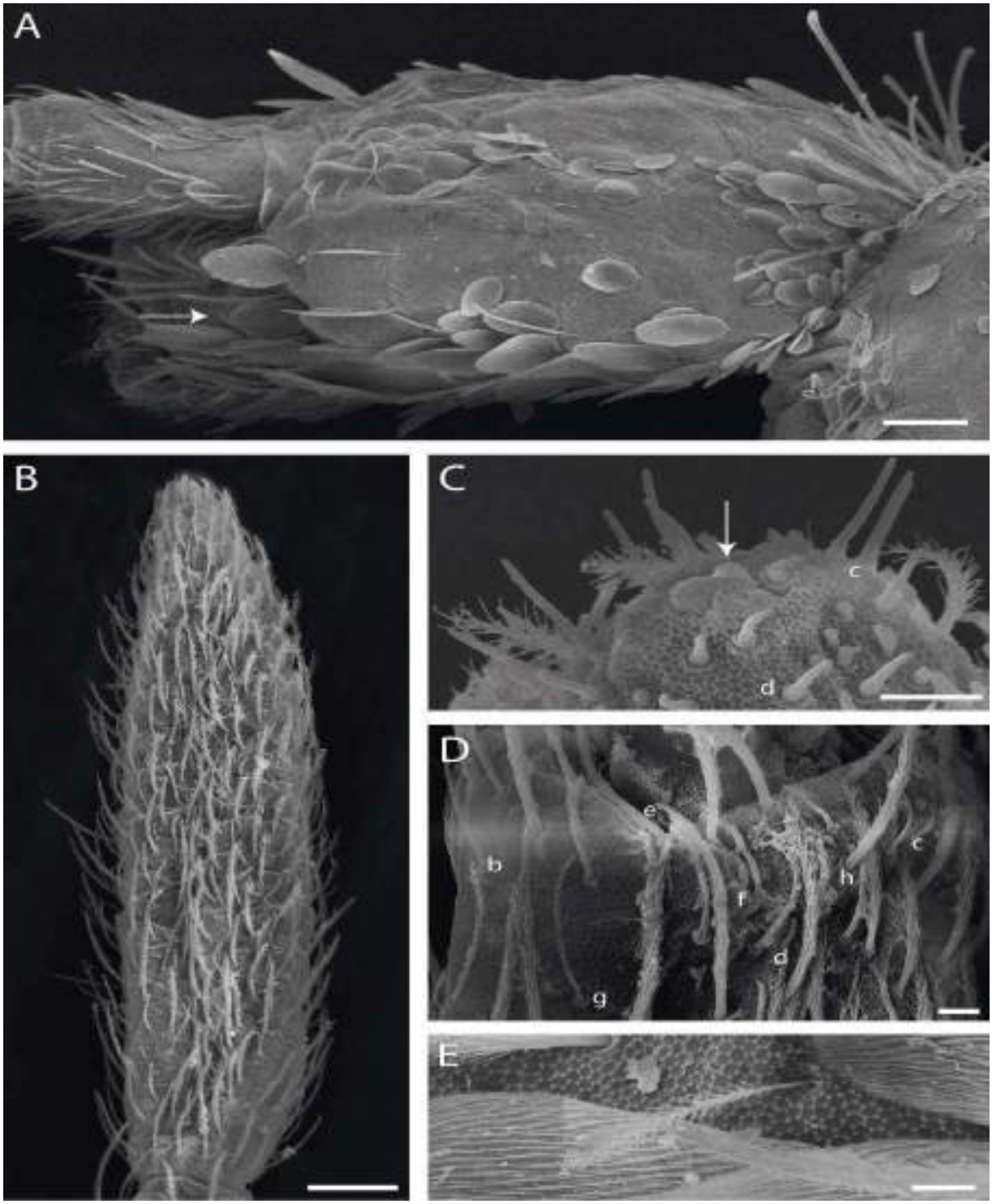

FIGURE 3A–E. *Tyrannoseira bicolorcornuta*: head and antennae; **A**, lateral head, arrow indicates subantennal bothriotrichum; **B**, Ant IV segment (inner side); **C**, apex of Ant IV, arrow indicate apical bulb, **c** and **d** are sens types (see Fig. 7B); **D**, Ant III apex (lateral side), apical organ (**a** sens) omitted, **b**–**f** are sens types, **g** and **h** chaetae weakly and heavily ciliate, respectively (see Fig. 7B); **E**, subantennal bothriotrichum (left side); Scale bars: **A** (0.04 mm), **B** (0.02 mm), **C**–**E** (0.004 mm).

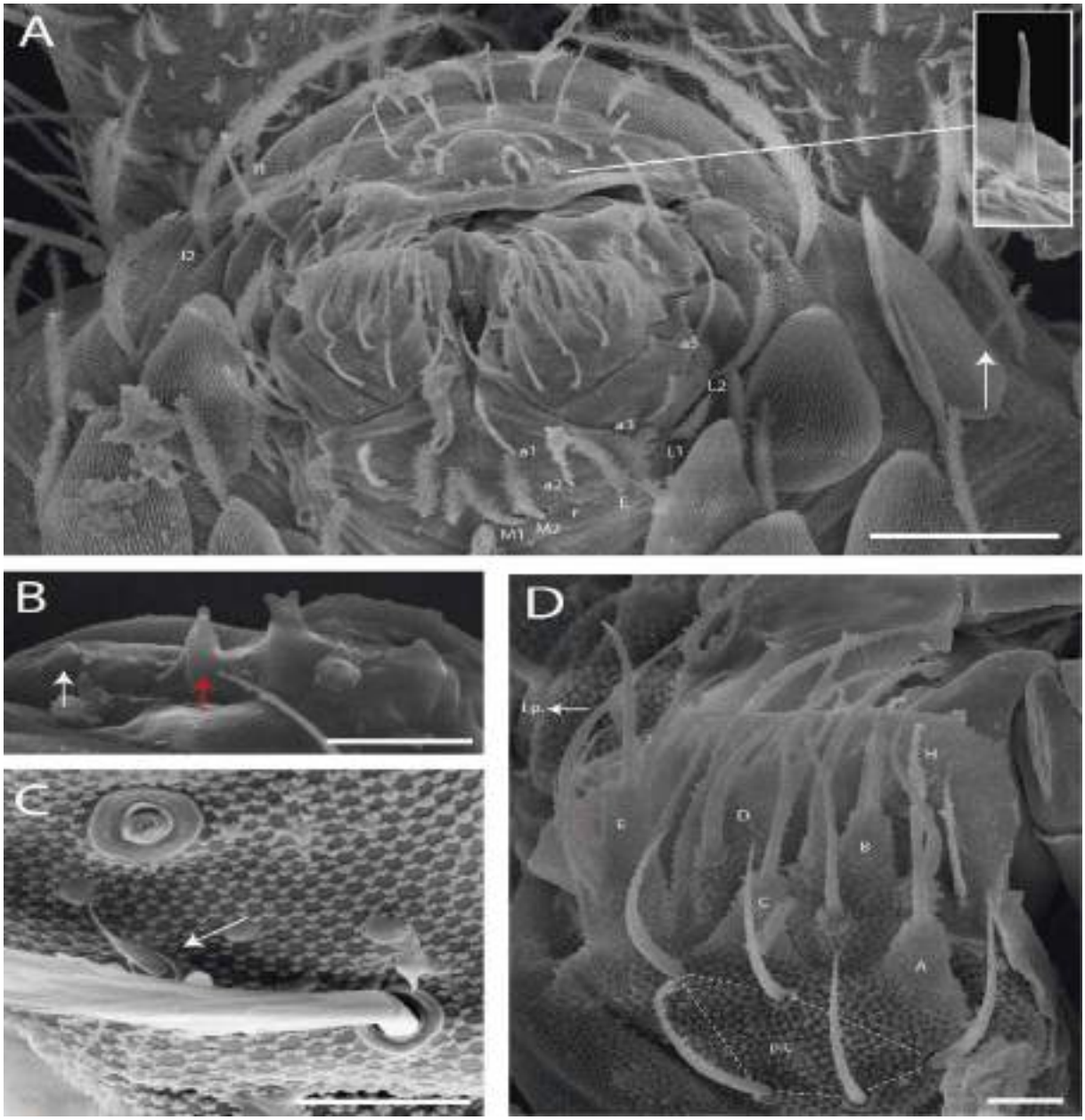

FIGURE 4A–D. *Tyrannoseira bicolorcornuta*: ventral and frontal head; **A**, mouthparts (anterior view), **l1** and **l2** clypeal chaetae larger and apically acuminate, **a1**–**3** and **a5** smooth chaetae (**a4** fallen), **M1**–**2**, **E**, **L1**–**2** ciliate chaetae and **r** spine-like smooth chaeta reduced of basomedian and basolateral labial fields, augmented image is **a1** chaeta of labrum, arrow indicate subantennal bothriotrichum; **B**, labral papillae (dorsal view), white arrow indicates outer papilla reduced and red arrow indicates inner papilla apically bifurcate; **C**, basomedian labial field laterally (left side), arrow indicates **r** spine-like smooth chaeta reduced; **D**, labial papillae (left side), A–E main papillae and H main hypostomal chaeta, arrow indicates lateral process (**l.p.**) of papilla E, dashed line indicates proximal chaetae (**p.c.**). Scale bars: **A** (0.03 mm), **B**–**D** (0.004 mm).

Legs

Subcoxa I with one row of ciliate chaetae and 2 psp; subcoxa II with two rows (anterior and posterior) of ciliate chaetae and 3 psp; subcoxa III with one row of ciliate chaetae and 2 (rarely 3) psp (Figs 12A–C). Leg I in males with 1 subdistal inner spine finely ciliate and apically pointed on coxa (Fig. 12A). Trochanter with 1 inner baster-shaped spine finely ciliate (Fig. 5A). Femur strongly enlarged on outer and inner sides and with one subdistal group of inner spines heavily ciliate, thinner or thicker and apically pointed (Figs 5A–B). Tibiotarsus armed by a single inner row of spines finely ciliate and apically rounded (proximal shorter, median larger and apically curved), followed by distal spine-like mac heavily ciliate and apically acuminate (Figs 5A, C, 12E); outer side distally with 1 tenent hair finely ciliate and apically capitate, inner side of tibiotarsus III with one smooth chaetae weakly ramificate on distal two thirds (Figs 5D–E). Pretarsus with one minute anterior and one posterior smooth chaetae (Fig. 12G). Unguis inner side with 2 paired basal teeth, 1 unpaired median tooth, and 1 unpaired apical tooth; outer side with 2 paired lateral teeth and one unpaired basomedian lamella apically pointed (Figs 5D–F). Unguiculus with 4 acuminate lamellae, pe lamella serrated on distal half and with a small median tooth, other lamellae smooth (ai, ae, pi) (Figs 5E, G, 15G).

Collophore (Figs 6A–B, 13A, 28A). Anterior side with 9–10 chaetae, proximal region with 1 psp, 3–4 reduced spine-like smooth chaetae and at least 4 larger ciliate apically acuminate chaetae, plus distally 1–2 ciliate mac of equal or different lengths; posterior side with 2–5 distal chaetae, 1–3 smooth spines, 1 ciliate chaeta present or absent plus 1 smooth chaeta; lateral flap with distal smooth chaetae and proximal ciliate chaetae.

Tenaculum. Each ramus with 4 teeth; corpus with one weakly ciliate chaeta.

Genital plate. Circinate in males, with 15 circumgenital smooth chaetae (1 superior unpaired) and 3+3 small eugenital smooth chaetae (Figs 6C, 13B). Female with two pairs (superior and inferior) of small smooth chaetae, without other modifications.

Furcula (Figs 1, 6D). Subequal to length of abdomen. Manubrium smaller than dentes and with ciliate chaetae; ventral side with ciliate chaetae formula specific to each species (Figs 13C, 18B, 23B, 28B, 33B); dorsal side densely covered with ciliate chaetae of different sizes, manubrial plate distally with up to 5 ciliate chaetae and 3 psp. Dentes crenulate dorsally with numerous ciliate chaetae, lacking other modifications such as spines or tubercles (Fig. 6E). Mucro dorsally falcate without basal spine (Fig. 6E).

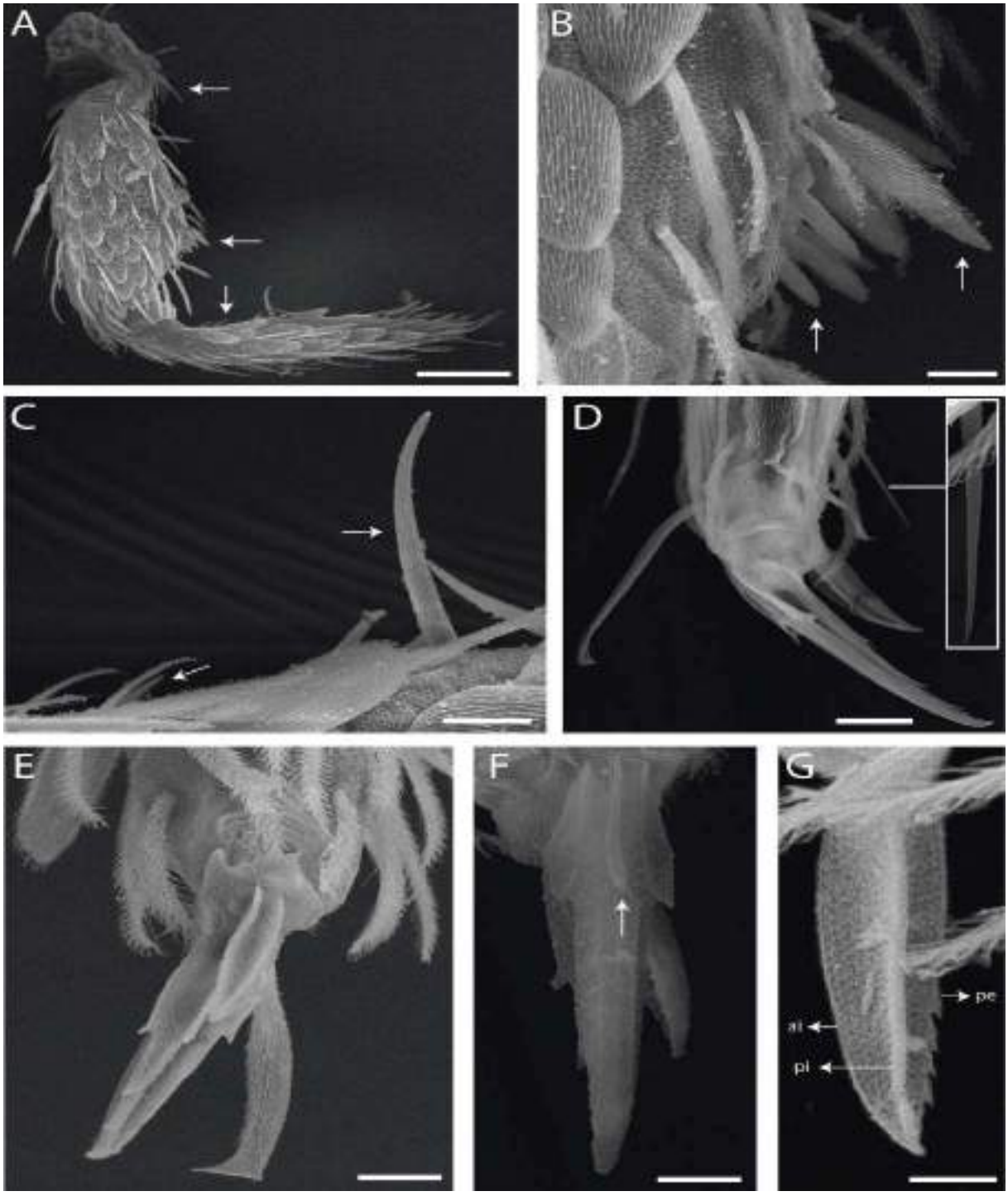

FIGURE 5A–G. *Tyrannoseira bicolorcornuta*, legs: **A**–**C**, left leg I of male (posterior side), **A**, general aspect (except coxa), arrows indicate inner spines in trochanter, femur and tibiotarsus, respectively; **B**, subdistal group of inner spines of femur I, arrows indicate spines heavily ciliate and apically pointed; **C**, inner proximal spines finely ciliate of tibiotarsus I, arrows indicate short and long spines; **D**–**F**, distal tibiotarsus and empodial of empodial complex III: **D**, posterior side, **E**, inner side, **F**, outer side, arrow indicate unpaired basomedian lamella apically pointed; **G**, unguiculus (outer side). Scale bars: **A** (0.06 mm), **C**–**D** (0.01 mm), **B**, **E**–**F** (0.006 mm), **G** (0.003 mm).

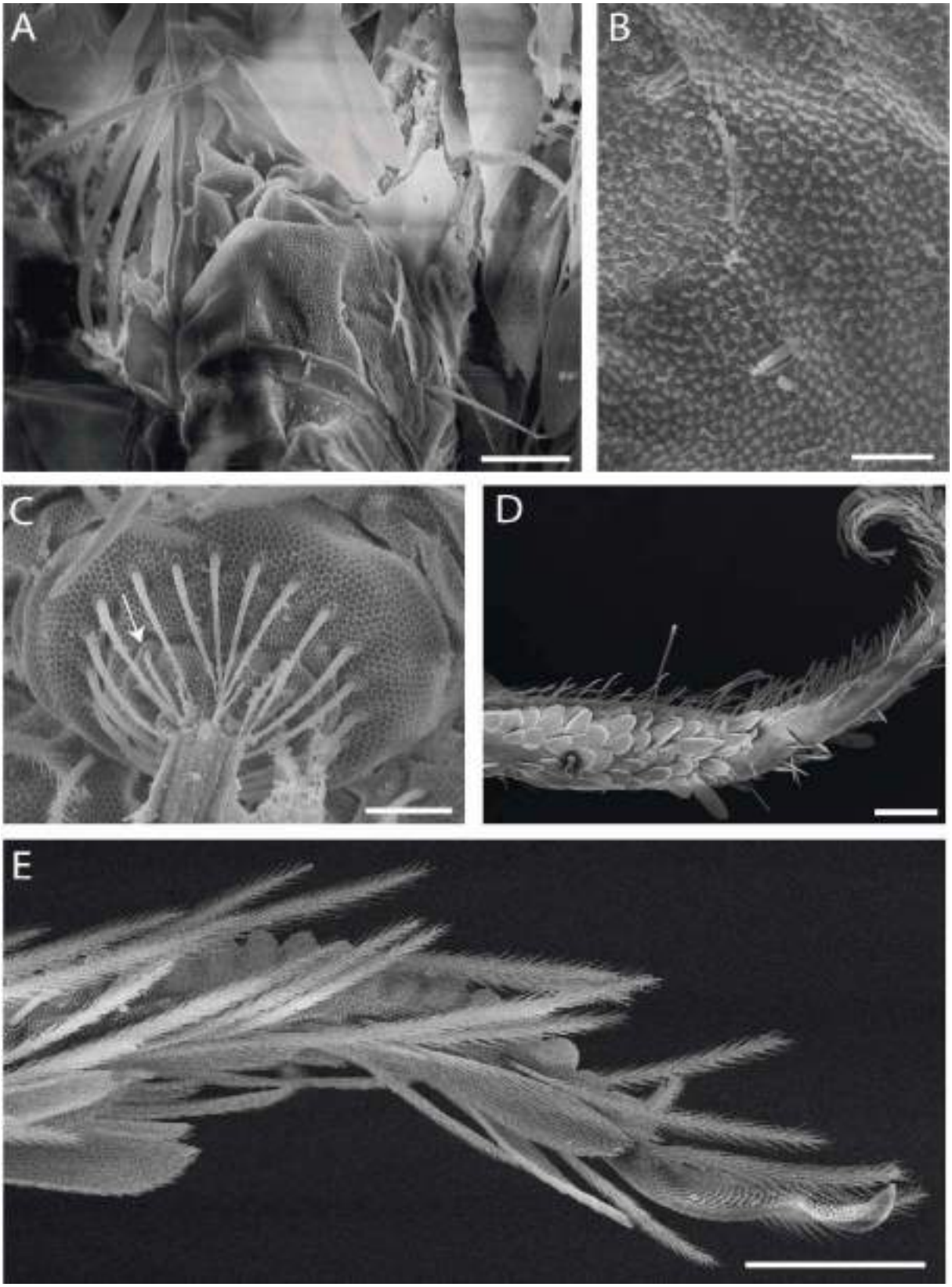

FIGURE 6A–E. *Tyrannoseira bicolorcornuta*; **A**, distal chaetotaxy of anterior collophore and lateral flap; **B**, subapical spines of posterior collophore (left side); **C**, male genital plate; **D**, furcula (lateral view); **E**, distal dens and mucro (lateral view). Scale bars: **A**, **E** (0.02 mm), **B** (0.004 mm), **C** (0.008 mm), **D** (0.06 mm).

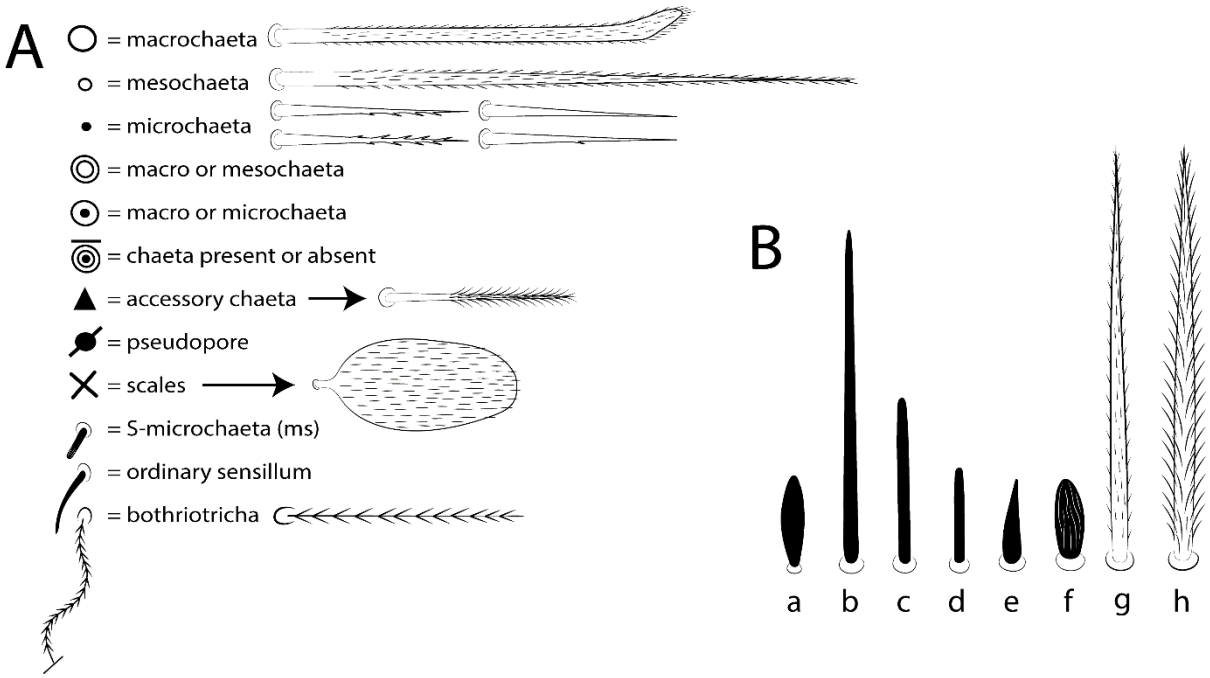

FIGURE 7A–B. Symbols used in chaetotaxy descriptions of *Tyrannoseira* species; **A**, dorsal chaetotaxy; **B**, Ant III–IV segments.

***Tyrannoseira raptora* (Zeppelini & Bellini, 2006)**

Figs 1A, 8–13, 34

Seira raptora Zeppelini & Bellini 2006: 22, figs. 1-8a, 9, Brazil, Paraíba State, Cacimba de Dentro (orig. descr.). Bellini & Zeppelini 2008a: 726 (cit.). Bellini & Zeppelini 2008b: 53 (cit.). Bellini, Pais & Zeppelini 2009: 38, fig. 1A-B, 4 (compared). Palacios-Vargas & Castaño-Meneses 2009: 961 (cit.). Abrantes *et al.* 2010: 10 (cat.). Barra 2010: 586, 592 (compared).

Tyrannoseira raptora; Bellini & Zeppelini 2011: 547, fig. 2a, 3, type species. Bellini & Godeiro 2012: 84 (compared). Abrantes et al. 2012: 12 (cat.). Zeppelini & Lima 2012: 37, 42-43, compared

Examined type material. Holotype male subadult, paratypes 4 males and 2 females (MZUSP/0056).

Other examined material. 1 male and 1 female on slides (CC/UFRN): Brazil, Paraíba state, Cacimba de Dentro, "Cachoeira da Capivara" farm, 06°40'S, 35°45'W, 314 m, 15.iv-17.v.2008, entomological aspirator, BC Bellini coll.

Diagnosis. Body dark blue with irregular spots of blue pigment on proximal appendages (Fig. 1A); Ant III without sens type–**f** (Fig. 8B); head dorsal chaetotaxy with **An3i** and **An3i2** mic, **A4** absent and with 3 posterior mac (**Pe3** and 2 uncertain) (Fig. 8C); clypeus with **l2** and **f2** chaetae normal (Fig. 8D); outer labral papilla subequal to inner papillae (Fig. 8E); ventral head with 2 chaetae after anterior postlabial formula (Fig. 9C); Th II with 4–5 anterior mac (**a5**, **a5p**, **a5i**, **a5i2**, **a5+**), **m1i**, **p1ip** and **p2ea2** mac absent, **p1i2** mac present (Fig. 10A); Th III with 3 lateral mac (**a6**, **m6**–**7**) (Fig. 10B); Abd IV with 4 anterocentral mac (**A3**, **B3**, **C1**, **T1**) and 5 mac (**Fe2**–**6**) in **Fe** series (Fig. 11A); trochanteral organ with 27–31 spine-like chaetae (Fig. 12D); leg I of males with 10–15 thicker femural spines and 6–8 tibiotarsal spines finely ciliate (Figs 12E–F); collophore anteriorly with 4 mac apically acuminate and 2 distal mac, posteriorly with 3 spines and 1 distal smooth chaeta (Fig. 13A); manubrium ventral formula with 1, 0, 0, 2/ 4 and 12 ciliate chaetae, manubrial plate with 2 psp (Figs 13C–D).

Redescription. Total length (head + trunk) of the holotype 1.94 mm. Specimens dark blue, pale in Ant I to one-third proximal Ant III, head medially, femur to tibiotarsus, distal collophore and distal half of dentes; eyepatches black (Fig 1A). Scales present on Ant I to basal half of Ant III, dorsal and ventral head, Th and Abd dorsally, legs (except empodia), anterior collophore, and manubrium and dentes ventrally.

Head. Antennal ratio as I: II: III: IV = 1: 1.65: 1.43: 2.43. Ant III apical organ with 2 sens type **a**, 3 guard sens (type **d**), sens of different sizes (type **b**–**d**) and chaetae types **g**–**h**; sens type–**f** absent (Fig. 8B). Eyes A and B largest, G and H discretely smaller, others subequal (Fig. 8C). Head dorsal chaetotaxy with 13–15 'An', 5 'A', 5 'M', 5 'S', 3 'Ps', 6 'Pa', 2 'Pm', 6 'Pp', 2 'Pe' chaetae plus 2 mac of uncertain homology (Fig. 8C). Clypeal formula with 4 (**l1**–**2**), 4 (**f**), 3 (**pf0**–**1**) ciliate chaetae, **l1**–**2** larger, **l1** apically acuminate, others subequal (Fig. 8D). Labral papillae apically pointed, outer papillae subequal to inner papillae (Fig. 8E). Ventral chaetotaxy with 12–13 ciliate chaetae, anterior postlabial formula with 4 (**G1**–**4**), 2 (**H2**–**3**), 3 (**J1**–**3**) plus two chaetae near 'J' series, basal chaetae (**b.c.**) larger plus one normal chaeta present or absent (Fig. 9C).

Thorax chaetotaxy (Figs 10A–B). Th II, series ‘a’, ‘m’ and ‘p’ with 6–7, 11 and 17 chaetae respectively (**m1i** absent). Th III, series ‘a’, ‘m’ and ‘p’ with 8, 6 and 7 chaetae respectively. Th ratio as II: III = 1.47: 1.

Abdomen chaetotaxy (Figs 10C–E, 11A–B). Abd I, series ‘a’, ‘m’ and ‘p’ with 5, 5 and 2 mic respectively. Abd II, series ‘a’, ‘m’ and ‘p’ with 5, 7 and 3 chaetae respectively, chaeta **el** present, bothriotricha **a5** and **m2** with 5 and 4 accessory chaetae respectively. Abd III, series ‘a’, ‘m’ and ‘p’ with 5, 7 and 6 chaetae respectively, 5 accessory chaetae on bothriotrichum **m2**, and 11 between bothriotricha **a5** and **m5**. Abd IV with 8 medial mac of series ‘A’ to ‘T’ (**A3**, **A5**, **B3**–**6**, **C1**, **T1**), and 15 lateral mac of series ‘E’ to ‘Fe’ (**E2**–**4p**, **Ee10**, **F1**–**3**, **Fe2**–**6**); postero-median side with 7 sens and 5 posterior mes. Abd V, series ‘a’, ‘m’, ‘pa’, ‘p’ and ‘pp’ with 4, 6, 4, 5 and 4 chaetae respectively. Abd ratio as III: IV = 1: 4.39.

Legs. Subcoxa I with 3–4 ciliate chaetae and 2 psp; subcoxa II with an anterior row of 9 chaetae, posterior row with 3 chaetae and 3 psp; subcoxa III with one row of 9 chaetae, 1 anterior chaeta, and 2 posterior psp (Figs 12A–C). Trochanteral organ with 27–31 spine-like chaetae, holotype with 27 (Fig. 12D). Femur I of males with 10–15 (holotype with 15) thicker spines and 1 spine-like mac (Figs 12E–F). Tibiotarsus I with one row of 10–12 inner chaetae, 6–8 proximal spines finely ciliate (3–5 short and 3 larger) and 4 distal spine-like mac heavily ciliate and apically acuminate (Fig. 12E). Unguis with median tooth discretely larger than basal teeth, apical tooth smaller; ratio unguis: unguiculus = 1: 0.47. Tibiotarsus III with “smooth” chaeta 1.26 larger than unguiculus; tenent hairs 0.82 smaller than ungues outer side (Fig. 12G).

Collophore (Fig. 13A). Anterior side with 9 chaetae, 2 distal mac with same sizes, 4 larger and apically acuminate and 3 proximal spine-like chaetae; posterior side with 4 chaetae, 3 spines and 1 distal smooth chaeta; lateral flap with 6 smooth and 8 ciliate chaetae.

Furcula (Figs 13C–D). Ventral manubrium with formula 1, 0, 0, 2/ 4 (subapical) and 12 (apical) ciliate chaetae, subapical chaetae with same sizes, apical inner chaeta normal; manubrial plate (dorsally) with 4–5 ciliate chaetae and 2 psp.

Remarks. *Tyrannoseira raptora* resembles other congeners by Ant IV with apical bulb bilobed distally, general morphology of the prelabrum, labrum, basolateral and basomedian labial fields, empodial complex and overall dorsal chaetotaxy pattern,

especially of Abd I–III. However, *T. raptora* differs from other species by body color all blue (reduced in *T. diabolica* and *T. sex*) present also on distal Ant II to IV, while *T. bicolorcornuta* and *T. gladiata* present a distinct pattern on the distal half of segments (Fig. 1). The head dorsal chaetotaxy, *T. raptora* differs by **An3i** and **An3i2** mic (both absent in *T. gladiata* and *T. sex*, **An3i2** absent in *T. bicolorcornuta* and *T. diabolica*), and 3 extra posterior mac (1 in *T. diabolica*, 2 in other species). Still in head, other differences of *T. raptora* are: Ant III without subapical modified sens (type–**f** present in *T. bicolorcornuta* and *T. gladiata*), clypeus with **l1** apically acuminate and **l2** normal (both acuminate in *T. bicolorcornuta* and l1 normal in *T. sex*), outer labral papillae subequal to inner papillae (smaller in *T. gladiata* and *T. sex*, reduced in *T. bicolorcornuta*), and head ventrally with 2 chaetae after postlabial formula (1 in *T. bicolorcornuta*, 3 in *T. diabolica* and *T. gladiata*).

The trunk dorsal chaetotaxy, *T. raptora* differs in Th II without **a4+**, **a4i**, **m1i**, **p1ip** mac (most present in other species), Th III with **a6** mac (as mic in *T. bicolorcornuta*, *T. gladiata* and *T. sex*), and Abd IV without **A3a**, **B1**, **B2** and **T7** mac (most present in other species). Other differences still in chaetotaxy of *T. raptora* are: trochanteral organ with 27–31 spine-like chaetae (less in other species), collophore with 3 anterior and 3 posterior spine-like chaetae (4 anterior and 1 posterior in *T. diabolica*, 2 posterior in *T. sex*), and manubrium ventrally with 2/4 subapical chaetae (2/2 in *T. bicolorcornuta*, 0/2 in *T. diabolica*). General differences among the species are presented in Table 1.

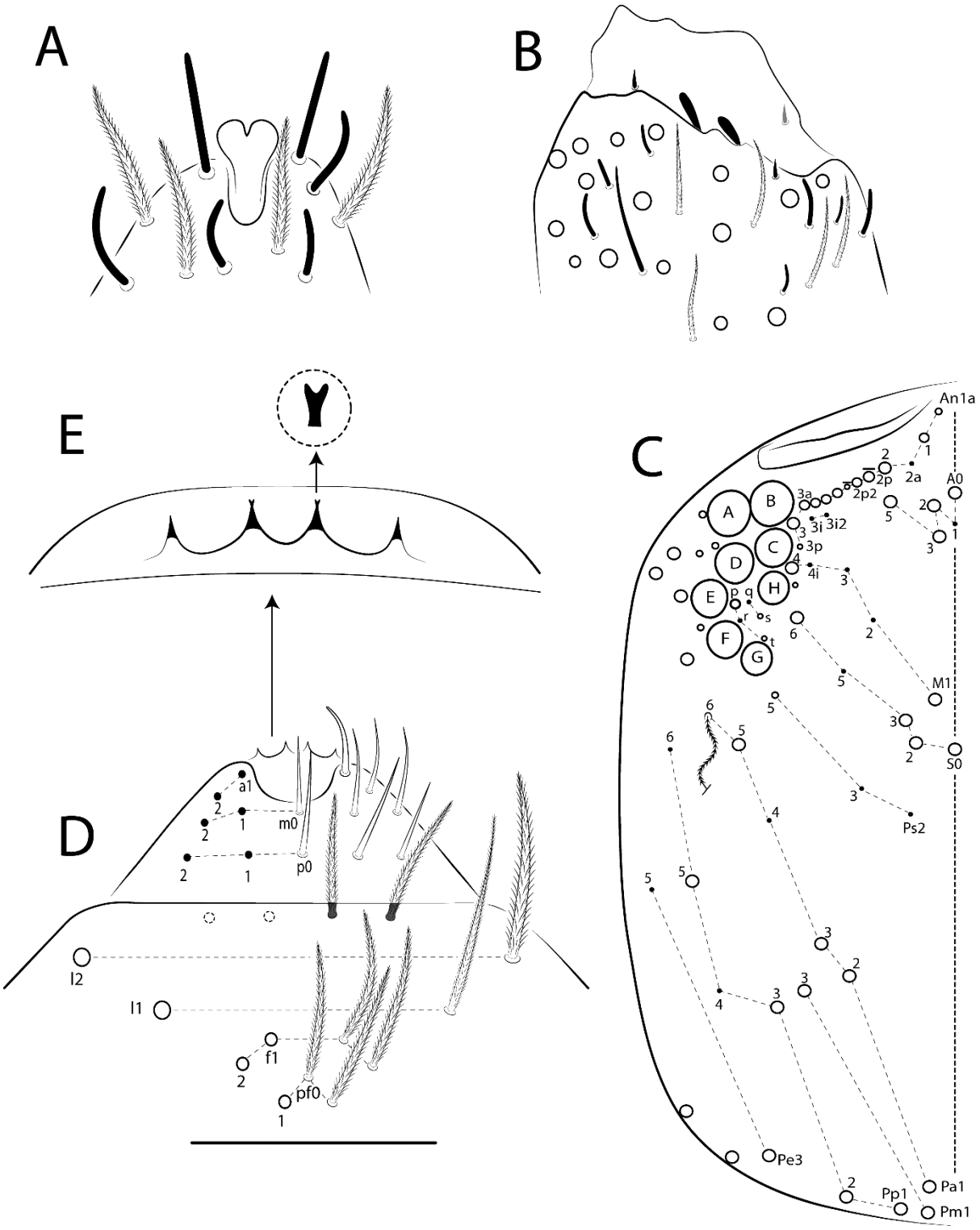

FIGURE 8A–F. *Tyrannoseira raptora*: head; **A**, apex of Ant IV; **B**, Ant III apical organ (lateral side); **C**, cephalic dorsal chaetotaxy (left side); **D**, chaetotaxy of the clypeus, prelabrum and labrum; **E**, labral papillae.

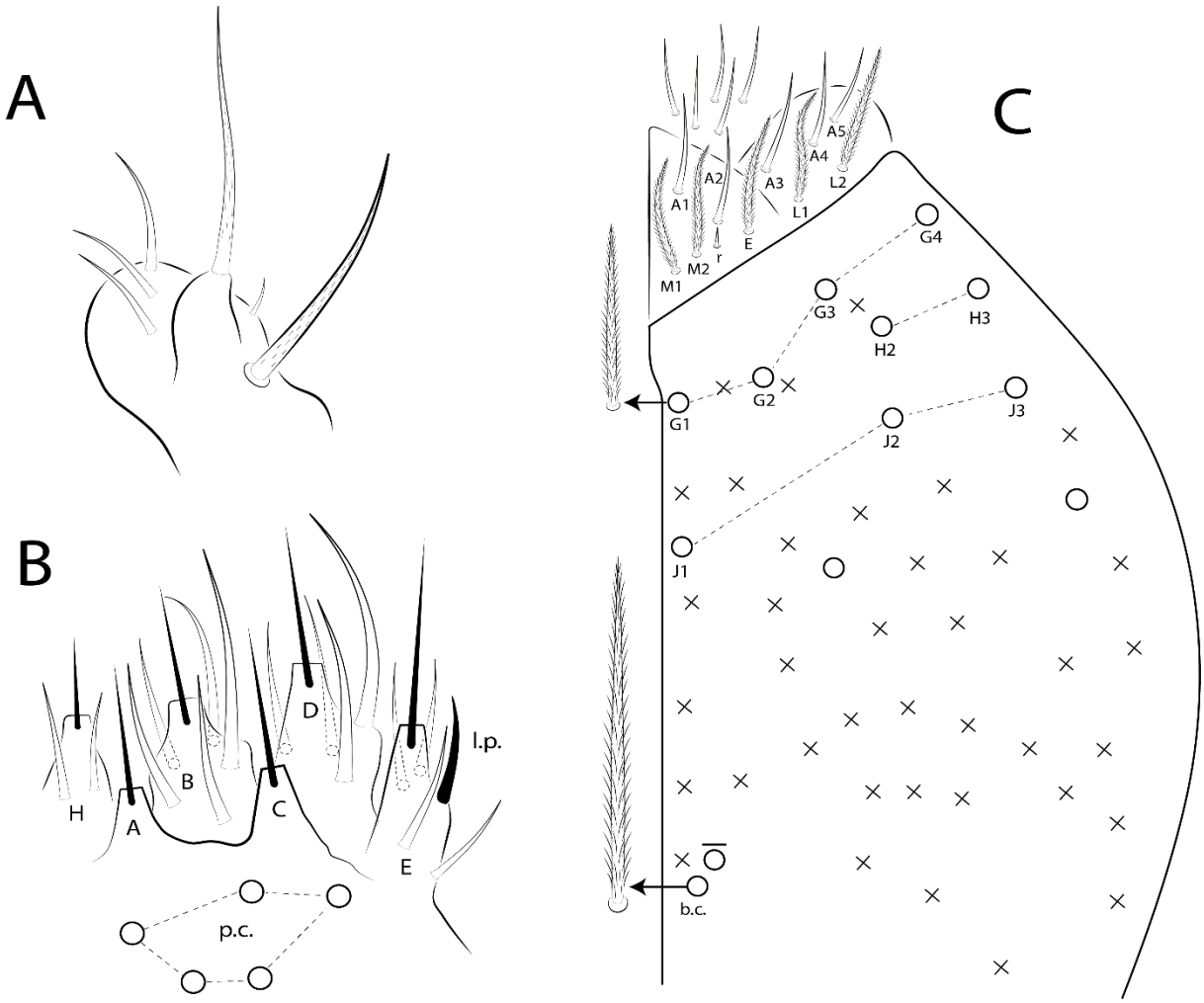

FIGURE 9A–C. *Tyrannoseira raptora*: ventral head (right side); **A**, maxillary palp and outer lobe; **B**, labial palp and proximal chaetae (p.c.), "**l.p.**" is lateral process of papilla E; **C**, chaetotaxy of the basomedian and basolateral fields, postlabial and cephalic groove (right side).

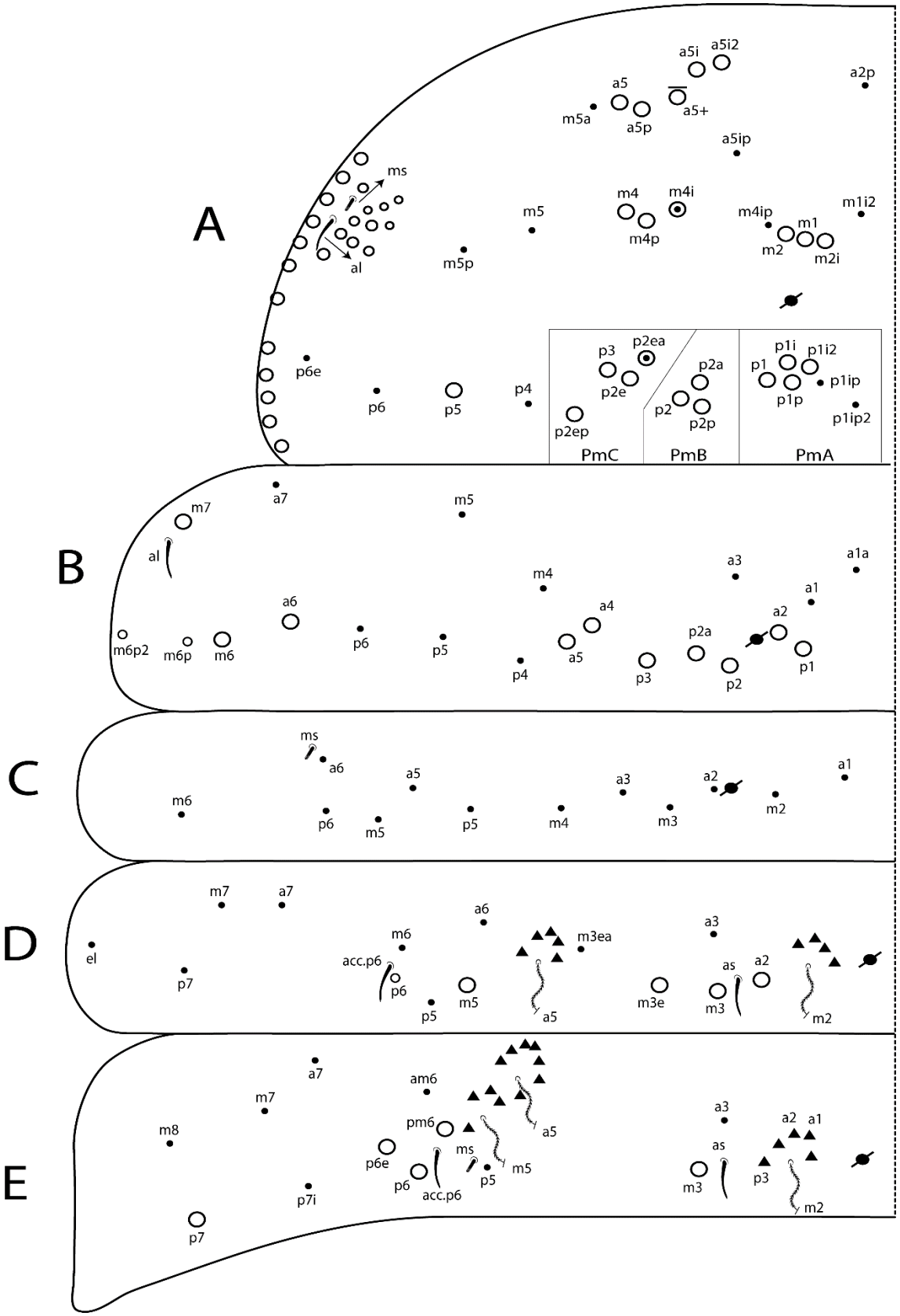

FIGURE 10A–E. *Tyrannoseira raptora*: dorsal chaetotaxy; **A**, Th II; **B**, Th III; **C**, Abd I; **D**, Abd II; **E**, Abd III.

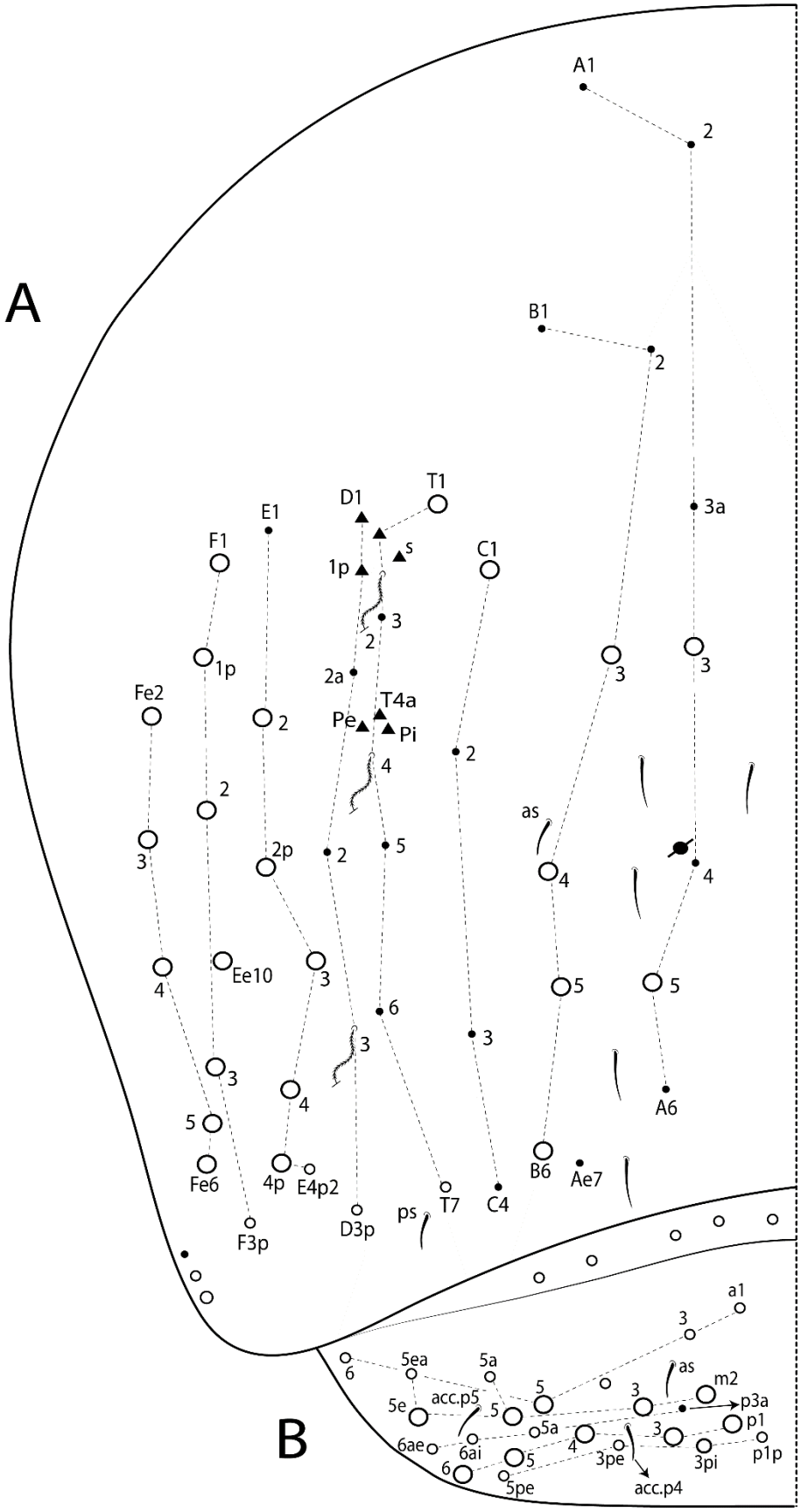

FIGURE 11A–B. *Tyrannoseira raptora*: dorsal chaetotaxy; **A**, Abd IV; **B**, Abd V.

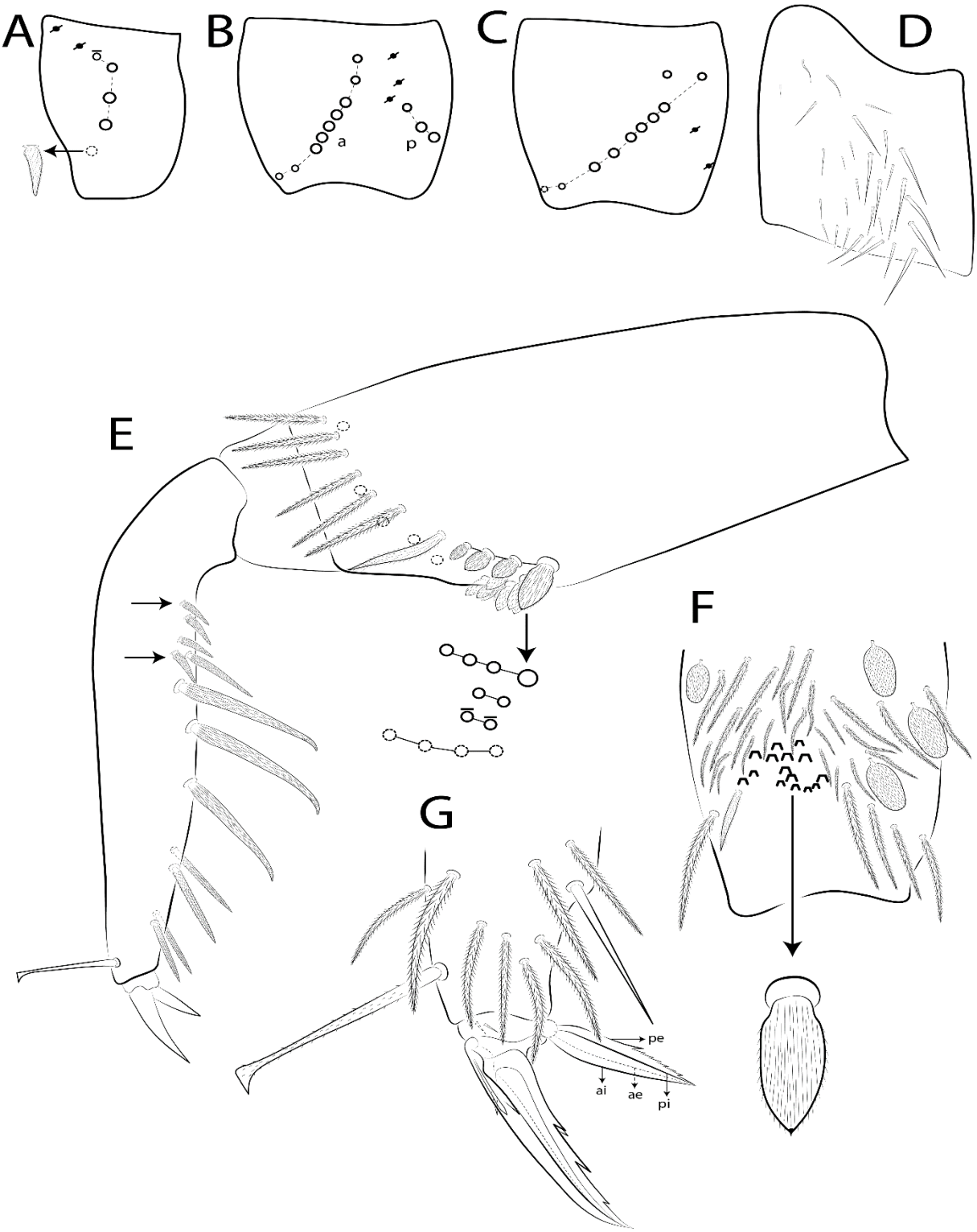

FIGURE 12A–G. *Tyrannoseira raptora*: legs chaetotaxy; **A**, subcoxa I; **B**, subcoxa II; **C**, subcoxa III (outer side); **D**, trochanteral organ (inner side); **E**, femur and tibiotarsus I (anterior side), arrow in femur indicates distribution of spines in inner view, arrows in tibiotarsus indicate spines present or absent; **F**, distribution of femoral spines in holotype (inner view), arrow indicates thicker spines; **G**, distal tibiotarsus and empodial complex III (posterior view).

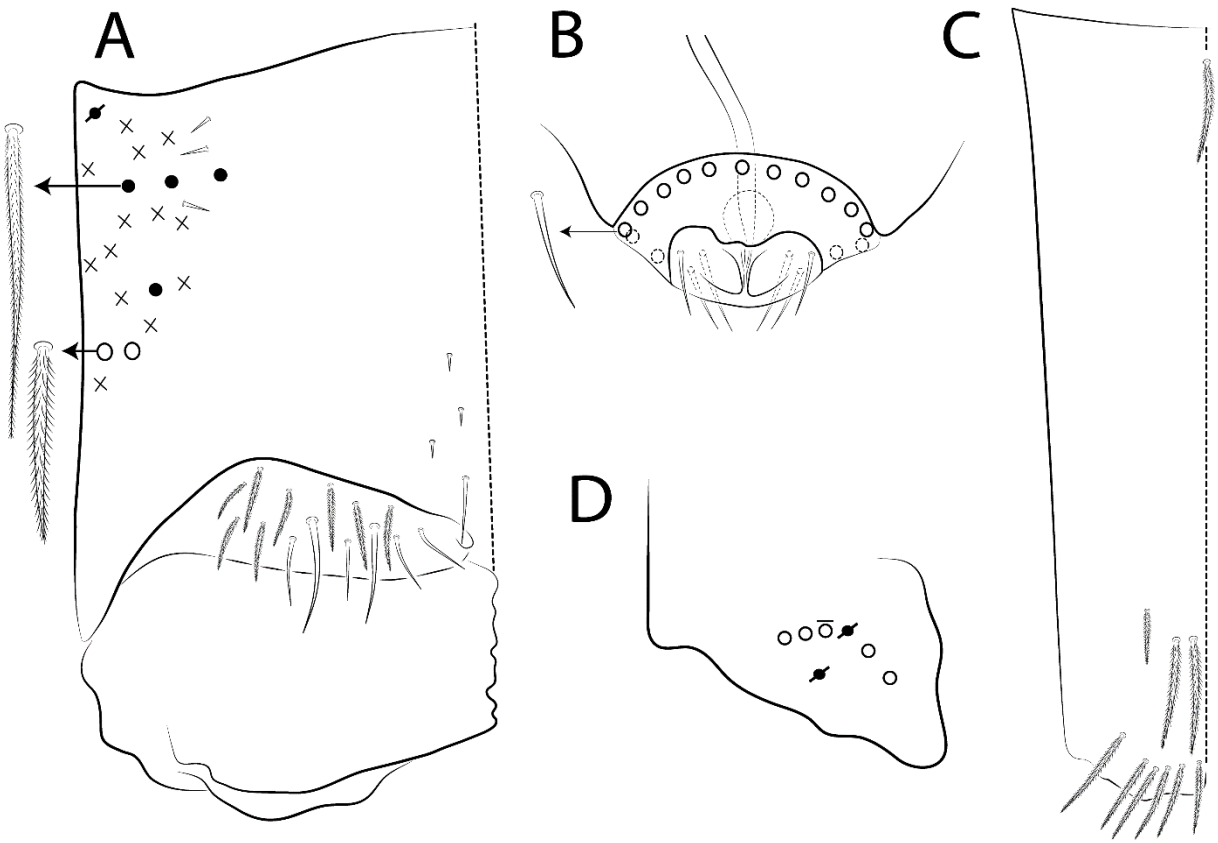

FIGURE 13A–D. *Tyrannoseira raptora*: **A**, collophore chaetotaxy (lateral view); **B**, male genital plate and sperm duct; **C**, manubrium ventral chaetotaxy; **D**, chaetotaxy of the manubrial plate (dorsal view).

***Tyrannoseira bicolorcornuta* (Bellini, Pais & Zeppelini, 2009)**

Figs 1B–D, 2–6, 14–18, 34

Seira bicolorcornuta Bellini, Pais & Zeppelini 2009: 40, figs. 1-4, Brazil, Pernambuco State, Alto do Moura (orig. descr.). Barra 2010: 586, 592 (compared). Abrantes *et al.* 2010: 9 (cat.).

Tyrannoseira bicolorcornuta; Bellini & Zeppelini 2011: 547, fig. 2b (comb.). Bellini & Godeiro 2012: 84 (compared). Abrantes *et al.* 2012: 12 (cat.). Zeppelini & Lima 2012: 42-43 (compared).

Examined type material. Holotype male and paratypes 7 females (MNRJ/3169).

Other examined material. 1 male, 1 female and 1 juvenile on slides (CC/UFRN): Brazil, Paraíba state, Cacimba de Dentro municipality, “Cachoeira da Capivara” farm, 06°40’S, 35°45’W, 314 m, 15.iv-17.v.2008, entomological aspirator, BC Bellini coll. 3 females on slides, 5 specimens metalized and 15 specimens in alcohol (CC/UFRN): Sapé municipality, urban region, 07°06’18”S, 35°14’03”W, 105 m, 17.iii.2014, entomological aspirator, DD Silva coll. 1 male and 1 female on slides and 1 specimen in alcohol (INPA): Bananeiras, State Ecological Reserve of “Goiamunduba”, 06°44’12”S, 35°36’35”W, 474 m, 19.iii.2014, entomological aspirator, DD Silva coll. 3 males and 5 females on slides and 37 specimens in alcohol (CC/UFRN): Rio Grande do Norte, Apodi municipality, Lajedo de Soledade, 05°35′20″S, 37°49′53″W, 123 m, 22.iv.2014, entomological aspirator, NN Godeiro & DD Silva coll. 2 males and 10 females on slides and 22 specimens in alcohol (CC/UFRN): Tibau do Sul municipality, “Pipa” Beach, 06°13'36.7"S, 35°04'29.9"W, 39 m, 21.vi.2015, entomological aspirator, NN Godeiro coll. 3 males and 4 females on slides and 31 specimens in alcohol (CC/UFRN): Ceará, Quixadá municipality, 04°57'35.1"S, 39°00'25.8"W, 180 m, 18–20.iv.2014, entomological aspirator, NN Godeiro & DD Silva coll.

Diagnosis. Body dark blue with pigments on distal two-thirds of Ant II–IV (Figs 1B–D); Ant III with 1 subapical sens type–**f** (Fig. 14A); head chaetotaxy with **An3i** mic, **An3i2** and **A4** absent and with 2 posterior mac (**Pe3** and 1 uncertain) (Fig. 14B); clypeus

with **l2** acuminate, **f2** smaller (Fig. 14C); outer labral papilla reduced (Fig. 14D); ventral head with 1 chaeta after anterior postlabial formula (Fig. 14E); Th II with 4 anterior mac (**a5**, **a5p**, **a5i**, **a5i2**), **m1i** and **p1i2** mac present or absent, **p1ip** mac present, **p2ea2** mac absent (Fig. 15A); Th III with 2 lateral mac (**m6**–**6p**) (Fig. 15B); Abd IV with 5 anterocentral mac (**A3**, **B2**–**3**, **C1**, **T1**) and 4 mac (**Fe3**–**6**) in **Fe** series (Fig. 16A); trochanteral organ with about 19 spine-like chaetae (Fig. 17D); leg I of males with 9–19 thin femural spines and 5 tibiotarsal spines finely ciliate (Fig. 17E); collophore anteriorly with 4 mac apically acuminate and 2 distal mac, posteriorly with 3 spines and 1 distal smooth chaeta (Fig. 18A); manubrium ventral formula with 1, 0, 0, 2/ 2 and 12 ciliate chaetae, manubrial plate with 3 psp (Figs 18B–C).

Redescription. Total length (head + trunk) of the holotype 1.49 mm. Specimens dark blue, pale in Ant I to proximal half of Ant II, proximal one-thirds of Ant III–IV, trochanter to tibiotarsus, distal collophore and distal two-thirds of dentes; eyepatches black (Fig 1B). Specimens sometimes with weaker pigmentation (Fig. 1C). Specimen dried in critical point with same color pattern, but antennae and legs yellowish (Fig. 1D). Scales present on Ant I to basal half of Ant III, dorsal and ventral head, Th and Abd dorsally, legs (except empodia), anterior collophore, and manubrium and dentes ventrally.

Head. Antennal ratio as I: II: III: IV = 1: 1.92: 2.09: 2.63. Ant III apical organ with 2 sens type **a**, 3 guard sens (type **d**), 1 modified rounded sens (type **f**), sens of different sizes (type **b**–**d**) and chaetae types **g**–**h** (Fig. 14A). Eye A largest, G and H smaller, others subequal (Fig. 14B). Head dorsal chaetotaxy with 11 'An', 5 'A', 5 'M', 5 'S', 3 'Ps', 6 'Pa', 2 'Pm', 6 'Pp', 3 'Pe' chaetae plus 1 mac of uncertain homology (Fig. 14B). Clypeal formula with 4 (**l1**–**2**), 4 (**f1**–**2**), 3 (**pf0**–**1**) ciliate chaetae, **l1–2** larger and apically acuminate, **f2** smaller (Fig. 14C). Labral papillae apically pointed, outer papillae reduced (Fig. 14D). Ventral chaetotaxy with 11 ciliate chaetae, anterior postlabial formula with 4 (**G1**–**4**), 2 (**H2**–**3**), 3 (**J1**–**3**) plus one chaeta near 'J' series, basal chaeta (**b.c.**) larger (Fig. 14E).

Thorax chaetotaxy (Figs 15A–B). Th II, series 'a', 'm' and 'p' with 6, 12 and 17 chaetae respectively (**m1i**, **p1i2** and **p2p** as mac or mic). Th III, series 'a', 'm' and 'p' with 8, 6 and 7 chaetae respectively. Th ratio as II: III = 1.36: 1.

Abdomen chaetotaxy (Figs 15C–E, 16A–B). Abd I, series 'a', 'm' and 'p' with 5, 5 and 2 mic respectively. Abd II, series 'a', 'm' and 'p' with 5, 7 and 3 chaetae respectively,

chaeta **el** present, bothriotricha **a5** and **m2** with 5 and 4 accessory chaetae respectively. Abd III, series 'a', 'm' and 'p' with 5, 7 and 6 chaetae respectively, 4 accessory chaetae on bothriotrichum **m2**, and 10 between bothriotricha **a5** and **m5**. Abd IV with 9 medial mac of series 'A' to 'T' (**A3**, **A5**, **B2**–**6**, **C1**, **T1**), and 15 lateral mac of series 'E' to 'Fe' (**E2**–**4p**, **Ee10**, **F1**–**3p**, **Fe3**–**6**); postero-median side with 8 sens and 4 posterior mes present. Abd V, series 'a', 'm', 'pa', 'p' and 'pp' with 4, 6, 3, 6 and 4 chaetae respectively. Abd ratio as III: IV = 1: 4.08.

Legs. Subcoxa I with 3 ciliate chaetae and 2 psp; subcoxa II with an anterior row of 8 chaetae, posterior row with 2 chaetae and 3 psp; subcoxa III with one row of 9 chaetae and 2 posterior psp (Figs 17A–C). Trochanteral organ with 19 spine-like chaetae (Fig. 17D). Femur I of males with 19–9 (holotype) thin spines (Fig. 17E). Tibiotarsus I with one row of 10 inner chaetae, 5 proximal spines finely ciliate (2 short and 3 larger) and 5 distal spine-like mac heavily ciliate and apically acuminate (Fig. 17E). Unguis with median tooth discretely larger than basal teeth, apical tooth smaller; ratio unguis: unguiculus = 1: 0.61. Tibiotarsus III with "smooth" chaeta 0.85 smaller than unguiculus; tenent hairs 0.92 smaller than ungues outer side (Figs 5D–G).

Collophore (Fig. 18A). Anterior side with 9 chaetae, 2 distal mac with same sizes, 4 longer and acuminate and 3 proximal spine-like chaetae; posterior side with 4 chaetae, 3 spines and 1 distal smooth chaeta; lateral flap with about 5 smooth and 11 ciliate chaetae.

Furcula (Figs 18B–C). Ventral manubrium with formula 1, 0, 0, 2/ 2 (subapical) and 12 (apical) ciliate chaetae, outer subapical chaeta smaller than inner chaeta, apical inner chaeta smaller; manubrial plate (dorsally) with 4 ciliate chaetae and 3 psp.

Remarks. *Tyrannoseira bicolorcornuta* modified legs were described from a single male specimen, apparently subadult, and for this reason variations in number of femoral spines of leg I are now revealed here. The analyzed specimens from Bananeiras (Paraíba) has 9 femural spines, as well as the holotype (Fig. 17E). This number may be even smaller in subadult males from Cacimba de Dentro (Paraiba) and Tibau do Sul (Rio Grande do Norte), since the leg I has 4 and 7–8 femural spines in such specimens, respectively.

In general, adults of *T. bicolorcornuta* from other localities have between 13–19 spines, and this number is quite similar to *T. gladiata*, but this last species can reach up to 24 femural spines (Fig. 27E). For this reason, this characteristic can not be used to separate species. Further comparisons are presented in *T. raptora* remarks and Table 1.

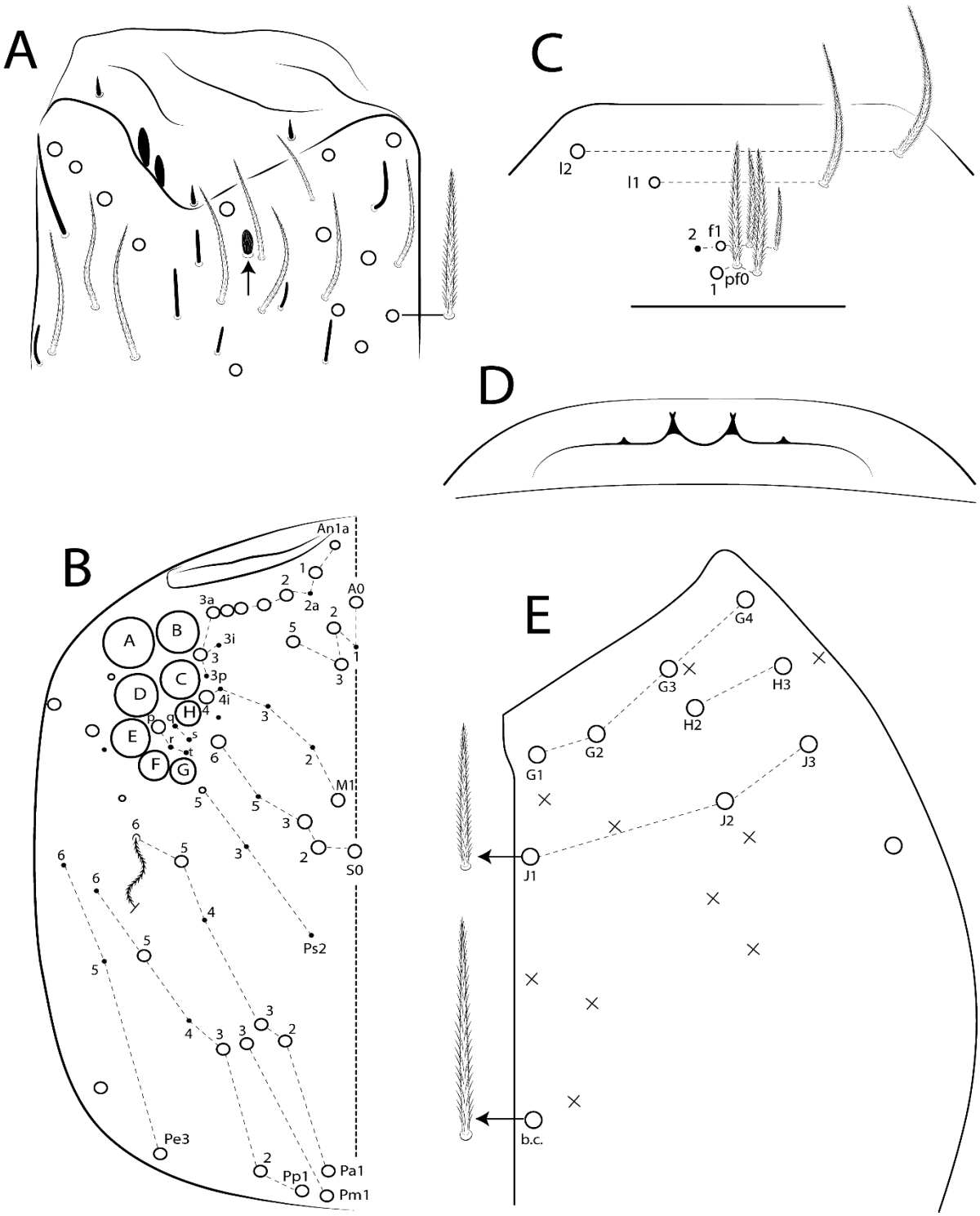

FIGURE 14A–E. *Tyrannoseira bicolorcornuta*: head; **A**, Ant III apical organ (lateral side), arrow indicates modified sens (type **f**); **B**, cephalic dorsal chaetotaxy (left side); **C**, chaetotaxy of the clypeus; **D**, labral papillae; **E**, postlabial and cephalic groove chaetotaxy (right side).

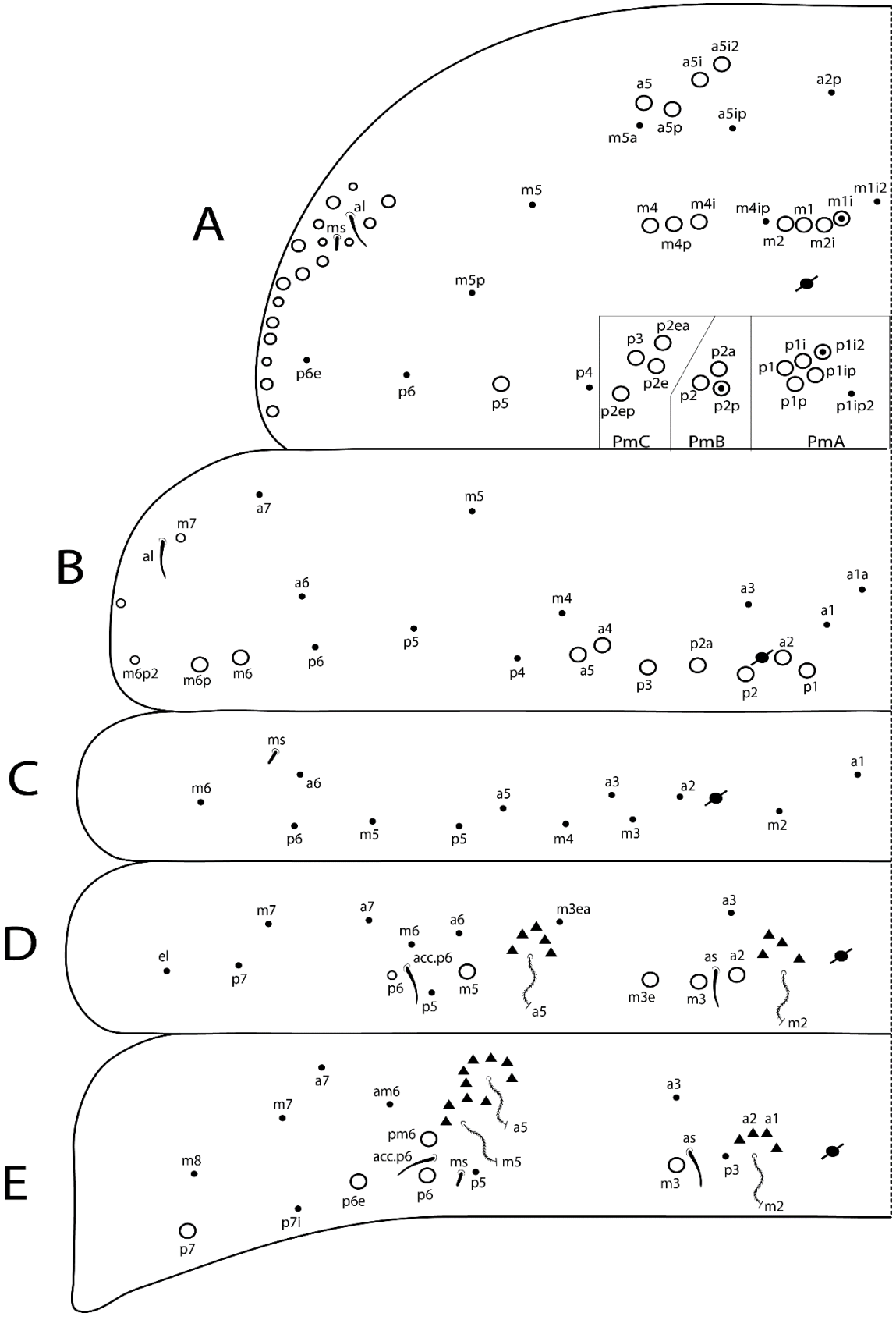

FIGURE 15A–E. *Tyrannoseira bicolorcornuta*: dorsal chaetotaxy; **A**, Th II; **B**, Th III; **C**, Abd I; **D**, Abd II; **E**, Abd III.

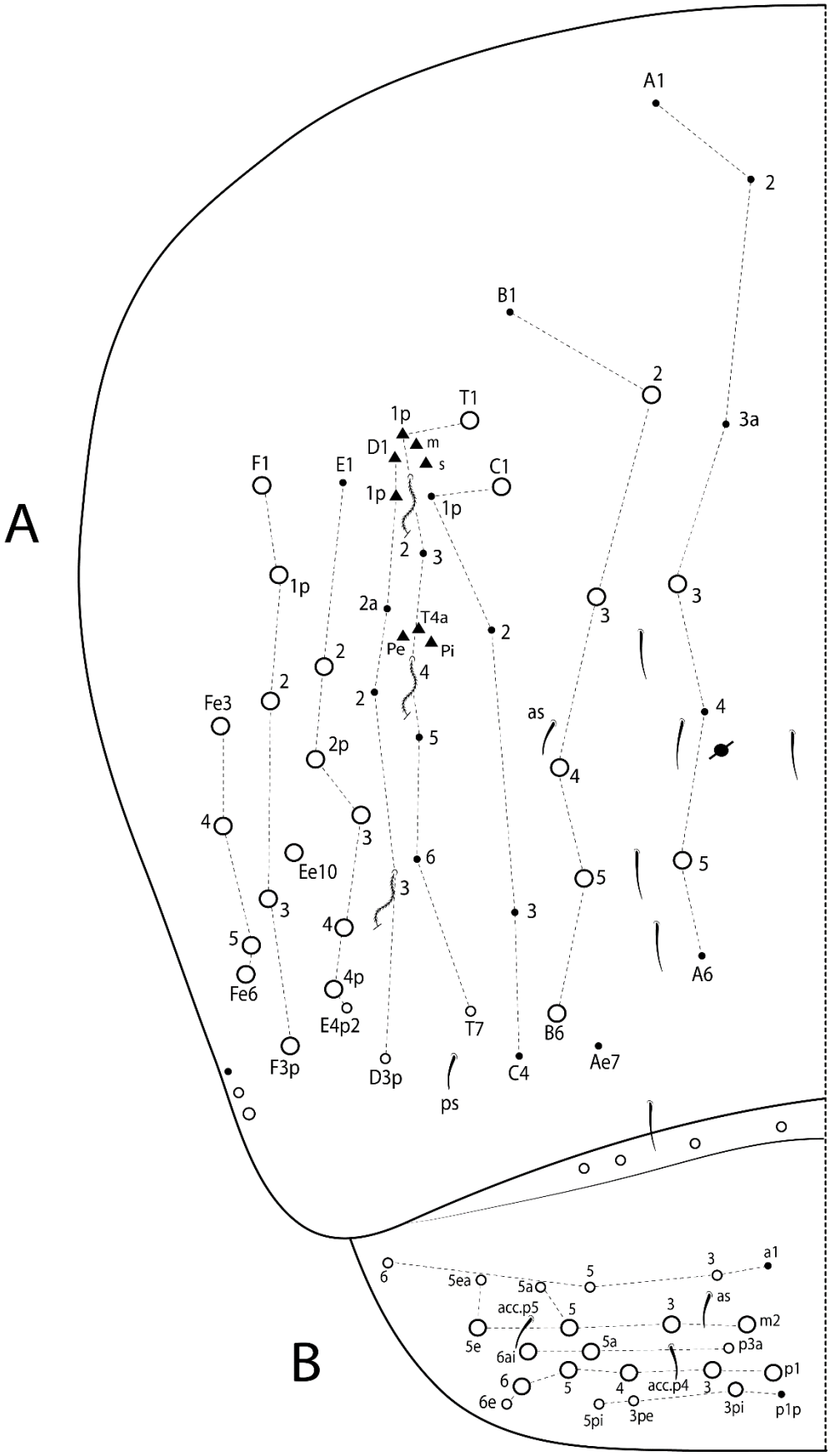

FIGURE 16A–B. *Tyrannoseira bicolorcornuta*: dorsal chaetotaxy; **A**, Abd IV; **B**, Abd V.

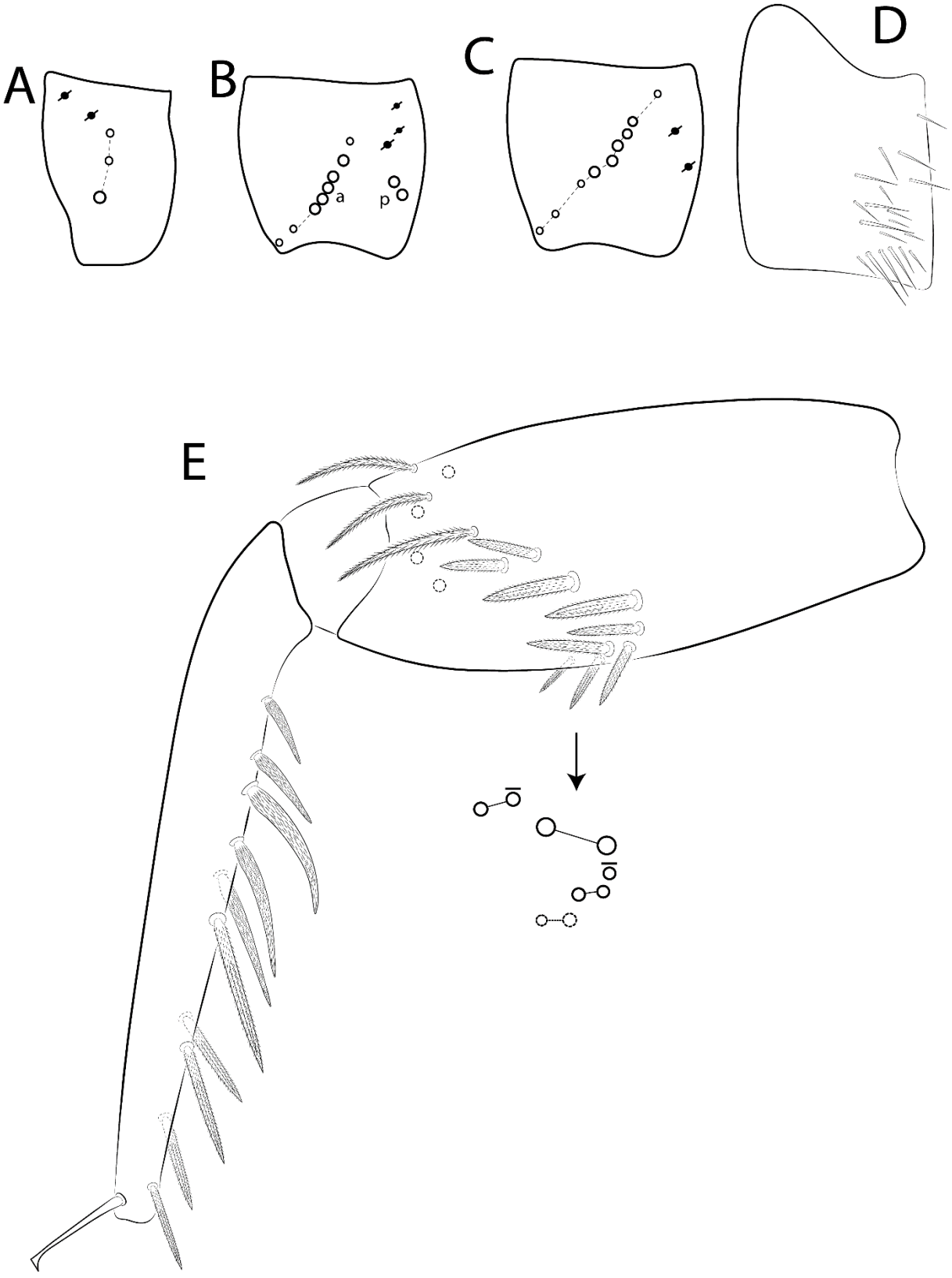

FIGURE 17A–E. *Tyrannoseira bicolorcornuta*: legs chaetotaxy; **A**, subcoxa I; **B**, subcoxa II; **C**, subcoxa III (outer side); **D**, trochanteral organ (inner side); **E**, femur and tibiotarsus I (anterior side), arrow in femur indicates distribution of spines in inner view.

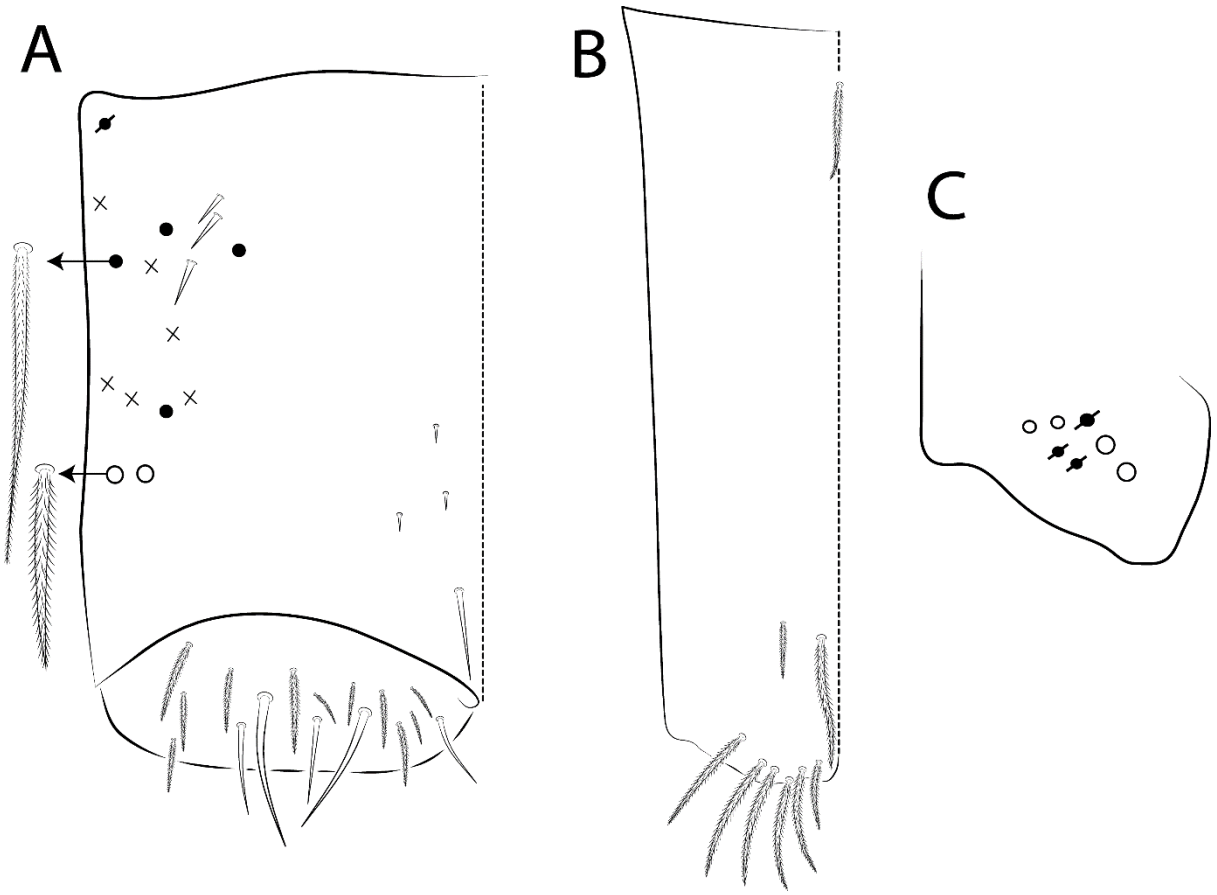

FIGURE 18A–C. *Tyrannoseira bicolorcornuta*: **A**, collophore chaetotaxy (lateral view); **B**, manubrium ventral chaetotaxy; **C**, chaetotaxy of the manubrial plate (dorsal view).

***Tyrannoseira diabolica* Bellini & Godeiro, 2012**

Figs 1E, 19–23, 34

Tyrannoseira diabolica Bellini & Godeiro 2012: 81, figs. 1-13, Brazil, Rio Grande do Norte state, Parnamirim, Barreira do Inferno (orig. descr.). Zeppelini & Lima 2012: 41-43 (compared).

Examined type material. Holotype female, paratypes 1 male, 8 females and 1 juvenile, all examined (MNRJ/3170).

Typological note. One paratype was designed as female in original description and we establish it here as a juvenile.

Diagnosis. Body pale with irregular purple pigment on Ant distally and Th II to Abd IV (Fig. 1E); Ant III without sens type–**f** (Fig. 19A); head chaetotaxy with **An3i** mic, **An3i2** and **A4** absent and with 1 posterior mac (**Pe3**) (Fig. 19B); clypeus with **l2** acuminate, **f2** smaller (Fig. 19C); outer labral papilla subequal to inner papillae (as Fig. 8E); ventral head with 3 chaetae after anterior postlabial formula (Fig. 19D); Th II with 6 anterior mac (**a4+**, **a4i**, **a5**, **a5p**, **a5i**, **a5i2**), **m1i** and **p1i2** mac absent, **p1ip** mac present, **p2ea2** mic present (Fig. 20A); Th III with 2 lateral mac (**a6**, **m6**) (Fig. 20B); Abd IV with 4–5 anterocentral mac (**A3a**, **A3**, **B3**, **C1**, **T1**) and 4 mac (**Fe2**–**5**) in **Fe** series (Fig. 21A); trochanteral organ with 18 spine-like chaetae (Fig. 22D); leg I of males with 6–8 thin femural spines and 4 tibiotarsal spines finely ciliate (Fig. 22E); collophore anteriorly with 3 mac apically acuminate and 1 distal mac, posteriorly with 1 spine and 1 distal smooth chaeta (Fig. 23A); manubrium ventral formula with 1, 0, 2, 0/ 2 and 12 ciliate chaetae, manubrial plate with 3 psp (Figs 23B–C).

Redescription. Total length (head + trunk) of the holotype 1.25 mm. Color pale yellow with purple pigment on distal Ant III-IV, one dark spot on anterior head, Th II to Abd I laterally, and weakly on Abd II–IV; eyepatches black (Fig. 1E). Scales present on Ant I to basal half of Ant III, dorsal and ventral head, Th and Abd dorsally, legs (except empodia), anterior collophore, and manubrium and dentes ventrally.

Head. Antennal ratio as I: II: III: IV = 1: 1.89: 1.85: 2.96. Ant III apical organ with 2 sens type **a**, 3 guard sens (type **d**), sens of different sizes (type **b**–**d**) and chaetae types **g**–

h; sens type–**f** absent (Fig. 19A). Eyes A and B larger, G smaller, others subequal (Fig. 19B). Head dorsal chaetotaxy with 11 'An', 5 'A', 5 'M', 5 'S', 3 'Ps', 6 'Pa', 2 'Pm', 6 'Pp' and 2 'Pe' chaetae (Fig. 19B). Clypeal formula with 4 (**l1**–**2**), 4 (**f1**–**2**), 3 (**pf0**–**1**) ciliate chaetae, **l2** larger, **l1** apically acuminate, **f2** smaller, others subequal (Fig. 19C). Labral papillae apically pointed, outer papillae subequal to inner papillae (as Fig. 8E). Ventral chaetotaxy with 13 ciliate chaetae, anterior postlabial formula with 4 (**G1**–**4**), 2 (**H2**–**3**), 3 (**J1**–**3**) plus three chaetae near 'J' series, basal chaeta (**b.c.**) larger (Fig. 19D).

Thorax chaetotaxy (Figs 20A–B). Th II, series 'a', 'm' and 'p' with 8, 11 and 17-18 chaetae respectively (**m1i** and **p1i2** absent). Th III, series 'a', 'm' and 'p' with 8, 5 and 8 chaetae respectively. Th ratio as II: III = 1.43: 1.

Abdomen chaetotaxy (Figs 20C–E, 21A–B). Abd I, series 'a', 'm' and 'p' with 5, 5 and 2 mic respectively. Abd II, series 'a', 'm' and 'p' with 5, 7 and 3 chaetae respectively, chaeta **el** present, bothriotricha **a5** and **m2** with 5 and 3–4 accessory chaetae respectively. Abd III, series 'a', 'm' and 'p' with 6, 6 and 5–6 chaetae respectively, 4 accessory chaetae on bothriotrichum **m2**, and 10 between bothriotricha **a5** and **m5**. Abd IV with 8-9 medial mac of series 'A' to 'T' (**A3a**–**3**, **A5**, **B3**–**6**, **C1**, **T1**), and 12–14 lateral mac of series 'E' to 'Fe' (**E2**–**4p**, **Ee10**, **F1**–**3**, **Fe2**–**5**); postero-median side with 4 sens and 4 posterior mes present. Abd V, series 'a', 'm', 'pa', 'p' and 'pp' with 4, 6, 3, 7 and 3 chaetae respectively. Abd ratio as III: IV = 1: 4.33.

Legs. Subcoxa I with 3 ciliate chaetae and 2 psp; subcoxa II with an anterior row of 9 chaetae, posterior row with 3 chaetae and 3 psp; subcoxa III with one row of 7 chaetae and 2 posterior psp (Figs 22A–C). Trochanteral organ with 18 spine-like chaetae (Fig. 22D). Femur I of males with 6–8 thin spines (Fig. 22E). Tibiotarsus I with one row of 9 inner chaetae, 4 proximal spines finely ciliate (3 short and 1 larger) and 5 distal spine-like mac heavily ciliate and apically acuminate (Fig. 22E). Unguis with median tooth discretely larger than basal teeth, apical tooth smaller; ratio unguis: unguiculus = 1: 0.50. Tibiotarsus III with "smooth" chaeta subequal to unguiculus; tenent hairs 1.08 larger than ungues outer side (as Fig. 12G).

Collophore (Fig. 23A). Anterior side with 10 chaetae, 1 mac and 1 mes distal with unequal sizes, 4 longer and acuminate and 4 proximal spine-like chaetae; posterior side with 2 chaetae, 1 spine and 1 distal smooth chaeta; lateral flap with about 7 smooth and 7 ciliate chaetae.

Furcula (Fig. 23B–C). Ventral manubrium with formula 1, 0, 2, 0/ 2 (subapical) and 12 (apical) ciliate chaetae, apical inner chaeta smaller; dorsal manubrial plate with 4 ciliate chaetae and 3 psp.

Remarks. *Tyrannoseira diabolica* resembles *T. sex* by reduced pigmentation and general morphology. Differences between these species are presented in remarks of *T. raptora* and Table 1.

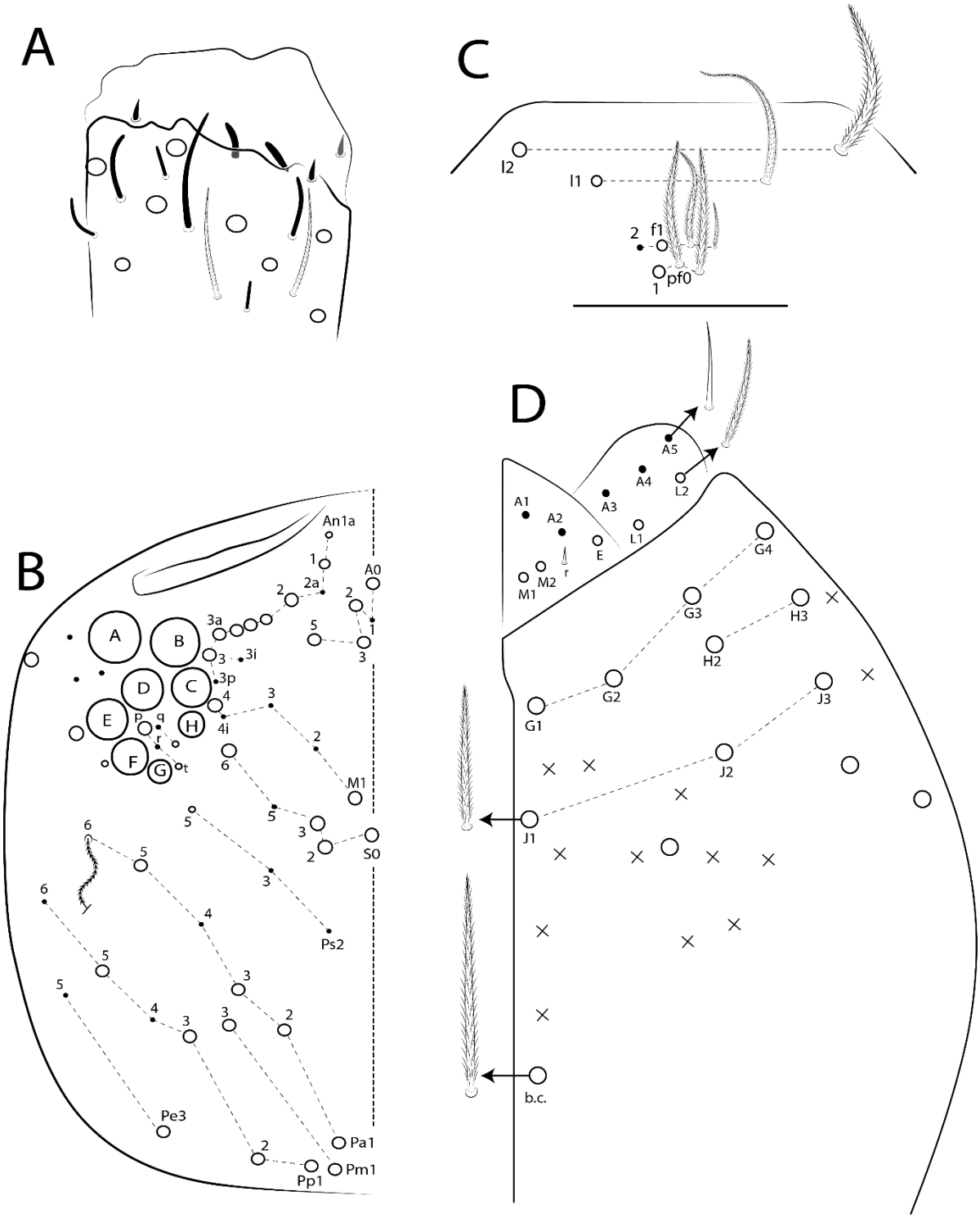

FIGURE 19A–D. *Tyrannoseira diabolica*: head; **A**, Ant III apical organ (lateral side); **B**, cephalic dorsal chaetotaxy (left side); **C**, chaetotaxy of the clypeus; **D**, chaetotaxy of the basomedian and basolateral fields, postlabial and cephalic groove (right side).

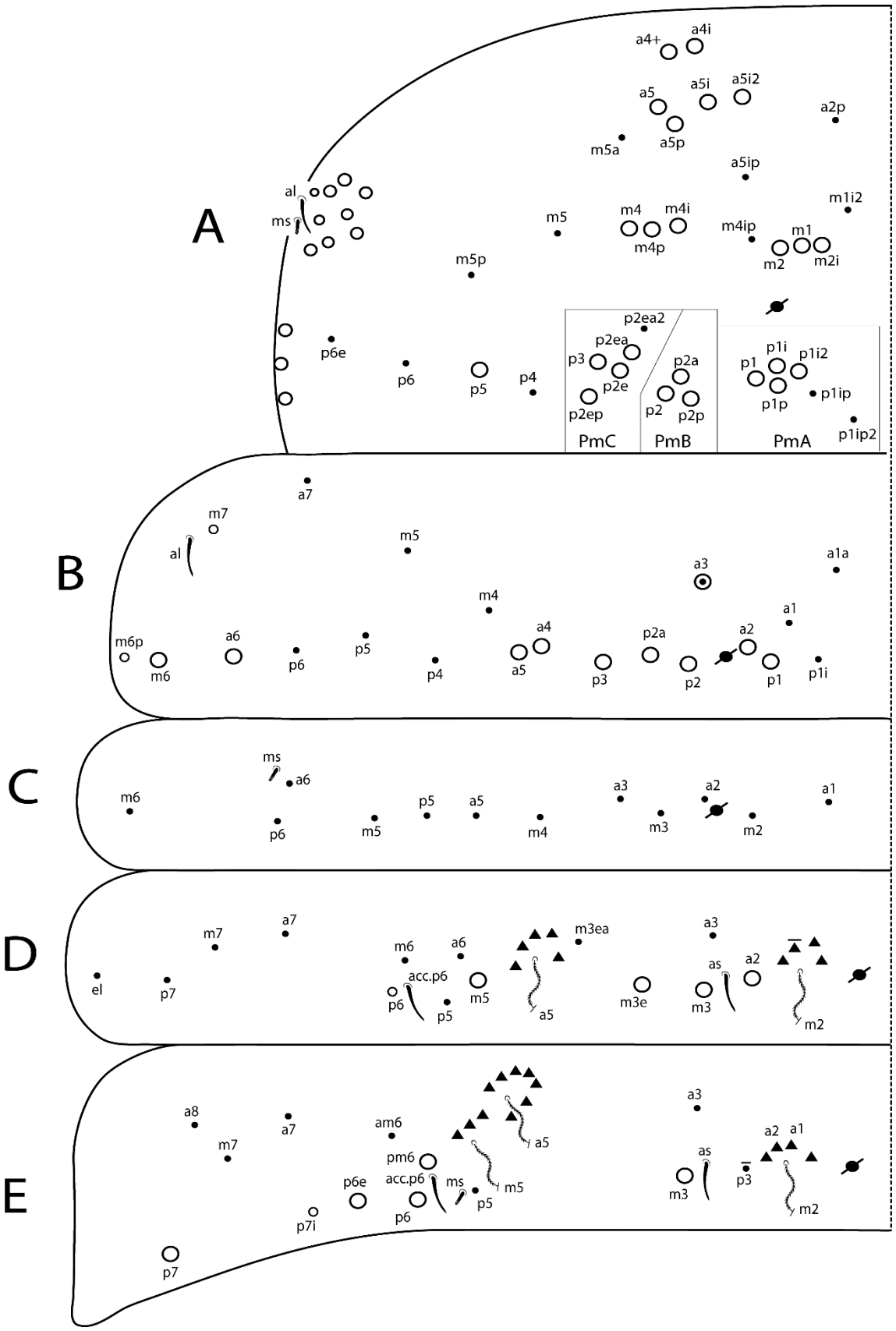

FIGURE 20A–E. *Tyrannoseira diabolica*: dorsal chaetotaxy; **A**, Th II; **B**, Th III; **C**, Abd I; **D**, Abd II; **E**, Abd III.

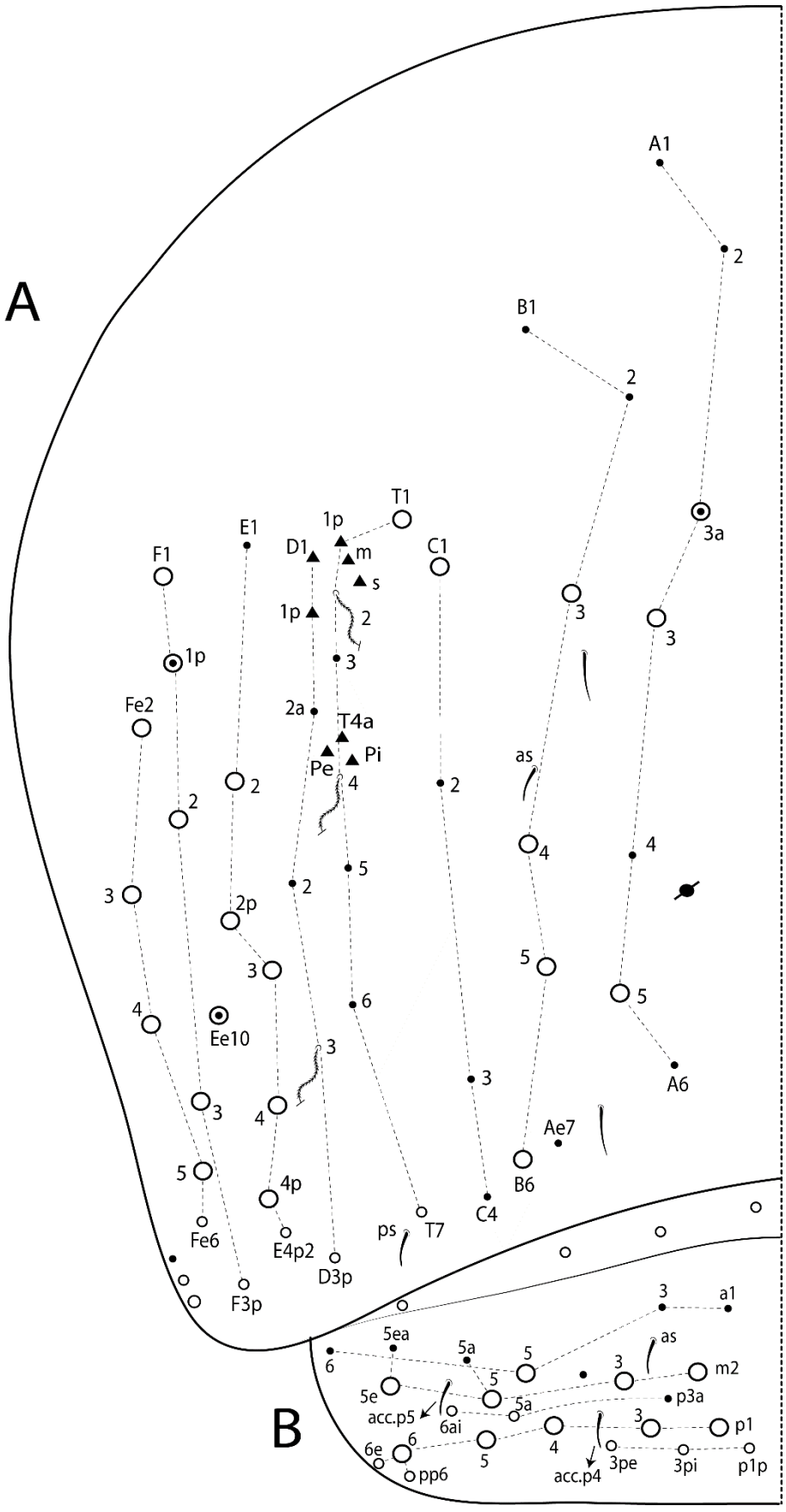

FIGURE 21A–B. *Tyrannoseira diabolica*: dorsal chaetotaxy; **A**, Abd IV; **B**, Abd V.

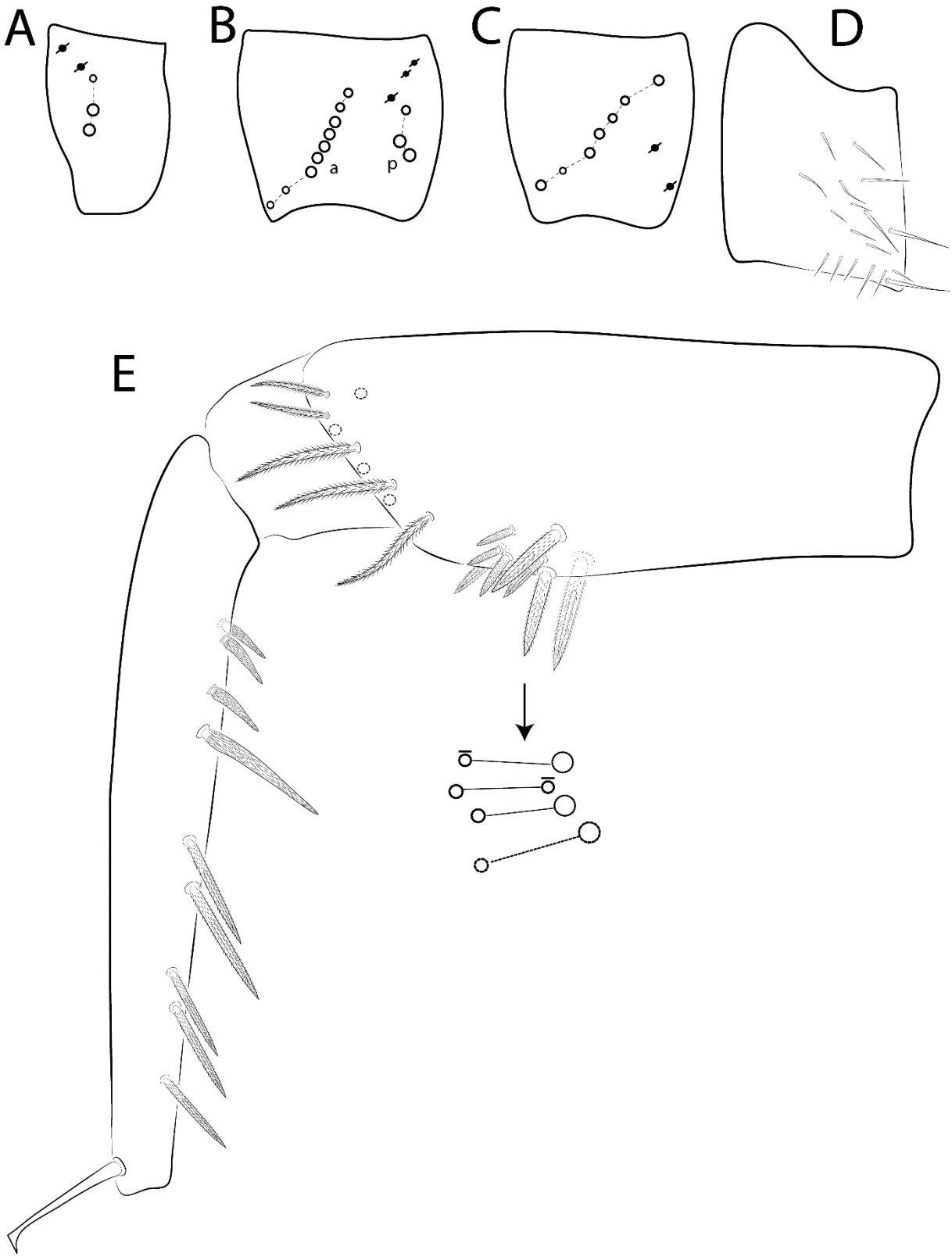

FIGURE 22A–E. *Tyrannoseira diabolica*: legs chaetotaxy; **A**, subcoxa I; **B**, subcoxa II; **C**, subcoxa III (outer side); **D**, trochanteral organ (inner side); **E**, femur and tibiotarsus I (anterior side), arrow in femur indicates distribution of spines in inner view.

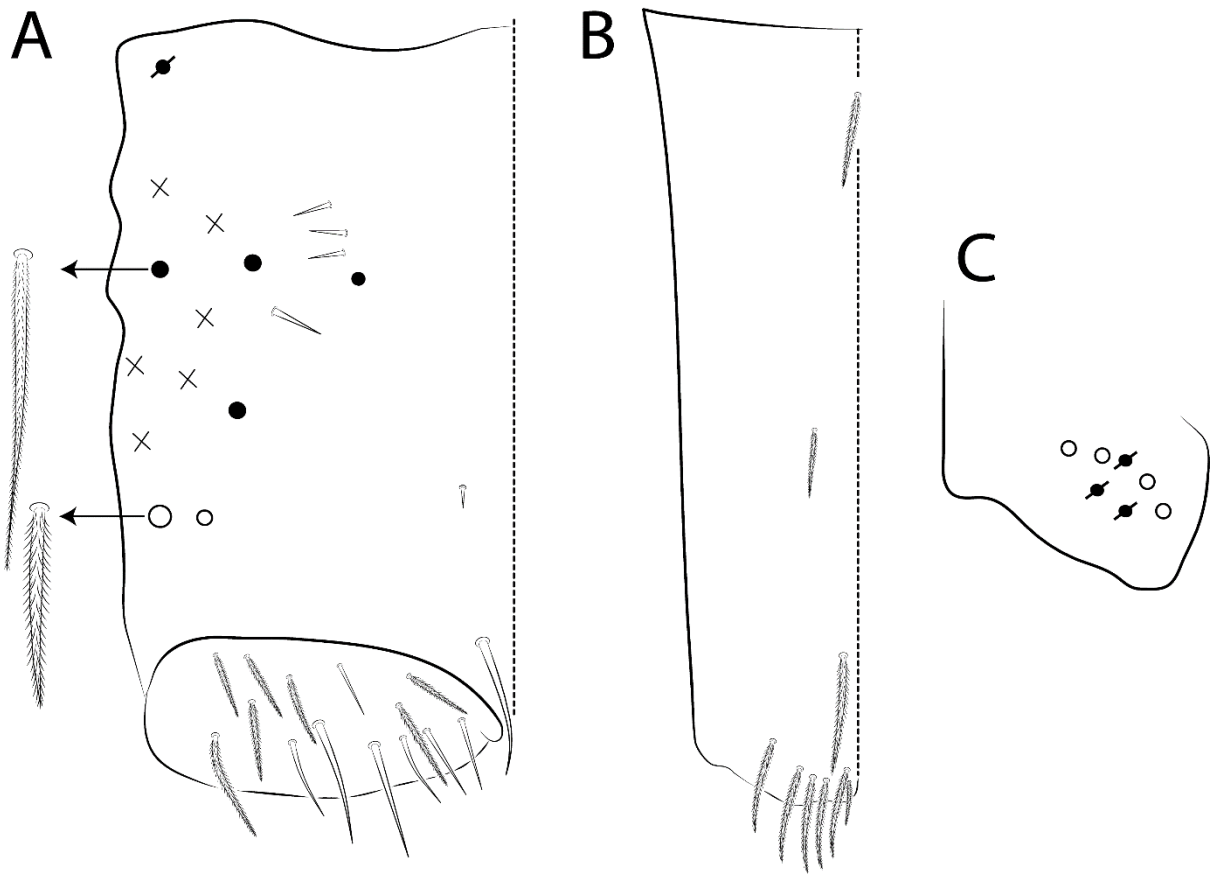

FIGURE 23A–C. *Tyrannoseira diabolica*: **A**, collophore chaetotaxy (lateral view); **B**, manubrium ventral chaetotaxy; **C**, chaetotaxy of the manubrial plate (dorsal view).

***Tyrannoseira gladiata* Zeppelini & Lima, 2012**

Figs 24–28, 34

Tyrannoseira gladiata Zeppelini & Lima 2012: 37, figs. 1-18, Brazil, Paraíba State, Araruna, State Park Pedra da Boca (orig. descr.).

Examined type material. Holotype male, paratypes 3 males and 8 females (MNRJ/2294).

Diagnosis. Body dark brownish to reddish with pigments on distal two-thirds of Ant II–IV (Fig. 1B); Ant III with 1 subapical sens type–**f** (Fig. 24A); head chaetotaxy with **An3i**, **An3i2** and **A4** mic absent and with 2 posterior mac (**Pe3** and 1 uncertain) (Fig. 24B); clypeus with **l2** normal, **f2** smaller (Fig. 24C); outer labral papilla gently smaller (Fig. 24D); ventral head with 3 chaetae after anterior postlabial formula (Fig. 24E); Th II with 6 anterior mac (**a4+**, **a4i**, **a5**, **a5p**, **a5i**, **a5i2**), **m1i**, **p1i2** and **p1ip** mac present, **p2ea2** mac present or absent (Fig. 25A); Th III with 1 lateral mac (**m6**) (Fig. 25B); Abd IV with 5 anterocentral mac (**A3**, **B2**–**3**, **C1**, **T1**) and 4 mac (**Fe3**–**6**) in **Fe** series (Fig. 26A); trochanteral organ with about 26 spine-like chaetae (Fig. 27D); leg I of males with 13–24 thicker femural spines and 4 tibiotarsal spines finely ciliate (Fig. 27E); collophore anteriorly with 3 mac apically acuminate and 1 distal mac, posteriorly with 3 spines and 1 distal ciliate and smooth chaetae (Fig. 28A); manubrium ventral formula with 1, 2, 2, 2/ 4 and 10 ciliate chaetae, manubrial plate with 3 psp (Figs 28B–C).

Redescription. Total length (head + trunk) of the holotype 1.49 mm. Specimens completely dark brown to dark red, pale in Ant I to proximal half of Ant II, proximal one-thirds of Ant III–IV, trochanter to tibiotarsus, distal collophore and distal two-thirds of dentes; eyepatches black (similar to *T. bicolorcornuta*, Fig 1B). Scales present on Ant I to basal half of Ant III, dorsal and ventral head, Th and Abd dorsally, legs (except empodia), anterior collophore and manubrium and dentes ventrally.

Head. Antennal ratio as I: II: III: IV = 1: 1.34: 1.51: 1.76. Ant III apical organ with 2 sens type **a**, 3 guard sens (type **d**), 1 modified rounded sens (type **f**), sens of different sizes (type **b**–**d**) and chaetae types **g**–**h** (Fig. 24A). Eyes A–D larger, G and H smaller, others subequal (Fig. 24B). Head dorsal chaetotaxy with 10 ‘An’, 5 ‘A’, 5 ‘M’, 5 ‘S’, 3 ‘Ps’, 6 ‘Pa’, 2 ‘Pm’, 6 ‘Pp’, 3 ‘Pe’ chaetae plus 1 mac of uncertain homology (Fig. 24B).

Clypeal formula with 4 (**l1**–**2**), 4 (**f1**–**2**), 3 (**pf0**–**1**) ciliate chaetae, **l1** larger and apically acuminate, **f2** smaller, others subequal (Fig. 24C). Labral papillae apically pointed, outer papillae gently smaller than inner papillae (Fig. 24D). Ventral chaetotaxy with 13 ciliate chaetae, anterior postlabial formula with 4 (**G1**–**4**), 2 (**H2**–**3**), 3 (**J1**–**3**) plus three chaetae near 'J' series, basal chaeta (**b.c.**) larger (Fig. 24E).

Thorax chaetotaxy (Figs 25A–B). Th II, series 'a', 'm' and 'p' with 8, 12 and 17–18 chaetae respectively (**m1**, **p1i2** and **p1ip** mac present, **p2ea2** present or absent). Th III, series 'a', 'm' and 'p' with 8, 6 and 7 chaetae respectively. Th ratio as II: III = 1.24: 1.

Abdomen chaetotaxy (Figs 25C–E, 26A–B). Abd I, series 'a', 'm' and 'p' with 5, 5 and 2 mic respectively. Abd II, series 'a', 'm' and 'p' with 5, 7 and 3 chaetae respectively, chaeta **el** present, bothriotricha **a5** and **m2** with 6 and 4 accessory chaetae respectively. Abd III, series 'a', 'm' and 'p' with 6, 7 and 5 chaetae respectively, 4 accessory chaetae on bothriotrichum **m2**, and 10 between bothriotricha **a5** and **m5**. Abd IV with 9–10 medial mac of series 'A' to 'T' (**A3**, **A5**, **B2**–**6**, **C1**, **T1**, **T7**), and 16 lateral mac of series 'D' to 'Fe' (**D3p**, **E2**–**4p**, **Ee10**, **F1**–**3p**, **Fe3**–**6**); postero-median side with 6 sens and 5 posterior mes present. Abd V, series 'a', 'm', 'pa', 'p' and 'pp' with 4, 6, 5, 7 and 3 chaetae respectively. Abd ratio as III: IV = 1: 3.64.

Legs. Subcoxa I with 3 ciliate chaetae and 2 psp; subcoxa II with an anterior row of 8 chaetae, posterior row with 2 chaetae and 3 psp; subcoxa III with one row of 7 chaetae and 3 posterior psp (Figs 27A–C). Trochanteral organ with 26 spine-like chaetae (Fig. 27D). Femur I of males with 13–24 thicker spines, holotype with 9 (Fig. 27E). Tibiotarsus I with one row of 9 inner chaetae, 4 proximal spines finely ciliate (2 short and 2 larger) and 5 distal spine-like mac heavily ciliate and apically acuminate (Fig. 27E). Unguis with median tooth discretely larger than basal teeth, apical tooth smaller; ratio unguis: unguiculus = 1: 0.51. Tibiotarsus III with "smooth" chaeta 0.89 smaller than unguiculus; tenent hairs 0.86 smaller than ungues outer side (as Fig. 12G).

Collophore (Fig. 28A). Anterior side with 9 chaetae, 1 mac and 1 distal mes, 3 longer and 1 smaller acuminate and 3 proximal spine-like chaetae; posterior side with 5 chaetae, 3 spines, 1 distal ciliate plus 1 smooth chaetae; lateral flap with about 5 smooth and 12 ciliate chaetae.

Furcula (Figs 28B–C). Ventral manubrium with formula 1, 2, 2, 2/ 4 (subapical) and 10 (apical) ciliate chaetae; manubrial plate (dorsally) with 5 ciliate chaetae and 3 psp.

Remarks. *Tyrannoseira gladiata* resembles specially *T. bicolorcornuta* by antennal color pattern and general morphology. Differences between these species are shown in remarks of *T. raptora* and Table 1.

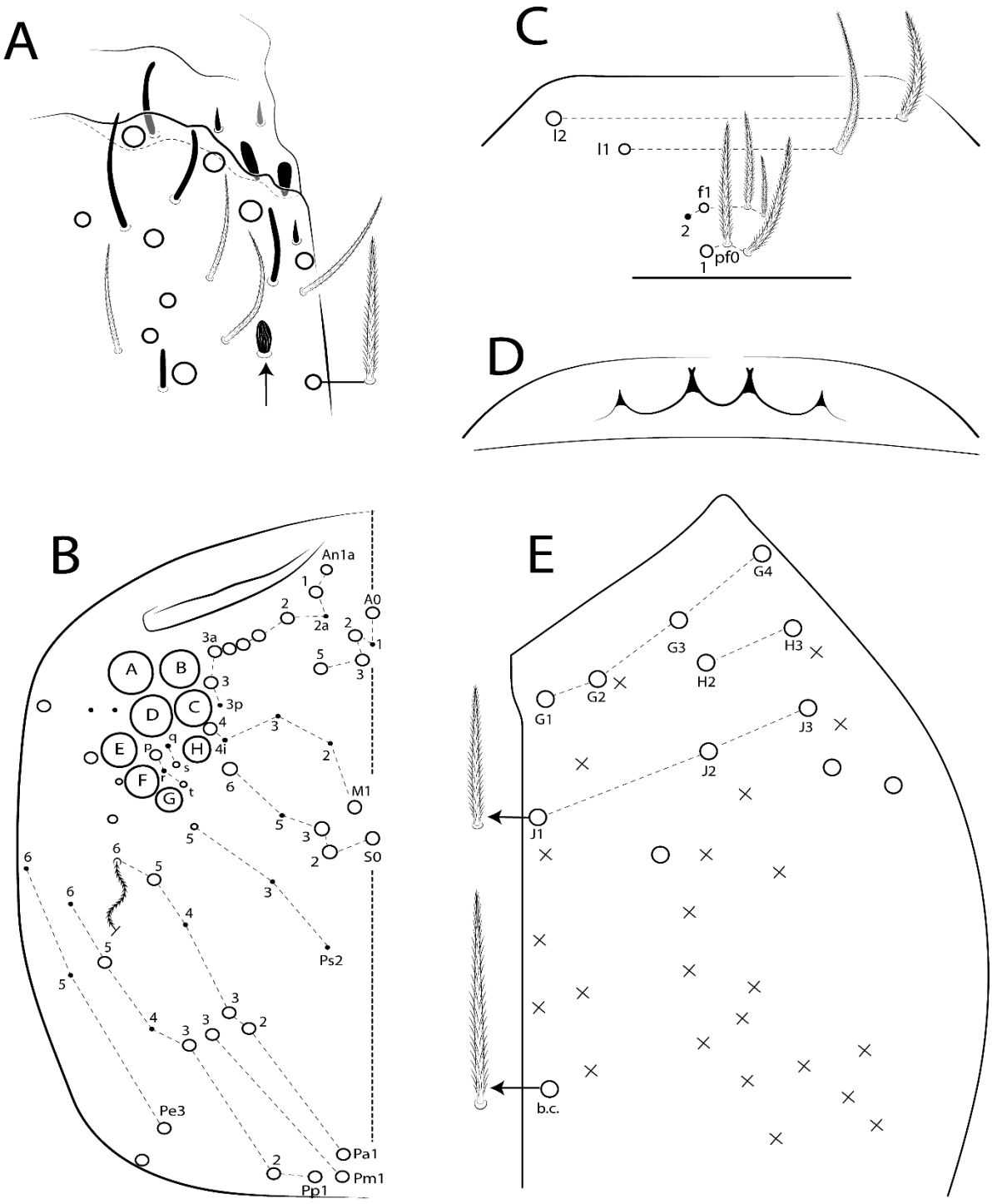

FIGURE 24A–E. *Tyrannoseira gladiata*: head; **A**, Ant III apical organ (lateral side), arrow indicates modified sens (type **f**); **B**, cephalic dorsal chaetotaxy (left side); **C**, chaetotaxy of the clypeus; **D**, labral papillae; **E**, postlabial and cephalic groove chaetotaxy (right side).

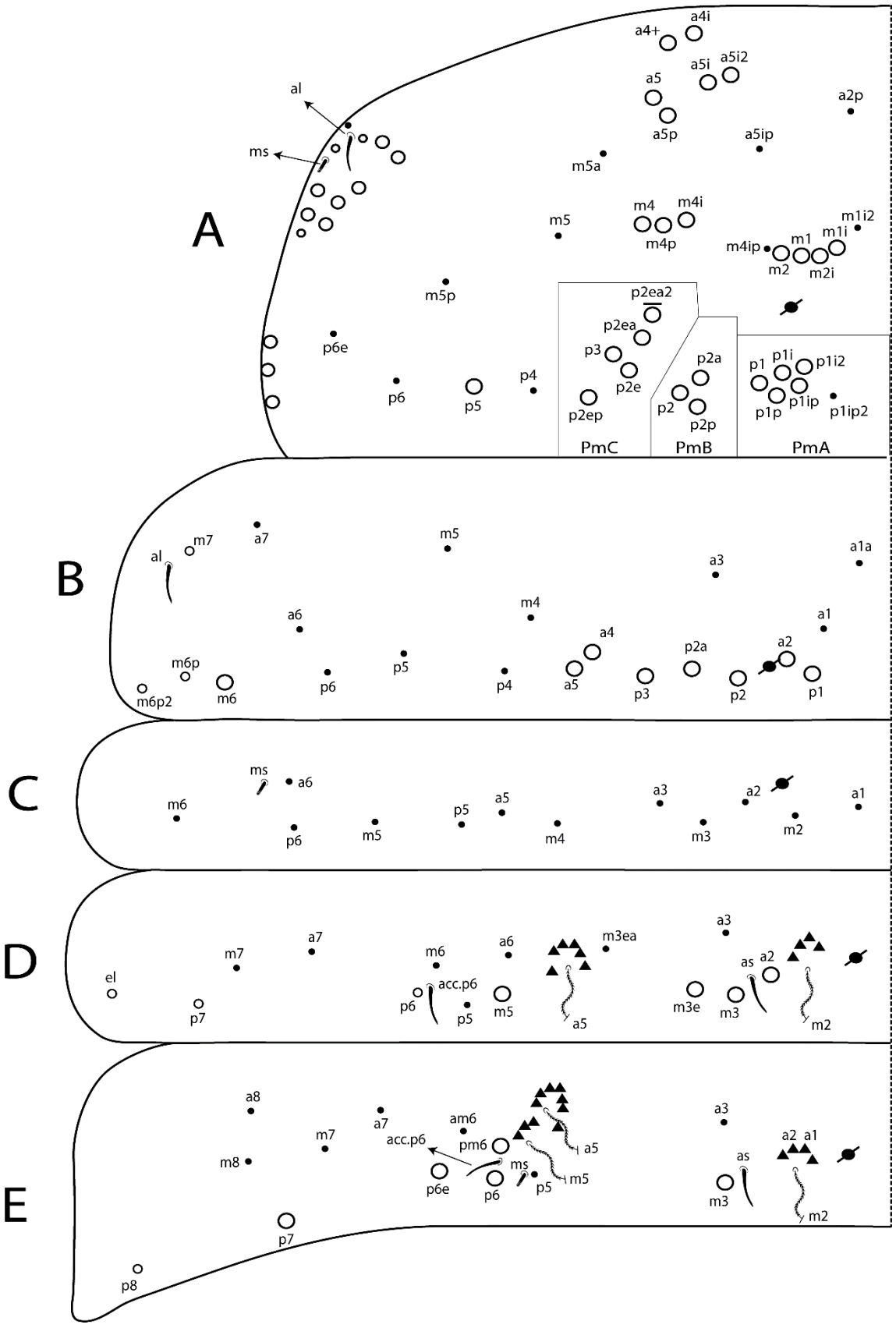

FIGURE 25A–E. *Tyrannoseira gladiata*: dorsal chaetotaxy; **A**, Th II; **B**, Th III; **C**, Abd I; **D**, Abd II; **E**, Abd III.

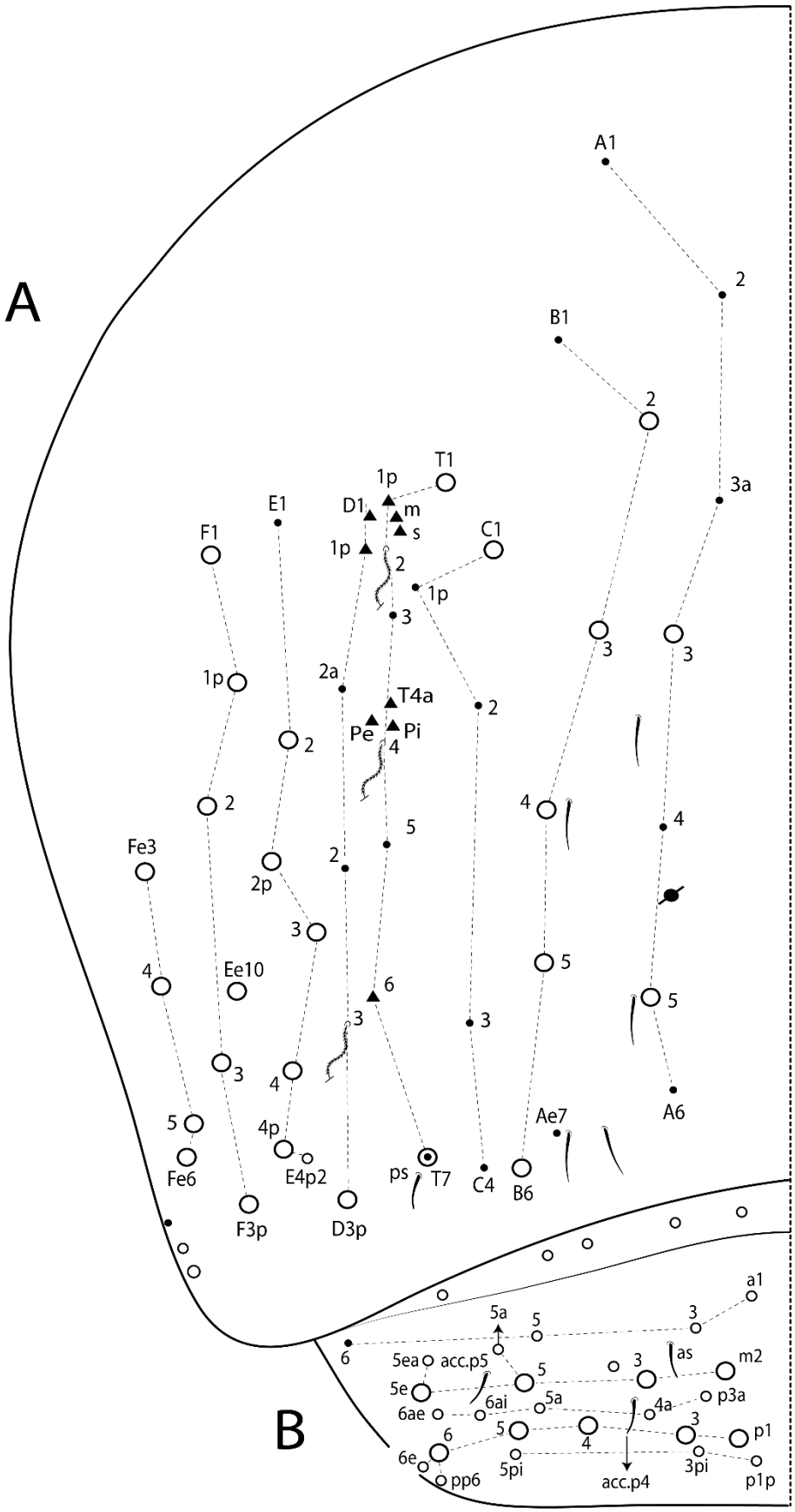

FIGURE 26A–B. *Tyrannoseira gladiata*: dorsal chaetotaxy; **A**, Abd IV; **B**, Abd V.

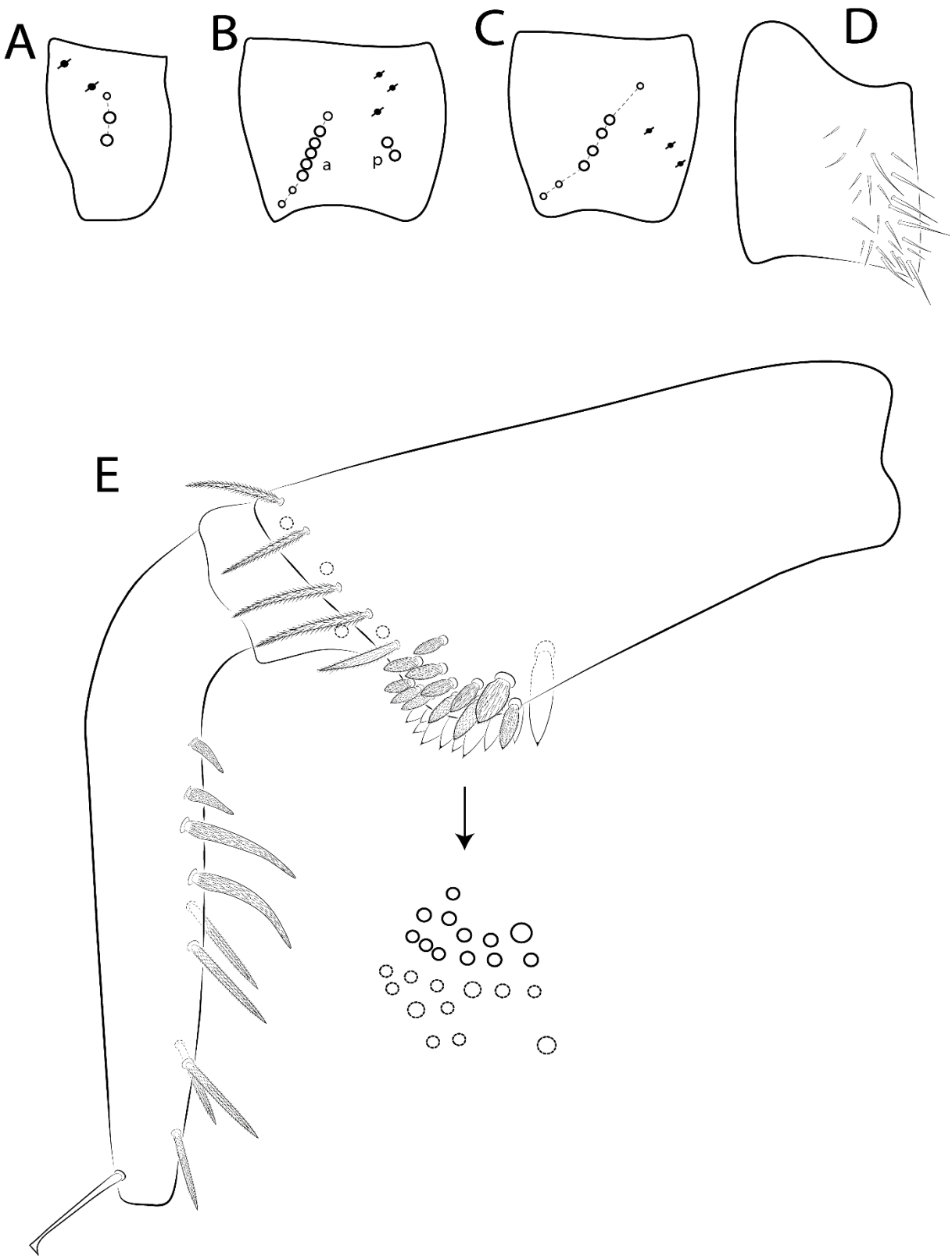

FIGURE 27A–E. *Tyrannoseira gladiata*: legs chaetotaxy; **A**, subcoxa I; **B**, subcoxa II; **C**, subcoxa III (outer side); **D**, trochanteral organ (inner side); **E**, femur and tibiotarsus I (anterior side), arrow in femur indicates distribution of spines in inner view.

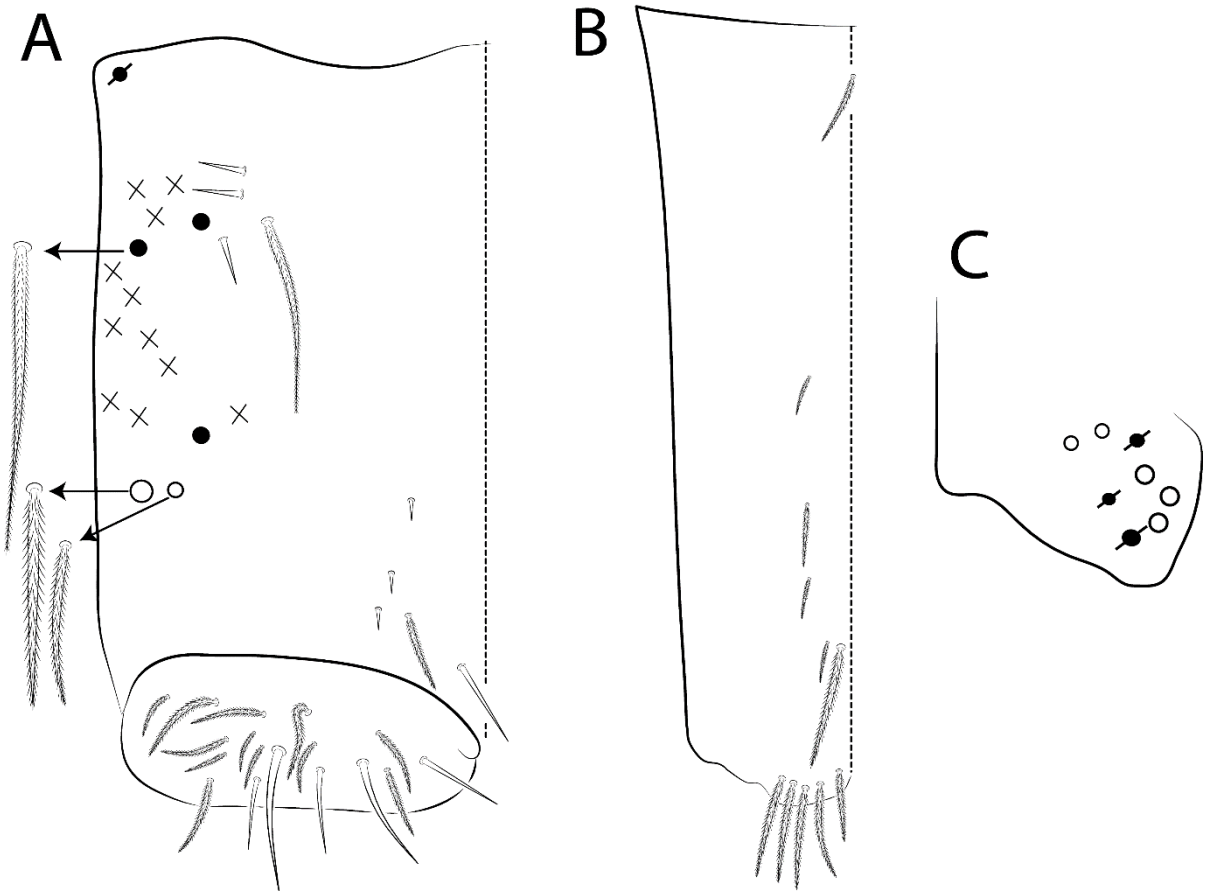

FIGURE 28A–C. *Tyrannoseira gladiata*: **A**, collophore chaetotaxy (lateral view); **B**, manubrium ventral chaetotaxy; **C**, chaetotaxy of the manubrial plate (dorsal view).

***Tyrannoseira sex* Bellini & Zeppelini, 2011**

Figs 1F, 29–34

Tyrannoseira sex Bellini & Zeppelini 2011: 553, figs. 4-6, Brazil, Paraíba State, São João do Cariri, Furna dos Ossos (orig. descr.). Abrantes *et al*. 2012: 13 (cat.). Bellini & Godeiro 2012: 84 (compared). Zeppelini & Lima 2012: 41-43 (compared).

Examined type material. Holotype male, paratypes 1 male and 5 females (MNRJ/2175).

Typological note. In original description were reported 6 paratypes deposited in MNRJ, but we counted more 9 specimens along with paratypes slides.

Other examined material. 3 males, 4 females and 2 juveniles on slides (MNRJ/2175): same date of type series.

Diagnosis. Body with pigmentation reduced (Fig. 1F); Ant III without sens type–**f** (Fig. 29A); head chaetotaxy without **An3i** and **An3i2** mic, **A4** present and with 2 posterior mac (**Pe3** and 1 uncertain) (Fig. 29B); clypeus with **l1** not apically acuminate, **f2** normal (Fig. 29C); outer labral papilla gently smaller (as Fig. 24D); ventral head with 2 chaetae after anterior postlabial formula (Fig. 29D); Th II with 6 anterior mac (**a4+**, **a4i**, **a5**, **a5p**, **a5i**, **a5i2**), **m1i**, **p1i2** and **p1ip** mac present, **p1ip2** and **p2ea2** mac present or absent (Fig. 30A); Th III with 1 lateral mac (**m6**) (Fig. 30B); Abd IV with 5–6 anterocentral mac (**A3**, **B1–3**, **C1**, **T1**) and 4 mac (**Fe2**–**5**) in **Fe** series (Fig. 31A); trochanteral organ with 23–28 spine-like chaetae (Fig. 32D); leg I of males with 8–11 thin femural spines and 5 tibiotarsal spines finely ciliate (Figs 32E–F); collophore anteriorly with 4 mac apically acuminate and 1 distal mac, posteriorly with 2 spines, 1 distal ciliate and 1 smooth chaetae (Fig. 33A); manubrium ventral formula with 1, 0, 2, 2/ 4 and 12 ciliate chaetae, manubrial plate with 2 psp (Figs 33B–C).

Redescription. Total length (head + trunk) of the holotype 1.96 mm. Color pale yellow with light purple pigment on Ant II-IV and one dark blue spot on anterior head; eyepatches black (Fig. 1F). Scales present on Ant I to basal one-third of Ant III, dorsal and

ventral head, Th and Abd dorsally, legs (except empodia), anterior collophore and manubrium and dentes ventrally.

Head. Antennal ratio as I: II: III: IV = 1: 1.43: 1.53: 1.79. Ant III apical organ with 2 sens type **a**, 3 guard sens (type **d**), sens of different sizes (type **b**–**d**) and chaetae types **g**–**h**; sens type–**f** absent (Fig. 29A). Eyes A larger, G smaller, others subequal (Fig. 29B). Head dorsal chaetotaxy with 12 'An', 6 'A', 5 'M', 5 'S', 3 'Ps', 6 'Pa', 2 'Pm', 6 'Pp', 3 'Pe' chaetae plus 1 mac of uncertain homology (Fig. 29B). Clypeal formula with 4 (**l1**–**2**), 4 (**f1**–**2**), 3 (**pf0**–**1**) ciliate chaetae, **l1**–**2** larger, others subequal (Fig. 29C). Labral papillae apically pointed, outer papillae gently smaller than inner papillae (as Fig. 24D). Ventral chaetotaxy with 13 ciliate chaetae, anterior postlabial formula with 4 (**G1**–**4**), 3 (**H2**–**4**), 4 (**J1**–**4**) plus two chaetae near 'J' series, basal chaeta (**b.c.**) larger (Fig. 29D).

Thorax chaetotaxy (Figs 30A–B). Th II, series 'a', 'm' and 'p' with 8, 12 and 17–18 chaetae respectively, **m1i**, **p1i2** and **p1ip** mac present, **p1ip2** and **p2ea2** mac present or absent. Th III, series 'a', 'm' and 'p' with 8, 6 and 7 chaetae respectively. Th ratio as II: III = 1.44: 1.

Abdomen chaetotaxy (Figs 30C–E, 31A–B). Abd I, series 'a', 'm' and 'p' with 5, 5 and 2 mic respectively. Abd II, series 'a', 'm' and 'p' with 6, 7 and 3 chaetae respectively, chaeta **el** absent or not seen, bothriotricha **a5** and **m2** with 7 and 4 accessory chaetae respectively. Abd III, series 'a', 'm' and 'p' with 6, 7 and 6 chaetae respectively, 4 accessory chaetae on bothriotrichum **m2**, and 10 between bothriotricha **a5** and **m5**. Abd IV with 9–10 medial mac of series 'A' to 'T' (**A3**, **A5**, **B1**–**6**, **C1**, **T1**), and 14 lateral mac of series 'E' to 'Fe' (**E2**–**4p**, **Ee10**, **F1**–**3**, **Fe2**–**5**); postero-median side with 6 sens and 4 posterior mes present. Abd V, series 'a', 'm', 'pa', 'p' and 'pp' with 4, 6, 4, 7 and 4 chaetae respectively. Abd ratio as III: IV = 1: 3.27.

Legs. Subcoxa I with 3 ciliate chaetae and 2 psp; subcoxa II with an anterior row of 9 chaetae, posterior row with 3 chaetae and 3 psp; subcoxa III with one row of 8 chaetae and 2 posterior psp (Figs 32A–C). Trochanteral organ with 23–28 spine-like chaetae (Fig. 32D). Femur I of males with 8–11 thin spines, holotype with 11 (Figs 32E–F). Tibiotarsus I with one row of 10 inner chaetae, 5 proximal spines finely ciliate (3 short and 2 larger) and 5 distal spine-like mac heavily ciliate and apically acuminate (Fig. 32E). Unguis with median tooth discretely larger than basal teeth, apical tooth smaller; ratio unguis: unguiculus = 1: 0.50. Tibiotarsus III with "smooth" chaeta 1.22 larger than unguiculus; tenent hairs 0.83 smaller than ungues outer side (as Fig. 12G).

Collophore (Fig. 33A). Anterior side with 10 chaetae, 1 distal mac, 4 longer and acuminate, 2 acuminate mes and 3 proximal spine-like chaetae; posterior side with 4 chaetae, 2 spines and 1 distal ciliate and 1 smooth chaetae; lateral flap with about 6 smooth and 5 ciliate chaetae.

Furcula (Figs 33B–C). Ventral manubrium with formula 1, 0, 2, 2/ 4 (subapical) and 12 (apical) ciliate chaetae, subapical chaetae with same sizes, apical inner chaeta smaller; dorsal manubrial plate with 4 ciliate chaetae and 2 psp.

Remarks. *Tyrannoseira sex* resembles mostly *T. diabolica* by reduced pigmentation and general morphology. Differences between these species are shown in remarks of *T. raptora* and Table 1.

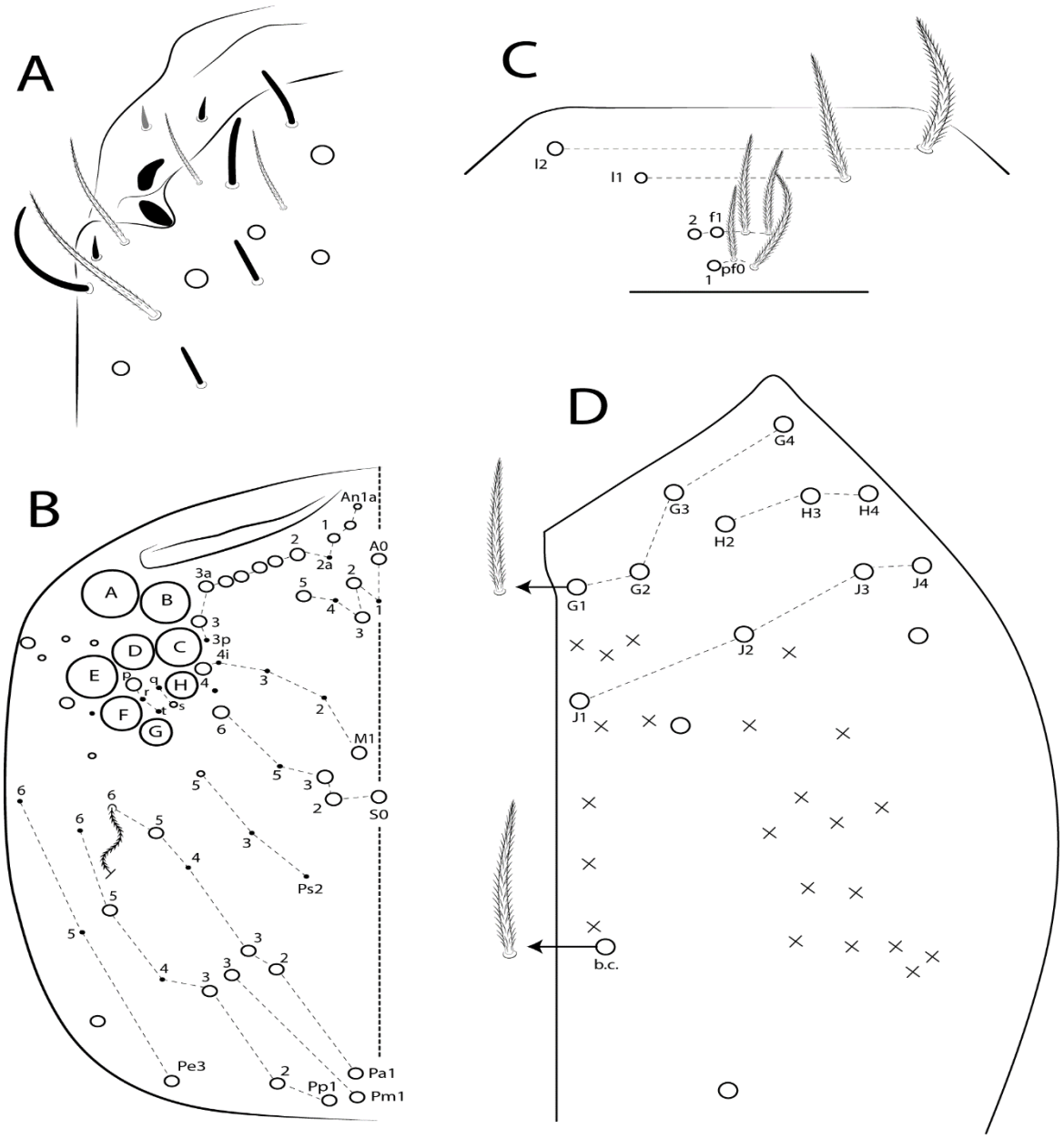

FIGURE 29A–D. *Tyrannoseira sex*: head; **A**, Ant III apical organ (lateral side); **B**, cephalic dorsal chaetotaxy (left side); **C**, chaetotaxy of the clypeus; **D**, postlabial and cephalic groove chaetotaxy (right side).

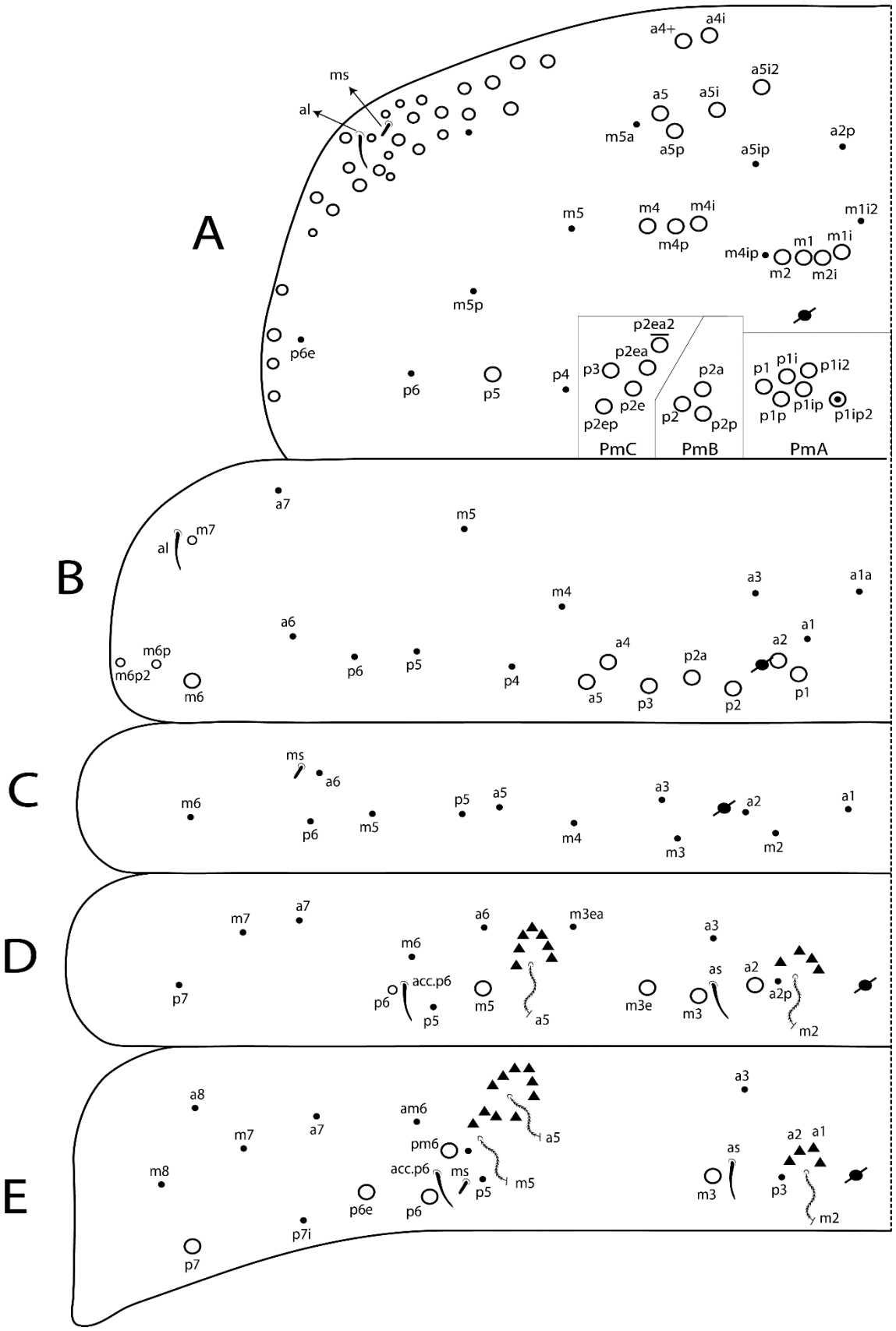

FIGURE 30A–E. *Tyrannoseira sex*: dorsal chaetotaxy; **A**, Th II; **B**, Th III; **C**, Abd I; **D**, Abd II; **E**, Abd III.

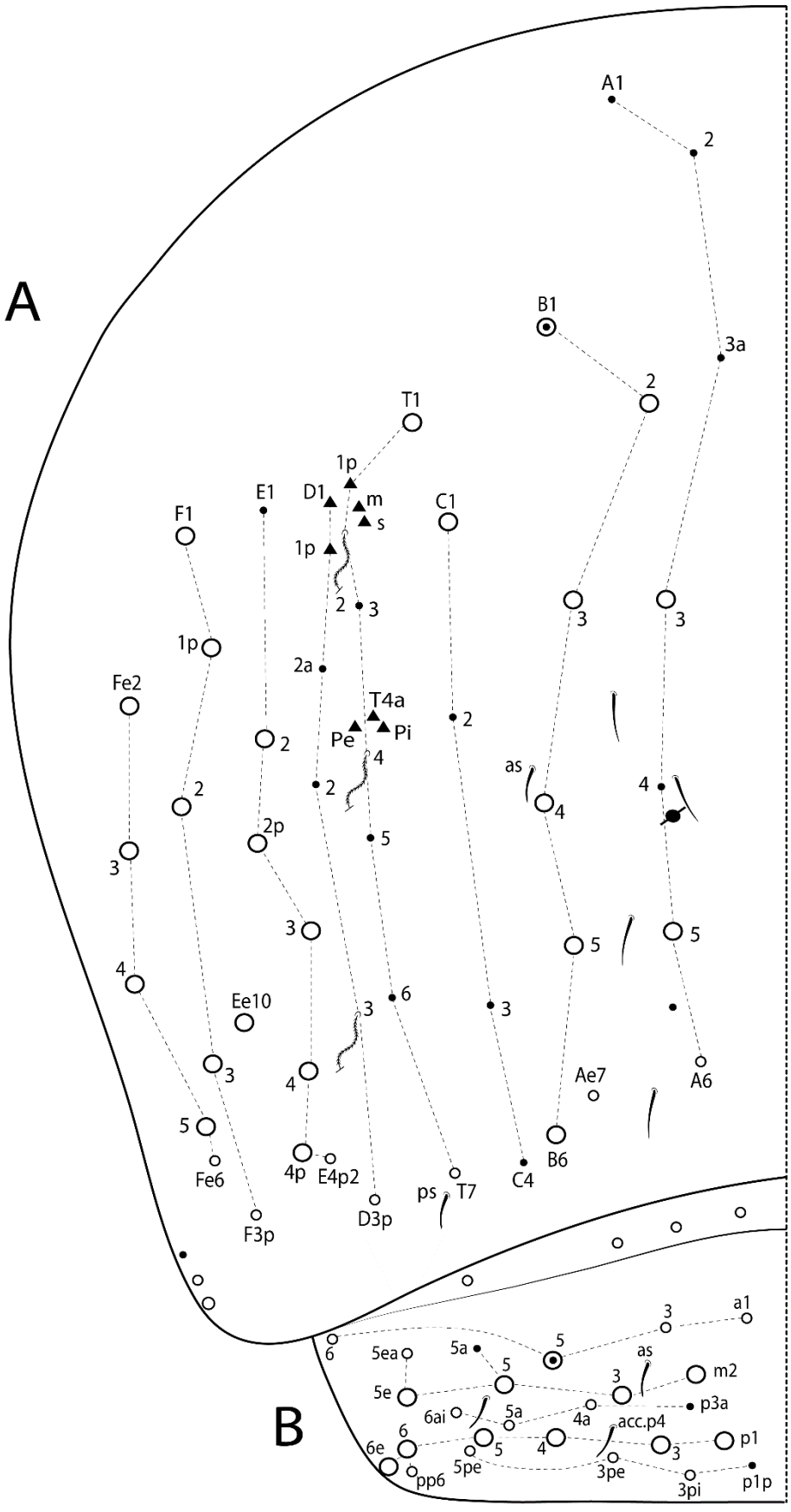

FIGURE 31A–B. *Tyrannoseira sex*: dorsal chaetotaxy; **A**, Abd IV; **B**, Abd V.

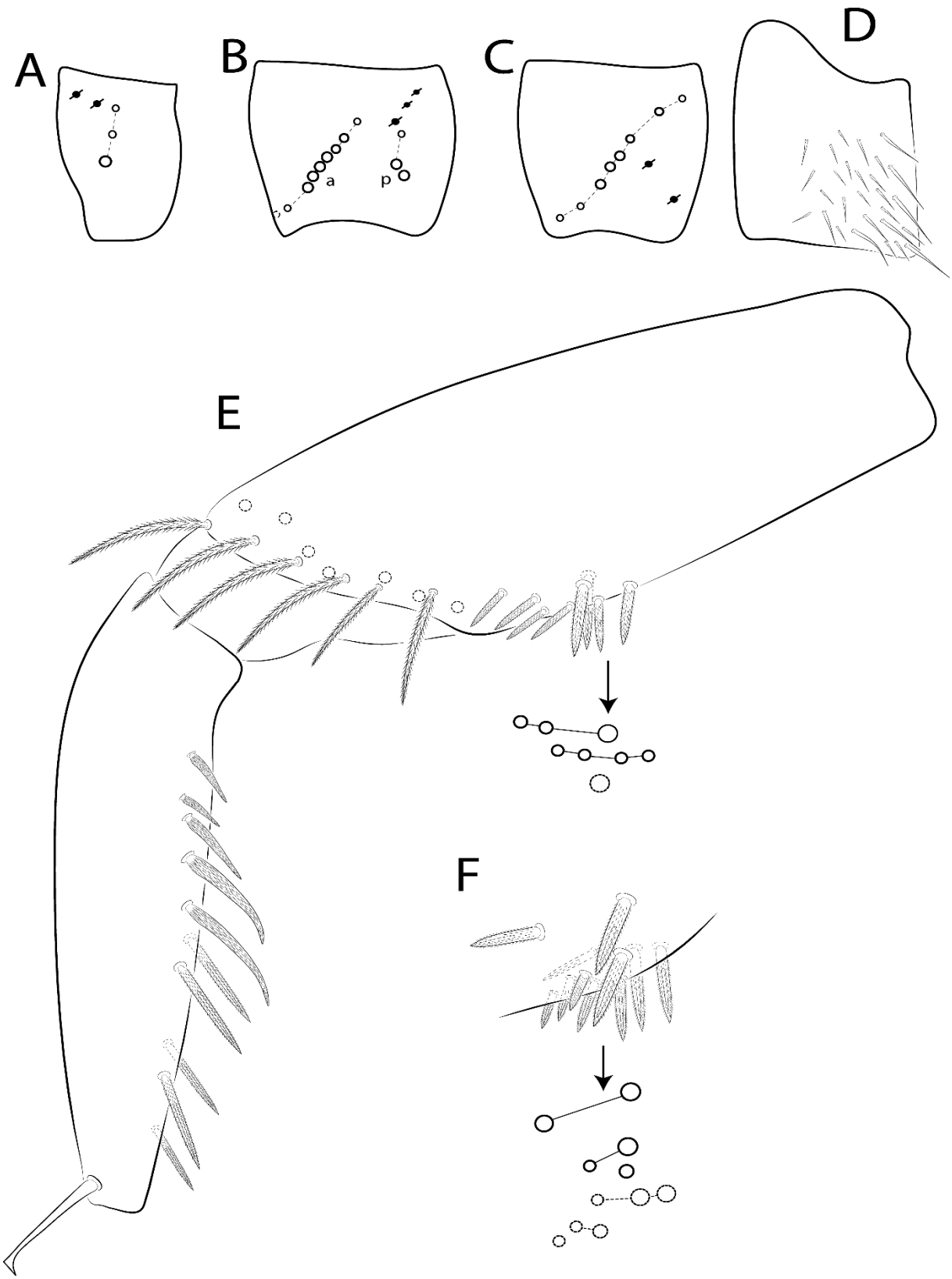

FIGURE 32A–F. *Tyrannoseira sex*: legs chaetotaxy; **A**, subcoxa I; **B**, subcoxa II; **C**, subcoxa III (outer side); **D**, trochanteral organ (inner side); **E**, femur and tibiotarsus I chaetotaxy in males (anterior view), arrow indicates distribution of spines in inner view; **F**, distribution of femoral spines in holotype.

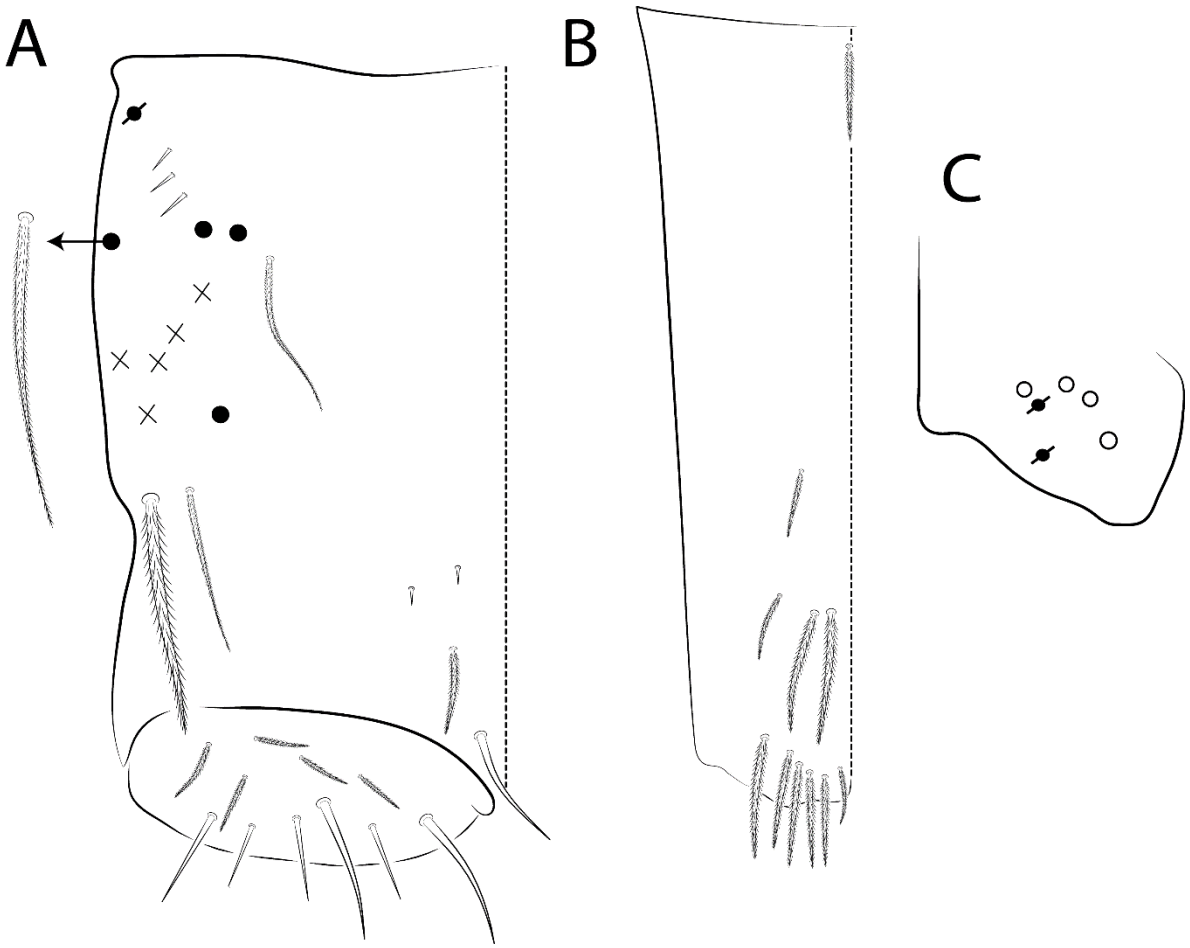

FIGURE 33A–C. *Tyrannoseira sex*: **A**, collophore chaetotaxy (lateral view); **B**, manubrium ventral chaetotaxy; **C**, chaetotaxy of the manubrial plate (dorsal view).

Key to *Tyrannoseira* species

1 Body pigmented (blueish, brownish, reddish or violet) (Figs 1A–D) … 2

- Body mostly pale (Figs 1E–F) … 4

2(1) Ant II–IV with dark violet pigment on distal two-thirds (Fig. 1B–D); Ant III with 1 subapical modified round sens type **f** (Fig. 14A); Th II with **p1ip** mac in **PmA** group; Th III without **a6** mac (Figs 15A–B); Abd IV with 5 antero-central mac, **B2** mac present (Fig. 16A); manubrial plate with 3 psp (Figs 18C, 28C) … 3

- Ant II–IV with different color pattern, head not completely pigmented (Fig. 1A); Ant III only with blunt normal sens (Fig. 8B); Th II without **p1ip** mac in **PmA** group; Th III with

a6 mac (Figs 10A–B); Abd IV with 4 antero-central mac, **B2** mac absent (Fig. 11A); manubrial plate with 2 psp (Fig. 13D) … *T. raptora*

3(2) Head chaetotaxy with **An3i** mic (Fig. 14B); clypeal **l2** chaeta apically acuminate; outer papillae reduced (Figs 14C–D); Th II devoid of **a4**+ and **a4i** mac (Fig. 15A); femur I of males with up to 9 spines (Fig. 17E); manubrial formula with 1, 0, 0, 2/ 2 and 12 chaetae (Fig. 18B) … *T. bicolorcornuta*

- Head chaetotaxy without **An3i** chaeta (Fig. 24B); clypeal **l2** chaeta normal; outer papillae evident (Figs 24C–D); Th II with **a4**+ and **a4i** mac (Fig. 25A); femur I of males with more than 13 spines (Fig. 27E); manubrial formula with 1, 2, 2, 2/ 4 and 10 chaetae (Fig. 28B) … *T. gladiata*

4(1) Head dorsal chaetotaxy without **A4** mic and **An3i** present (Fig. 19B); clypeal **l1** chaeta apically acuminate (Fig. 19C); Th II without **m1i** and **p1i2** mac, **p1ip2** as mic; Th III with **a6** mac (Figs 20A–B); Abd IV without **B2** mac, **A3a** eventually present (Fig. 21A); collophore posteriorly with 1 reduced spine-like chaeta and without ciliate chaetae; manubrium with 0/2 subapical chaetae (Figs 23A–B); manubrial plate with 3 psp (Fig. 23C) … *T. diabolica*

- Head dorsal chaetotaxy with **A4** mic and **An3i** absent (Fig. 29B); clypeal **l1** chaeta normal (Fig. 29C); Th II with **m1i** and **p1i2** mac, **p1ip2** mac or mic; Th III without **a6** mac (Figs 30A–B); Abd IV with **B2** mac, **B1** eventually present (Fig. 31A); collophore posteriorly with 2 reduced spine-like chaetae and with 1 ciliate chaeta; manubrium with 2/4 subapical chaetae (Figs 33A–B); manubrial plate with 2 psp (Fig. 33C) … *T. sex*

Remarks. In the original descriptions of *Tyrannoseira* species some characteristics have been misinterpreted or omitted (see Zeppelini & Bellini 2006; Bellini *et al.* 2009; Bellini & Zeppelini 2011; Bellini & Godeiro 2012; Zeppelini & Lima 2012). The apical bulb of Ant IV was reported as absent in *T. diabolica* and unilobed in other species, but is bilobed in all species (Figs 3C, 8A). The lateral view of the apical bulb of Ant IV can easily be misinterpreted as single (e.g. Zeppelini & Lima 2012: 38, fig. 2), since the lobes can be overlapped, and for this reason they should be observed in dorsal or ventral side. Other characteristic typical of all *Tyrannoseira* spp. is the presence of chaeta **r** reduced and smooth on basomedian labial field, but that was reported as absent in *T. diabolica*, ciliate in

T. gladiata and normal smooth in *T. raptora*. This latter case is notable since a MEV photograph was used to illustrate such character, but **r** chaeta is reduced and is partially occluded by **a2** chaeta (see Zeppelini & Bellini 2006: 25, upper side of fig.4). In the same sense, *T. diabolica* was reported as with 3 inner teeth in ungues, but it bears 4 teeth as all other species.

The nomenclature and detailed chaetotaxy in all species also needed to be revealed to be adequately compared. In head there are 4 mac on 'A' series (**A0**, **A2**, **A3**, **A5**), but **A5** was originally omitted in *T. raptora* and *T. sex*, and **A0** doubled was a misinterpretation of *T. gladiata* frontal head. Still in the head, the postocular mac (**Pa5** and **Pp5**), as well as the five posterior mac (**Pa1**, **Pm1**, **Pp1**, **Pp2**, **Pe3**), were also partially omitted in the descriptions, except in *T. gladiata*. In Th II anteriorly, *T. raptora* may present 1 extra mac (**a5+**), while *T. diabolica*, *T. gladiata* and *T. sex* present 2 extra mac (**a4+** and **a4i**). On Abd II there are 3 central mac (**a2**, **m3** and **m3e**) in all species (Figs 10D, 15D, 20D, 25D, 30D), but *T. bicolorcornuta* was reported with 5 and *T. gladiata* with 2 mac (see Zeppelini & Lima 2012: 41, fig. 17). Laterally in Abd III there are 4 mac typically (**pm6**, **p6**, **p6e** and **p7**), therefore the presence of 2 or 3 lateral mac in all species (except *T. bicolorcornuta*) omitted the whole interpretation of this region. In Abd IV, *T. bicolorcornuta* and *T. diabolica* were reported with 12 and 13 central mac, respectively. However, the Abd IV have from 8 central mac (**A3**, **A5**, **B3**–**6**, **C1**, **T1**) constant in genus (e.g. Fig. 11A), to at most 10 central mac (**A3a**, **B1–2**, **T7**) (Figs 16A, 21A, 26A, 31A). The **B2** mac is constant only in *T. bicolorcornuta*, *T. gladiata* and *T. sex*, while the others present intraspecific variations of mac present or absent as **A3a** in *T. diabolica*, **B1** in *T. sex*, and **T7** in *T. gladiata*. Other variations were not reported in the descriptions. In 'm' series of Th II, **m4i** mac was observed as present or absent in *T. raptora*, while **m1i** in *T. bicolorcornuta* can be present or absent as well. In the same segment, the **PmA**–**PmC** group of mac that may be present or absent are: **p1ip2** in *T. sex*, **p2ea** in *T. raptora*, **p1i2** and **p2p** in *T. bicolorcornuta*, and **p2ea2** in *T. gladiata* and *T. sex* (Figs 10A, 15A, 20A, 25A, 30A). Note that these variations in both segments (Th II and Abd IV), only the latter (**p2ea2** in Th II), is variable in more than one species, and for this reason the other variations can help in the species diagnoses.

Other characteristics that were omitted in the descriptions and are now useful for separate the species are: Ant III modificate subapical sens, labral papillae shape,

chaetotaxy of clypeus, ventral head, collophore, manubrial ventral formula and manubrial plate (see Table 1).

Distribution and habitat of *Tyrannoseira*. The genus was so far only found in Brazilian northeastern region, from Ceará (new record), Paraíba, Pernambuco and Rio Grande do Norte states (Fig. 34), Good's biogeographic zone 27 of the Neotropical region (Good 1974). The region climate is tropical with dry season (Aw) and hot semi-arid (BSh), in Atlantic Rainforest and Caatinga biomes, respectively (Kottek *et al.* 2006). These climates are characterized by low humidity and low rainfall volume.

Tyrannoseira is apparently endemic from this region of Brazil, but the delimitation of the genus as well as the selection of microhabitats is still uncertain. However, most of the species were found living over granitic rocks, even during moments of strong solar incidence, surpassing 40°C in Caatinga phytogeographic domain. From Atlantic Rainforest, only *T. bicolorcornuta* (in part) and *T. diabolica* were register. Is important to note the northern Atlantic Rainforest of Neotropical region suffer strong influence of Caatinga, which may result in such occupations from these last two species. These data suggests habitat selection for species of the genus is probably more related to the hot climate of the region than to the biomes, since the species are known only for the type locality (except for *T. bicolorcornuta*).

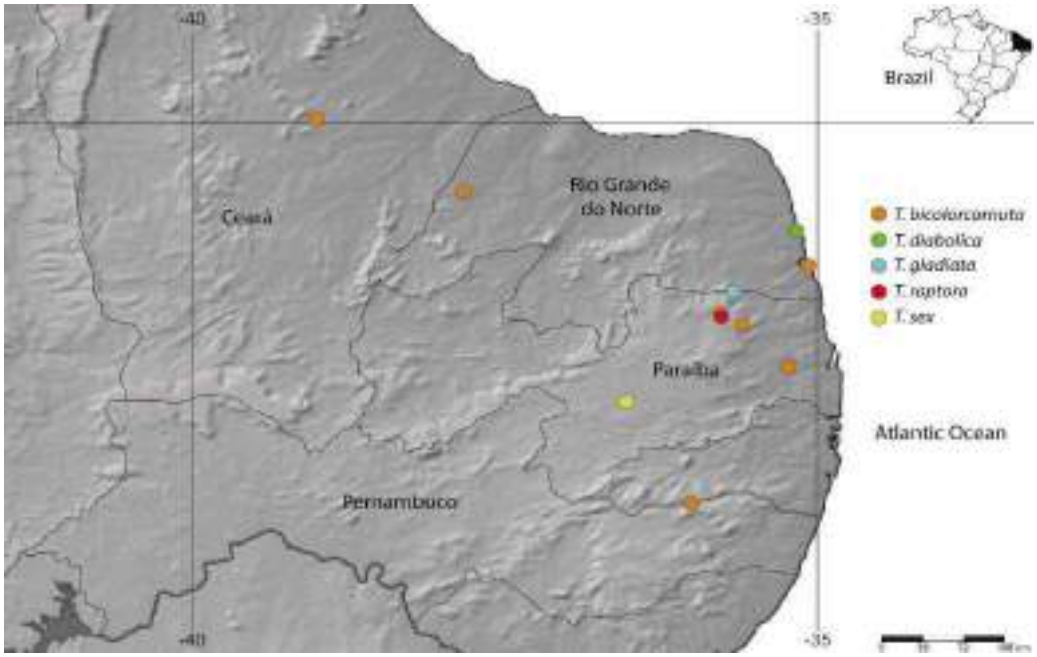

FIGURE 34. Records of *Tyrannoseira* species in Brazilian northeastern region.

TABLE 1. Comparison among species of *Tyrannoseira.*

Characteristics		Species				
		T. bicolorcornuta	*T. diabolica*	*T. gladiata*	*T. raptora*	*T. sex*
Ant III modificate subapical sens		+	–	+	–	–
Clypeal chaetae	l1	ac.	ac.	ac.	ac.	normal
	l2	ac.	normal	normal	normal	normal
	f2	smaller	smaller	smaller	subequal	subequal
	pf1	subequal	subequal	subequal	subequal	subequal
Outer labral papilla		reduced	subequal	smaller	subequal	smaller
Postlabial chaetae	H4	–	–	–	–	+
	J4	–	–	–	–	+
	extra**	1	3	3	2	2
Head dorsal chaetae	A4	–	–	–	–	+
	An3i	+	+	–	+	–
	An3i2	–	–	–	+	–
	Pe mac	2	1	2	3	2
Th II mac	a4+	–	+	+	–	+
	a4i	–	+	+	–	+
	m1i	+/–	–	+	–	+
	p1i2	+/–	–	+	+	+
	p1ip	+	+	+	–	+
	p1ip2	–	–	–	–	+/–
	p2p	+/–	+	+	+	+
	p2ea	+	+	+	+/–	+
	p2ea2	–	–	+/–	–	+/–

Th III mac	a3	–	+*	–	–	–
	a6	–	+	–	+	–
	m6p	+	–	–	–	–
Abd II chaeta	a2p	–	–	–	–	+
Abd III chaeta	p3	mic	mic or –	–	fan	mic
Abd IV mac	A3a	–	+/–	–	–	–
	B1	–	–	–	–	+/–
	B2	+	–	+	–	+
	Ee10	+	+/–	+	+	+
	F1p	+	+/–	+	+	+
	Fe2	–	+	–	+	+
	Sens	8	4	6	7	6
	mes posterior	4	4	5	5	4
Trocanteral organ		19	18	26	27–31	23–28
Number of femur I spines in males		9–19	6–8	13–24	10–15	8–11
Number of tibiotarsus I spines in males	proximal	5	4	4	6–8	5
	distal	5	5	5	4	5
Collophore anterior chaetae	spine-like	3	4	3	3	3
	ac.	4	4	4	4	6
	distal	2 mac	2 (1 mac)	2 (1 mac)	2 mac	2 (1 mac)
Collophore posterior Chaetae	ciliate	–	–	1	–	1
	spines	3	1	3	3	2

Lateral flap of collophore	11C, 5S	7C, 7S	12C, 5S	8C, 6S	5C, 6S
Manubrium ventral formula	1, 0, 0, 2/2, 12	1, 0, 2, 0/2, 12	1, 2, 2, 2/4, 10	1, 0, 0, 2/4, 12	1, 0, 2, 2/4, 12
Manubrial plate	4 chaetae, 3 psp	4 chaetae, 3 psp	5 chaetae, 3 psp	4–5 chaetae, 2 psp	4 chaetae, 2 psp

Notes: Symbols used to represent the morphological characteristics: (mac) macrochaeta; (mic) microchaeta; (fan) fan-shaped accessory chaeta; (C) ciliated chaeta; (S) smooth chaeta; (r) reduced chaeta; (ac.) acuminate chaeta; (psp) pseudopore; (+) present; (–) absent; (*) rare condition; (**) extra mac near ‘J’ series.

Discussion

The sole presence of sexual dimorphism in leg I of males is insufficient to clearly separate *Tyrannoseira* from *Seira* (Cipola *et al.* 2018). The presence of spines on legs I of *Seira* species were observed by Denis (1938), Selga (1957) and Gisin & Da Gama (1962) in *S. domestica*, Altner (1960) in *S. squamoornata*, Dallai (1973) in *S. dagamae*, Zeppelini & Bellini (2006) in *S. mantis*; and Barra (2010) in *S. polysperes* and *S. uwei*, all from Palearctic region. On fore femora of males of these species, there are elongated spine-like mac apically rounded or pointed, present in one longitudinal inner row on median half, while in *Tyrannoseira* there are short spines pointed, thin or thicker, presents on transversal rows in subdistal region (as in Figs 5A–B). Other difference in *Tyrannoseira* is the fore femur of males are strongly enlarged on outer and inner sides and fore trochanter bear one inner spine (absent in dimorphic species of *Seira*). On tibiotarsus I of males, although the modified chaetae have similar distribution (inner-proximal side) and ciliation (finely) which could be homologous, the morphology of such chaetae are different. In Palearctic species they are elongated spine-like mac similar to femur spines, except that are short, baster-shaped and bullet-shaped, respectively in *S. mantis* and *S. uwei*. In *Tyrannoseira* they are slim spines finely ciliate apically rounded (short or larger), with median spines apically curved (as in Figs 5A, C). In generic diagnosis, Bellini & Zeppelini (2011) report tibiotarsus apically curved in *Tyrannoseira*, but this is not a diagnostic character, since it is quite common in most Seirinae (Cipola *et al.* 2018).

The microchaetotaxy morphology of *Tyrannoseira* is revealed here for the first time in details (Figs 2D–J). Mic are apparently similar to *Seira*, smooth or ramificate (see Winkler & Dányi 2017: 511, figs 37, 39), and for this reason their morphology has no generic diagnostic value. However, the macrochaetotaxy pattern between the Palearctic dimorphic *Seira* and *Tyrannoseira* is consistent to separate both groups, and to reaffirm *Tyrannoseira* as an independent genus. In Palearctic dimorphic *Seira* the macrochaetotaxy is dense, with the following mac always present: head **M2**, **S1**, **S5**, **S6i** and **Ps2**; Th II **a5ip**, **p2ep2**, and **PmA** group with more than 5 mac (e.g. with **p1i2p**, **p1ip2**), Th III **a1**–**3**, **p1i**, **p1p**, **p2e**, **p2ea**, **p5**–**6** mac and **m1** mic present. Still, Palearctic dimorphic *Seira* presents on Abd I at least 6 mac (**a3**, **m2i**–**2**, **m3**, **m4i**–**4**), Abd II with **a3** (present or not) and **m3ep** mac, and Abd IV with **A4**, **A6**, **Ae7** and **Ee7** mac (see Cipola *et al.* 2018). In *Tyrannoseira*, all these dorsal mac are absent, therefore the macrochaetotaxy is typically reduced (as in

Figs 8C, 10–11). In addition, *Tyrannoseira* also have on Abd III one extra lateral mac (**p6e**), which so far was not observed any other Seirinae (Christiansen & Bellinger 2000; Bellini & Zeppelini 2008a, 2008b; Soto-Adames 2008; Barra 2010; Baquero *et al.* 2014, 2015; Bernard *et al.* 2015; Godeiro & Bellini 2014, 2015; Cipola *et al.* 2014a, 2014b, 2018).

The Abd I–IV formula with 0, 3 and 1 central mac of *Tyrannoseira* is also present in some *Seira* species as *S. paucisetosa* Jacquemart, 1980 (in 1980a), *S. yemenensis* Barra, 2004, both from Old World, *S. miriane* Arlé & Guimarães, 1981 and *S. glabra* Godeiro & Bellini 2013, from Brazil. *Seira andensis* Jacquemart, 1980 (in 1980b) from Peru is more similar to *Tyrannoseira* by central head with 4 mac (**M1**, **S0**, **S2**, **S3**), and Th II to Abd IV with about 22, 7, 0, 3, 1 and 7 central mac. However, these species present the macrochaetotaxy more reduced than in *Tyrannoseira* in other segments, as in head and Th II–III, Abd III without **p6e** chaeta and males legs without modifications.

Thus, dorsal macrochaetotaxy associate to modified chaetae in legs I of males are exclusive of *Tyrannoseira*, and for this reason this taxon is herein sustained in generic level within Seirinae.

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CAPÍTULO V

Cipola, N.G; Morais, J.W. & Bellini, B.C. 2018. **Taxonomic revision of *Lepidocyrtinus* Börner, 1903 (Collembola: Entomobryidae: Seirinae).** Em preparação para *Zootaxa*, 2018.

Abstract

Here *Lepidocyrtinus* is reviewed and a new diagnosis and generic status is proposed, including a proposal for dorsal chaetotaxy made from postembryonic development. *Ctenocyrtinus* Arlé is confirmed as a junior synonym of *Lepidocyrtinus*. In total, 20 species were transferred to *Lepidocyrtinus*. In addiction, four neotypes were designated and 9 species were redescribed: *L. barnardi* Womersley **stat. nov.** and *L. dayi* **stat. nov.** Yosii from South Africa, *L. voeltzkowi* Börner **comb. rev.** from Madagascar, and *L. diamantinae* Godeiro & Bellini **comb. nov.**, *L. harena* Godeiro & Bellini **comb. nov.**, *L. nigrans* Arlé **comb. nov.**, *L. paraibensis* **comb. nov.**, *L. prodigus* Arlé **comb. nov.** and *L. pulcher* **comb. rev.** from Brazil. Here 15 new species are described and illustrated: 4 from Africa, 4 from Madagascar and 7 from Brazil. *Lepidocyrtinus* now has 44 species in the world (about 20% of Seirinae species), 27 in African continent and 17 in South America. A key to all species is provided.

Key words: chaetotaxy, new generic status, new species, *Seira*, tergal homology, taxonomy.

Introduction

Lepidocyrtinus was firstly proposed by Börner (1903) as a subgenus of *Lepidocyrtus* Bourlet, 1839 to allocate one sole species *Lepidocyrtus* (*L.*) *annulicornis* Börner, 1839 from Nyasa Lake (as Nyassa), located among Malawi, Mozambique and Tanzania. Börner (1903) diagnosis for the genus established: mesonotum slightly projected, third and fourth antennal segment annulated, scales apically rounded or pointed, and facate mucro. Börner (1908) still described another African species and synonymized *Lepidocyrtinus* with *Mesira* Scherbakov, 1898, which is currently a junior synonym of *Seira* Lubbock, 1870.

Afterwards Womersley (1934) proposed for the first time the generic status for *Lepidocyrtinus* and describe two more species from South Africa: *L. capensis* Womersley, 1934 and *L. barnardi* Womersley, 1934. Yosii (1959) studying species of *Seira* from Africa South, transferred *Lepidocyrtinus* to *Seira* due the shape of mucro (falcate) and redefined the subgeneric diagnosis based in abdominal segment fourth with with 3+3 bothriotricha

and dens with blunt chaetae. Still in this work, *Seira* (*Lepidocyrtinus*) *annulicornis* (Börner) from Table Mountain (Cape Town) was redescribed and five more species were included in the subgenus. Independently in the same year, Arlé (1959) proposed a new genus from Brazil, *Ctenocyrtinus* to host two new species with blunt chaetae on dens: *C. nigrans* and *C. prodigus*. plus *C. prodigus xinguenguis* as a subspecies.

In the next year, Gisin (1960) synonimized *Lepidocyrtinus* with *Seira* without any justification, because none of European species fit the characteristics established by Yosii (1959). Salmon (1964) disregarded this taxonomic change and resurrected *Lepidocyrtinus* as its generic status, caracterized by fourth antennal segment annulated and shorter than body, 8 eyes per side of head, mesonotum not projected, scales apically rounded or obtusely pointed prensent on body and dens, and falcate mucro. Coates (1968), in the other hand, studied 23 *Seira* species from Africa and considered the diagnosis of *Lepidocyrtinus* inconsistent and synonymized it with *Seira* once again, even though several of those species presented characteristics of *Lepidocyrtinus*, specialy blunt mac on dens (*sensu* Yosii 1959).

Ctenocyrtinus remained as genus until Yoshii & Suhardjono (1989) proposed *Lepidocyrtinus* as a senior synonym. Yoshii & Suhardjono (1992a) resurrected *Lepidocyrtinus* as subgenus of *Seira*, and *Austroseira* Yoshii & Suhardjono, 1992 (in 1992a) was proposed as other subgenus that differed from *Lepidocyrtinus* only by the number of blunt chaetae on dens (Yoshii & Suhardjono 1992a). Later, Christiansen & Bellinger (2000) considered *Lepidocyrtinus* and *Ctenocyrtinus* as synonyms of *Seira*, as well as Soto-Adames *et al.* (2008), the later including *Austroseira* as another junior synonym of *Seira*.

Historically we note taxonomic conflicts among similar genera (e.g. dens with blunt chaetae) on disjunct continents, *Lepidocyrtinus* from Africa and *Ctenocyrtinus* from America. Currently, in Africa there are at least 14 species with characteristics compatible to *Lepidocyrtinus* (Yosii 1959; Coates 1968), while in Brazil there are at least 9: *C. nigrans* Arlé, 1959, C. *prodigus* Arlé, 1959, *C. xinguenguis* Arlé, 1959, *L. pulcher* Handschin, 1924, *S. pseudoannulata* Bellini & Zeppelini, 2008, *S. diamantinae* Godeiro & Bellini, 2015, *S. harena* Godeiro & Bellini, 2014, *S. primaria* Godeiro & Bellini, 2014 and *S. dapeste* Santos & Bellini, 2018. From these American species, the first four have never been revised using the type material or any specimens from theirs type locality, therefore most of its morphology is unknown, mainly chaetotaxic elements. Consequently,

descriptions and identifications provided by Christiansen & Bellinger (2000) may be mistaken, since the authors suggest that the color patterns (e.g. *C. nigrans* and C. *prodigus*) and antennae length (*C. prodigus* and *C. xinguenguis*) may be variations of a single species. This suggests the morphology of most species of *Lepidocyrtinus* and *Ctenocyrtunus* need to be better studied and revealed to minimize errors in comparisons among species.

Herein *Lepidocyrtinus* is reviewed and a new diagnosis and generic status is proposed, including a proposal for dorsal chaetotaxy made based on postembryonic development. In addition, 20 species are transferred to *Lepidocyrtinus*, 9 of them are redescribed and 15 new species are described from Africa and South America. Finally, identification keys for species are provided.

Material and methods

Specimens were preserved in ethanol, clarified with Nesbitt's solution (HCl + C2H3Cl3O2 + distilled water), and latter mounted on glass slides in Hoyer's medium following the procedures described by Jordana *et al.* (1997). Specimens were photographed in ethanol gel using a stereomicroscope (M165C) attached to a DFC420 digital camera. Photographs were digitally corrected using Application Suite V3.4.1.
Map of species locality were made after Shorthouse (2010). The examined material is deposited at the following institutions: Instituto Nacional de Pesquisas da Amazônia (INPA), Universidade Federal do Rio Grande do Norte (CC/UFRN), Museu Nacional do Rio de Janeiro (MNRJ), Museu de Zoologia da Universidade de São Paulo (MZUSP), Entomological Collection "Prof. J.M.F. Camargo", Universidade de São Paulo (RPSP), Brasil; Natural History Museum of Los Angeles County (NHMLA), California Academy of Sciences (CAS), USA; and Iziko South African Museum (SAM/IZIKO), Cape Town.

The terminology used in descriptions follows: clypeal chaetotaxy after Yoshii & Suhardjono (1992b), labral chaetotaxy after Cipola *et al.* (2014a), labial chaetotaxy after Gisin's system (1967) plus Mari Mutt (1986) labels to **a1**–**5** chaetae for anterior row, labial papilla and maxillary palp after Fjellberg (1999); postlabial chaetotaxy after Chen & Christiansen (1993); subcoxae outer chaetotaxy after Yosii (1959); tibiotarsal chaetotaxy after Nayrolles (1988) adapted of Zhang & Deharveng (2015a); unguiculus lamellae after

Hüther (1986); chaetotaxy of the male genital plate after Christiansen (1958), and ventral formula of manubrium chaetotaxy after Christiansen & Bellinger (2000).

Homology and dorsal chaetal nomenclature

Dorsal head chaetotaxy follows Mari Mutt (1979) adapted from Jordana & Baquero (2005) and Soto-Adames (2008), with labels to nine different series: antennal **An**, anterior **A**, medio-ocellar **M**, interocellar **IO**, sutural **S**, post-sutural **Ps**, postoccipital anterior **Pa**, postoccipital media **Pm**, postoccipital posterior **Pp**, and postoccipital external **Pe**. This system is based respectively in *Dicranocentrus* Schött, 1893, *Entomobrya* Rondani, 1861 and *Seira* genera.

Dorsal tergal chaetotaxy presents three transverse rows of primary chaetae (except to Abd IV): **a** (anterior), **m** (median) and **p** (posterior), which follows Yosii (1956), Szeptycki (1979) and Soto-Adames (2008), based in Poduromorpha, Entomobryoidea and *Seira*, respectively. This system was proposed to immature to adult stages and represents **a**, **m** and **p** plus a number for primary chaetae, which can be followed by anterior (**a**), internal (**i**), posterior (**p**) and external (**e**) for secondary chaetae (Szeptycki 1979). The specialized chaetae (S-chaetae) of thorax and abdomen are labeled as anterolateral sens (**al**), anterosubmedial sens (**as**) and accessory sens of posterior row chaetae (**acc.p**), and follows Zhang & Deharveng (2015b). Symbols used to depict the chaetotaxy are presented in Figure 10. Dashed lines indicate the head series, and the relation of the secondary to primary chaetae of the trunk. Chaetae of uncertain homology are followed by a question mark (?); polymorphic chaetae mostly as macrochaetae is marked with "*", polymorphic chaetae rarely as macrochaetae is marked with "§", and chaetae not marked is apparently equaly polymorphic. All dorsal chaetotaxy given to the left side of body.

Abbreviations: Abd–abdominal segment(s), Ant–antennal segment(s), ai–antero-intern lamella, ae–antero-extern lamella, pi–postero-intern lamella, pe–postero-extern lamella, mac–macrochaeta(e), mes–mesochaeta(e), mic–microchaeta(e), psp–pseudopore(s), Th–thoracic segment(s), ms–specialized microchaeta(e), sens–specialised ordinary chaeta(e).

Taxonomy

Family Entomobryidae Schäffer, 1896 *sensu* Hemming, 1957

Subfamily Seirinae Yosii, 1961 *sensu* Zhang & Deharveng, 2015b

Genus *Lepidocyrtinus* Börner, 1903 stat. rev.

Lepidocyrtus (*Lepidocyrtinus*) Börner, 1903: 154. Type species: *Lepidocyrtinus annulicornis* Börner, 1903: 154, 179 (orig. desig.).
Lepidocyrtinus; Börner, 1908: 55 synonymized with *Mesira* Scherbakov, 1898.
Lepidocyrtinus; Womersley, 1934: 460 (stat. gen.)
Seira (*Lepidocyrtinus*); Yosii, 1959: 10 (stat. subgen.).
Lepidocyrtinus; Gisin, 1960: 234 synonymized with *Seira* Lubbock, 1870.
Lepidocyrtinus; Salmon, 1964: 133 (stat. gen.).
Lepidocyrtinus; Coates, 1968: 436 synonymized with *Seira* Lubbock, 1870.
Seira (*Lepidocyrtinus*); Yoshii & Suhardjono, 1992a: 24 (stat. subgen.).
Lepidocyrtinus; Christiansen & Bellinger, 2000: 39 synonymized with *Seira* Lubbock, 1870.

Ctenocyrtinus Arlé, 1959: 171, synonymized by Yoshii & Suhardjono, 1989: 35.
Austroseira Yoshii & Suhardjono, 1992a: 23, synonymized by Soto-Adames *et al.* 2008: 512.

Typological note. Oudemans (1890: 87), described *Sira annulicornis* from Java, Indonesia, but typical features of *Lepidocyrtinus* (e.g. falcate mucro, blunt mac on dens, etc.) were not reported to this species, so the descripition does not make it clear if specimens of *Sira annulicornis* belong to any group of Seirinae. In addition, Börner (1903) in the original description clearly reports characteristics of *Lepidocyrtinus*, as scales shape, Ant IV annulated, ungues outer side with a pair of large laterobasal teeh and falcate mucro. For this reason, we considered as the valid description to *L. annulicornis* Börner's work (1903) (see Ellis & Bellinger, 1973: 27).

Diagnosis. Scales heavily ciliate present on body and appendages (Figs 1C, 2A, E, 5A, 6C, 7A–B, 9A). Tergal mac finely ciliate and apically foot-shaped, smooth mic distally ramificate or unramificate (Figs 2A, D, 5E, 10). Antennae with 4 segments (Fig. 13); Ant IV annulated and with apical bulb; Ant III generally not annulated (Figs 1A–B). Eyes 8+8; head dorsal macrochaetotaxy generally lacking postoccipital mac (except **Pa5**) (Fig. 14F);

1 subantennal and 1 post-ocellar bothriotrichum present (Figs 2A–C, 3). Prelabral chaetae ciliate or smooth, bifurcated or simple (Figs 3, 14D, 18B). Labral **p0** chaeta with or without median filament (Figs 3, 18B). Labral inner papillae generally conical, labral outer papillae generally absent (Figs 22C, 125C). Th II generaly projected anteriorly and with one anterior mac group (**a5** group), sometimes with numerous mic at apex, **p5** always mic (Fig. 5A, 116A). Th II–Abd V with ms and sens formulae 1, 0| 1, 0, 1, 0, 0 and 1, 1 | 0, 2, 2, +, 3, respectively (Figs 5C–D, 15–16). Abd IV well developed, much longer than the Abd III length in midline (Fig. 13). Abd II–IV bothriotrichal formula 2 (**a5**, **m2**), 3 (**a5**, **m2**, **m5**), 3 (**T2**, **T4**, **D3**) (Figs 15D–16B). Abdominal bothriotricha with accessory chaetae distally enlarged and heavily ciliate (Figs 5B–C, 10). Tibiotarsus normal or subdivided, outer side with large chaetae apically acuminate and inner side with mac weakly ciliate (Figs 6A, 26E). Ungues outer side with a pair of large laterobasal teeth and one unpaired proximal tooth (Figs 6B–D). Collophore anteriorly generally with proximal smooth spine-like chaetae and spines posteriorly (Figs 7A, C–D). Male genital plate circinate and with smooth chaetae (Fig. 8). Manubrial plate and dens dorsally generally with blunt mac (Figs 9A–C). Mucro falcate without basal spine (Figs 9D, 12E).

Morphological definition of Lepidocyrtinus

Dorsal chaetae and structure

Bothriotricha (Figs 2A–C, 3, 5B–C, 10). Thin and densely ciliate by elongated cilia, short on head (1 subantennal and 1 post-ocellar) and elongated on Abd II–IV.

Bothriotrichal accessory chaeta (Figs 5B–C, 10). Heavily ciliate on distal two thirds or more, with fringed aspect and present on Abd II–IV.

Mac (Figs 2A, 10). Finely ciliate and apically foot-shaped mac present on dorsal head and Th II to Abd V.

Mes (Figs 2A–B, 10). Heavily ciliate and apically acuminate present on body, generally in Abd IV.

Mic (Figs 2D, 5B–C, E, 10). Smooth, apically acuminate and with similar sizes and with 1–5 ramifications on distal half, present on head and AMP series of Th II to Abd V. In **A** and **M** series of head mic are heavily ciliate and apically acuminate (Fig. 2B).

Ordinary sens (Figs 5B–E, 10). Smooth and apically rounded with similar sizes (type I) present on Th II–III (**al**), Abd II–III (**as**, **acc.p6**), Abd IV (**as**, **ps**) and Abd V (**as**, **acc.p4**, **acc.p5**), and more (Type II) present on Abd IV .

Psp (Figs 10, 15–16, 17A–C, 49–50). Small, circular, smooth concavity with a narrow opening in the edges present centrally or more rarely in other parts on Th II–Abd IV, coxae, manubrial plate and dens dorsally.

Specialized microchaetae – **ms** (Figs 5C–D, 10). Small, smooth and distally striate with rounded apex present on Th II, Abd I and III.

Spine (Figs 1C, 4C, 7D). Smooth, small and apically pointed present on Ant I laterally, **r** chaeta of basomedian labial field, and collophore posteriorly.

Scales (Figs 2A). Heavily ciliate with short interrupted cilia, generally oval or elongated and apically rounded (rarely truncate, pointed or irregular). The cilia are toothpick-shaped and abruptly acuminate at apex. Scales present on Ant I–III, both sides of head, dorsal and lateral trunk, all legs (except pretarsus), anterior collophore and sometimes posteriorly, ventral and generally dorsal manubrium, and dens ventrally.

Head

Antennae with varied length, generally subequal or longer than trunk (Fig. 13); all segments with s-blunt sens of different sizes and weakly to heavily ciliate chaetae (Figs 1A–B, 82A–B); Ant IV annulated with apical bulb apically unilobed, bilobed or trilobed (Figs 1A, 82A); Ant III sometimes annulated, 2 sense rods and 3 spiny guard sens present (Figs 1B, 82B); Ant I with at least 1 dorsal mac surround sometimes by reduced mic, 3 smooth mic at base and spines present or not (Fig. 1C, 43A). Eyes oval and 8+8 with at least 5 interocular chaetae (**q**, **s**, **p**, **r**, **t**) (Fig. 2B). Head dorsal macrochaetotaxy (Figs 14F, 70C, 110D) with 0–4 ‘A’ (**A0**, **A2**–**3**, **A5**), 1–4 ‘M’ (**M1–2**, **M4i–4**), 2–8 ‘S’ (**S0–6**), 1 ‘Ps” (**Ps5**) and 1 ‘Pa’ (**Pa5**) mac, **Pp5** mac or mic, **Pa3**, **Pm3** and **Pp5** rarely mac. Clypeus with chaetae **l**, **fr** and **pf**, chaeta **l1** apically acuminate (Figs 3, 14C). Four prelabral chaetae of subequal size, ciliate or smooth, bifurcated distally or simple, when smooth, eventualy with 1–2 median ramifications (Figs 3, 14D, 18B, 22C, 48D, 57B). Labral formula with 4 (**a1–2**), 5 (**m0–2**), 5 (**p0–2**) smooth chaetae, **a1** normal, **p0** commonly with median filament, **p0–1** or only **p1** larger, others subequal (Figs 3, 18B, 22C, 48D). Inner labral papillae generally conical and outer papillae generaly absent (Fig. 125C), eventually rounded and not projected (Fig. 18C) or even weakly pointed (Fig. 104B). Labial palp with five main

papillae (A–E) plus one hypostomal papilla (H) respectively with 0, 5, 0, 4, 4, 2 guard appendages with small denticles, papilla E with lateral process (**l.p.**) smooth (Figs 3, 4A–B, 23A, 82D). Labium with five smooth proximal chaetae (Figs 4B, 23C, 82D). Maxillary palp with apical appendage (**a.a.**) and basal chaeta (**b.c.**), both weakly ciliate; sublobal plate internally with 3 smooth main appendages, plus 1 small smooth appendage distally (Figs 4D, 23B, 82E). Basolateral and basomedian labial fields with chaetae **a1–5** smooth, **M1**–**2** ciliate, **E** and **L1**–**2** ciliate (common) or smooth, **r** ciliate or spine (Figs 3, 4C, 23C, 53D, 57E, 82F). Postlabial chaetotaxy with **G**, **H** and **J** chaetae ciliate, generally numerous thin posterior chaetae, some larger chaetae, including 1–2 larger basal chaetae (**b.c.**) on cephalic groove (Figs 14G, 18F, 33F, 53D).

Dorsal chaetotaxy

Thorax chaetotaxy. Th II generaly projected anteriorly over head; **a** series with one anterior mac group (**a5** group) formed by secondary chaetae of **a5i**, **a5p** and **a5ip**, plus several other secondary chaetae of uncertain homology; and with numerous ciliate mic at apex; **m** series with mac **m1**–**1ip** and **m2**–**2i2**, **m1ip** and **m2i2** present or absent, **m4i–4p** and **m2i** mac or mic, **m1i2**–**4**, **m4ip**, **m5i**–**5p** mic, **m5p** present or absent; **p** series with **p1**–**1i** and **p2** mac, **p4**, **p5** and **p6**–**6e** mic, **p3** and other secundary chaetae mac or mic; sometimes with an extra series (**mp**) of mic between **m** and **p** series (Figs 5A, 30A, 65, 100A, 116A). Th III, **a** series with **a1**–**6** mac or mic, **a7** mes or mic, **a1a** present or absent; **m** series with **m6** mac or mic, **m7** mes or mic, **m1** and **m4**–**5** mic, **m1** and **m6p** present or absent; **a** series with **p2** mac, **p1** and **p2** (including secondary chaetae), **p5**–**6** mac or mic, **p4** mic, chaetae **p1i**, **p1p**, **p2e** and **p2ea** present or absent (Figs 30B, 38B, 71B, 79B, 111B).

Abdomen chaetotaxy. Abd I, **a** series with **a2** mac or mic, **a1**–**1e**, **a2e**, **a3**, **a5**–**6** mic, **a1e** present or absent; **m** series with **m2i, m3**–**4** mac or mic (**m2** mac generally present), **m5** mic, chaetae **m2i**, **m4** and **m4i** present or absent; **p** series with **p5**–**6** mic (Figs 30C, 49C, 54C, 71C, 79C, 84C, 100C). Abd II, **a** series with **a2** mac (more commonly) or mic, **a3** and **a6**–**7** mic, **a2p** mic or accessory chaeta present or absent; **m** series with **m3** and **m5** mac, **m3e** (present or absent) and **m3ep** mac or mic, **m3ea** and **m6**–**7** mic; **p** series with **p6** mes or mic, **p5** and **p7** mic; bothriotricha **a5** and **m2** with 5–7 and 3–5 accessory chaetae, respectively (Figs 15D, 19D, 30D, 58D, 71D). Abd III, **a** series with **a2** mac, **a1**–**2** accessory chaetae, **a3** and **a6** (present or absent) mic, **a7**–**9** mac, mes or mic; **m** series with

m3 and **pm6** mac, **am6** mac or mic, **m7**–**8** mes or mic, **m9** mes, **m8**–**9** present or absent; **p** series with **p3** mic or accessory chaeta present or absent, **p6** mac or mic (rarely), **p5** mic, **p7i**–**7** and **p8** mac, mes or mic; bothriotrichum **m2** with 4–6 accessory chaetae and bothriotricha **a5** and **m5** with 5–12 accessory chaetae between them (Figs 20A, 25A, 31A, 85A, 122A). Abd IV, **A** series with **A1**–**2** mic, **A3** mac, others mac or mic; **Ae** series with **Ae3–6** mac, **Ae7** mac or mic, all present or absent; **B** series with **B1**–**4** mac or mic, **B5**–**6** mac; **Be** series with **Be2–3** mac or mic, present or absent; **C** series with **C1** and **C4** mac or mic, **C2**–**3** and **C4a** mic, **C4** and **C4a** present or absent; **T** series with **T1** mac or mic, **T3** mic or accessory chaeta, **T5**–**6** mic, **T6** mes or mac (rarely), bothriotricha **T2** and **T4** respectively with at least 3 (**s**, **m**, **T1p**) and 3–6 (**T4a**, **Pi**, **Pe**) accessory chaetae; **D** series with **D1** accessory chaeta, **D1p** and **D2a** mic or accessory chaetae present or absent, **D2** mic, **D3p** mes, bothriotrichum **D3** with or without accessory chaetae; **E** series with **E1** mic, **E2**–**3** and **E4p** mac, **E4** mac or mic, present or absent, **E4p2** mac, mes or mic; **Ee** series with **Ee7** and **Ee10** mac, present or absent; **F** series with **F1** mac or mic, **F2**–**3** mac, **F3p** mes, chaetae **F2p** and **F3p** present or absent; **Fe** series with **Fe1**–**4** mac, **Fe5**–**6** mac or mes, **Fe1**–**3** present or absent. Abd. IV with 3–12 sens (**ps** type I, others type II), and 5–13 posterior mes on transversal row (Figs 50B, 59B, 101B, 112B, 131B). Abd V, **a** series with **a1**, **a3** and **a6** mic or mes, **a5** mac; **m** series with **m2**–**3**, **m5**–**5e** mac, **m5a** and **m5ea** mes or mic, present or absent; **p** series with **p1** mac or mic, **p3**–**6e** mac (Figs 16C, 35C, 45C, 96C).

Legs. Subcoxa I (outer side) with one ciliate chaetae row and at least 2 psp, eventually with an extra row of chaetae anteriorly; subcoxa II with anterior and posterior rows of ciliate chaetae and at least 3 psp; subcoxa III with one ciliate chaetae row and at least 2 psp (Figs 51A–C; 73A–C, 97A–C). Trochanter I–III (anterior side) with some small spines; trochanteral organ with varied number of smooth spine-like chaetae, apically pointed and with different lengths (Fig. 17D). Femur I–III with ciliate chaetae, without any modification or sexual dimorphism (Figs 6A, 13). Tibiotarsus normal or subdivided on distal two thirds (most often only tibiotarsus III), outer side with large chaetae (**e** and **pe** series) apically acuminate and inner side with mac weakly ciliate (**i** and **pi** series) (Figs 6A, 26E). Tibiotarsus outer side distally with 1 tenent hair finely ciliate and apically capitate, inner side of tibiotarsus III with 1 smooth chaeta (Figs 6C–D, 26F). Pretarsus with one minute anterior and one posterior smooth chaetae (Fig. 6D, 26F). Ungues inner side with 3–4 teeth, 2 paired basal, 1 unpaired median, and 1 apical tooth present or absent; outer

side with 3 teeth, 2 paired large laterobasal teeth (apparently concave) and one unpaired proximal tooth (Figs 6B–D, 86E–G, 107E). Unguiculus with 4 lamellae (**ai**, **ae**, **pi**, **pe**), **ai** lamella acuminate or truncate, **pe** lamella acuminate, serrated or smooth and with small proximal tooth, other lamellae smooth and acuminate (**ae** and **pi**) (Figs 6B–D, 26F, 51E, 81D, 86E–G).

Collophore. Anterior side with small smooth spine-like chaetae, normal longer ciliate apically acuminate chaetae (widely distributed on corpus), and at least 2 ciliate mac distally; posterior side with thin ciliate chaetae widely distributed, spines and 1–2 smooth chaetae distally present or not; lateral flap with some distal smooth chaetae and various ciliate chaetae (Fig. 7).

Genital plate. Circinate in males, with about 16 circumgenital smooth chaetae and 3+3 small eugenital smooth chaetae (Fig. 8). Female with two pairs (superior and inferior) of small smooth chaetae, without other modifications.

Furcula. Smaller than trunk length. Manubrium smaller than dens; ventral side with ciliate chaetae formula distinct to each species, subapical chaetae present or absent, apical chaetae always present (Figs 17F, 27B, 32F, 52B, 97F); dorsal side densely covered with ciliate chaetae of different sizes, manubrial plate distally with ciliate chaetae of differents length, 2–3 psp; manubrial plate and dorsal dens commonly with blunt mac finely ciliate and apically nipple-like or weakly ciliate and apically bullet-like or abruptly acuminate at apex (Figs 9, 27C, 46H, 52C). Dens crenulate dorsally with numerous ciliate chaetae of different sizes and some psp (Figs 9A, 88C). Mucro dorsally falcate without basal spine (Figs 9D, 12E).

Remarks. *Lepidocyrtinus* resembles the other Seirinae genera (*Seira* and *Tyrannoseira* Bellini & Zeppelini, 2011) by presence of scales heavily ciliate (Fig. 2E), tergal mic smooth and with ramifications (Fig. 2D), head with 1 subantennal and 1 post-ocellar bothriotricha (Figs 2A, C), Th II–Abd V with ms and sens formula 1, 0| 1, 0, 1, 0, 0 and 1, 1 | 0, 2, 2, +, 3, respectively (Figs 15–16), Abd II–IV bothriotrichal formula 2, 3 and 3 (Figs 15D–16B), bothriotricha accessory chaetae distally enlarged and heavily ciliate (Figs 5B–C), and falcate mucro (see Bellini & Zeppelini 2011; Cipola *et. al.* 2014a, 2014b, 2018c, 2018d). However, *Lepidocyrtinus* is distinct from the other genera by: Th II with one anterior mac group (**a5** group, Figs 5A, 24A), tibiotarsus outer side with large ciliate chaetae apically acuminate (Figs 6A, 26E), and ungues outer side with a pair of large

laterobasal teeth (Figs 6B–D). Other features (not exclusive) can aid in separating them as: Ant IV and sometimes III clearly annulated (normal in *Tyrannoseira* and rarely annulated in *Seira*), macrochaetotaxy of dorsal head lacking postoccipital mac in most species (present in *Tyrannoseira* and most *Seira* taxa), labral outer papillae generally absent (present in *Tyrannoseira* and *Seira*), Th II generally projected anteriorly and **p5** as mic (normal and p5 as mac in *Tyrannoseira* and *Seira*), male legs dimorphism absent (present in *Tyrannoseira* and few *Seira* species), and manubrial plate and dens generally with blunt mac (completely absent in *Tyrannoseira* and *Seira*). Characteristcs such as prelabral chaetae bifurcated and labral **P0** chaeta with median filament are present only in part of *Lepidocyrtinus* species (Fig. 3).

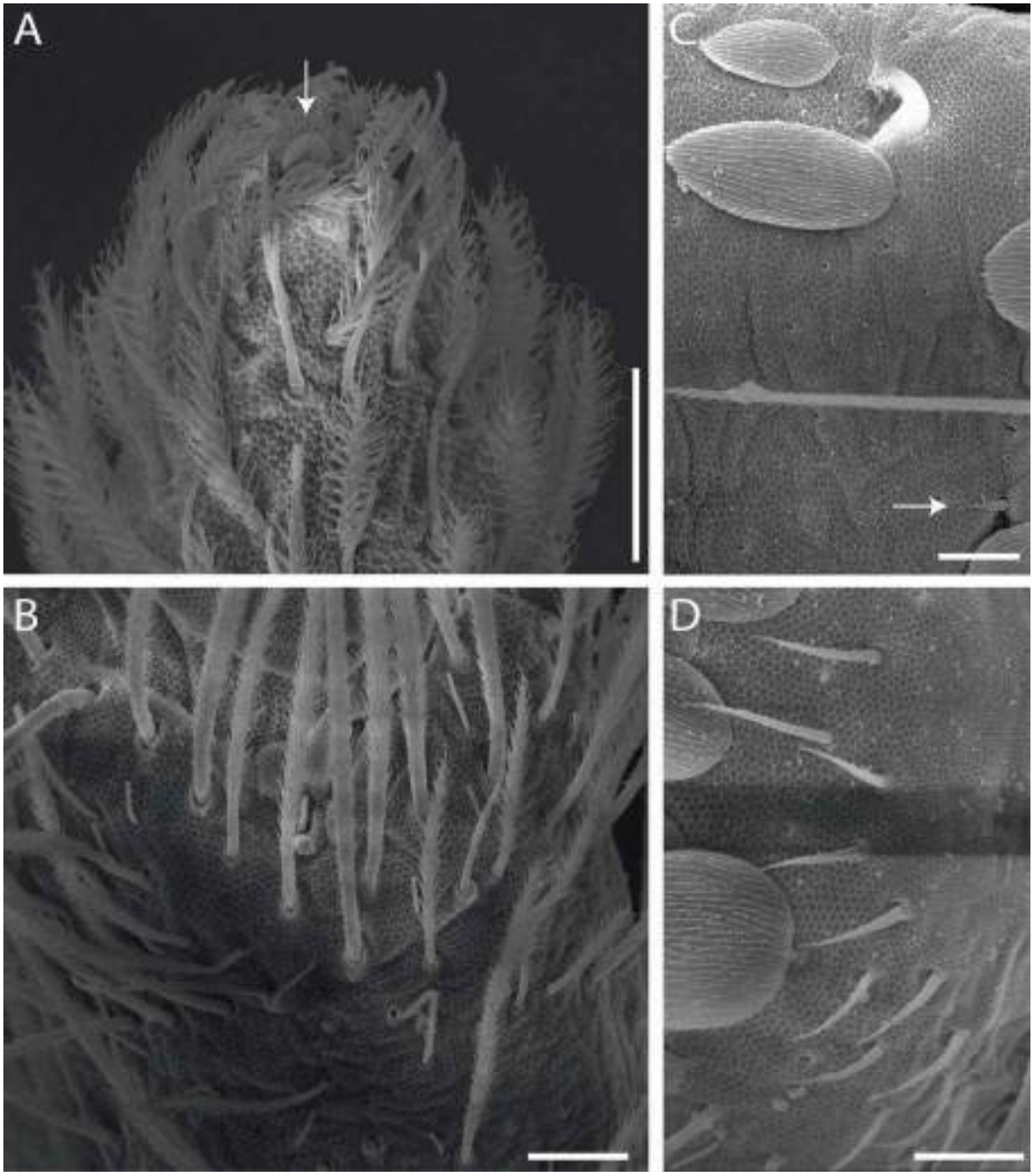

FIGURE 1A–**D.** *Lepidocyrtinus* sp.: antennal segments; **A**, apex of Ant IV, arrow indicate apical bulb; **B**, Ant III apex (lateral side), apical organ omitted; **C**–**D**, Ant I (lateral side): **C**, median part, arrow indicates reduced spine, **D**, proximal part showing smooth mic. Scale bars: 0.01 mm.

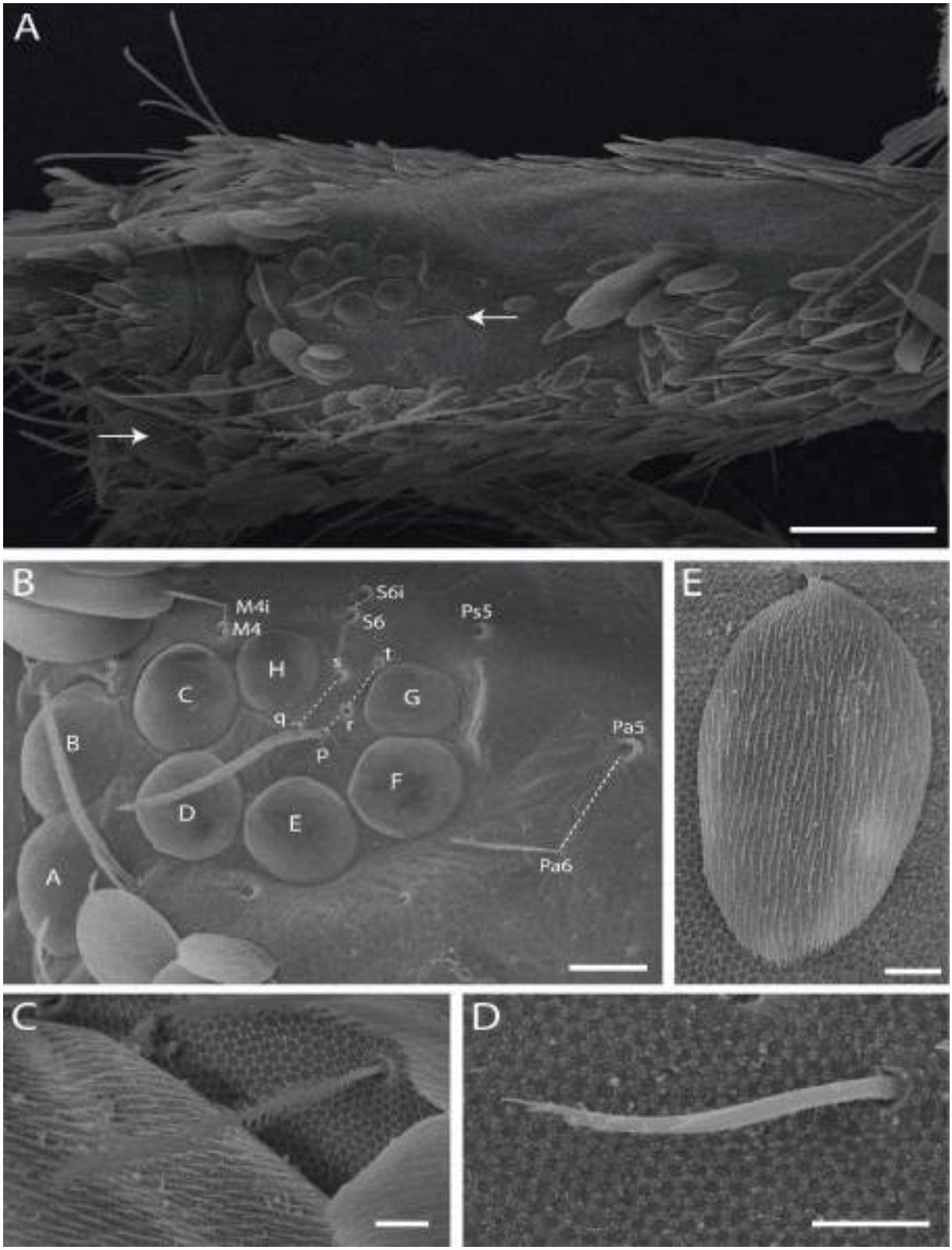

FIGURE 2A–E. *Lepidocyrtinus* sp.: head (left side), **A**, head laterally, arrows indicates subantennal and post-ocellar bothriotricha; **B**, ocellar region, A–H is ocellus, **M4**, **S6i**, **S6**, **Ps5**, **Pa5** and **p** mac, **q**, **s** and **r** mes, **M4i** and **t** mic, and **Pa6** post-ocellar bothriotrichum; **C**, subantennal bothriotrichum; **D**, **Pp6** mic smooth with 4 ramifications on distal half; **E**, scale. Scale bars: **A** (0.1 mm), **B** (0.02 mm), **C**–**E** (0.004).

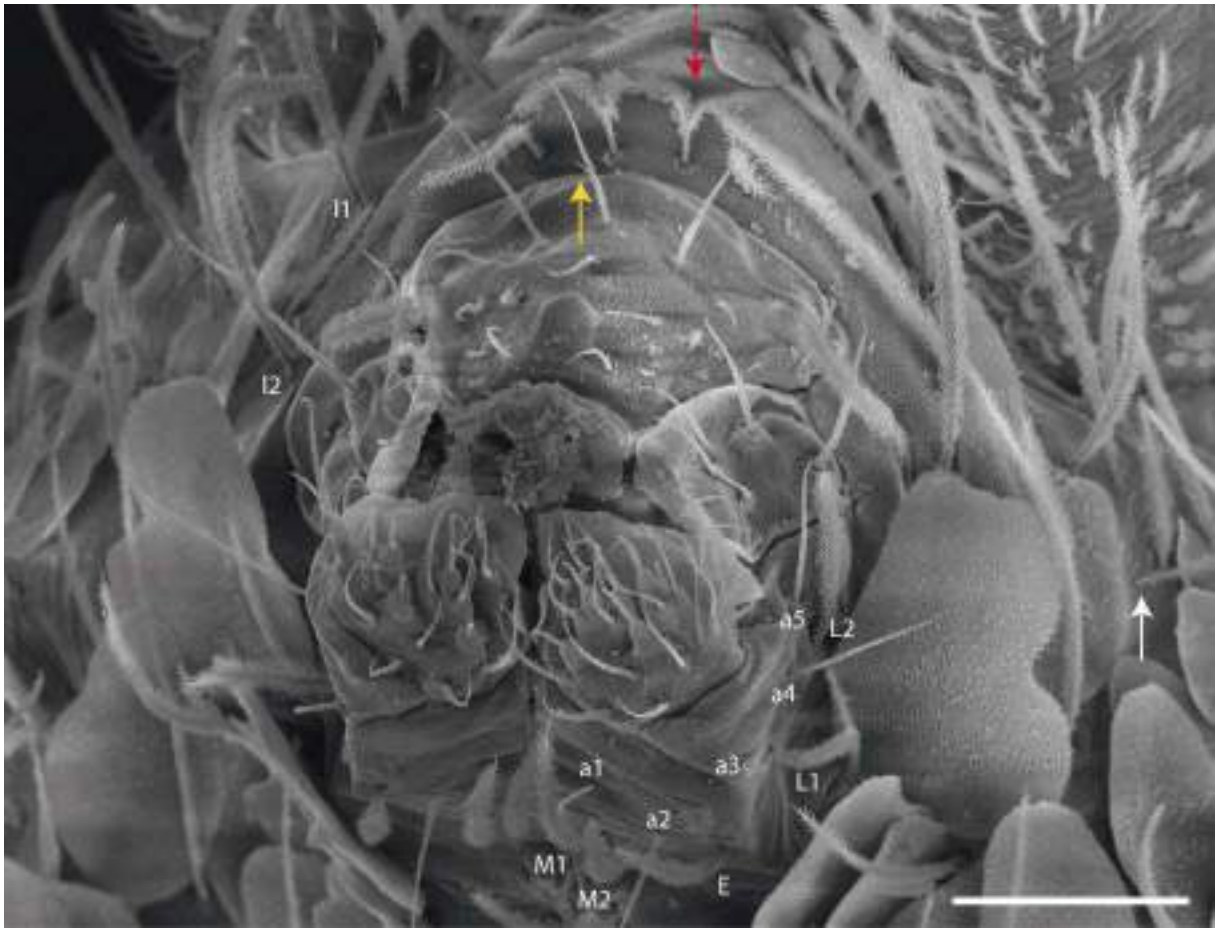

FIGURE 3. *Lepidocyrtinus* sp.: frontal head, **l1** and **l2** clypeal chaetae larger, **a1**–**5** smooth chaetae, **M1**–**2**, **E**, **L1**–**2** ciliate chaetae of basomedian and basolateral labial fields (**r** not show), red arrow indicates prelabral chaetae ciliate and bifurcate, yellow median filament of **p0** labral chaeta, white arrow subantennal bothriotrichum. Scale bars: 0.05 mm.

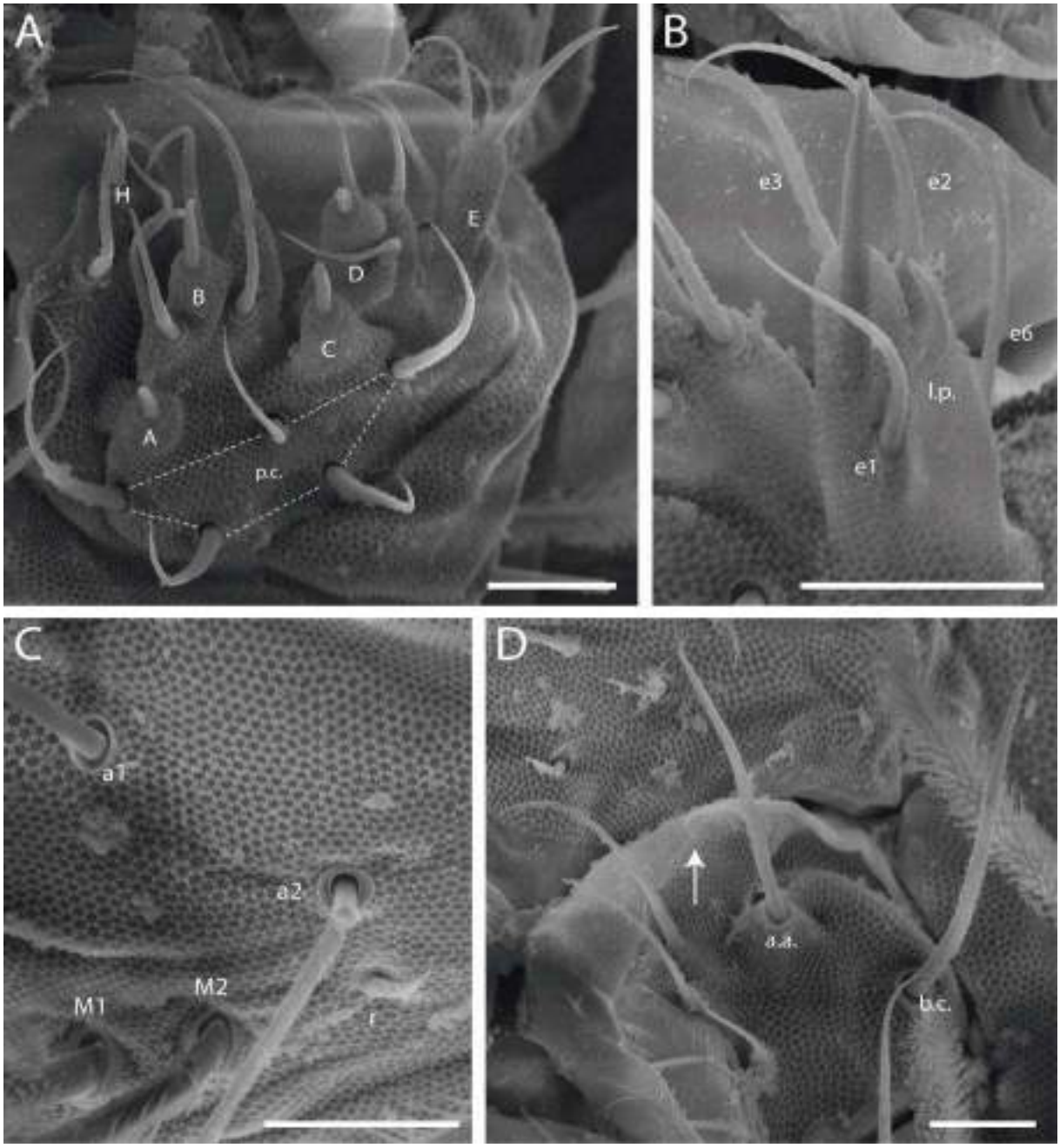

FIGURE 4A–**D.** *Lepidocyrtinus* sp.: mouthparts right side (ventral view); **A**, labial papillae, A–E main papillae and H hypostomal papilla, dashed line indicates proximal chaetae (**p.c.**); **B**, papilla E, e1–3 and e6 is guard appendages, **l.p.** is lateral process; **C**, basomedian labial field internaly, **a1**–**2** smooth chaetae, **M1**–**2** ciliate, **r** reduced spine; **D**, maxillary palp and outer lobe, **a.a.** is apical appendage and **b.c.** basal chaeta, both weakly ciliate, arrow indicates small anterior chaeta. Scale bars: 0.01 mm.

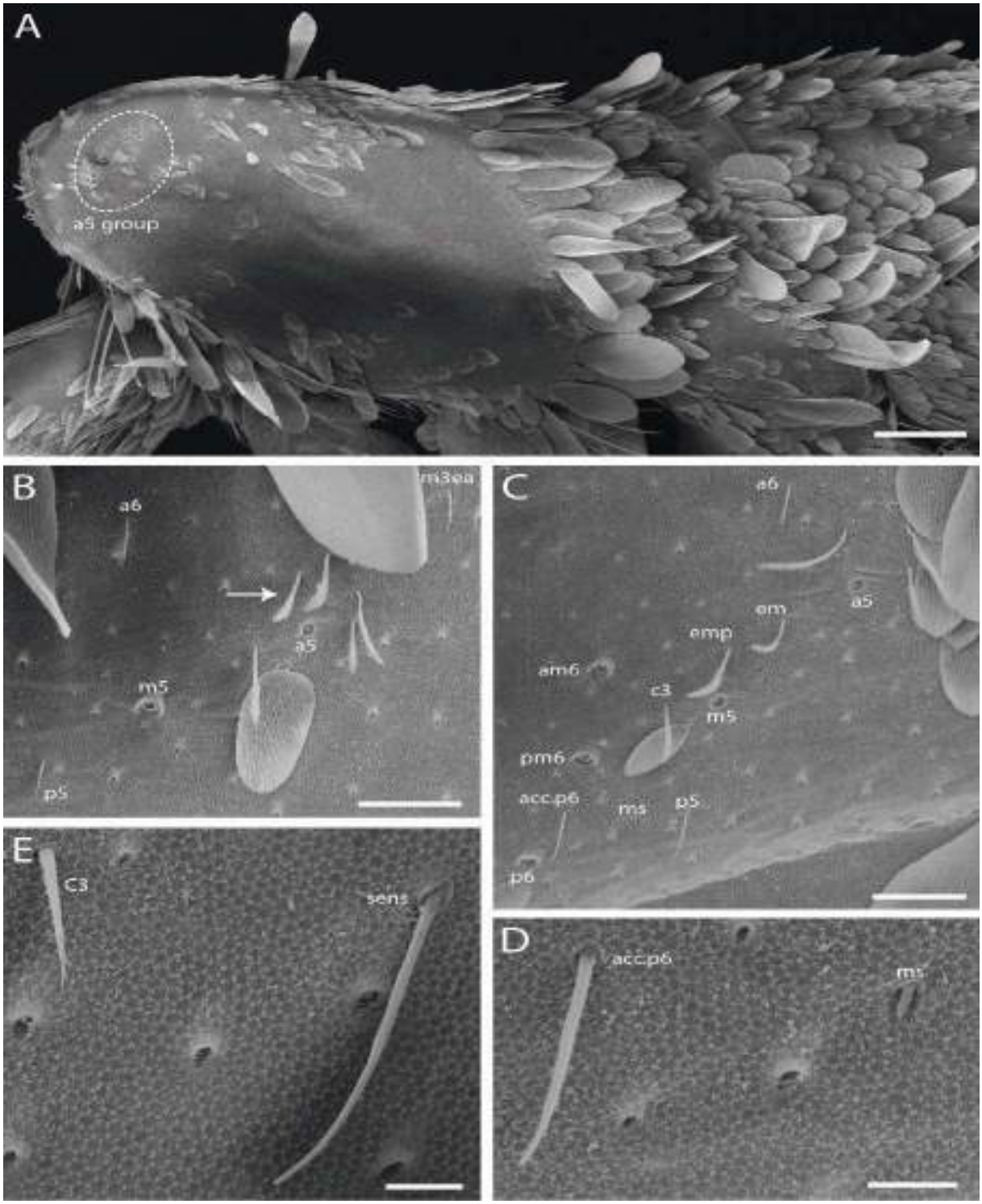

FIGURE 5A–D. *Lepidocyrtinus* sp.: trunk (left side); **A**, Th II–Abd I, dashed lines indicates anterior mac group; **B**, Abd II laterally, **a5** bothriotrichum, **a6**, **m3ea** and **p5** is mic, arrow indicates accessory chaeta heavily ciliate; **C**, Abd III laterally, **a5** and **m5** bothriotricha, **am6**, **pm6** and **p6** mac, **a6** and **p5** mic, **c3**, **em** and **emp** accessory chaeta heavily ciliate, **acc.p6** accessory sens (type I) of **p6** chaeta and **ms** specialized microchaeta; **D**, S-chaetae laterally of Abd III, **acc.p6** accessory sens (type I) of **p6** chaeta and **ms** specialized microchaeta; **E**, Abd IV posteriorlly, **c3** smooth mic with 2 distal ramifications and large sens type II. Scale bars: **A** (0.1 mm), **B–C** (0.02 mm), **D**–**E** (0.004).

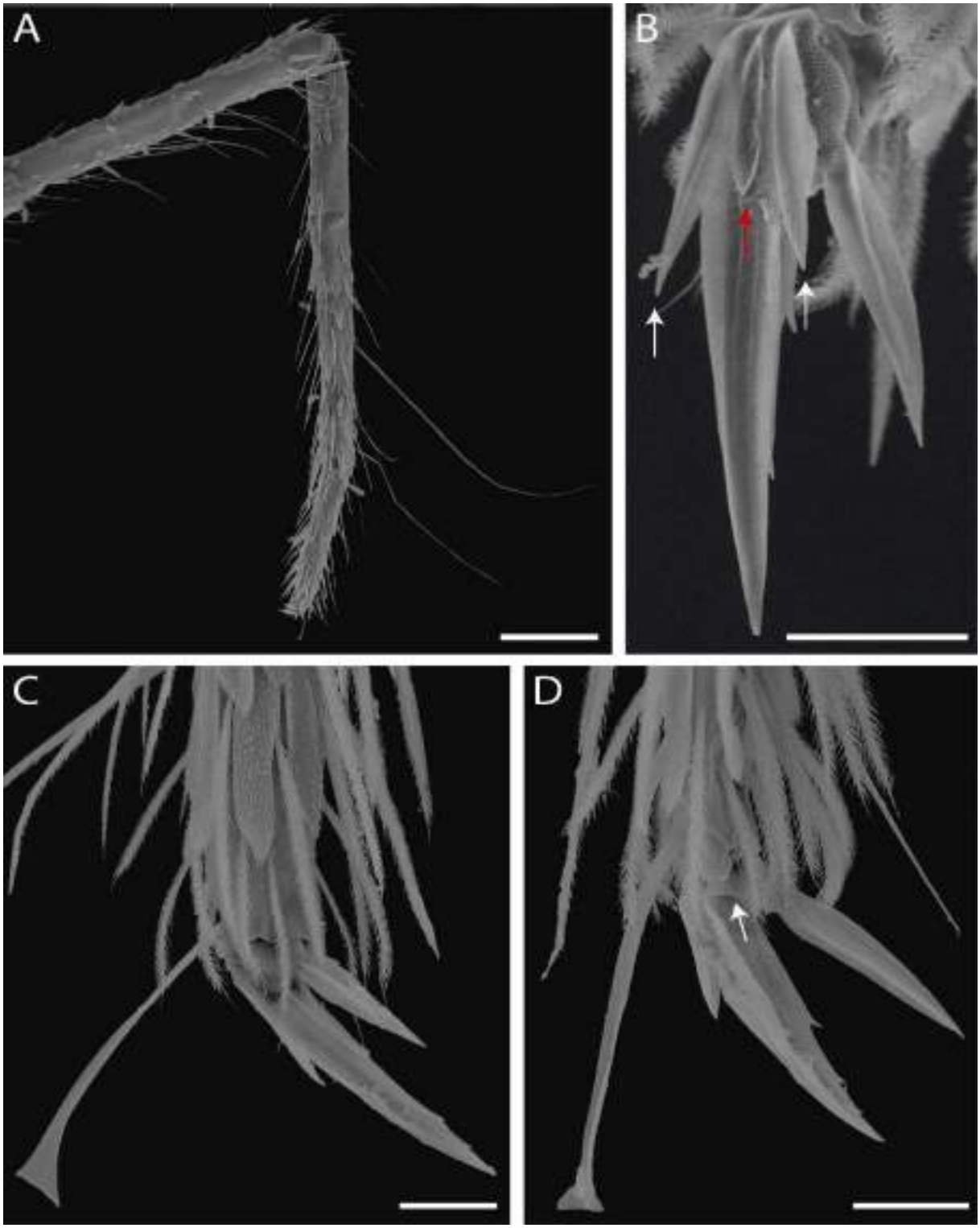

FIGURE 6A–D. *Lepidocyrtinus* sp.: legs; **A**, femur and tibiotarsus III (anterior view); **B**, empodial complex I (outer side), white arrow indicate pair of large laterobasal teeth, red arrow unpaired basomedian teeth apically pointed; **C**, distal tibiotarsus and empodial complex I (posterior side); **D**, distal tibiotarsus and empodial complex III (anterior side), arrow indicate minute pretarsal smooth chaeta. Scale bars: **A** (0.2 mm), **B–D** (0.02 mm).

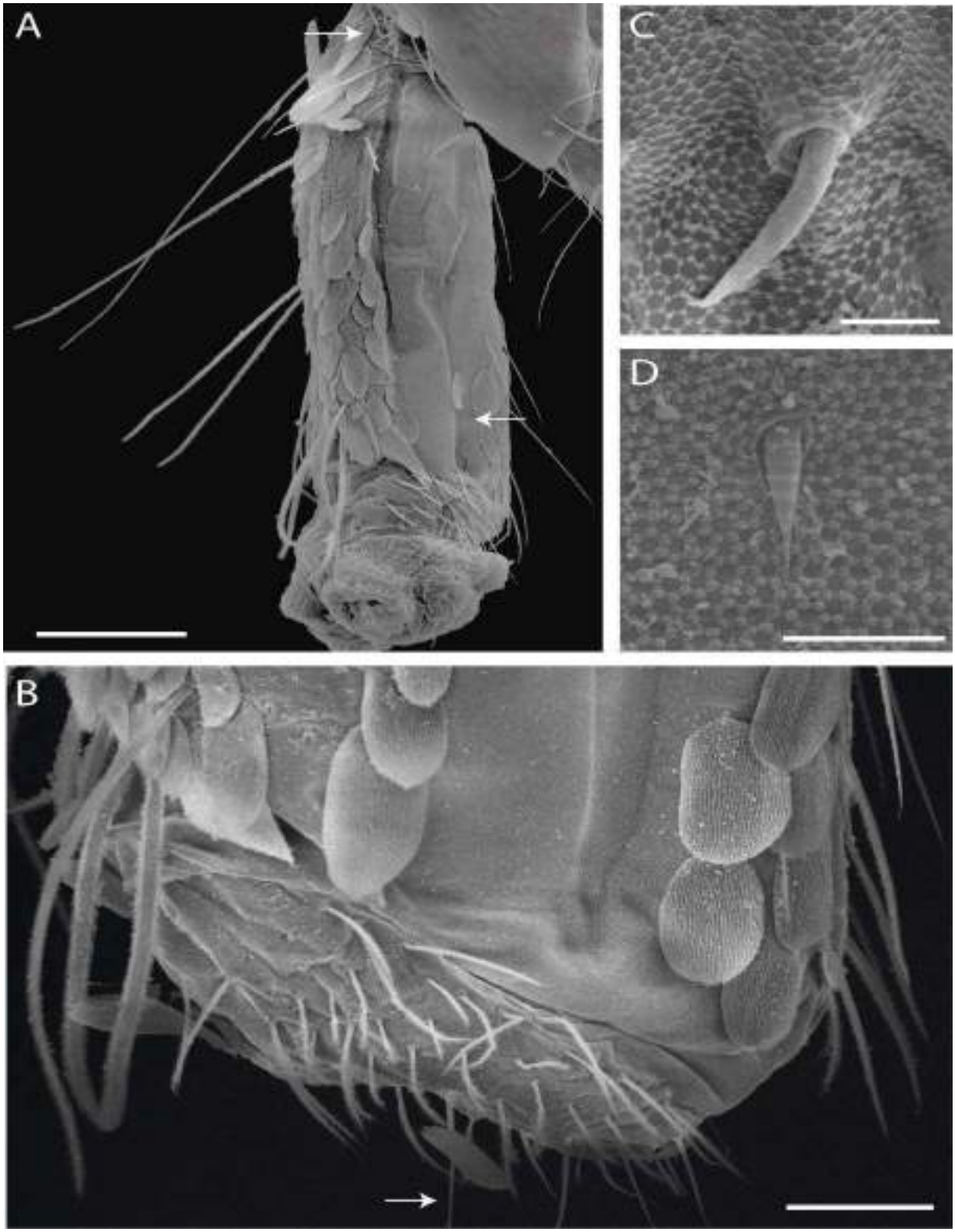

FIGURE 7A–D. *Lepidocyrtinus* sp.; **A**, collophore (lateral view), upper arrow indicates anterior proximal spines, bottom arrow indicates posterior subdistal spine; **B**, collophore distal chaetotaxy (lateral view); arrow indicates smooth chaeta of lateral flap; **C**, proximal spines anteriorly of collophore (left side); **D**, subdistal reduced spines posteriorly of collophore (left side). Scale bars: **A** (0.1 mm), **B** (0.03 mm), **C–D** (0.004 mm).

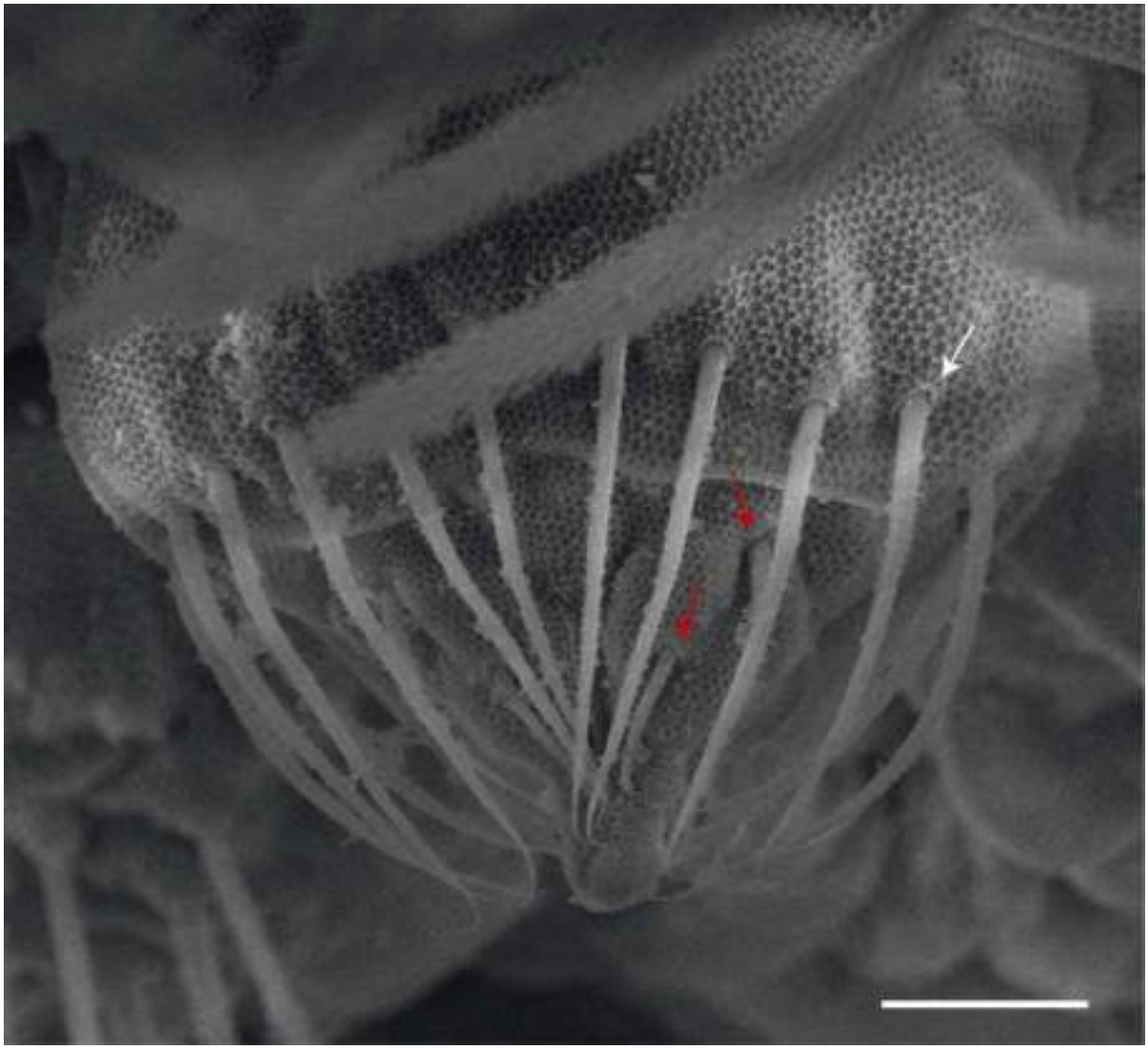

FIGURE 8. *Lepidocyrtinus* sp.; circinate genital plate of male (superior side), white arrow indicates circumgenital chaetae, red arrows eugenital chaetae. Scale bars: 0.01 mm.

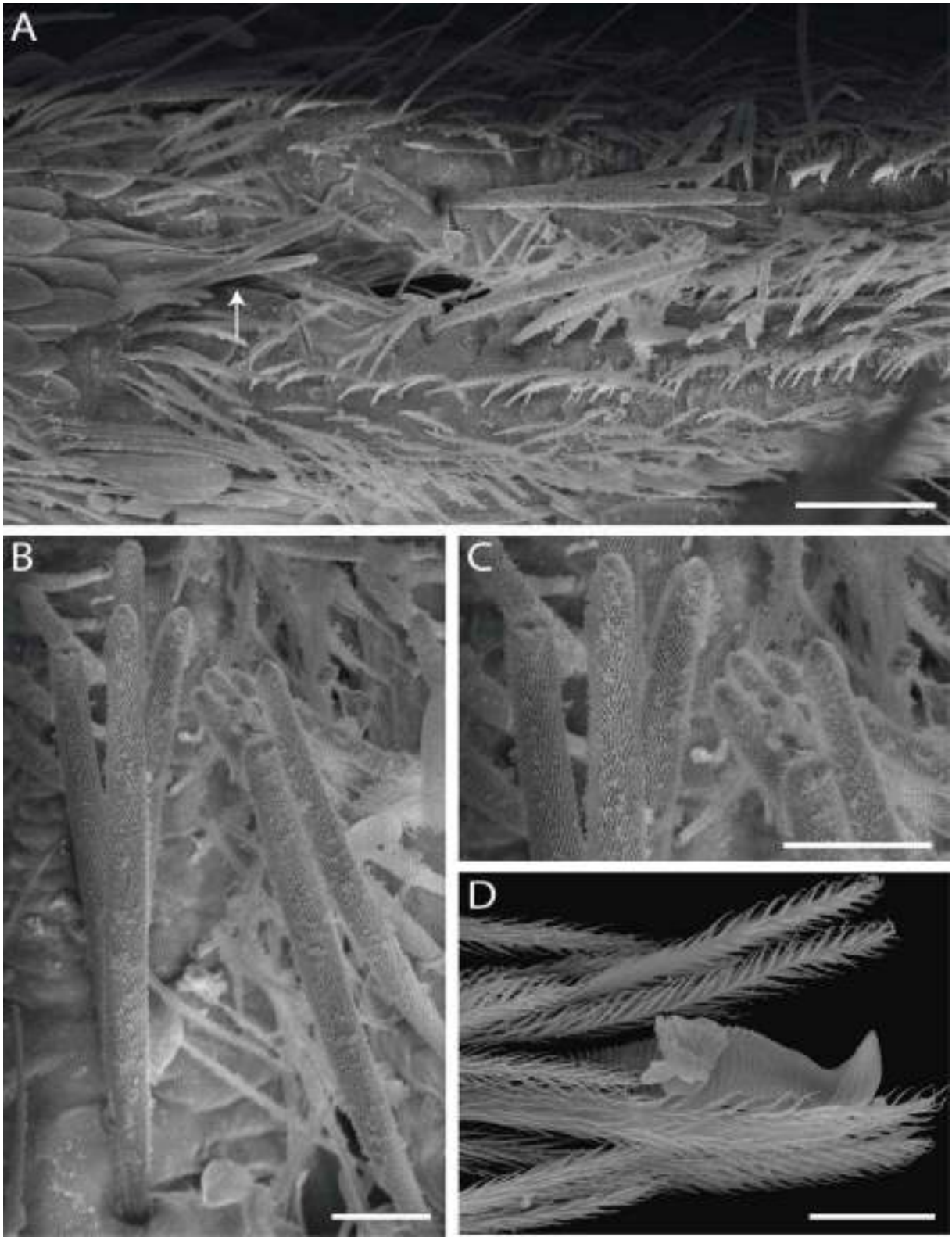

FIGURE 9A–D. *Lepidocyrtinus* sp.: furcula; **A**, distal manubrium and proximal dens (dorsal side), arrow indicates blunt mac finely ciliate and apically nipple-like on manubrial plate; **B**, dorsal dens showing row of blunt mac finely ciliate and apically nipple-like; **C**, apex of blunt mac of dens; **D**, mucro (lateral view). Scale bars: **A** (0.06 mm), **B**–**C** (0.02 mm), **D** (0.01 mm).

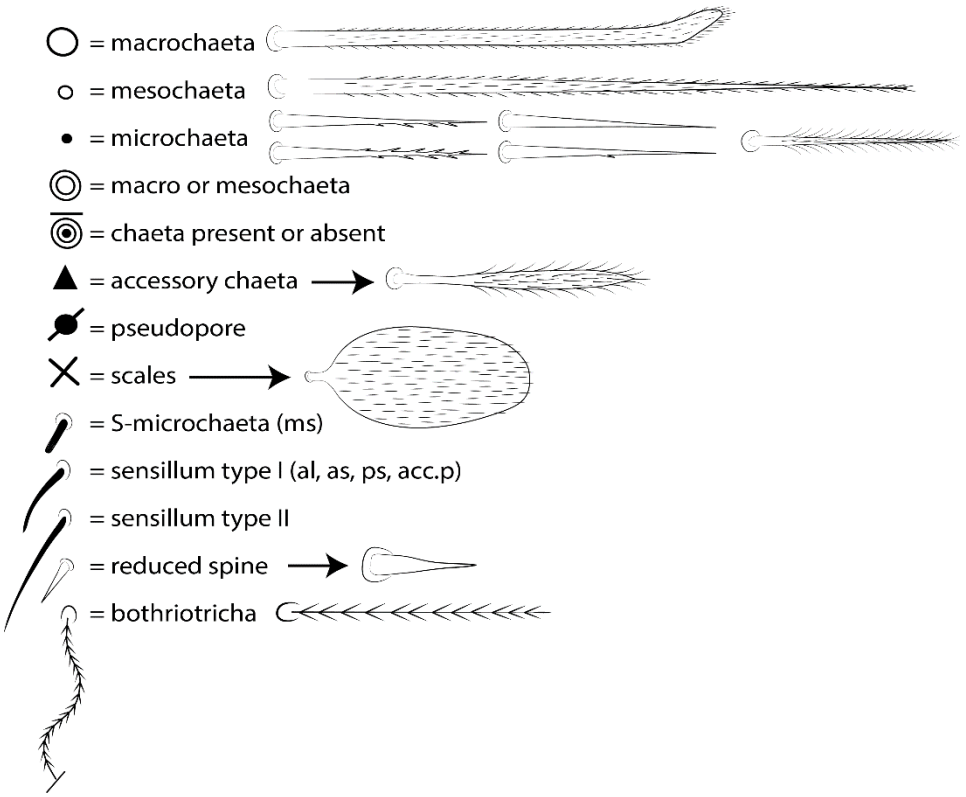

FIGURE 10. Symbols used in chaetotaxy descriptions of *Lepidocyrtinus* species.

African continental species

***Lepidocyrtinus annulicornis* (Börner, 1903) comb. rev.**

Figs 11A–B, 41

Lepidocyrtus (*Lepidocyrtinus*) *annulicornis* Börner, 1903: 154, Mozambique, Lake Malawi (as Nyassa See), (orig. descr.), not examined.

Pseudosira (*Mesira*) *annulicornis* Börner, 1908: 56 (comb.).

Lepidocyrtus annulicornis; Womersley, 1934: 463 (comb.)

Lepidocyrtinus (*Mesira*) *annulicornis*; Denis, 1935: 5, Mozambique, stations: Bas Sangadzé, Vila Pery, Nova Choupanga (comb. and descr.).

Seira annulicornis; Coates, 1968: 449, figs 43-44, Mozambique and Africa South: Pongola and Pretoria (comb.). Coates, 1970: 182, South Africa, Kruger National Park (cat.). Jacquemart, 1974: 7 (compared). Janion-Scheepers *et al.* 2015: 68, Africa South (cat.).

Diagnosis. Body pale white with dark violet pigments on Ant I–IV, proximal leg III, femur and tibiotarsus distally; Th II with 6 median (**m1ip** present) in **m1**–**2** complex and 11 posterior mac (**p3** absent); Th III–Abd II with 9, 5, 4 central mac respectively (Fig 11A); ungues apical tooth present; unguiculus with all lamella acuminate; manubrial plate with 2–3 blunt mac; dens with 4 blunt mac (Fig. 11B) (modified from Börner 1903; Coates 1968).

Remarks. The specimen of *L. annulicornis* described by Yosii (1959) from Cape Town does not present the same morphology of specimens (*sensu* Börner 1903; Denis 1935; Coates 1968) from Mozambique (Fig. 41), and for this reason here is designated *L. riozoi* **nom. nov.** In this sense, the chaetotaxy description of Szeptycki (1979), as well as chaetotaxic interpretation by Soto-Adames (2008) for *Seira annulicornis* (locality not specified) also do not corroborate with the descriptions of Yosii (1959) and Coates (1968), and consequently should not be considered as identity for any species. However, *L. annulicornis* **comb. rev.** differ from these species by body with dark violet pigments on Ant I–IV, proximal leg III, femur and tibiotarsus distally, while *L. riozoi* **nom. nov.** has pigments on Ant III–IV, Ant II and tibiotarsus I–III distally (unknow in Szeptycki's specimens). *Lepidocyrtinus annulicornis* **comb. rev.** differ in chaetotaxy by Th II with 6

median mac in **m1**–**2** complex (5 in *L. riozoi* **nom. nov.** and Szeptycki's specimens) and posteriorly without **p3** mac (present in *L. riozoi* **nom. nov.**). They also differ by Th III with **p1i** mac and **p1i2** mac absent (opposite in *L. riozoi* **nom. nov.**), and dens with 4 blunt mac (9–10 in *L. riozoi* **nom. nov.**).

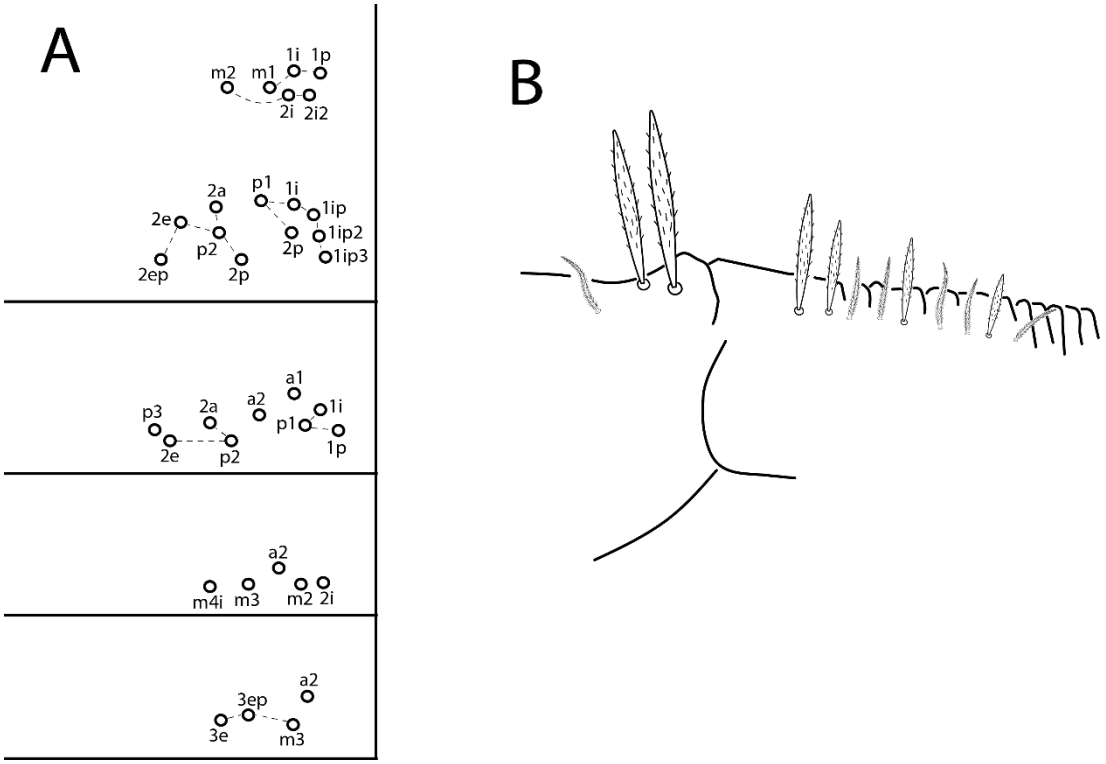

FIGURE 11A–**B.** *Lepidocyrtinus annulicornis* **comb. rev.** (modified from Coates 1968); **A**, chaetotaxy of Th II to Abd II (left side); **B**, chaetotaxy of the manubrial plate and proximal dens (lateral view).

***Lepidocyrtinus riozoi* nom. nov.**

Figs 12A–E, 41

Seira (*Lepidocyrtinus*) *annulicornis*; Yosii, 1959: 10, figs 5A–H, South Africa, Cape Town, Table Mountain (Fig. 41) (comb. and descr.), not examined. Janion-Scheepers *et al.* 2015: 68, Africa South (cat.).

Diagnosis. Body pale white with violet pigments on Ant III–IV, Ant II and tibiotarsus I–III distally; Th II with 14 anterior, 7 median (**m1ip** absent, **m4** and **m4i** present) and 11 posterior mac (**p3** present); Th III–Abd II with 9, 5, 4 central mac respectively (Fig. 12A); Abd IV with 10 central mac and 11 lateral mac (Fig. 12B);
ungues apical tooth present; unguiculus with all lamella acuminate (Fig. 12C); manubrial plate with 3 blunt mac; dens with 9–10 blunt mac apically nipple-like (Fig. 12D).

Remarks. *Lepidocyrtinus riozoi* **nom. nov.** resembles *L. annulicornis* **comb. rev.** in general morphology (see remarks of this species).

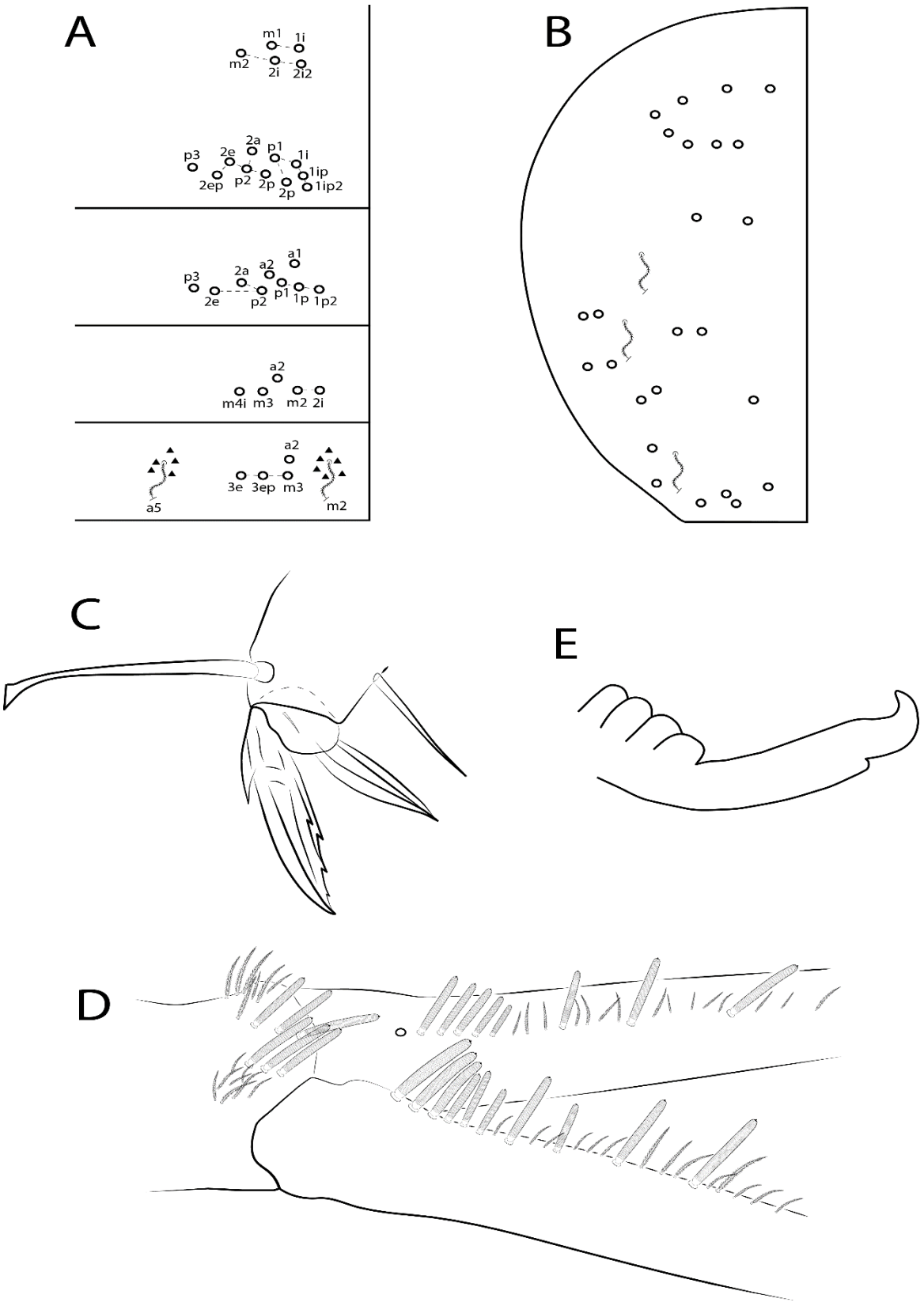

FIGURE 12A–E. *Lepidocyrtinus riozoi* **nom. nov.** (modified from Yosii 1959); **A**, chaetotaxy of Th II to Abd II (left side); **B**, chaetotaxy of Abd IV (left side); **C**, distal tibiotarsus and empodial complex III; **D**, chaetotaxy of the manubrial plate and proximal dens (lateral view); **E**, distal dens and mucro (lateral view).

***Lepidocyrtinus barnardi* Womersley, 1934 stat. nov.**
Figs 13A, 14–17

Lepidocyrtinus cooperi var. *barnardi* Womersley, 1934: 461, fig. 10, South Africa, Cape Town, Kirstenbosch (orig. descr.), not examined.

Seira (*Lepidocyrtinus*) *barnardi*; Yosii, 1959: 12, figs 6A–I, South Africa, Cape Town, Kirstenbosch (comb. and descr.).

Seira barnardi; Coates, 1968: 454 (comb.). Janion-Scheepers *et al.* 2015: 68, Africa South (cat.).

Typological note. One cotype of four specimens used in the original description of *Lepidocyrtinus cooperi* var. *barnardi* by Womersley (1934) is deposited at SAM/IZIKO (Scheepers, personal communication). We did not analyze this material, but our specimens fit the descriptions of Womersley (1934) and Yosii (1959) besides being from the same locality, and for this reason the redescription is justified.

Examined material. 1 male and 4 females in slides and 1 specimen in alcohol (INPA): South Africa, Cape Town, Table Mountain National Park, Newlands, 33°57'51.9"S, 18°26'25.1"E, in Pine Plantation, 200 m, 12.ix.2008, Leaf Litter, C Uys coll. 3 females in slides and 170 specimens in alcohol (CC/UFRN): 33°57'58.3"S, 18°26'31.6"E, in Afrotemperate Forest, 230 m, 15.i.2009, Sugar-baited Ant Trap, C Uys coll. 23 specimens in alcohol (INPA): Spilhaus, Cecilia Ravine, 33°59'53.7"S, 18°24'51.6"E, in Fynbos, 520 m, 23.i.2009, Sugar-baited Ant Trap, C Uys coll.

Diagnosis. Body with dark blue pigments on Ant III–IV, Th II laterally up to one transverse band of Abd III, ans spots on Abd IV–V and legs (Fig. 13A); head mac **A0**, **A2**–**3**, **A5**, **M1**–**2**, **M4i**, **S0**–**6** and **Pp5** present; prelabral chaetae smooth; labial papilla E with lateral process (l.p.) apically pointed and not reaching the base of apical appendage (Figs 14D–F); Th II with 17 anterior, 9 median (**m1ip**, **m4i**–**4p** present) and 15–16 posterior mac (**p2ep**, **p2ep2**, **p3** mac); Th III–Abd II with 10, 5–6, 4 central mac respectively; Abd IV

with 10–11 central mac and 11 lateral mac (Figs 15, 16B); ungues apical tooth present or not; unguiculus with all lamella acuminate; collophore anteriorly with 4–5 spine-like chaetae and 4 ciliate chaetae apically acuminate, posteriorly without spines, smooth chaeta present (Fig. 17E); manubrium ventrally with 2/2 subapical chaetae; manubrial plate without blunt mac; dens with with 13–19 blunt mac apically nipple-like (Figs 17F–G).

Description. Total length (head + trunk) of specimens 2.21–3.22 (n=4). Specimen pale white with dark blue on distal Ant II to Ant IV, anterior head, lateral Th II to Abd II that which extends to most of the Abd III, one central spots on Abd IV and V, coxa II–III, and trochanter to proximal half of tibiotarsus; eyepatches black (Fig. 13A). Scales present on Ant I to basis of Ant III, dorsal and ventral head, dorsal thorax and abdomen, legs (except empodia), anterior collophore, ventral and dorsal manubrium and dens ventrally.

Head. Antennae subequal to trunk length (Fig. 13A); ratio antennae: trunk = 1: 1.04; antennal segments ratio as I: II: III: IV = 1: 1.57–1.82: 2.92–3.24: 2.97 (Ant IV present in one specimens). Ant IV annulated on distal one seventh, with apical bulb apically bilobed. Ant III annulated on distal two thirds, sense organ with 2 rods elongated, 3 spiny guard sens, s-blunt sens of different sizes and ciliated chaetae (Fig. 14A). Ant I dorsally with 3–4 median mac and 3 smooth mic at base, without spines (Fig. 14B). Eyes A and B larger, G and H smaller, others subequal, and with 5 'IO' chaetae; head dorsal macrochaetotaxy with 9–10 **An**, 4 **A**, 4 **M**, 8 **S**, 1 **Pa** and 1 **Pp** mac (Fig. 14F). Clypeal formula with 4 (**l1**–**2**), 8 (**fr**), 5 (**pf1**–**2**) ciliate chaetae, **l1**–**2** and **pf0**–**1** larger, **l1** apically acuminate, others subequal (Fig. 14C). Prelabral chaetae smooth, inner chaetae eventually with two small median filaments (Fig. 14D). Labral **p0** chaeta with median filament unequal in length. Labral inner and outer papillae rounded, not projected (as Fig. 18C). Maxillary palp with smooth apical appendage (**a.a.**) and basal chaeta (**b.c.**) weakly ciliate, thicker and 1.19 larger in length than the apical. Labial papilla E with lateral process (l.p.) apically pointed and not reaching the base of apical appendage (Fig. 14E). Basolateral and basomedian labial fields with chaetae **M1**–**2**, **R** (smaller) ciliate, **e** and **l2** smooth, **L1** ciliate or smooth. Ventral head with about 25 ciliate chaetae, postlabial formula with 4 (**G1**–**4**), 2 (**H2**, **H4**), 3 (**J1**–**3**) chaetae, 5 thin posterior chaetae of different length, and 3 larger chaetae, 1 basal chaetae (b.c.) surrounding the cephalic groove (Fig. 14G).

Thorax chaetotaxy (Figs 15A–B). Th II **a**, **m** and **p** series with 17, 9 and 15–16 mac, respectively. Th III **a**, **m** and **p** series with 4, 1 and 8 mac, respectively. Ratio Th II: III = 1.69–153: 1 (n=4).

Abdomen chaetotaxy (Figs 15C–D, 16A–C). Abd I **a**, **m** and **p** series with 0–1, 5 and 0 mac. Abd II **a**, **m** and **p** series with 1, 4 and 0 mac, respectively. Abd III **a**, **m** and **p** series with 0–1, 3 and 1 mac, respectively. Abd IV with 10–11 central mac of **A**–**T** series and 11 lateral mac of **E**–**Fe** series; 12 posterior sens (**ps** type I, others type II) and 11 posterior mes. Abd V **a**, **m** and **p** series with 1, 4 and 6 mac, respectively. Ratio Abd III: IV = 1: 3.87–4.23 (n=4).

Legs. Subcoxa I with 5 chaetae and 3 psp; subcoxa II with an anterior row of 12 chaetae, posterior row of 7 chaetae. 1 posterior chaeta and 8 psp; subcoxa III with one row of 12 chaetae, 2 anterior chaetae and 2 posterior psp (Figs 17A–C). Trochanteral organ with about 94 spine-like chaetae (Fig. 17D). Tibiotarsus normal or subdivided on distal two third, outer side with 3 large chaetae and apically acuminate, inner side with 8 mac weakly ciliate. Ungues inner side with 3–4 teeth, 2 paired basal, 1 unpaired median larger to basal teeth, and 1 minute apical tooth present or not. Unguiculus with all lamellae acuminate, **pe** lamella serrated and with small proximal tooth, other lamellae smooth; ratio unguis: unguiculus = 1: 0.52. Tibiotarsal smooth chaeta 1.32 larger than unguiculus and tenent hair 0.88 smaller than unguis outer edge.

Collophore. Anterior side with 19–22 chaetae, 4–5 proximal spine-like chaetae, 1 thin and 7–9 normal ciliate chaetae, 4 ciliate chaetae apically acuminate and 3 mac distally; posterior side with 12 chaetae, 8 thin ciliate chaetae widely distributed and 3 ciliate and 1 smooth chaetae distally; lateral flap with about 44 chaetae, 4–5 smooth and 38–39 ciliate (Fig. 17E).

Furcula. Manubrium ventral formula with 0, 0, 0, 2/2 (subapical), 24–28 (apical) ciliate chaetae plus about 18 elongated apical scales per side (Fig. 17F); manubrial plate with 3 ciliate mac apically acuminate (no blunt), 11 ciliate chaetae of different sizes and 3 psp. Dens dorsally with one proximal row of 13–19 blunt mac finely ciliate and apically nipple-like (Fig. 17G).

Remarks. *Lepidocyrtinus barnardi* **stat. nov.** resembles *L. dayi* **stat. nov.** in Th II normal (not projected anteriorly) and with anterior mac group sparce, prelabral chaetae smooth, labral papillae rounded and without filaments, dorsal chaetotaxy of Th II–III, and

manubrial plate without blunt mac. However, *L. barnardi* **stat. nov.** differs from this species by color pattern with one transversal band on Abd III and one central spot on Abd IV, while in *barnardi* **stat. nov.** most of the body is pigmented (Figs 13A–B). They also differ in head by basomedian labial field with chaeta **e** smooth (ciliate in *L. barnardi* **stat. nov.**), labial papilla E with lateral process (l.p.) not reaching the base of apical appendage (surpass the base of apical appendage in *L. barnardi* **stat. nov.**), and dorsal chaetotaxy with **S4** mac and **Pa3**, **Pm3** and **Pp3** absent (opposite in *L. barnardi* **stat. nov.**) (Figs 14E–F, 18D–E). In dorsal chaetotaxy they differ by Th III with 10 central and 3 lateral mac (11 and 2 respectively in *L. barnardi* **stat. nov.**), Abd I generally with 6 central mac (**a2** present or not, **m4** present) and Abd II with 4 central mac, while in *L. barnardi* **stat. nov.** there are 5 central mac (**m4** absent) on Abd I and 3 central mac (**m3e** absent) on Abd II (Figs 15B–D, 19B–D). Other features that differ are: ungues apical tooth present (absent in *L. barnardi* **stat. nov.**), manubrium ventral formula with 0, 0, 0, 2/2 chaetae (1, 2, 2, 0/2 in *L. barnardi* **stat. nov.**), and dens with 13–19 blunt mac (only 1 in *L. barnardi* **stat. nov.**).

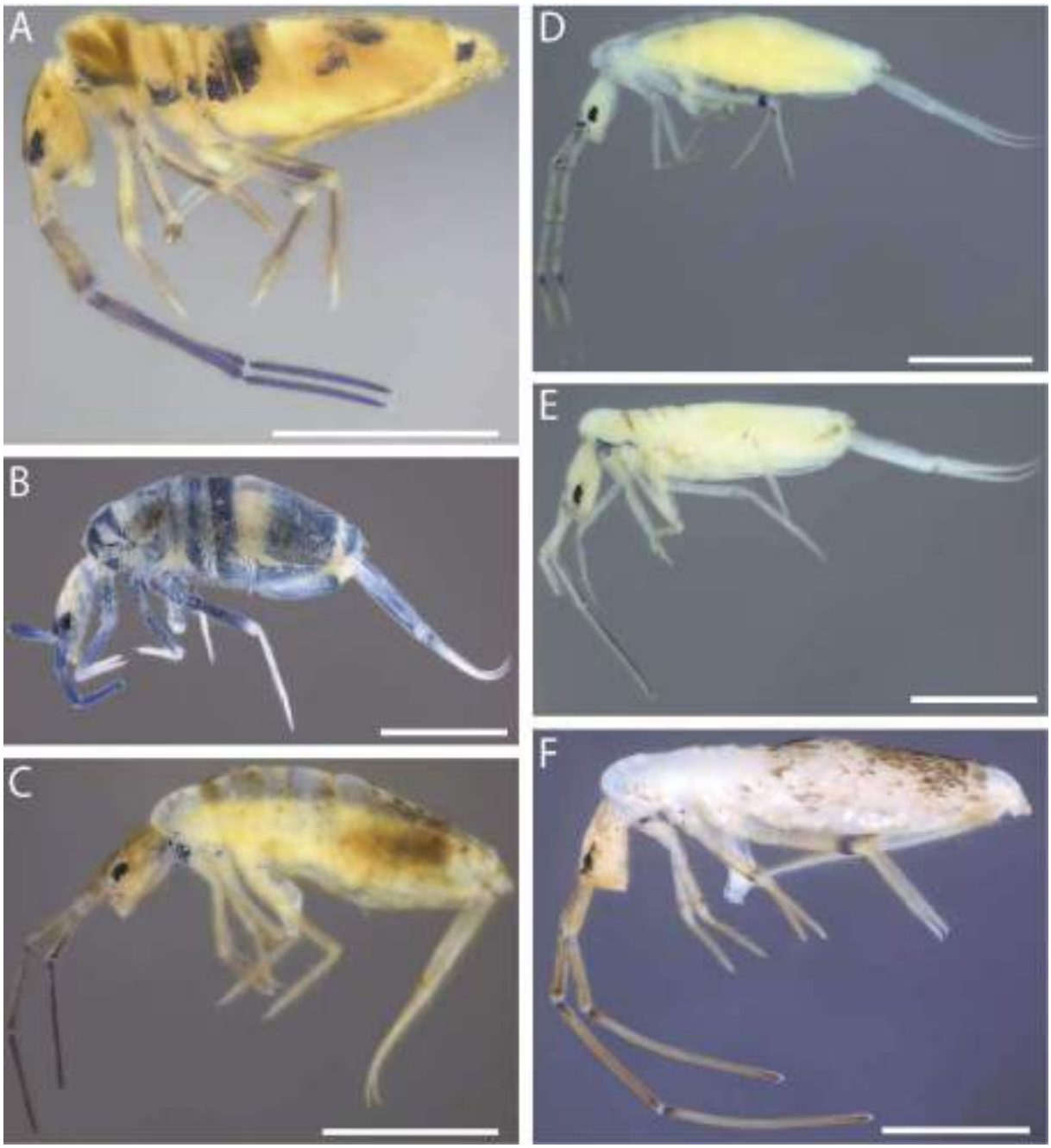

FIGURE 13A–F. *Lepidocyrtinus* spp., habitus of specimens fixed in alcohol (lateral view). **A**, *L. barnardi* **stat. nov.**; **B**, *L. dayi*; **C**, *L. botswanensis* **sp. nov.**; **D**, *L. fabioi* **sp. nov.**; **E**, *L. paucisensillum* **sp. nov.**; **F**, *L. scheepersae* **sp. nov.** Scale bars: 1 mm.

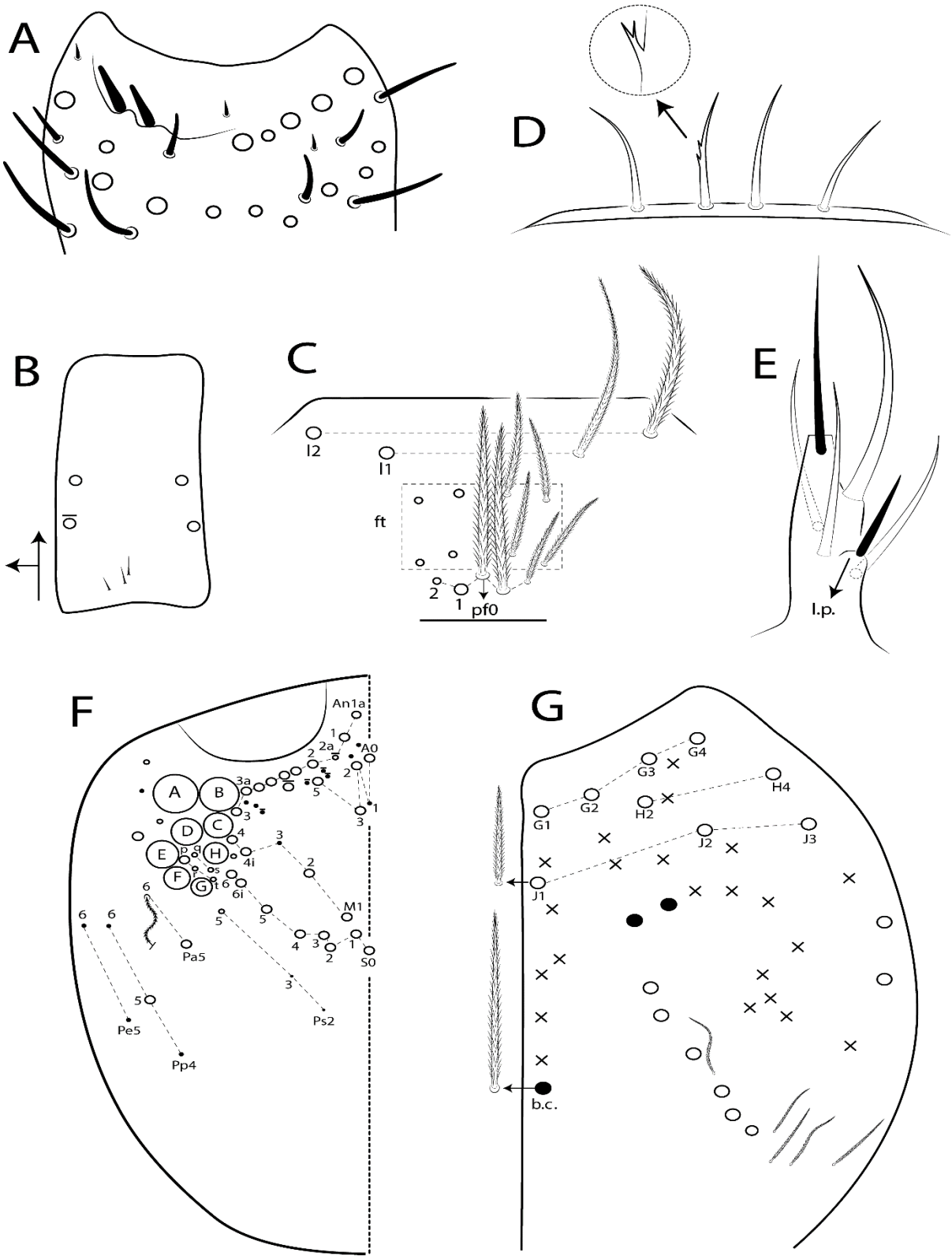

FIGURE 14A–G. *Lepidocyrtinus barnardi* **stat. nov.**: head; **A**, Ant III apical organ (lateral side); **B**, Ant I left chaetotaxy (dorsal side); **C**, chaetotaxy of the clypeus; **D**, prelabral chaetotaxy; **E**, labial papillae E (right side), arrow indicates lateral process (**l.p.**); **F**, dorsal chaetotaxy (left side); **G**, postlabial and cephalic groove chaetotaxy (right side).

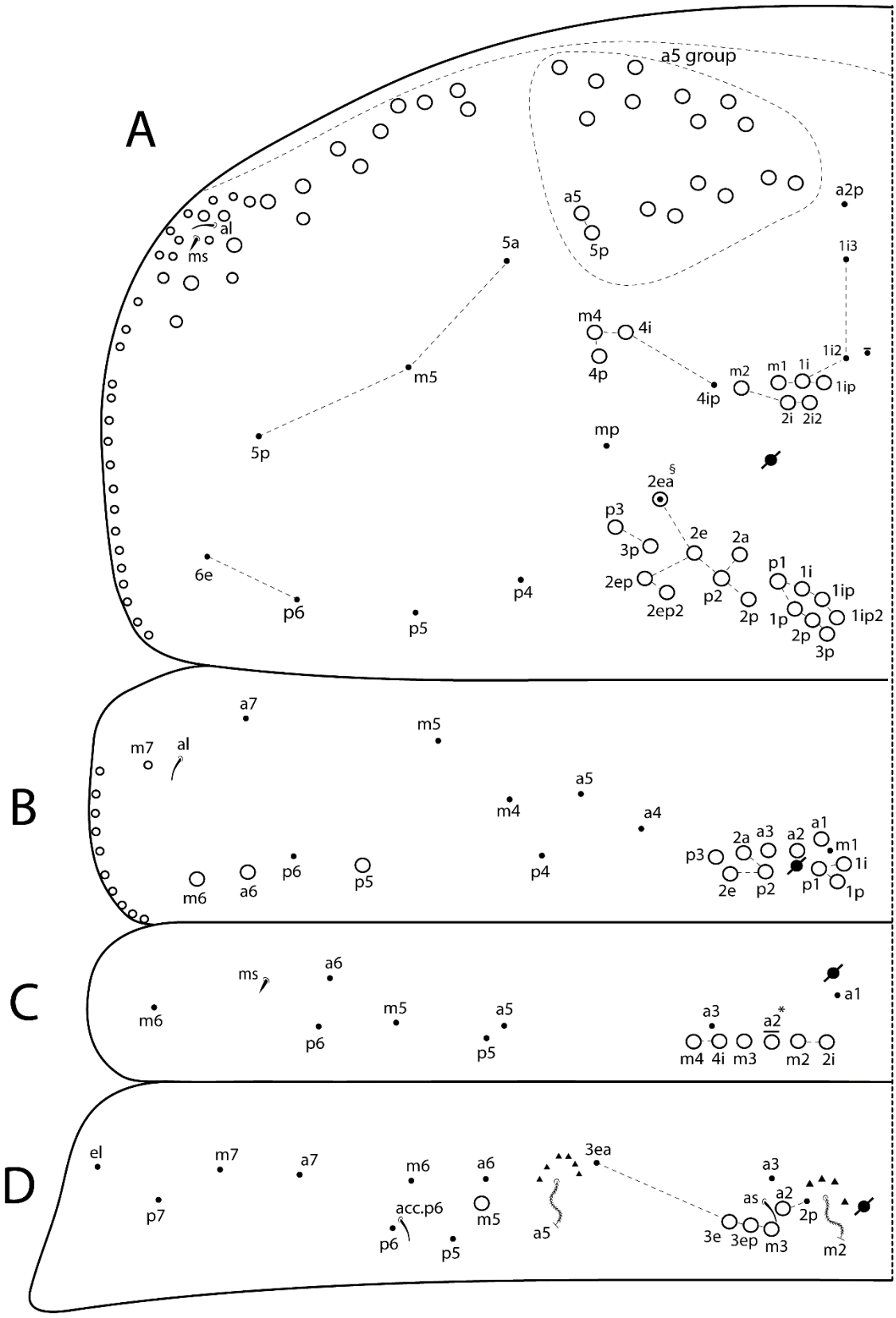

FIGURE 15A–D. *Lepidocyrtinus barnardi* **stat. nov.**: dorsal chaetotaxy; **A**, Th II; **B**, Th III; **C**, Abd I; **D**, Abd II.

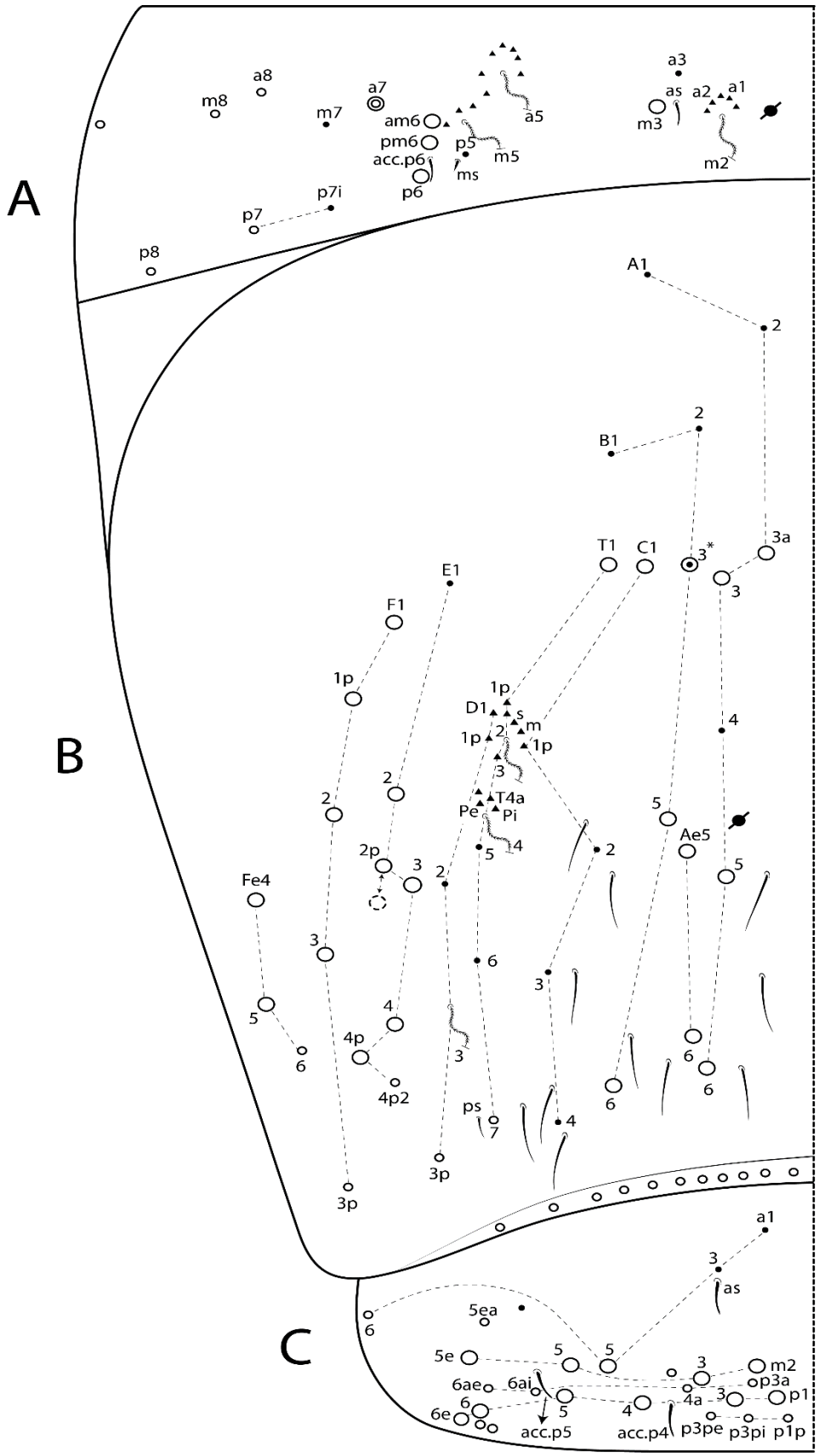

FIGURE 16A–C. *Lepidocyrtinus barnardi* **stat. nov.**: dorsal chaetotaxy; **A**, Abd III, **B**, Abd IV; **C**, Abd V.

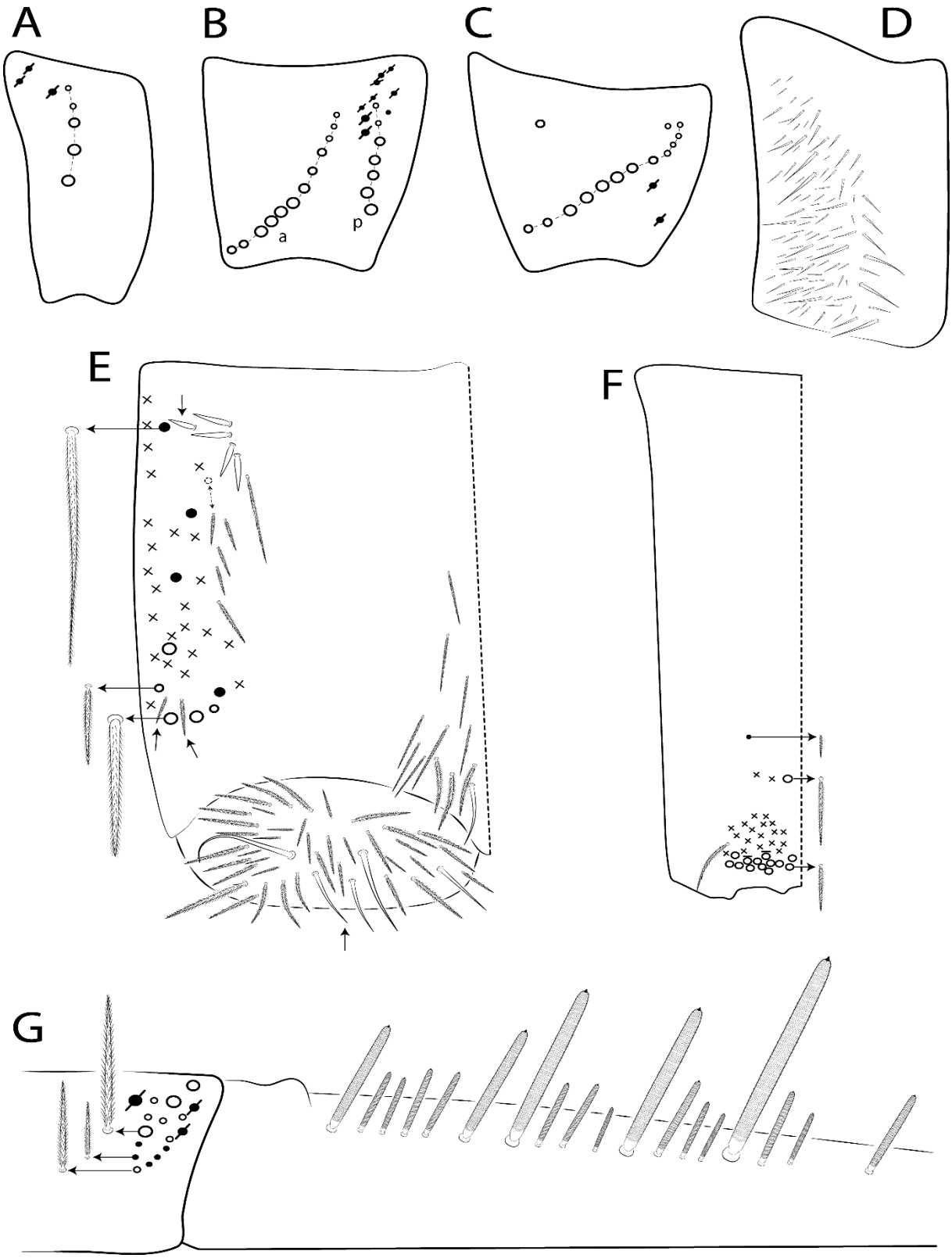

FIGURE 17A–G. *Lepidocyrtinus barnardi* **stat. nov.**; **A**, subcoxa I; **B**, subcoxa II; **C**, subcoxa III (outer side); **D**, trochanteral organ (inner side); **E**, collophore chaetotaxy (lateral view); arrows anteriorly and on lateral flap indicates chaetae present or absent; **F**, manubrium ventral chaetotaxy; **G**, chaetotaxy of the manubrial plate and proximal dens (lateral view).

***Lepidocyrtinus dayi* Yosii, 1959 stat. nov.**

Figs 13B, 18–21

Seira (Lepidocyrtinus) dayi Yosii, 1959: 14, Figs 7A–G, South Africa, Cape Town, Skeleton Gorge (orig. descr.).

Seira dayi; Coates 1968: 454 (comb.). Janion-Scheepers *et al.* 2015: 69, Africa South (cat.).

Typological note. The type material of *L. dayi* **stat. nov.** (Scheepers, personal communication) is probably lost in Yoshii collection. Thus, here the neotype is designated, according to ICZN (2000, chapter 16, article 72.4.5.), since the specimen corresponds to all morphological characteristics presented in the original description and was collected from the type locality, Kirstenbosch, Cape Town.

Examined type material. Neotype female designed on slide (SAM/IZIKO): South Africa, Cape Town, Table Mountain National Park, Kirstenbosch, 33°58'55.0"S, 18°25'25.0"E, Afrotemperate Forest, 400 m, 12.ii.2009, Pitfall trap, C Uys coll.

Other examined material. 2 females in slides (INPA): same data as neotype. 1 female in slide and 1 specimens in alcohol (INPA): South Africa, Cape Town, Table Mountain National Park, Orange Kloof, 34°00'12.3"S, 18°23'25.8"E, Afrotemperate Forest, 130 m, 28.i.2009, Sugar-baited Ant trap, C Uys coll. 6 specimens in alcohol (CC/UFRN): Cecilia-Rooikat, 33°59'36.9"S, 18°25'11.0"E, in Fynbos, 430 m, 21.ii.2009, Sugar-baited Ant trap, C Uys coll. 4 females in slides and 11 specimens in alcohol (CC/UFRN): Tokai, 34°03'54.3"S, 18°24'10.2"E, in Pine Plantation, 300 m, 19.i.2009, Sugar-baited Ant trap, C Uys coll.

Diagnosis. Body all dark blue but depigmented in dorsal head, trunk parts, tibiotasus and dens distally (Fig. 13B); head mac **A0**, **A2**–**3**, **A5**, **M1**–**2**, **S0**–**3**, **S5**–**6**, **Pa3**, **Pm3**, **Pp3** and **Pp5** present, **M4i** mac or mic; prelabral chaetae smooth; labial papilla E with lateral process (l.p.) apically pointed and surpass the base of apical appendage (Figs 18B, D–E); Th II with 32–34 anterior, 9 median (**m1ip**, **m4i**–**4p** present) and 17–19

posterior mac (**p2ep**, **p2ep2**, **p3** mac); Th III–Abd II with 11, 5, 3 central mac respectively; Abd IV with 11–12 central mac and 14 lateral mac (Figs 19, 20B); ungues apical tooth present; unguiculus with all lamella acuminate; collophore anteriorly with 5 spine-like chaetae and 3 ciliate chaetae apically acuminate, posteriorly without spines, smooth chaeta absent (Fig. 21E); manubrium ventrally with 0/2 subapical chaetae; manubrial plate without blunt mac; dens with 1 blunt mac apically nipple-like (Figs 21F–G).

Description. Total length (head + trunk) of specimens 2.20–2.55 (n=4). Specimen with black blue pigments on all body, except dorsal head, trunk intersegments parts, Abd IV anteriorly, tibiotasus, and collophore and dens distally; eyepatches black (Fig. 13B). Scales present on Ant I to proximal half of Ant III, dorsal and ventral head, dorsal thorax and abdomen, legs (except empodia), anterior collophore, ventral and dorsal manubrium and dens ventrally.

Head. Antennae smaller to trunk length (Fig. 13B); ratio antennae: trunk = 1: 1.98 (n=1); antennal segments ratio as I: II: III: IV = 1: 1.42: 1.83: 2.14. Ant IV annulated on distal fourth-fifths, apical bulb apically bilobed. Ant III annulated on distal half, sense organ with 2 rods, 3 spiny guard sens, s-blunt sens of different sizes and ciliated chaetae. Ant I dorsally with 1 inner mac and 3 smooth mic at base, without spines (Fig. 18A). Eyes A, B and C larger, G and H smaller, others subequal, and with 5 'IO' chaetae; head dorsal macrochaetotaxy with 9–10 **An**, 4 **A**, 3–4 **M**, 7 **S**, 2 **Pa**, 1 **Pm** and 2 **Pp** mac (Fig. 18E). Clypeal formula with 4 (**l1**–**2**), 4 (**fr**), 3 (**pf0**–**1**) ciliate chaetae, **l1**–**2** larger and apically acuminate, 1 frontal smaller, others subequal. Prelabral chaetae smooth and not bifurcated. Labral **p0** chaeta generally with median filament (Fig. 18B). Labral inner and outer papillae rounded, not projected (Fig. 18C). Maxillary palp with smooth apical appendage (**a.a.**) and basal chaeta (**b.c.**) weakly ciliate, thicker and 1.13 larger in length than the apical. Labial papilla E with lateral process (l.p.) apically pointed and surpass the base of apical appendage (Fig. 18D). Basolateral and basomedian labial fields with chaetae **M1**–**2**, **R**, **E**, **L1**, **R** (normal or gently smaller) ciliate, **l2** smooth. Ventral head with about 30 ciliate chaetae, postlabial formula with 4 (**G1**–**4**), 3 (**H2**–**4**), 4 (**J1**–**4**) chaetae, about 14 thin posterior chaetae of different length and 1 basal chaetae (b.c.) surrounding the cephalic groove (Fig. 18F).

Thorax chaetotaxy (Fig. 19A–B). Th II **a**, **m** and **p** series with 32–34, 9 and 17–19 mac, respectively. Th III **a**, **m** and **p** series with 4, 1 and 8 mac, respectively. Ratio Th II: III = 1.95–1.26: 1 (n=4).

Abdomen chaetotaxy (Figs 19C–D, 20A–C). Abd I **a**, **m** and **p** series with 1, 4 and 0 mac, respectively. Abd II **a**, **m** and **p** series with 1, 3 and 0 mac, respectively, **m3e** absent. Abd III **a**, **m** and **p** series with 0, 3 and 1 mac, respectively. Abd IV with 11–12 central mac of **A**–**T** series and 14 lateral mac of **E**–**Fe** series; 9 posterior sens (**ps** type I, others type II) and 10 posterior mes. Abd V **a**, **m** and **p** series with 1, 5 and 5 mac, respectively. Ratio Abd III: IV = 1: 4.26–5.25 (n= 4).

Legs. Subcoxa I with 5 chaetae, 1 anterior chaetae present or not and 2 psp; subcoxa II with an anterior row of 11–12 chaetae, posterior row of 6 chaetae and 4 psp; subcoxa III with one row of 13 chaetae, 3 anterior chaetae and 2 posterior psp (Fig. 21A–C). Trochanteral organ with about 38 spine-like chaetae (Fig. 21D). Tibiotarsus not subdivided and modified chaetae absent. Ungues inner side with 3 teeth, 2 paired basal and 1 unpaired median subequal to basal teeth, apical tooth absent. Unguiculus with all lamellae acuminate, **pe** lamella serrated and with small proximal tooth, other lamellae smooth.

Collophore. Anterior side with 18–19 chaetae, 5 proximal spine-like chaetae, 1 thin and 7–8 normal ciliate chaetae, 3 ciliate chaetae apically acuminate and 2 mac distally; posterior side with 15 chaetae, 13 thin ciliate chaetae widely distributed and 2 ciliate chaetae distally; lateral flap with about 31 chaetae, 4–5 smooth and 26 ciliate (Fig. 21E).

Furcula. Manubrium ventral formula with 1, 2, 2, 0/2 (subapical), 12–20 (apical) ciliate chaetae plus about 16 elongated apical scales per side (Fig. 21F); manubrial plate with 5 mac ciliate and apically acuminate (no blunt), 7–11 ciliate chaetae of different sizes and 3 psp. Dens dorsally with 1 proximal blunt mac finely ciliate and apically nipple-like (Fig. 21G).

Remarks. *Lepidocyrtinus dayi* **stat. nov.** resembles *L. barnardi* **stat. nov.** (see remarks of this species).

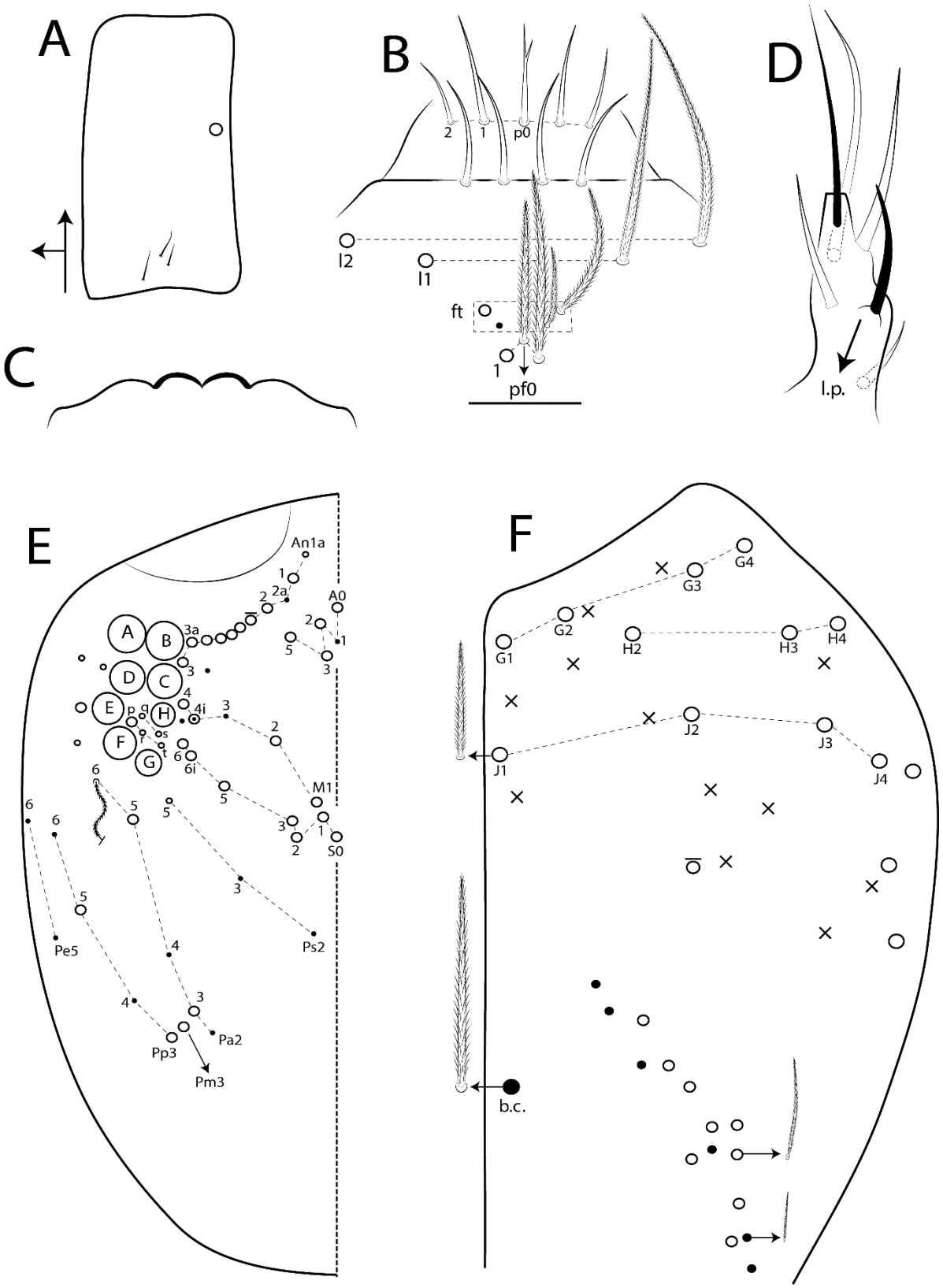

FIGURE 18A–F. *Lepidocyrtinus dayi*: head; **A**, Ant I left chaetotaxy (dorsal side); **B**, chaetotaxy of the clypeus, prelabral and labral posterior row; **C**, labral papillae (ventral side); **D**, labial papillae E (right side), arrow indicates lateral process (**l.p.**); **E**, dorsal chaetotaxy (left side); **F**, postlabial and cephalic groove chaetotaxy (right side).

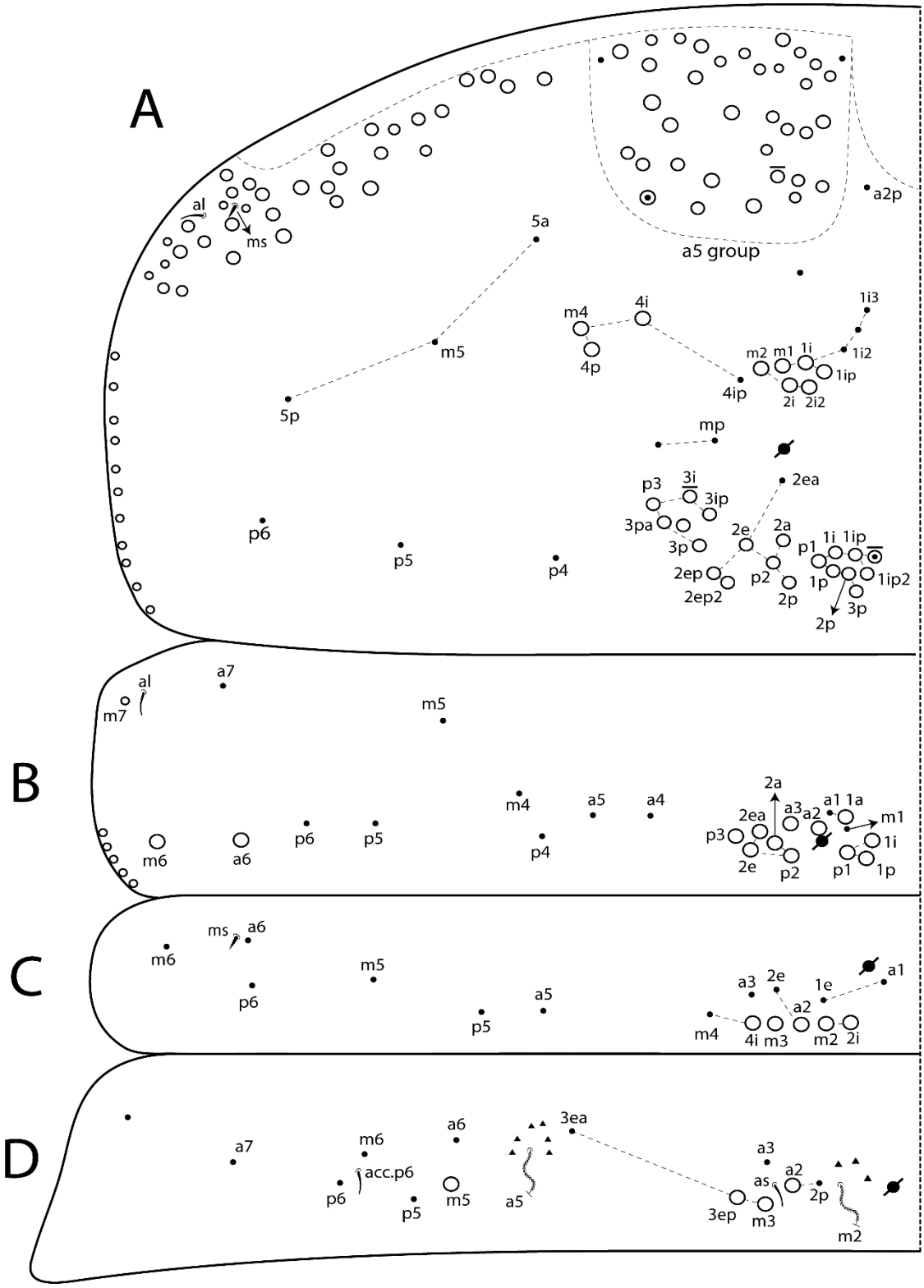

FIGURE 19A–D. *Lepidocyrtinus dayi*: dorsal chaetotaxy; **A**, Th II; **B**, Th III; **C**, Abd I; **D**, Abd II.

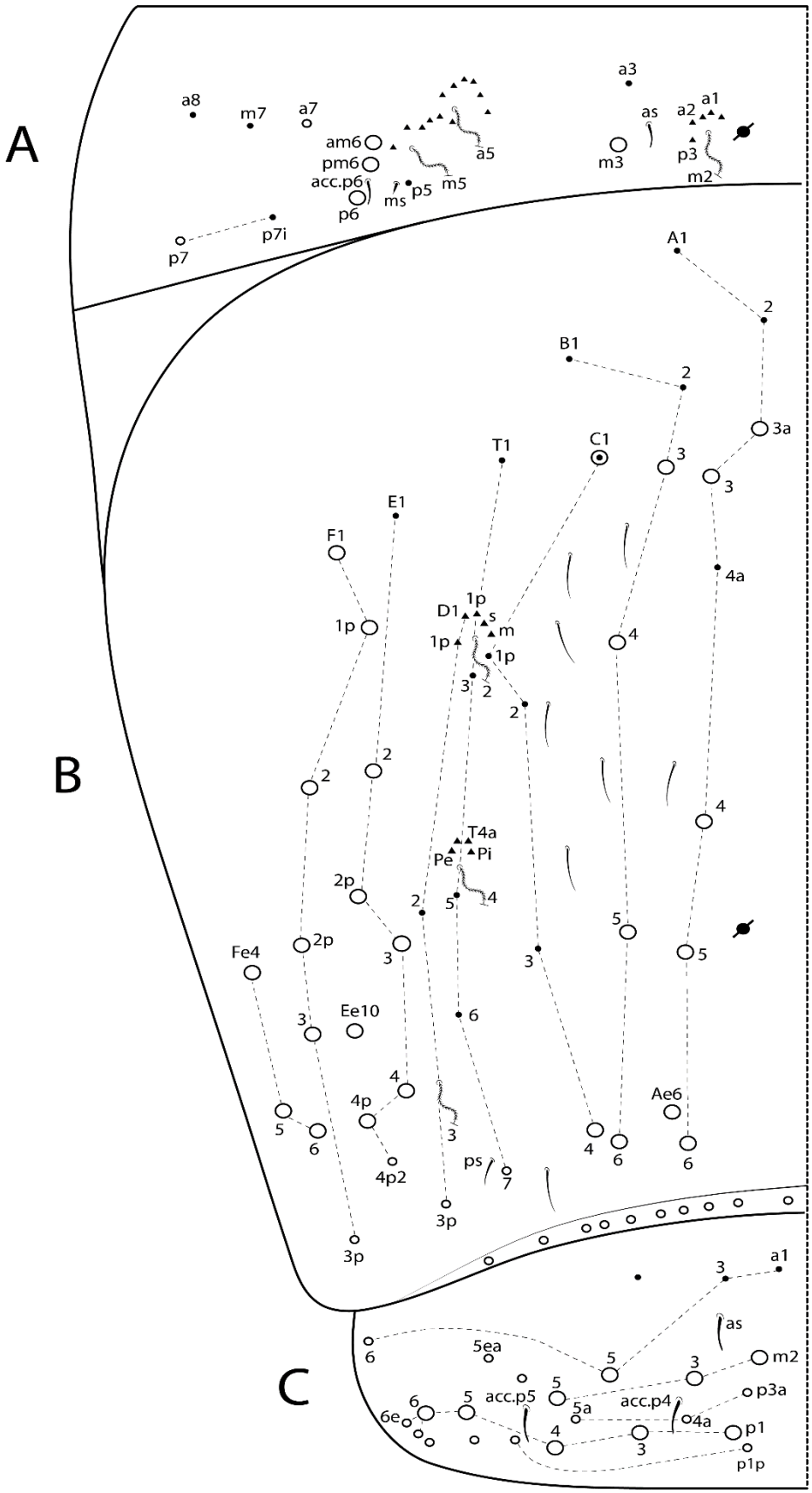

FIGURE 20A–C. *Lepidocyrtinus dayi*: dorsal chaetotaxy; **A**, Abd III, **B**, Abd IV; **C**, Abd V.

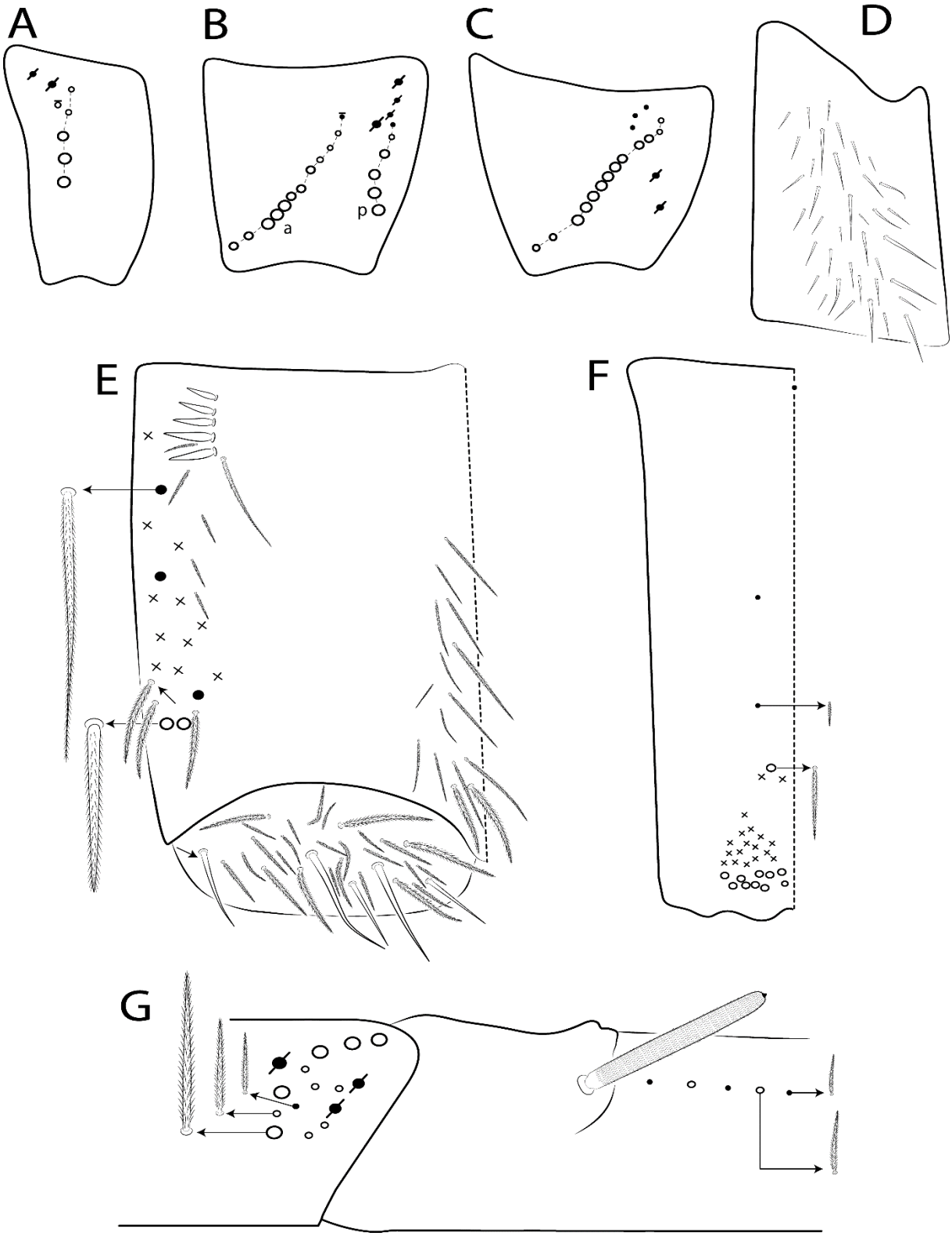

FIGURE 21A–G. *Lepidocyrtinus dayi*; **A**, subcoxa I; **B**, subcoxa II; **C**, subcoxa III (outer side); **D**, trochanteral organ (inner side); **E**, collophore chaetotaxy (lateral view); **F**, manubrium ventral chaetotaxy; **G**, chaetotaxy of the manubrial plate and proximal dens (lateral view).

***Lepidocyrtinus botswanensis* sp. nov. Cipola & Bellini**

Figs 13C, 22–27, 41

Type Material. Holotype female on slide (NHMLA): Botswana, South-East District, Lobatse, Moroekwe farm, 25°10'S; 25°06'E (Fig. 41), 8-22.xi.2005, Malaise trap, M Bing coll. Paratypes on slide (NHMLA): 3 females and 1 specimen in alcohol, same data as holotype.

Diagnosis. Body with purple pigments on Ant II internally to IV and dark blue on coxa I (Fig. 13C); head mac **A0**, **A2**–**3**, **A5**, **M1**–**2**, **M4i**, **S0**–**3**, **S5**–**6** and **Pp5** present; prelabral chaetae ciliate; labial papilla E with lateral process (l.p.) apically pointed and surpass the base of apical appendage (Figs 22C–D, 23A); Th II with 13–14 anterior, 8 median (**m1ip**, **m4-4p** present, **m4i** mac absent) and 11 posterior mac (**p2ep** mac, **p3** mic); Th III–Abd II with 9, 5, 4 central mac respectively; Abd IV with 17 central mac and 13 lateral mac (Figs 24, 25B); ungues apical tooth present; unguiculus with all lamella acuminate (Fig. 26F); collophore anteriorly with 7 spine-like chaetae and 4 ciliate chaetae apically acuminate, posteriorly without spines, smooth chaeta present (Fig. 27A); manubrium ventrally with 0/0 subapical chaetae; manubrial plate with 1 blunt mac abruptly acuminate at apex; dens with 3–4 blunt mac apically bullet-like (Figs 27B–C).

Description. Total length (head + trunk) of specimens 1.83–2.62 (n=4), holotype 2.61 mm. Specimen pale white with purple pigments on Ant IV, internal side of the Ant II–III, and weakly present on anterior and posterior head, and tibiotarsus I base. Pigments dark blue intensely on coxa I, and weakly on coxa II–III and Th II; eyepatches black (Fig. 13C). Scales present on Ant I to one-quarters proximal of Ant III, proximal Ant IV, dorsal and ventral head, dorsal thorax and abdomen, legs (except empodia), anterior and posterior collophore, ventral and dorsal manubrium and dens ventrally.

Head. Antennae smaller to trunk length (Fig. 13C); ratio antennae: trunk = 1: 1.35–1.84 (n=4), holotype 1: 1.40; antennal segments ratio as I: II: III: IV = 1: 1.43–1.59: 2.2–2.44: 2.38–3.34, holotype 1: 1.43: 2.2: 2.38. Ant IV completely annulated with apical bulb apically unilobed or bilobed. Ant III annulated on distal three-fourths, organ with 2 club-shaped sense, 3 spiny guard sens, s-blunt sens of different sizes and ciliated chaetae (Fig. 22A). Ant I dorsally with 3 median mac and 3 smooth mic at base, apparently without

spines (Fig. 22B). Eyes A and B larger, G and H smaller, others subequal, and with 5 'IO' chaetae; head dorsal macrochaetotaxy with 10 **An**, 4 **A**, 4 **M**, 7 **S**, 1 **Pa** and 1 **Pp** mac. (Fig. 22D). Clypeal formula with 4 (**l1**–**2**), 4 (**fr**), 3 (**pf0**–**1**) ciliate chaetae, **l1**–**2** larger, **l1** apically acuminate, others subequal (Fig. 22C). Prelabral chaetae ciliate and not bifurcated. Labral **p0** chaeta without median filament. Labral papillae with two inner conical projections, outer papillae absent (Fig. 22C). Maxillary palp with smooth apical appendage (**a.a.**) and basal chaeta (**b.c.**) weakly ciliate, thicker and 1.09 larger in length than the apical (Figs. 23B). Labial papilla E with lateral process (l.p.) apically pointed and surpass the base of apical appendage (Fig. 23A). Basolateral and basomedian labial fields with chaetae **M1**–**2**, **R** (smaller), **E**, **L1**–**2** ciliate (Fig. 23C). Ventral head with about 23 ciliate chaetae, postlabial formula with 4 (**G1**–**4**), 3 (**H2**–**4**), 4 (**J1**–**4**) chaetae, 5 thin posterior chaetae, and 3 larger chaetae, 1 basal chaetae (b.c.) surrounding the cephalic groove (Fig. 23C).

Thorax chaetotaxy (Fig. 24A–B). Th II **a**, **m** and **p** series with 13–14, 8 and 11 mac, respectively. Th III **a**, **m** and **p** series with 2, 0 and 8 mac, respectively. Ratio Th II: III = 1.90–1.40: 1 (n=4), holotype 1.40: 1.

Abdomen chaetotaxy (Figs 24C–D, 25A–C). Abd I **a**, **m** and **p** series with 1, 4 and 0 mac, respectively, **m4** absent. Abd II **a**, **m** and **p** series with 1, 4 and 0 mac, respectively. Abd III **a**, **m** and **p** series with 0, 2–3 and 0–1 mac, respectively. Abd IV with 17 central mac of **A**–**T** series and 13 lateral mac of **E**–**Fe** series; 2 posterior sens (**ps** type I, other type II) and 6 posterior mes. Abd V **a**, **m** and **pa**/**p** series with 1, 4 and 1/6 mac, respectively. Ratio Abd III: IV = 1: 3.53–4.48 (n= 4), holotype 1: 4.14.

Legs. Subcoxa I with 5 chaetae and 2 psp; subcoxa II with an anterior row of 9 chaetae, posterior row of 4 chaetae, 2 anterior chaetae and 6 psp; subcoxa III with one row of 9 chaetae and 2 posterior psp (Fig. 26A–C). Trochanteral organ with about 23 spine-like chaetae (Fig. 26D). Tibiotarsus not subdivided, outer side with 3 proximal larger ciliate chaetae and apically acuminate, inner side with 9 mac weakly ciliate, and anterior side with 2 on proximal half (Fig. 26E). Ungues inner side with 4 teeth, 2 paired basal, 1 unpaired median subequal to basal teeth and 1 small unpaired apical. Unguiculus with all lamellae acuminate, **pe** lamella serrated and with small proximal tooth, other lamellae smooth; ratio unguis: unguiculus = 1: 0.57. Tibiotarsal smooth chaeta 1.08 larger than unguiculus and tenent hair 0.90 smaller than unguis outer edge (Fig. 26F).

Collophore. Anterior side with 14 chaetae, 7 proximal spine-like chaetae, 1 ciliate chaetae, 4 ciliate chaetae apically acuminate and 2 mac distally; posterior side with 5

chaetae, 4 thin ciliate chaetae widely distributed and 1 smooth chaetae distally; lateral flap with about 19 chaetae, 5 smooth and 14 ciliate (Fig. 27A).

Furcula. Manubrium ventral formula with 1, 0, 0, 0/0 (subapical), 14 (apical) ciliate chaetae plus about 15 elongated apical scales per side (Fig. 27B); manubrial plate with 1 blunt mac ciliate and abruptly acuminate at apex, 5 ciliate chaetae of different sizes and 2 psp. Dens dorsally with one proximal row of 3–4 blunt mac weakly ciliate and apically bullet-like, holotype with 3 (Fig. 27C).

Etymology. *Lepidocyrtinus botswanensis* was named after its type locality, Botswana.

Remarks. *Lepidocyrtinus botswanensis* **sp. nov.** resembles *L. annulicornis* **comb. rev.** and *L. capensis* Womersley, 1934 **comb. rev.** in antennae subequal to trunk length, Th II with 6 median mac in **m1**–**2** complex, and Abd I–II with 5 and 4 central mac, respectively (Figs 24A, C–D). However, *L. botswanensis* **sp. nov.** differs from these species by body and legs pale (with one blue spot on coxa I), while in *L. capensis* **comb. rev.** there are dark pigments on head and Th II anteriorly, and *L. annulicornis* **comb. rev.** there are violet pigments on femur and tibiotarsus III distally. In chaetotaxy they differ by Th II with 11 posterior mac (12 in *L. capensis* **comb. rev.**), Th III with 9 central mac (8 in *L. capensis* **comb. rev.**), manubrial plate with 1 blunt mac (1–2 in *L. capensis* **comb. rev.** and 2–3 in *L. annulicornis* **comb. rev.**), and dens with 3–4 blunt mac (2–3 in *L. capensis* **comb. rev.** and 4 in *L. annulicornis* **comb. rev.**).

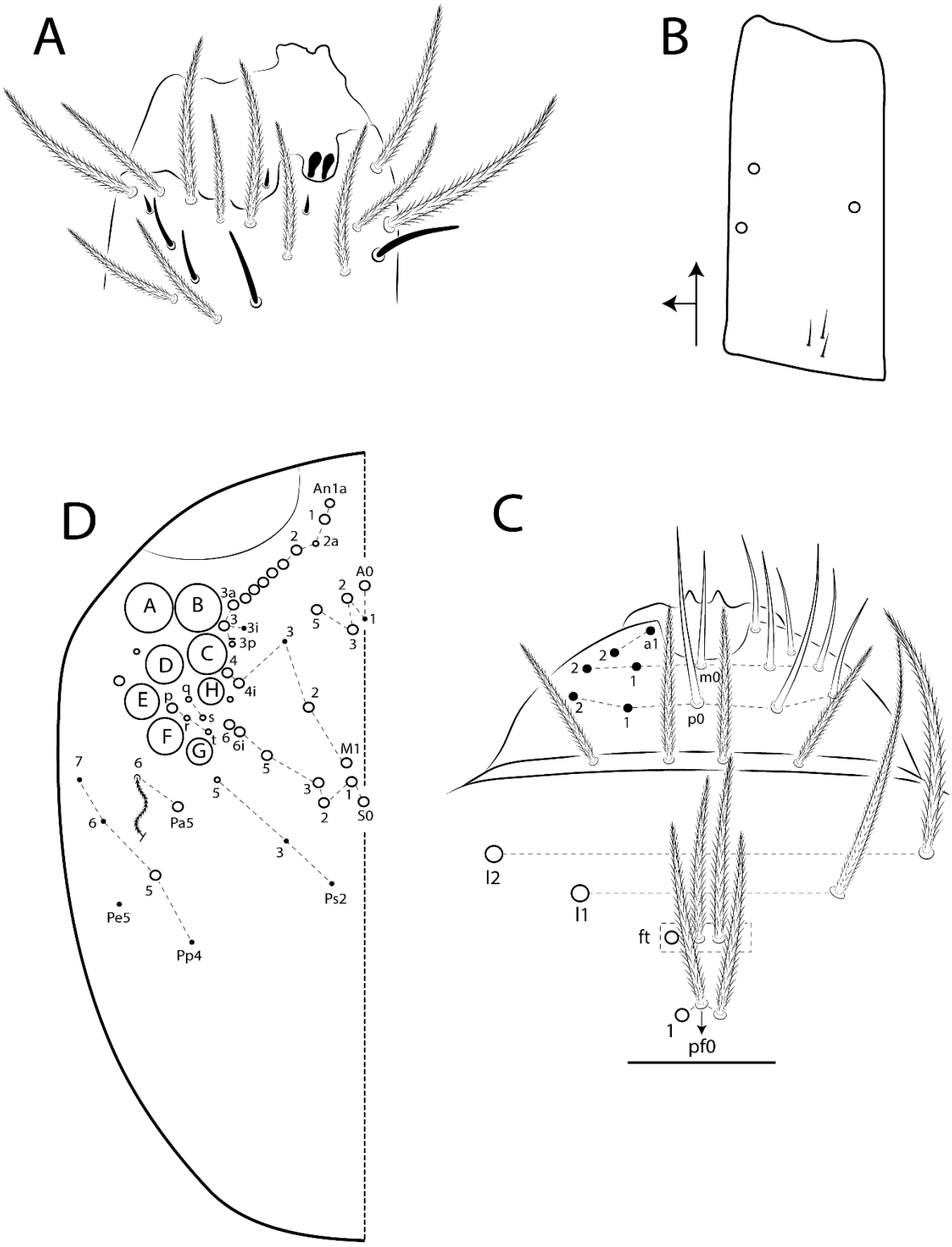

FIGURE 22A–D. *Lepidocyrtinus botswanensis* **sp. nov.**: head; **A**, Ant III apical organ (lateral side); **B**, Ant I left chaetotaxy (dorsal side); **C**, chaetotaxy of the clypeus, prelabral, labral and labral papillae (dorsal view); **D**, dorsal chaetotaxy (left side).

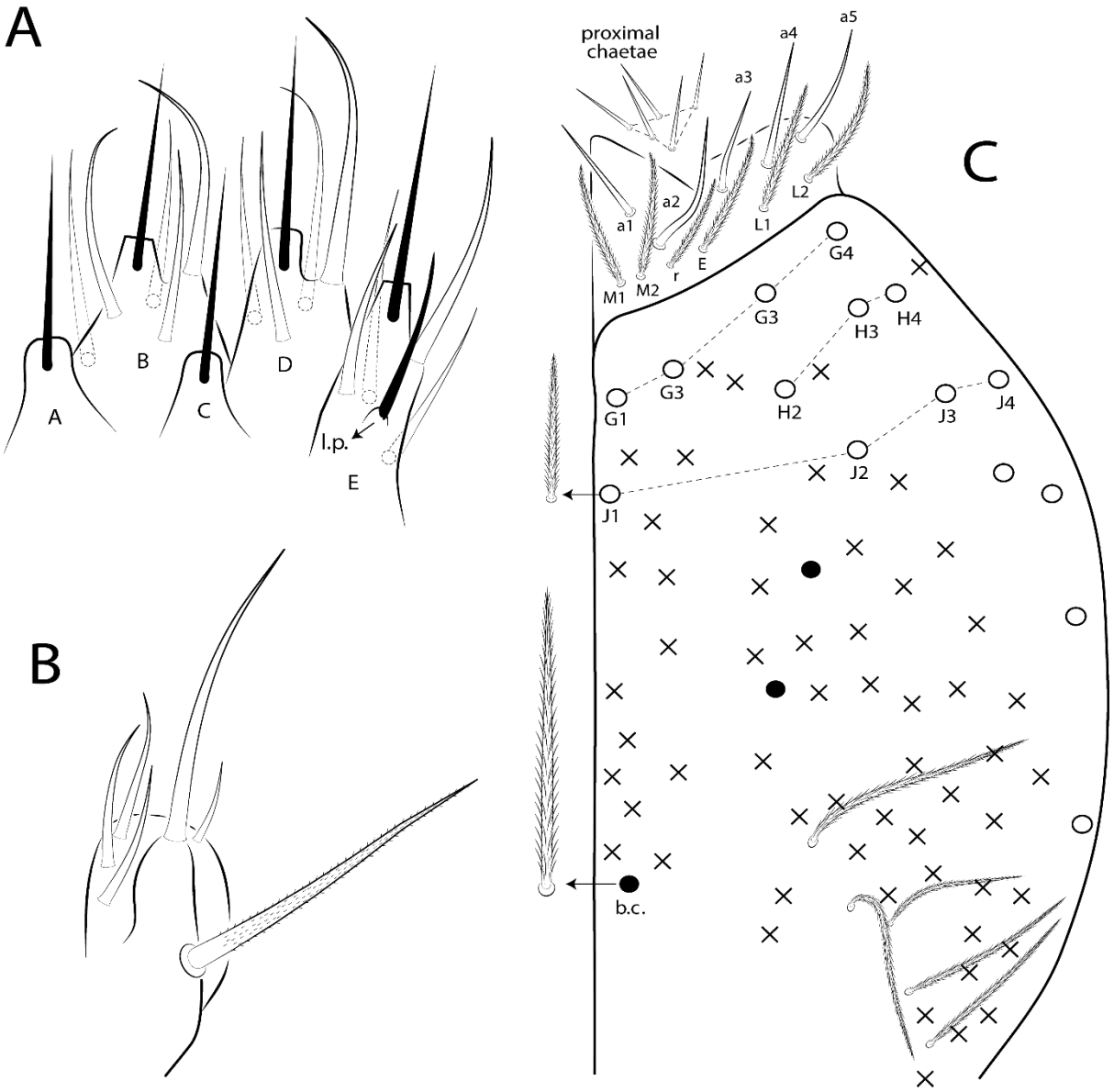

FIGURE 23A–C. *Lepidocyrtinus botswanensis* **sp. nov.**: ventral head (right side); **A**, labial papillae, A–E main papillae and H main hypostomal papillae, arrow indicates lateral process (**l.p.**) of papilla E; **B**, maxillary palp and outer lobe; **C**, chaetotaxy of the proximal chaetae, basomedian and basolateral fields, postlabial and cephalic groove (right side).

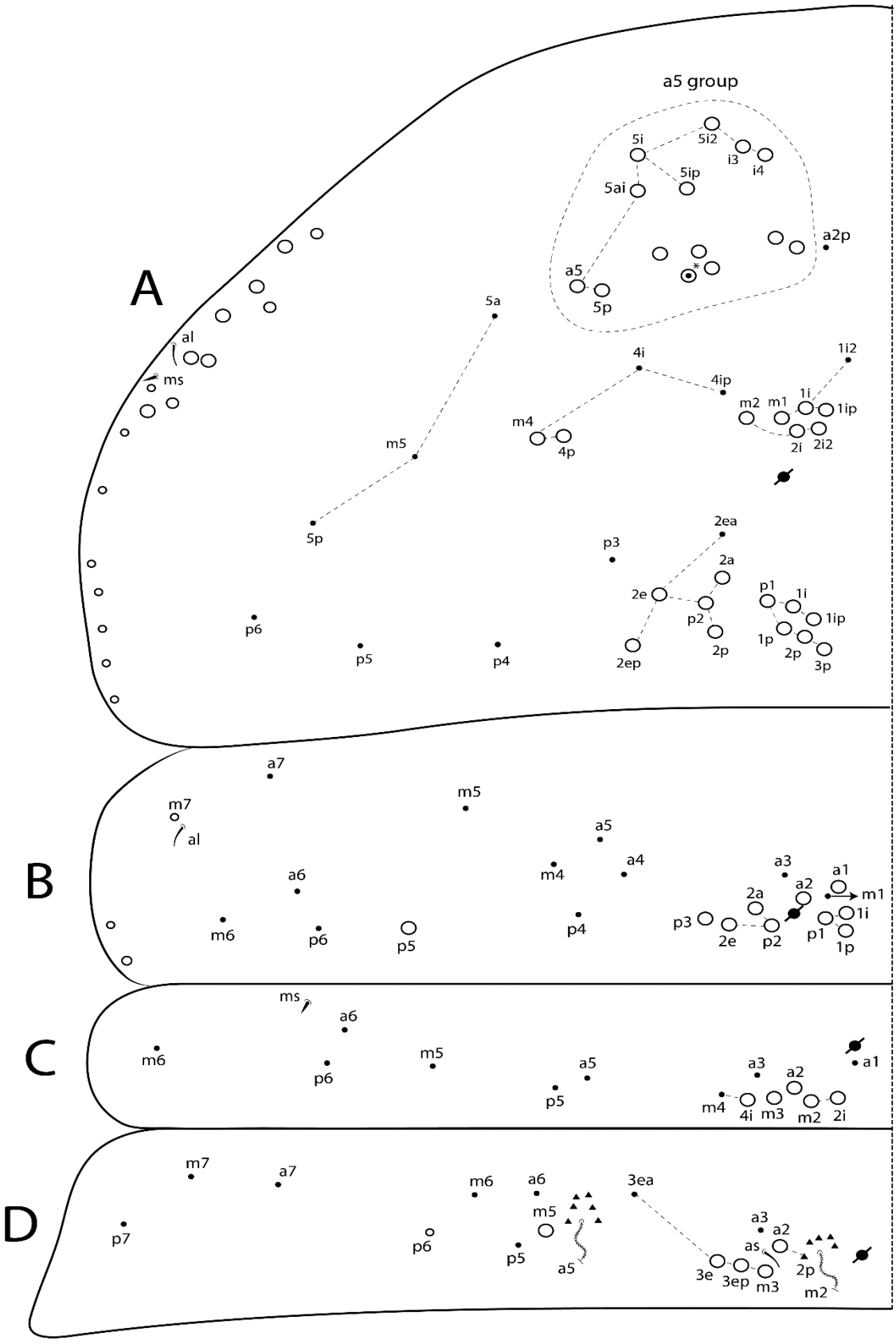

FIGURE 24A–D. *Lepidocyrtinus botswanensis* **sp. nov.**: dorsal chaetotaxy; **A**, Th II; **B**, Th III; **C**, Abd I; **D**, Abd II.

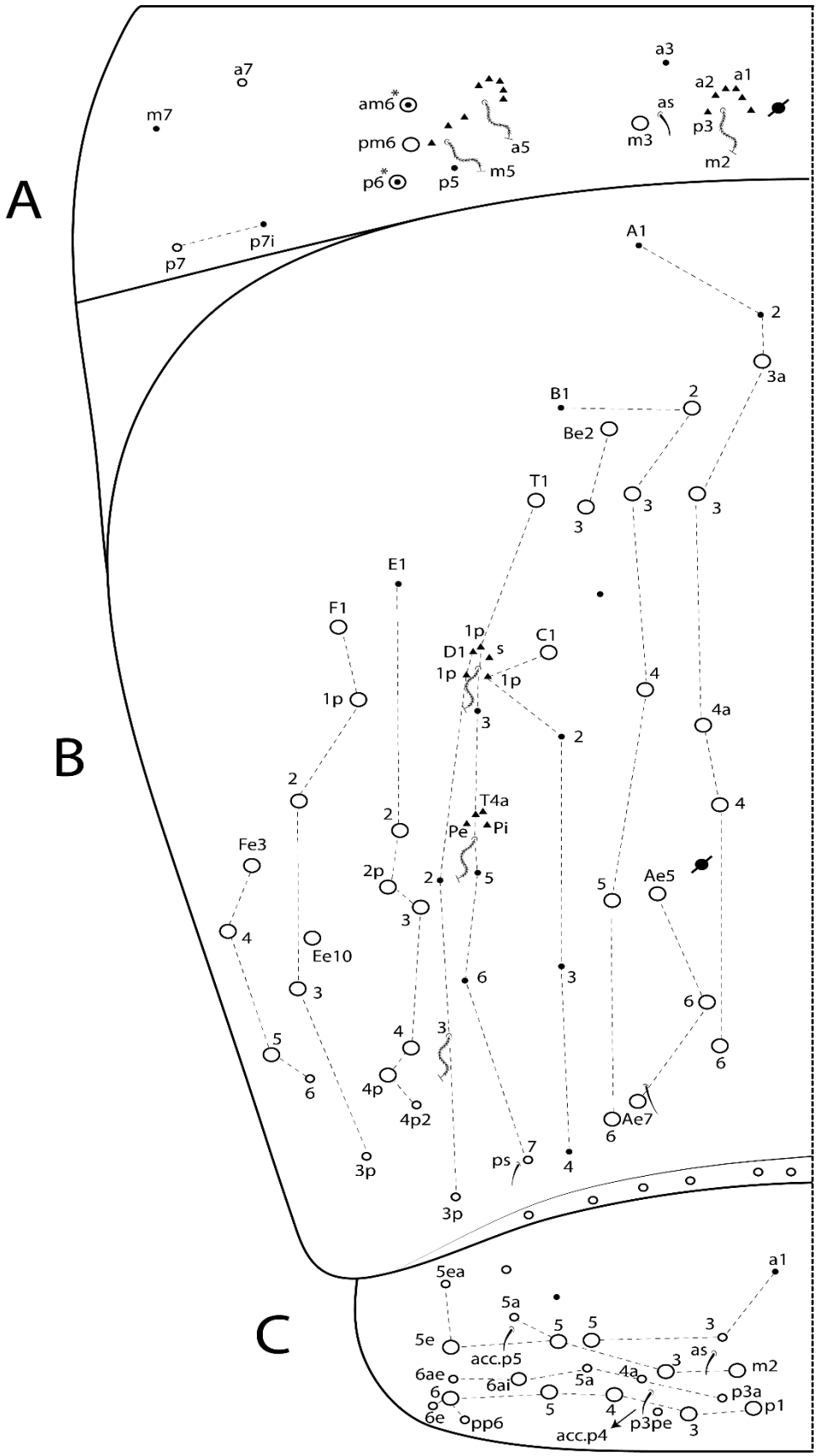

FIGURE 25A–**C.** *Lepidocyrtinus botswanensis* **sp. nov.**: dorsal chaetotaxy; **A**, Abd III, **B**, Abd IV; **C**, Abd V.

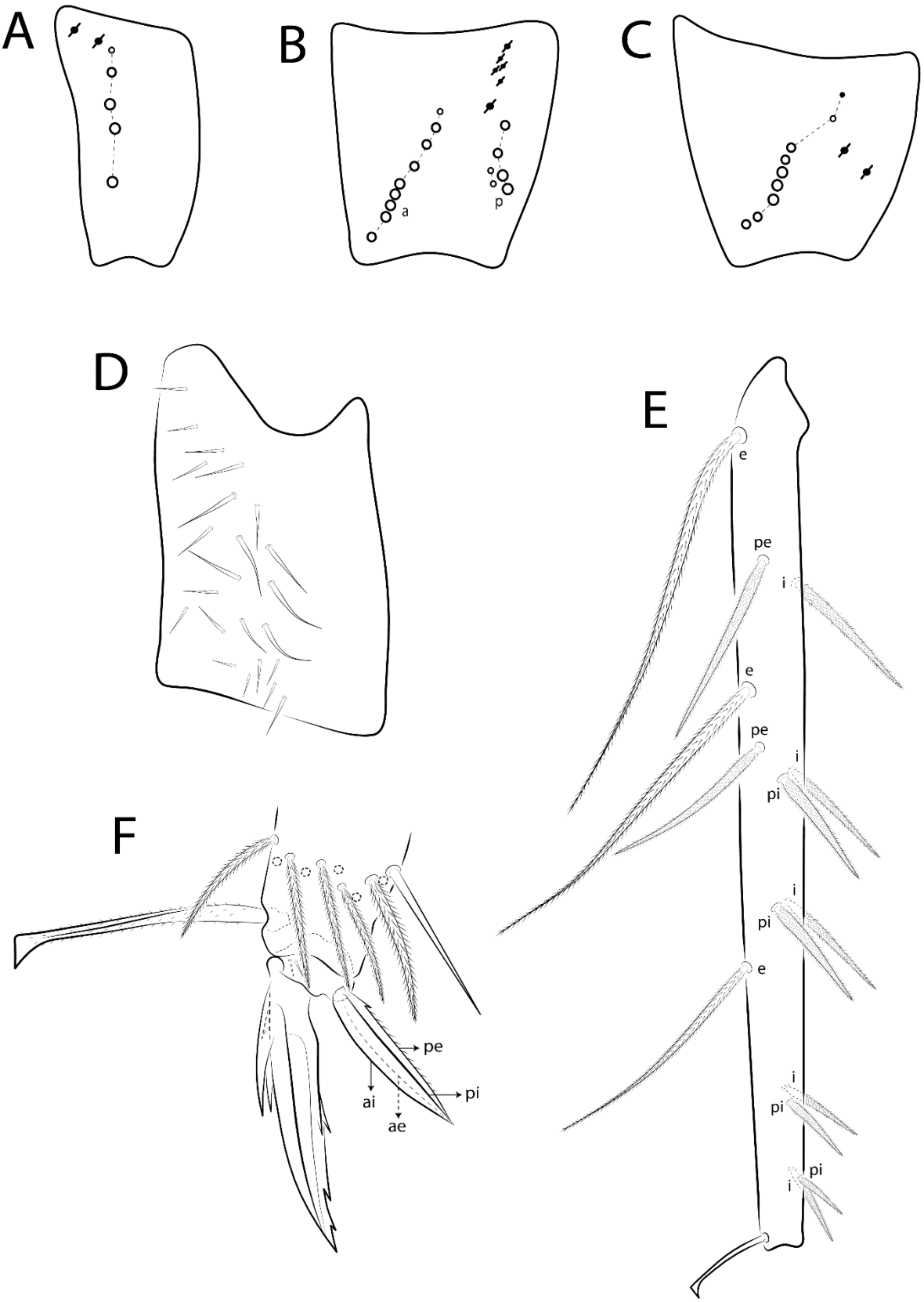

FIGURE 26A–F. *Lepidocyrtinus botswanensis* **sp. nov.**: legs chaetotaxy; **A**, subcoxa I; **B**, subcoxa II; **C**, subcoxa III (outer side); **D**, trochanteral organ (inner side); **E**, left tibiotarsus III (posterior side); **F**, distal tibiotarsus and empodial complex III (posterior side).

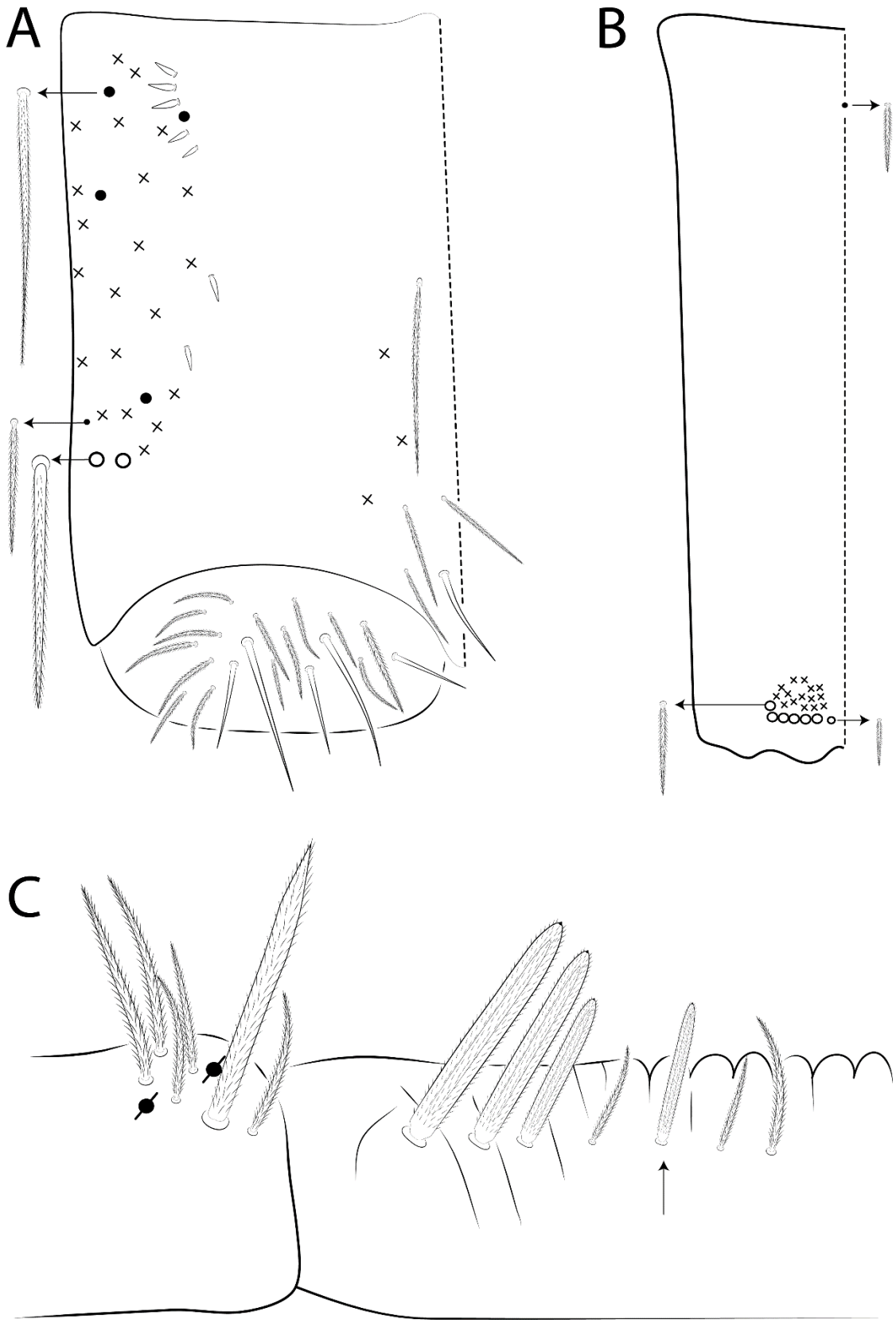

FIGURE 27A–C. *Lepidocyrtinus botswanensis* **sp. nov.**: **A**, collophore chaetotaxy (lateral view); **B**, manubrium ventral chaetotaxy; **C**, chaetotaxy of the manubrial plate and proximal dens (lateral view), arrow indicate blunt chaeta present or absent.

***Lepidocyrtinus fabioi* sp. nov. Cipola & Bellini**

Figs 13D, 28–32, 41

Type Material. Holotype female on slide (NHMLA): Republic of the Congo, Poll Departament, Nagbe, Lesio-Louna Reserve, 03°16'S, 15°28'E (Fig. 41), 18.viii.2008, Malaise trap, B Brown coll. Paratypes on slide (NHMLA): 2 females, same data as holotype. Paratypes on slide (NHMLA): 1 male, 2 females and 2 juveniles, same data as holotype, except 25.viii.2008.

Diagnosis. Body with dark bands on Ant III and femur III distally (Fig. 13D); head mac **A0**, **A2**, **A5**, **M1**–**2**, **S3**, **S5**, **S6** and **Pp5** present; prelabral chaetae ciliate; labial papilla E with lateral process (l.p.) apically finger-shaped and surpass the base of apical appendage (Figs 28D–E); Th II with 5–8 anterior, 5–6 median (**m4–4p** present, **m1ip**, **m2i2** and **m4i** mac absent) and 4–5 posterior mac (**p2ep** mic, **p3** mac); Th III–Abd II with 4, 1, 3 central mac respectively; Abd IV with 10 central mac and 14 lateral mac (Figs 30, 31B); ungues apical tooth present; unguiculus with all lamella acuminate; collophore anteriorly with 8 spine-like chaetae and 3 ciliate chaetae apically acuminate, posteriorly with 5 spines, smooth chaeta present (Fig. 32E); manubrium ventrally with 2/4 subapical chaetae; manubrial plate with 2 blunt mac abruptly acuminate at apex; dens without blunt mac (Figs 32F–G).

Description. Total length of body (head + trunk) 2.02–3.05 mm (n=4), holotype 2.92 mm. Specimen pale white with dark blue pigments on proximal Ant IV, distal and proximal of Ant I, femur II–III distally and proximal tibiotarsus; eyepatches and basal Ant I dark (Fig. 13D). Scales present on Ant I to one fifths proximal of Ant IV, ventral and dorsal head, dorsal trunk, legs (except empodium), anterior and posterior collophore, ventral and dorsal manubrium and dens ventrally.

Head. Antennae smaller to trunk length (Fig. 13D); ratio antennae: trunk = 1: 1.33–1.63 (n=2); antennal segments ratio as I: II: III: IV = 1: 1.23–1.5: 1.20–1.39: 2.01–2.48 (present in two paratypes), holotype 1: 1.25: 1.30: missing. Ant IV annulated on distal three quarters, with apical bulb apically unilobed. Ant III not annulated, organ with 2 club-shaped curved sense, 3 spiny guard sens, s-blunt sens of different sizes and ciliated chaetae (Fig. 28A). Ant I dorsally with 4 median mac and 6 smooth mic at base, without spines

(Fig. 28B). Eyes A and B larger, G and H smaller, others subequal, and with 5 'IO' chaetae; head dorsal macrochaetotaxy with 8–9 **An**, 3 **A**, 3 **M**, 3 **S**, 1 **Ps**, 1 **Pa** and 1 **Pp** mac. (Fig. 28E). Clypeal formula with 4 (**l1**–**2**), 2 (**fr**), 3 (**pf0**–**1**) ciliate chaetae, **l1**–**2** larger, **l1** apically acuminate, others subequal (Fig. 28C). Prelabral chaetae ciliate and not bifurcated. Labral **p0** chaeta without median filament. Labral papillae with two inner conical projections, outer papillae absent. Labial papilla E with lateral process (l.p.) apically finger-shaped and surpass the base of apical appendage (Fig. 28D). Basolateral and basomedian labial fields with chaetae **M1**–**2**, **E**, **L1**–**2** ciliate, **r** reduced. Ventral head with about 14 ciliate chaetae, postlabial formula with 4 (**G1**–**4**), 3 (**H2**–**4**), 4 (**J1**–**4**) chaetae, and 2 larger chaetae, 1 basal chaetae (b.c.) surrounding the cephalic groove (Fig. 28F).

Thorax chaetotaxy (Fig. 30A–B). Th II **a**, **m** and **p** series with 5–8, 5–6 and 4–5 mac, respectively. Th III **a**, **m** and **p** series with 0, 1 and 4 mac, respectively. Ratio Th II: III = 1.90–1.66: 1 (n=4), holotype 1.68: 1.

Abdomen chaetotaxy (Figs 30C–D, 31A–C). Abd I **a**, **m** and **p** series with 0, 1 and 0 mac, respectively, **m2i** and **m4i** absent. Abd II **a**, **m** and **p** series with 1, 3 and 0 mac, respectively, **m3ep** mic. Abd III **a**, **m** and **p** series with 0, 3 and 2 mac, respectively. Abd IV with 10 central mac of **A**–**T** series and 14 lateral mac of **E**–**Fe** series; 9 posterior sens (**ps** type I, others type II) and 8 posterior mes. Abd V **a**, **m** and **p** series with 1, 4 and 6 mac, respectively. Ratio Abd III: IV = 1: 3.31–4.82 (n= 4), holotype 1: 4.82.

Legs. Subcoxa I with 6 chaetae and 2 psp; subcoxa II with an anterior row of 10 chaetae, posterior row of 2 chaetae and 4 psp; subcoxa III with one row of 8 chaetae and 2 posterior psp (Fig. 32A–C). Trochanteral organ with about 37 spine-like chaetae (Fig. 32D). Tibiotarsus subdivided on distal two thirds, outer side with 2 proximal larger ciliate chaetae and apically acuminate, inner side with 7 mac weakly ciliate. Ungues inner side with 4 teeth, 2 paired basal, 1 unpaired median subequal to basal teeth and 1 small unpaired apical. Unguiculus with all lamellae acuminate, **pe** lamella serrated and with small proximal tooth, other lamellae smooth; ratio unguis: unguiculus = 1: 0.64. Tibiotarsus smooth chaetae 0.86 smaller than unguiculus; tenent hair 0.91 smaller than unguis outer edge.

Collophore. Anterior side with 14 chaetae, 8 proximal spine-like chaetae, 1 ciliate chaetae, 3 ciliate chaetae apically acuminate and 2 mac distally; posterior side with 9 chaetae, 5 spines, 3 thin ciliate chaetae and 1 smooth chaetae distally; lateral flap with about 17 chaetae, 5 smooth and 12 ciliate (Fig. 32E).

Furcula. Manubrium ventral formula with 1, 2 2, 2/4 (subapical), 12 (apical) ciliate chaetae of different sizes plus about 11 elongated apical scales per side (Fig. 32F); manubrial plate with 2 blunt mac ciliate and abruptly acuminate at apex, 4–5 ciliate chaetae of different sizes and 3 psp. Dens dorsally without blunt mac (Fig. 32G).

Etymology. It is named after the Collembola researcher Dr. Fabio Gonçalves de Lima Oliveira (USP/RP, Brazil), who helped with this study providing specimens from Africa.

Remarks. *Lepidocyrtinus fabioi* **sp. nov.** resembles *S. rykai* (Coates 1968) **comb. nov.** in reduced macrochaetotaxy, as Th II with 4 mac in **m1**–**2** complex, and Abd I–II with 1 and 3 central mac, respectively (Figs 30A, C–D). However, *L. fabioi* **sp. nov.** differs from this species by Ant III not annulated (annulated in *L. rykei* **comb. nov.**), Th II with 4–5 posterior mac (8 in *L. rykei* **comb. nov.**), Th III with 4 central mac (6 in *L. rykei* **comb. nov.**), and dens devoided of blunt mac (present in *L. rykei* **comb. nov.**) (Figs 30A–B, 32G).

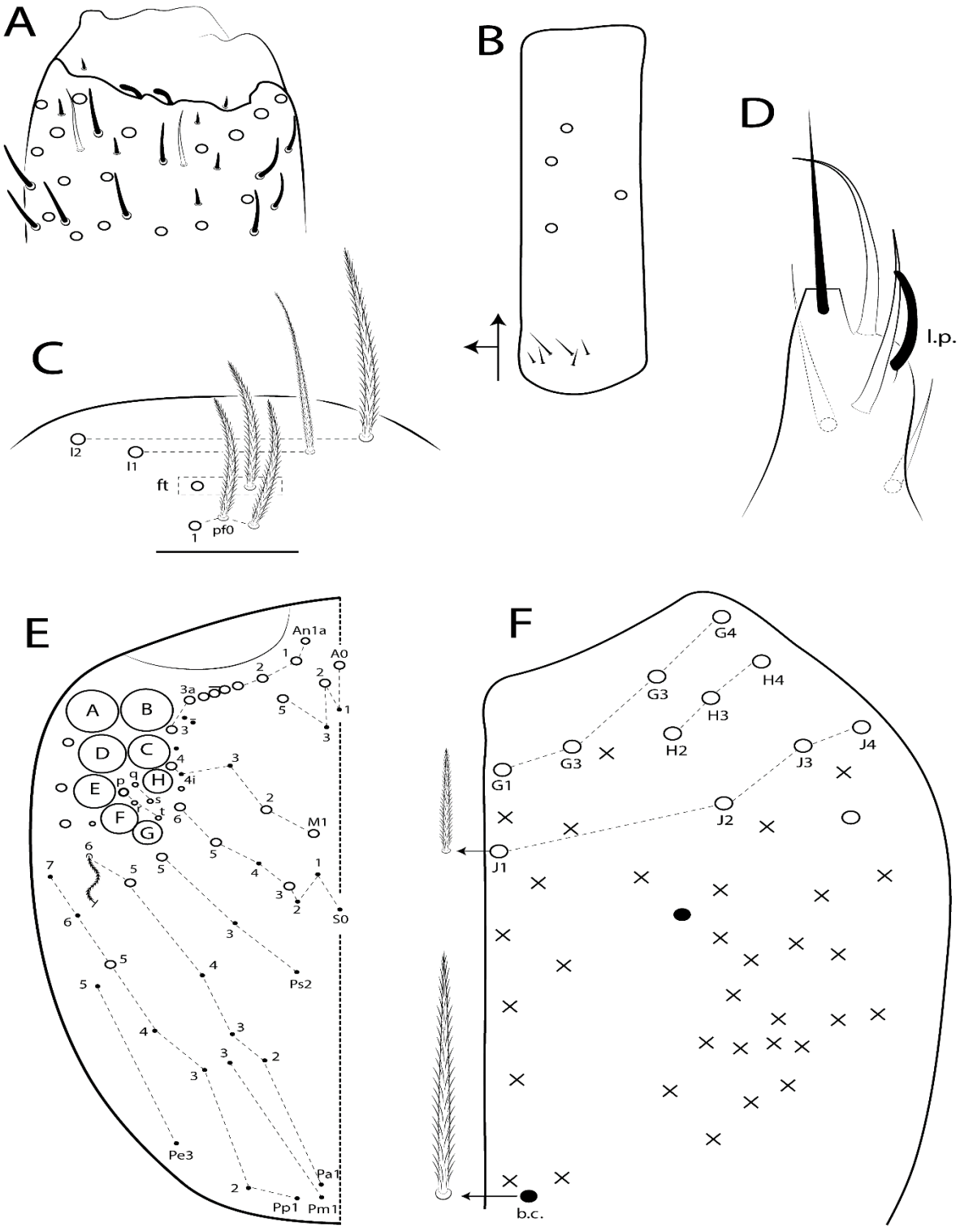

FIGURE 28A–F. *Lepidocyrtinus fabioi* **sp. nov.**: head; **A**, Ant III apical organ (lateral side); **B**, Ant I left chaetotaxy (dorsal side); **C**, chaetotaxy of the clypeus; **D**, labial papillae E (right side), arrow indicates lateral process (**l.p.**); **E**, dorsal chaetotaxy (left side); **F**, postlabial and cephalic groove chaetotaxy (right side).

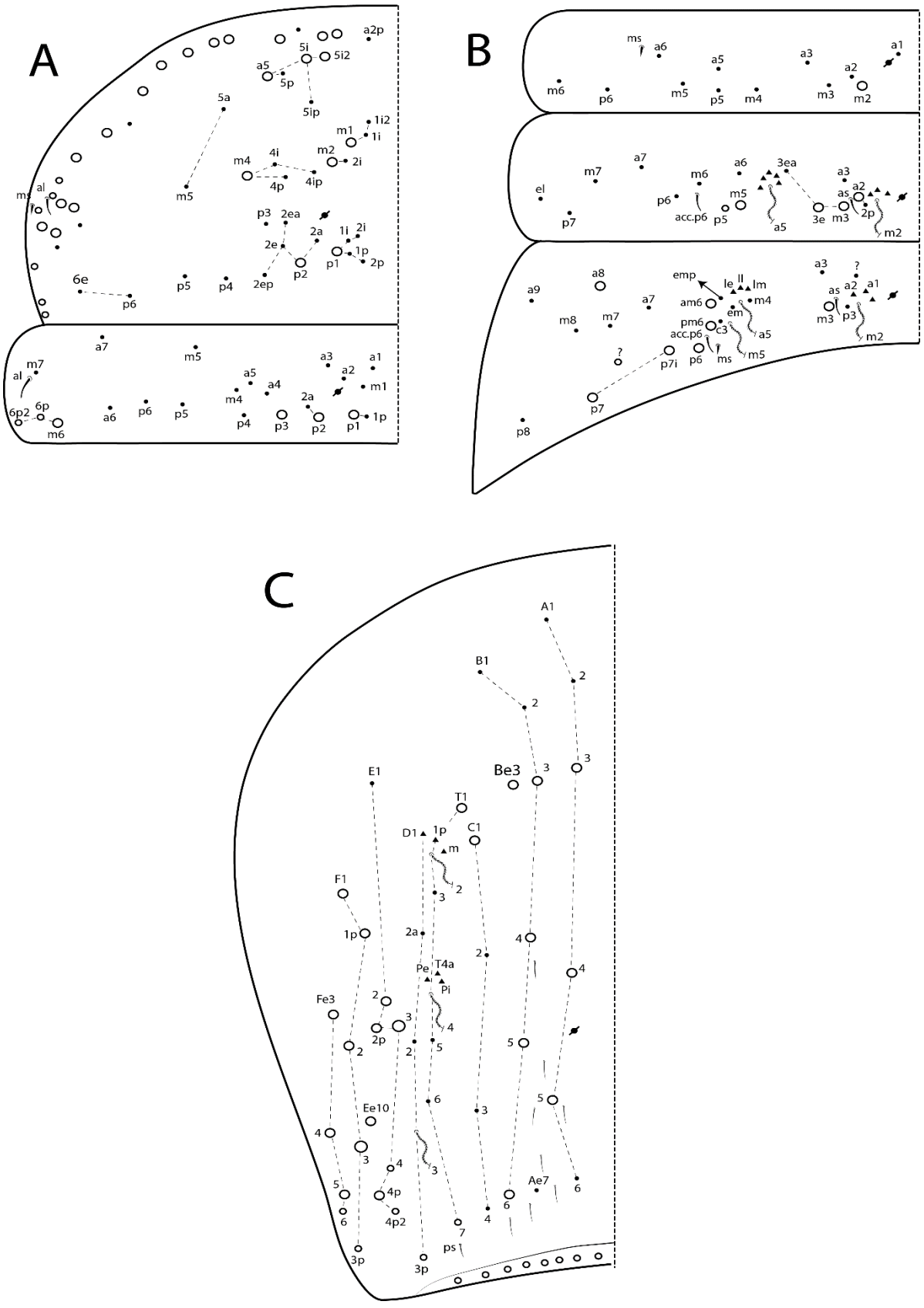

FIGURE 29A–C. *Lepidocyrtinus fabioi* **sp. nov.**: dorsal chaetotaxy of juvenile in intermediary instar: **A**, Th II–III; **B**, Abd I–III; **C**, Abd IV.

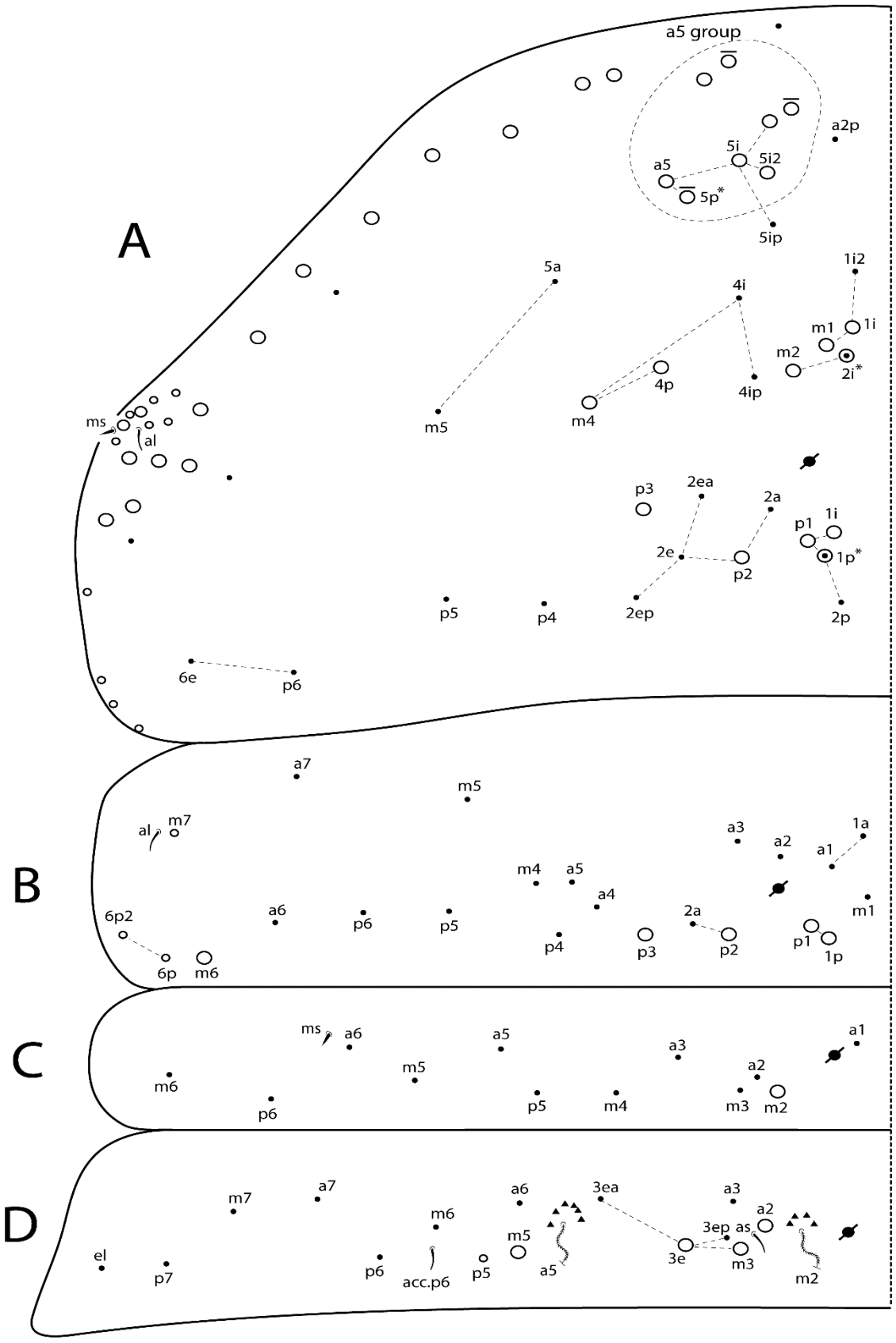

FIGURE 30A–**D.** *Lepidocyrtinus fabioi* **sp. nov.**: dorsal chaetotaxy; **A**, Th II; **B**, Th III; **C**, Abd I; **D**, Abd II.

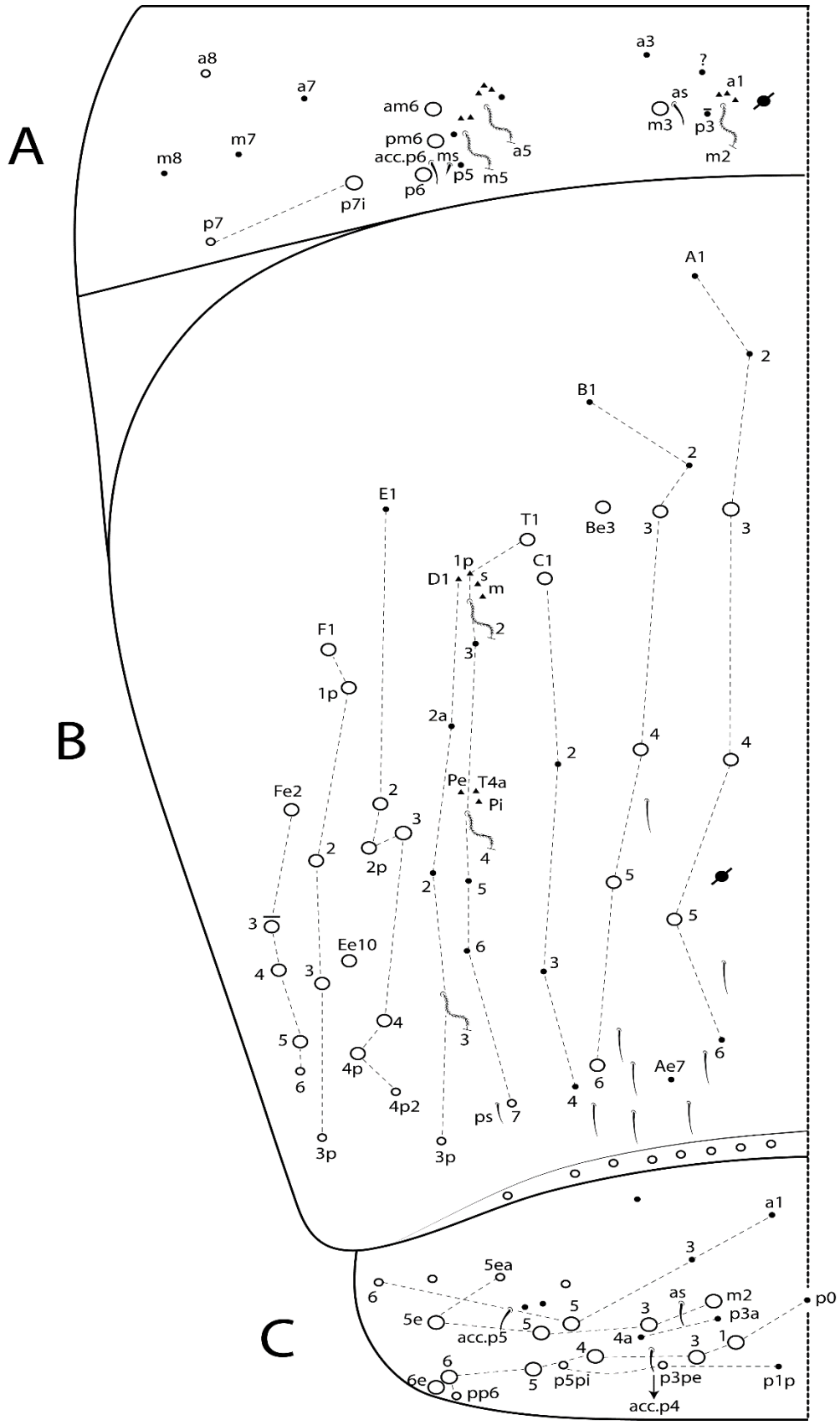

FIGURE 31A–**C.** *Lepidocyrtinus fabioi* **sp. nov.**: dorsal chaetotaxy; **A**, Abd III, **B**, Abd IV; **C**, Abd V.

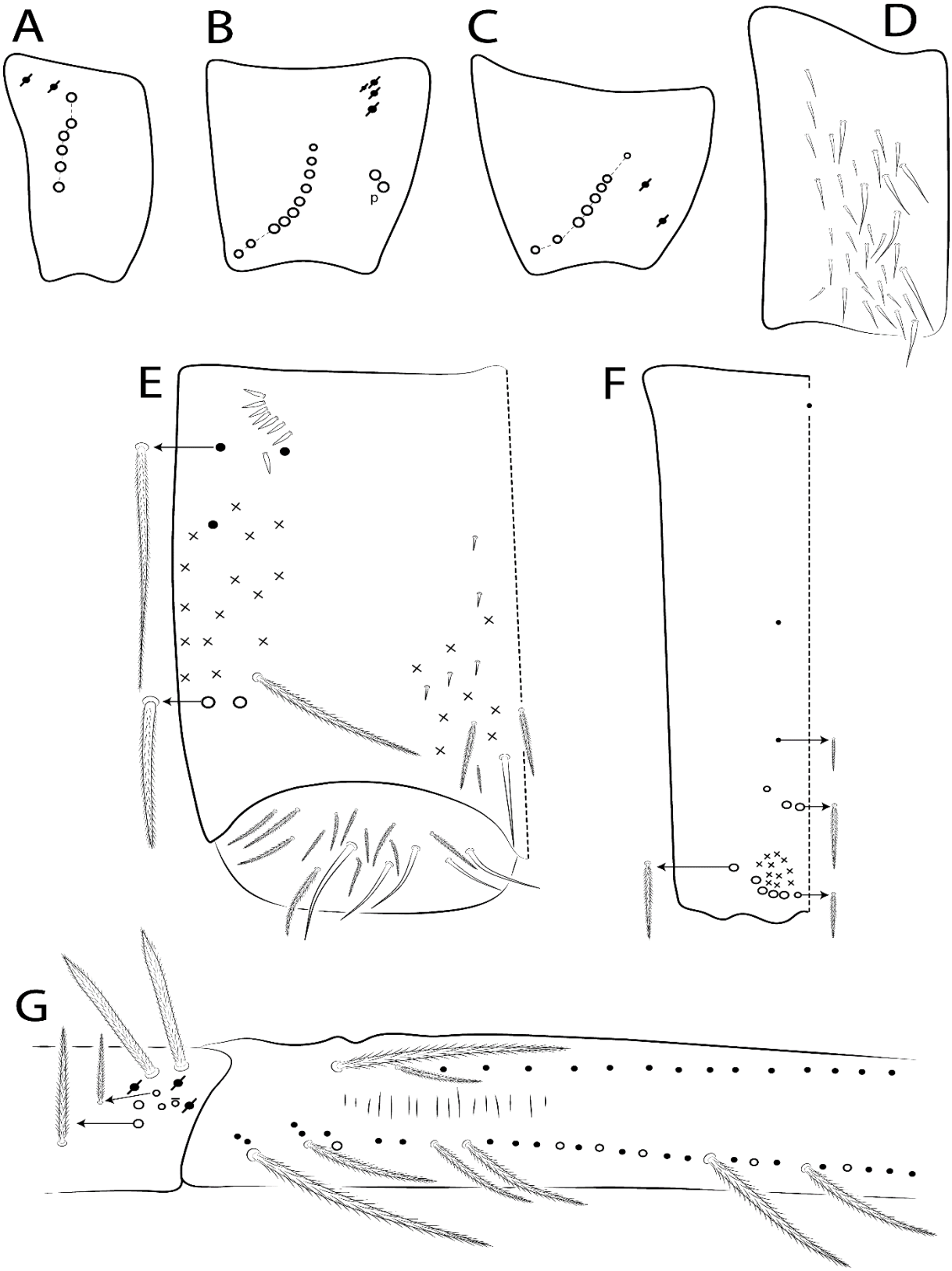

FIGURE 32A–G. *Lepidocyrtinus fabioi* **sp. nov.**: **A**, subcoxa I; **B**, subcoxa II; **C**, subcoxa III (outer side); **D**, trochanteral organ (inner side); **E**, collophore chaetotaxy (lateral view); **F**, manubrium ventral chaetotaxy; **G**, chaetotaxy of the manubrial plate and proximal dens (lateral view).

***Lepidocyrtinus paucisensillum* sp. nov. Cipola & Bellini**

Figs 13E, 33–36, 41

Type Material. Holotype female on slide (NHMLA): Republic of the Congo, Poll Departament, Nagbe, Lesio-Louna Reserve, 03°16'S, 15°28'E (Fig. 41), 18.viii.2008, Malaise trap, B Brown coll. Paratypes on slide (NHMLA): 1 male and 2 females, same data as holotype.

Diagnosis. Body with dark blue pigments on Ant II–III internally and posterior head to coxa I and Th II laterally (Fig. 13E); head mac **A0**, **A2**–**3**, **A5**, **M1**–**2**, **S0**–**3**, **S5**–**6** and **Pp5** present; prelabral chaetae ciliate; labial papilla E with lateral process (l.p.) apically finger-shaped and reaching the base of apical appendage (Figs 33D–E); Th II with 13–14 anterior, 7 median (**m4**–**4p** present, **m1ip** and **m4i** mac absent) and 11 posterior mac (**p2ep** mac, **p3** mic); Th III–Abd II with 8–9, 5, 3–4 central mac respectively; Abd IV with 16–18 central mac and 12–13 lateral mac (Figs 34, 35B); ungues apical tooth present; unguiculus with all lamella acuminate; collophore anteriorly with 12 spine-like chaetae and 4 ciliate chaetae apically acuminate, posteriorly without spines, smooth chaeta present (Fig. 36E); manubrium ventrally with 2/2 subapical chaetae; manubrial plate with 3 blunt mac abruptly acuminate at apex; dens with 9 blunt mac apically nipple-like (Figs 36F–G).

Description. Total length of body (head + trunk) 2.44–4.32 mm (n=4), holotype 4.32 mm. Specimen pale white with pigment dark blue present on inner side of the Ant I–III forming a longitudinal strip, posterolateral of dorsal head, Th II lateral margin and all coxa I. Pigment light blue present on Th III laterally and femur III distally; eyepatches dark (Fig. 13E). Scales present on Ant I to proximal half of Ant III, ventral and dorsal head, dorsal thorax and abdomen, legs (except empodium), anterior collophore, ventral and dorsal manubrium and dens ventrally.

Head. Antennae probably subequal or smaller than trunk length (Fig. 13E); ratio antennae: trunk = 1: 1.56–2.23 (n=3), holotype 1: 2.23 (Ant IV absent); antennal segments ratio as I: II: III = 1: 1.25–1.37: 2.26–2.65, holotype 1: 1.29: 2.28. Ant IV missing in all specimens, but probably annulated. Ant III annulated on distal three-fourth, organ with 2 club-shaped sense, 3 spiny guard sens and s-blunt sens of different sizes (Fig. 33A). Ant I dorsally with 2 median mac and 5 smooth mic at base, without spines (Fig. 33B). Eyes A

and B gently larger, G and H smaller, others subequal, and with 5 'IO' chaetae; head dorsal macrochaetotaxy with 10 **An**, 4 **A**, 3 **M**, 7 **S**, 1 **Ps** and 1 **Pp** mac (Fig. 33E). Clypeal formula with 4 (**l1**–**2**), 2 (**fr**), 3 (**pf0**–**1**) ciliate chaetae, **l1**–**2** larger, **l1** apically acuminate, others subequal (Fig. 33C). Prelabral chaetae ciliate and not bifurcated. Labral **p0** chaeta without median filament. Labral papillae with two inner conical projections, outer papillae absent. Maxillary palp with smooth apical appendage (**a.a.**) and basal chaeta (**b.c.**) weakly ciliate, thicker and 1.14 larger in length than the apical. Labial papilla E with lateral process (l.p.) finger-shaped and reaching the base of apical appendage (Fig. 33D). Basolateral and basomedian labial fields with chaetae **M1**–**2**, **R**, **E**, **L1**–**2** ciliate. Ventral head with about 25 ciliate chaetae, postlabial formula with 4 (**G1**–**4**), 3 (**H2**–**4**), 3 (**J1**–**3**) chaetae (**H2** and **J2** larger), 7 thin posterior chaetae, and 3 larger chaetae, 1 basal chaeta (b.c.) surrounding the cephalic groove (Fig. 33F).

Thorax chaetotaxy (Fig. 34A–B). Th II **a**, **m** and **p** series with 13–14, 7 and 11 mac, respectively. Th III **a**, **m** and **p** series with 2, 1 and 7–8 mac, respectively. Ratio Th II: III = 1.81–1.69: 1 (n=4), holotype 1.81: 1.

Abdomen chaetotaxy (Figs 34C–D, 35A–C). Abd I **a**, **m** and **p** series with 1, 4 and 0 mac, respectively. Abd II **a**, **m** and **p** series with 1, 3–4 and 0 mac, respectively. Abd III **a**, **m** and **p** series with 0, 3 and 1 mac, respectively. Abd IV with 16–18 central mac of **A**–**T** series and 12–13 lateral mac of **E**–**Fe** series; 4 posterior sens (**ps** type I, others type II) and 9 posterior mes. Abd V **a**, **m** and **p** series with 1, 4 and 6 mac, respectively. Ratio Abd III: IV = 1: 3.64–4.98 (n= 4), holotype 1: 4.98.

Legs. Subcoxa I with 7 chaetae and 2 psp; subcoxa II with an anterior row of 13 chaetae, posterior row of 5 chaetae, 1 anterior chaeta and 7 psp; subcoxa III with one row of 12 chaetae and 2 posterior psp (Fig. 36A–C). Trochanteral organ with about 63 spine-like chaetae (Fig. 36D). Tibiotarsus sometimes subdivided on distal two thirds, outer side with 4 larger ciliate chaetae and apically acuminate, inner side with 6 mac weakly ciliate. Ungues inner side with 4 teeth, 2 paired basal, 1 unpaired median subequal to basal teeth and 1 small unpaired apical. Unguiculus with all lamellae acuminate, **pe** lamella serrated and with small proximal tooth, other lamellae smooth; ratio unguis: unguiculus = 1: 0.65. Tibiotarsal smooth chaeta 0.83 smaller than unguiculus and tenent hair 0.86 smaller than unguis outer edge.

Collophore. Anterior side with 22 chaetae, 12 proximal spine-like chaetae, 3 ciliate chaetae, 5 ciliate chaetae apically acuminate and 2 mac distally; posterior side with 11

chaetae, 9 thin ciliate chaetae widely distributed and 1 ciliate and 1 smooth chaetae distally; lateral flap with about 42 chaetae, 11 smooth and 31 ciliate (Fig. 36E).

Furcula. Manubrium ventral formula with 1, 2 2, 2/2 (subapical), 2/16 (apical) ciliate chaetae of different sizes plus about 15 elongated apical scales per side (Fig. 36F); manubrial plate with 3 blunt mac weakly ciliate and abruptly acuminate at apex, 6 ciliate chaetae of different sizes and 3 psp. Dens dorsally with 9 blunt mac finely ciliate and apically nipple-like (Fig. 36G).

Etymology. *paucisensillum* refers to few (from latin: *pauci*) sensilla present in Abd IV.

Remarks. *Lepidocyrtinus paucisensillum* **sp. nov.** resembles *L. riozoi* **nom. nov.** in Th II with 5 central mac in **m1**–**2** group, Th III to Abd II with 9, 5, 4 central mac, respectively, ungues apical tooth present and dens with at least 9 blunt mac; However, *L. paucisensillum* **sp. nov.** differs from this species by dark blue pigments on Ant II–III internally and on posterior head to coxa I and Th II laterally, while in *L. riozoi* **nom. nov.** there are pigments on all Ant III–IV, and distally on femur and tibiotarsus I–III. In chaetotaxy they differ by Th II with **p3** mic and Th III without **p1p2** mac (opposite in *L. riozoi* **nom. nov.**), in Abd IV by 6–7 (anterior), 4 (median) and 6–7 (posterior) central mac (8, 5 and 4 in *L. riozoi* **nom. nov.**), and manubrial plate with 3 blunt mac abruptly acuminate at apex (apically nipple-like in *L. riozoi* **nom. nov.**).

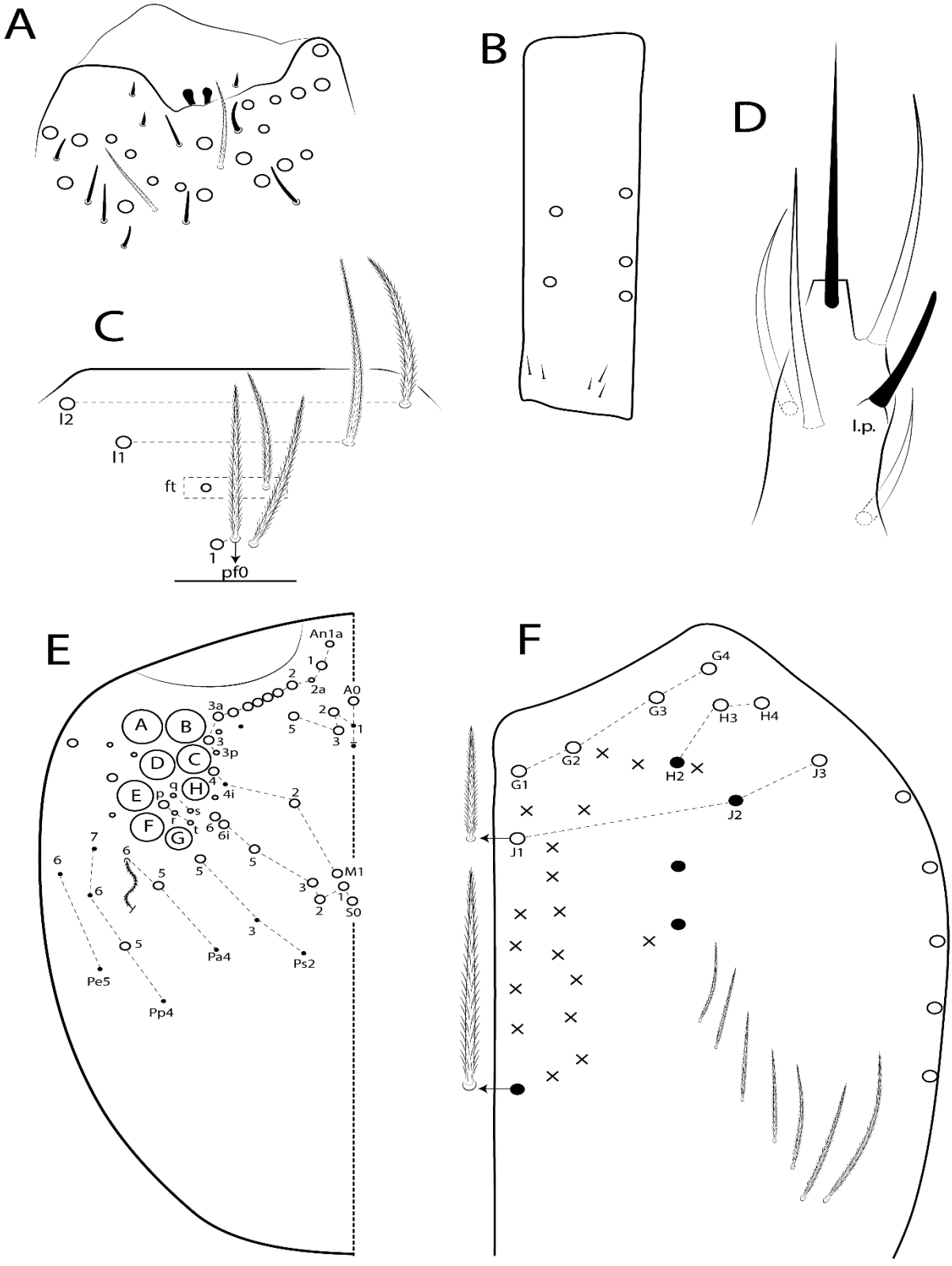

FIGURE 33A–F. *Lepidocyrtinus paucisensillum* **sp. nov.**: head; **A**, Ant III apical organ (lateral side); **B**, Ant I left chaetotaxy (dorsal side); **C**, chaetotaxy of the clypeus; **D**, labial papillae E (right side), arrow indicates lateral process (**l.p.**); **E**, dorsal chaetotaxy (left side); **F**, postlabial and cephalic groove chaetotaxy (right side).

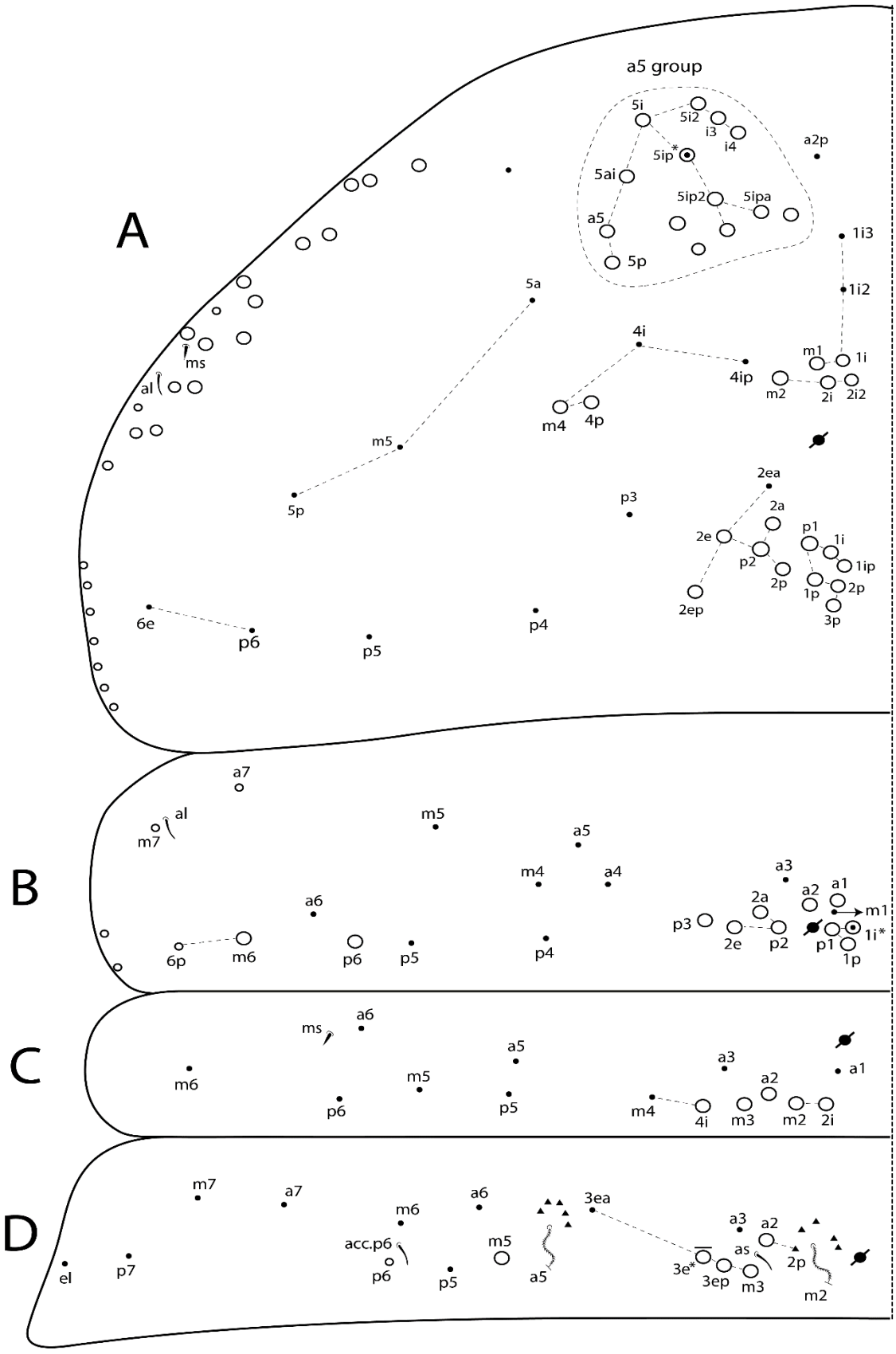

FIGURE 34A–D. *Lepidocyrtinus paucisensillum* **sp. nov.**: dorsal chaetotaxy; **A**, Th II; **B**, Th III; **C**, Abd I; **D**, Abd II.

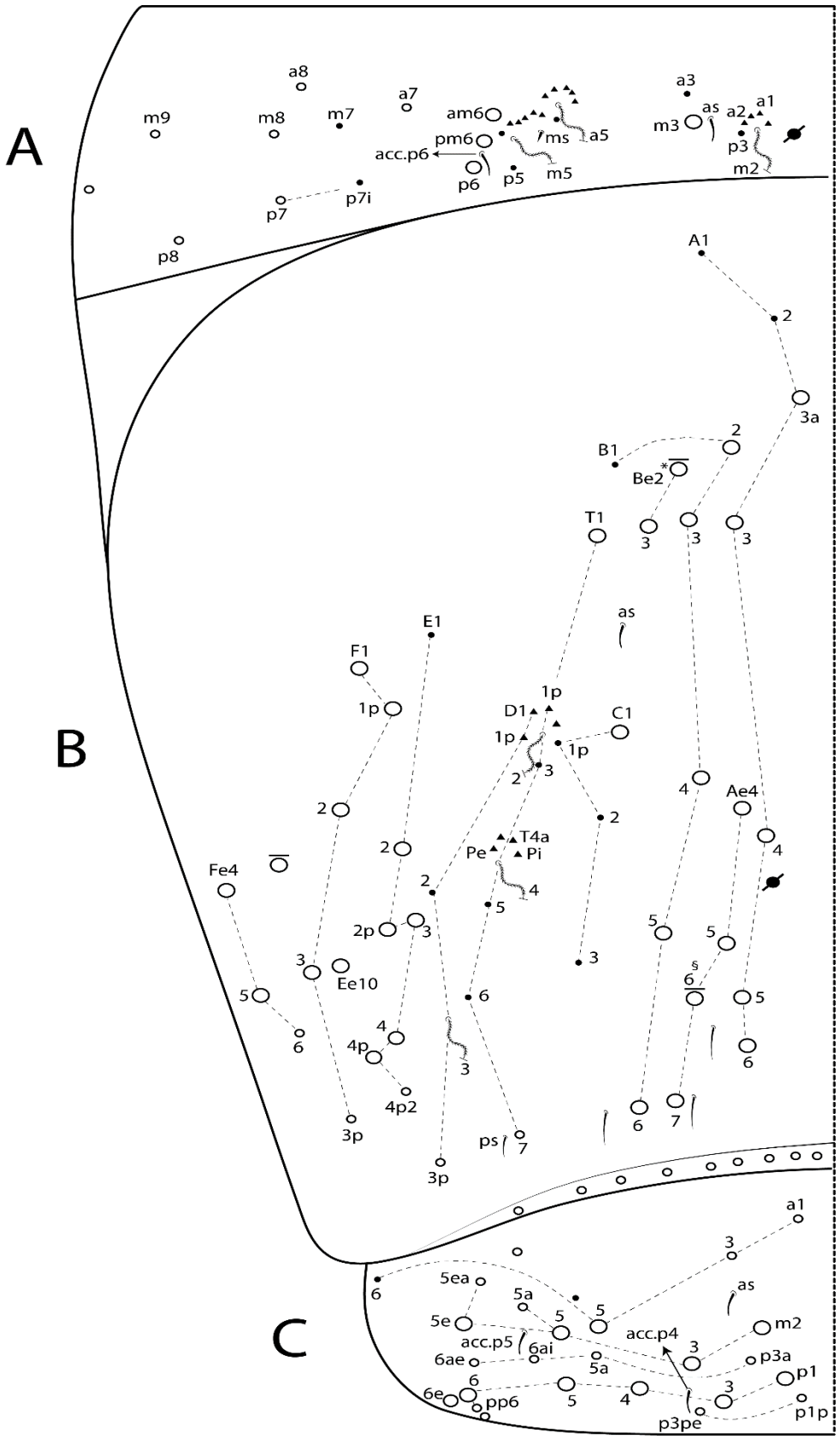

FIGURE 35A–C. *Lepidocyrtinus paucisensillum* **sp. nov.**: dorsal chaetotaxy; **A**, Abd III, **B**, Abd IV; **C**, Abd V.

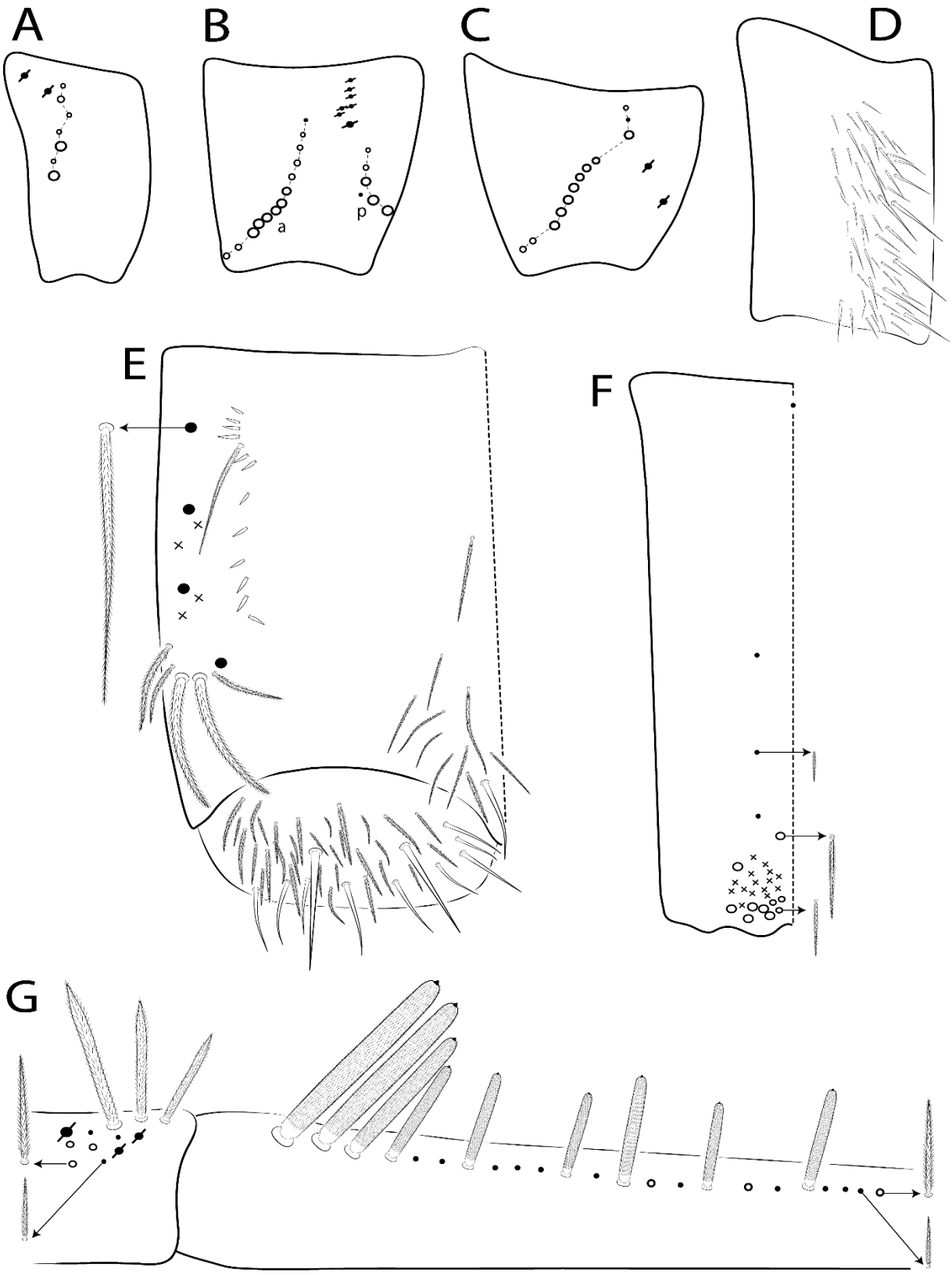

FIGURE 36A–G. *Lepidocyrtinus paucisensillum* **sp. nov.**: **A**, subcoxa I; **B**, subcoxa II; **C**, subcoxa III (outer side); **D**, trochanteral organ (inner side); **E**, collophore chaetotaxy (lateral view); **F**, manubrium ventral chaetotaxy; **G**, chaetotaxy of the manubrial plate and proximal dens (lateral view).

***Lepidocyrtinus scheepersae* sp. nov. Cipola & Bellini**

Figs 13F, 37–41

Type Material. Holotype female on slide (SAM/IZIKO): South Africa, Cape Town, Somerset West, Helderberg Nature Reserve, 34°03'40"S, 18°52'20"E (Fig. 41), Southern Afrotemperate Forest, 142 m., 13.xi.2017, beating and aspirating, A. Liu coll. 9 Paratypes (SAM/IZIKO): 4 females on slides and 5 specimens in alcohol, same data as holotype. 11 paratypes (SAM/IZIKO): 2 females and 1 juvenile in slides and 8 specimens in alcohol, same data as holotype, except 17.x.2017.

Diagnosis. Body with dark bands on Ant III–IV and femur III distally (Fig. 13F); head mac **A0**, **A2**–**3**, **A5**, **M1**–**2**, **M4i** and **S0**–**6** present; prelabral chaetae ciliate; labial papilla E with lateral process (l.p.) apically finger-shaped and not reaching the base of apical appendage (Figs 37C–D); Th II with 12–14 anterior, 8 median (**m1ip**, **m4**–**4p** present, **m4i** mac absent) and 12–13 posterior mac (**p2ep** and **p3** mac); Th III–Abd II with 11, 6, 4 central mac respectively; Abd IV with 16 central mac and 15–17 lateral mac (Figs 38, 39B); ungues apical tooth present; unguiculus with all lamella acuminate; collophore anteriorly with 11 spine-like chaetae and 4 ciliate chaetae apically acuminate, posteriorly without spines, smooth chaeta present (Fig. 40E); manubrium ventrally with 2/2 subapical chaetae; manubrial plate with 3 blunt mac apically nipple-like; dens with 11–13 blunt mac apically nipple-like (Figs 40F–G).

Description. Total length of body (head + trunk) 3.25–3.71 mm (n=4), holotype 3.71 mm. Specimen pale white with pigment dark brownish blue on distal and proximal Ant III–IV, distal Ant II, anterior and posterior of eyepatches region, and dark blue pigment on coxa I and tibiotarsus I–III distally; eyepatches dark (Fig. 13F). Scales present on Ant I to proximal two thirds of Ant III, one quarters proximal of Ant IV, ventral and dorsal head, dorsal trunk, legs (except empodium), anterior collophore, ventral and dorsal manubrium and dens ventrally.

Head. Antennae larger to trunk length (Fig. 13F); ratio antennae: trunk = 1: 0.84–0.87 (n=4), holotype 1: 0.84; antennal segments ratio as I: II: III: IV = 1: 1.31–1.52: 2.29–2.74: 2.97–3.18, holotype 1: 1.35: 2.29: 2.97. Ant IV annulated on distal three quarters, with apical bulb apically unilobed. Ant III annulated on distal two thirds, 2 sense organ

elongated, 3 spiny guard sens, s-blunt sens of different sizes and ciliated chaetae. Ant I dorsally with 5 median mac and 3 smooth mic at base, without spines (Fig. 37A). Eyes A and B larger, G and H discreetly smaller, others subequal, and with 5 'IO' chaetae; head dorsal macrochaetotaxy with 11–12 **An**, 4 **A**, 4 **M**, 8 **S** and 1 **Pa** mac. (Fig. 37D). Clypeal formula with 4 (**l1**–**2**), 13–17 (**fr**), 3 (**pf0**–**1**) ciliate chaetae, **l1**–**2** and **pf0**–**1** larger, **l1** apically acuminate, 1–3 **fr** smallar, others subequal (Fig. 37B). Prelabral chaetae ciliate and not bifurcated. Labral **p0** chaeta rarelly with minute median filament. Labral papillae with two inner conical projections, outer papillae absent. Maxillary palp with smooth apical appendage (**a.a.**) and basal chaeta (**b.c.**) weakly ciliate, thicker and 1.08 larger in length than the apical. Labial papilla E with lateral process (l.p.) apically finger-shaped and not reaching the base of apical appendage (Fig. 37C). Basolateral and basomedian labial fields with chaetae **M1**–**2**, **R**, **E**, **L1**–**2** ciliate. Ventral head with about 29 ciliate chaetae, postlabial formula with 4 (**G1**–**4**), 3 (**H2**–**4**), 3 (**J1**–**3**) chaetae, 13 thin posterior chaetae, and 1 larger basal chaetae (b.c.) surrounding the cephalic groove (Fig. 37E).

Thorax chaetotaxy (Fig. 38A–B). Th II **a**, **m** and **p** series with 12–14, 8 and 12–13 mac, respectively. Th III **a**, **m** and **p** series with 4, 1 and 9 mac, respectively. Ratio Th II: III = 2.11–1.67: 1 (n=4), holotype 2.11: 1.

Abdomen chaetotaxy (Figs 38C–D, 39A–C). Abd I **a**, **m** and **p** series with 1, 5 and 0 mac, respectively. Abd II **a**, **m** and **p** series with 1, 4 and 0 mac, respectively. Abd III **a**, **m** and **p** series with 1, 3 and 1 mac, respectively. Abd IV with 16 central mac of **A**–**T** series and 15–17 lateral mac of **E**–**Fe** series; 3 posterior sens (**ps** type I, others type II) and 8 posterior mes. Abd V **a**, **m** and **p** series with 1, 4 and 1/5 mac, respectively. Ratio Abd III: IV = 1: 3.86–4.62 (n= 4), holotype 1: 4.04.

Legs. Subcoxa I with 6 chaetae and 2 psp; subcoxa II with an anterior row of 13 chaetae, posterior row of 4 chaetae and 6 psp; subcoxa III with one row of 12 chaetae, 4 anterior chaetae and 2 posterior psp (Fig. 40A–C). Trochanteral organ with about 67 spine-like chaetae (Fig. 40D). Tibiotarsus not subdivided, outer side with 5 larger ciliate chaetae apically acuminate, inner side with 7 mac weakly ciliate. Ungues inner side with 4 teeth, 2 paired basal, 1 unpaired median subequal to unpaired apical. Unguiculus with all lamellae acuminate, **pe** lamella serrated and with small proximal tooth, other lamellae smooth; ratio unguis: unguiculus = 1: 0.54. Tibiotarsal smooth chaeta 1.79 larger than unguiculus and tenent hair 0.69 smaller than unguis outer edge.

Collophore. Anterior side with 21–23 chaetae, 11 proximal spine-like chaetae, 1 thin and 3–5 ciliate chaetae, 4 ciliate chaetae apically acuminate and 2 mac distally; posterior side with 15 chaetae, 14 thin ciliate chaetae widely distributed and 1 smooth chaetae distally; lateral flap with about 48 chaetae, 8 smooth and 35 ciliate (Fig. 40E).

Furcula. Manubrium ventral formula with 0, 0, 0, 2/2 (subapical), 20–22 (apical) ciliate chaetae of different sizes plus about 15 elongated apical scales per side (Fig. 40F); manubrial plate with 3 blunt mac finely ciliate and apically nipple-like, 14 ciliate chaetae of different sizes and 3 psp. Dens dorsally with one proximal row of 11–13 blunt mac finely ciliate and apically nipple-like, holotype with 11–13 (Fig. 40G)

Etymology. The new species is named after the Collembola researcher Dr. Charlene Janion-Scheepers (SAM/IZIKO, South Africa), who provided us specimens of the new species.

Remarks. In African continent, *L. scheepersae* **sp. nov.** resembles *L. barnardi* **stat. nov.** and *L. marephila* (Coates, 1968) **comb. nov.** in Th II with 6 median mac in **m1**–**2** complex and Abd I–II with 6 and 4 central mac, respectively (Figs 38A, C). *Lepidocyrtinus scheepersae* **sp. nov.** differs from these species by head mac **Pp5** absent (present in *L. barnardi* **stat. nov.**), Th II projected anteriorly (normal in *L. barnardi* **stat. nov.** and *L. marephila* **comb. nov.**) and with 12–13 posterior mac (15–16 in *L. barnardi* **stat. nov.**, 15 in *L. marephila* **comb. nov.**). In Th III it differs by 11 central mac (10 in *L. barnardi* **stat. nov.**, 12 in *L. marephila* **comb. nov.**), and Abd IV with 16 central mac (10–11 in *L. barnardi* **stat. nov.**). It also differs in ventral manubrium only with ciliate chaetae (3 distal smooth chaetae in *L. marephila* **comb. nov.**) and dens with 11–13 blunt chaetae (2–3 in *L. marephila* **comb. nov.**, 13–19 in *L. barnardi* **stat. nov.**).

Lepidocyrtinus scheepersae **sp. nov.** also resembles *L. betamponensis* **sp. nov.** from Madagascar in habitus, color patter with distal spots on femur III (Figs 13F, 47C), chaetotaxy pattern and other general morphology (Figs 37–40, 57–60). However, *L. scheepersae* **sp. nov.** differs from this species by dorsal head mac **S4** present (absent in *L. betamponensis* **sp. nov.**), prelabral chaetae ciliate and basomedian labial fields with chaetae **E** ciliate (both smooth in *L. betamponensis* **sp. nov.**). It differs also by dorsal chaetotaxy of the Th III–Abd II with 11, 6, 4 central mac, respectively (8–10, 1–2, 3–4 in *L. betamponensis* **sp. nov.**) and Abd IV with 16 central mac (12 in *L. betamponensis* **sp.**

nov.). Other differences between them are: collophore anteriorly with 11 spine-like chaetae but absent on posterior side in the new species (9 anterior and 8 posterior in *L. betamponensis* **sp. nov.**) and manubrial plate and dens with blunt mac apically nipple-like (apically bullet-like and abruptly acuminate at apex in *L. betamponensis* **sp. nov.**).

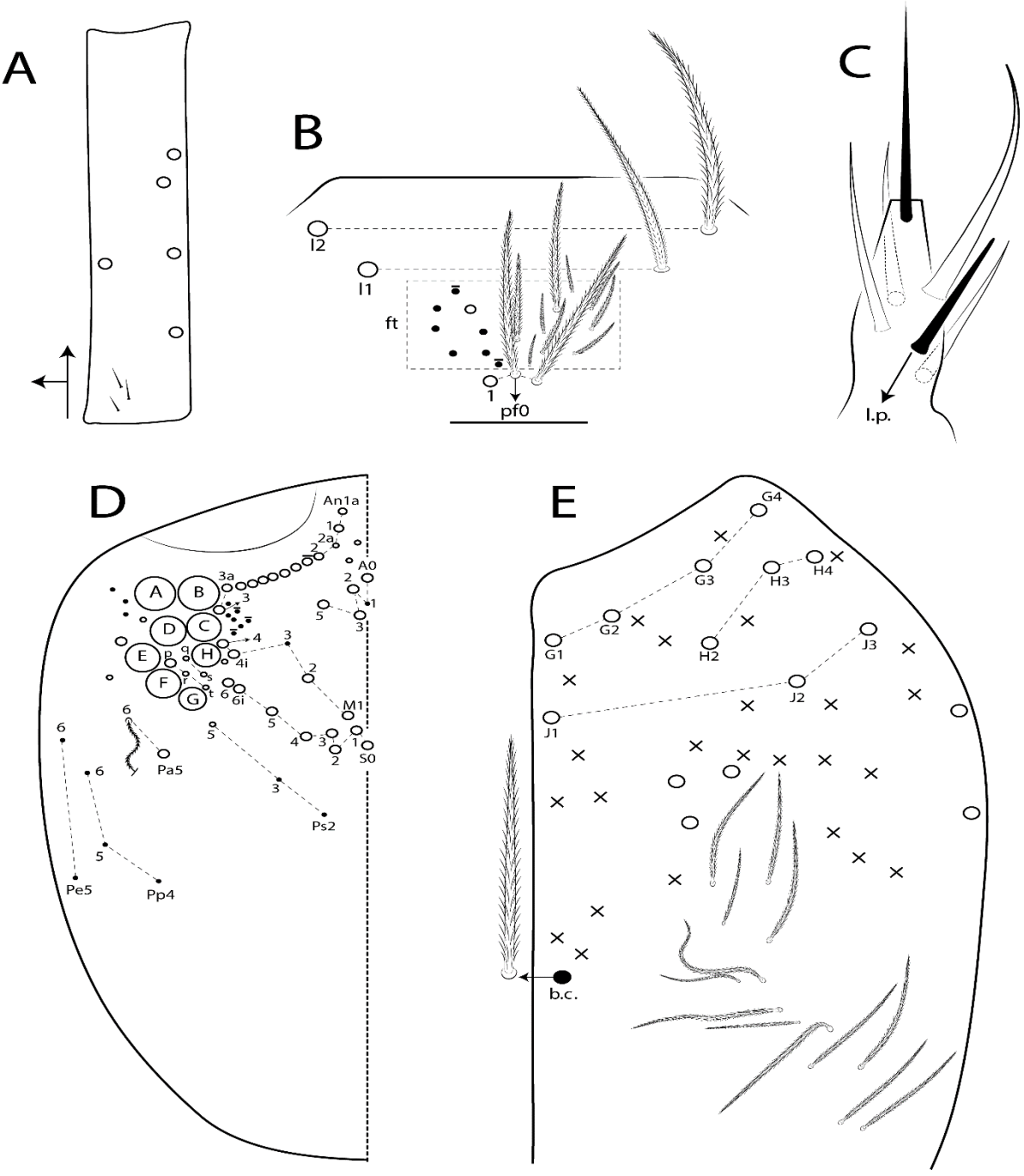

FIGURE 37A–E. *Lepidocyrtinus scheepersae* **sp. nov.**: head; **A**, Ant I left chaetotaxy (dorsal side); **B**, chaetotaxy of the clypeus; **C**, labial papillae E (right side), arrow indicates lateral process (**l.p.**); **D**, dorsal chaetotaxy (left side); **E**, postlabial and cephalic groove chaetotaxy (right side).

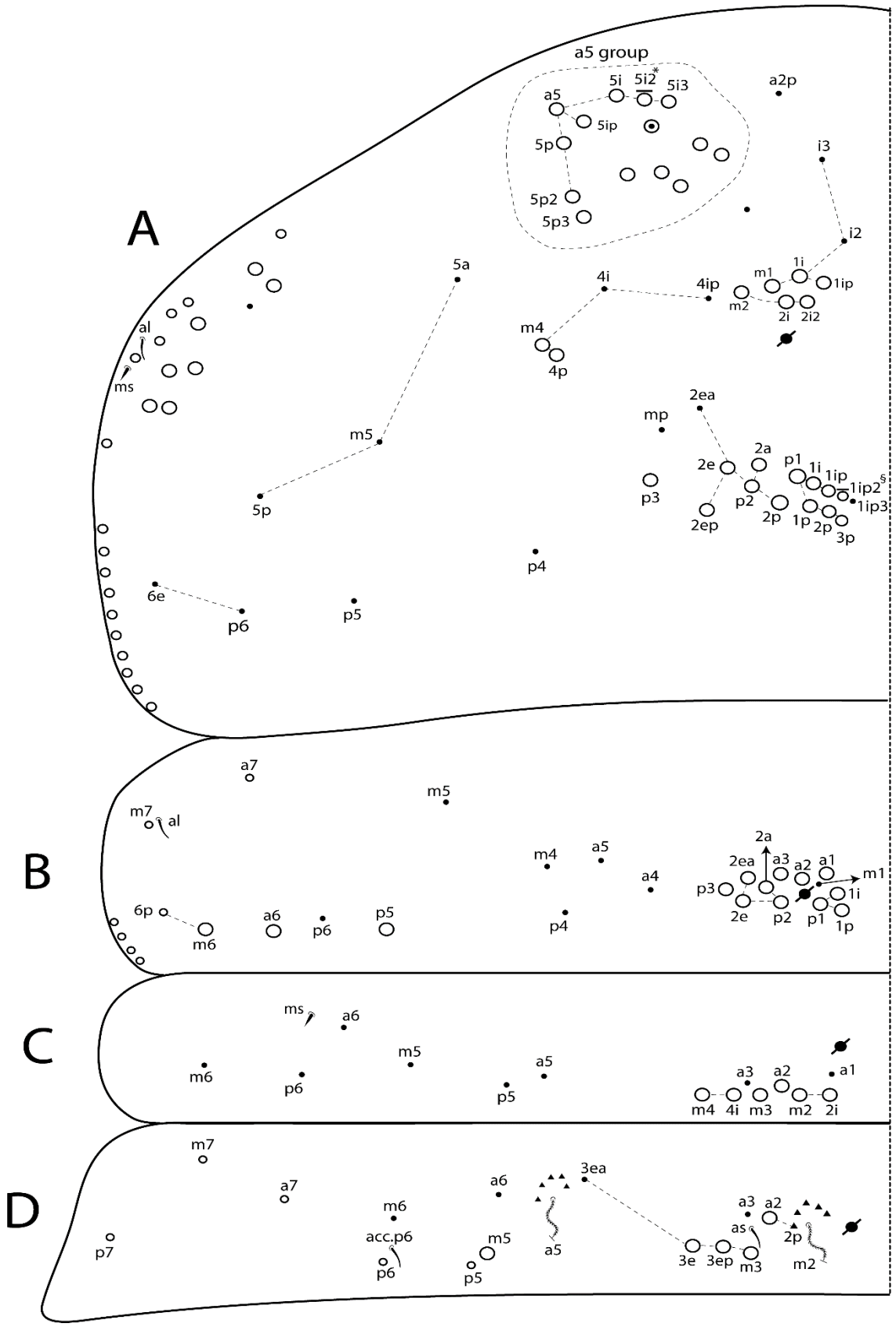

FIGURE 38A–D. *Lepidocyrtinus scheepersae* **sp. nov.**: dorsal chaetotaxy; **A**, Th II; **B**, Th III; **C**, Abd I; **D**, Abd II.

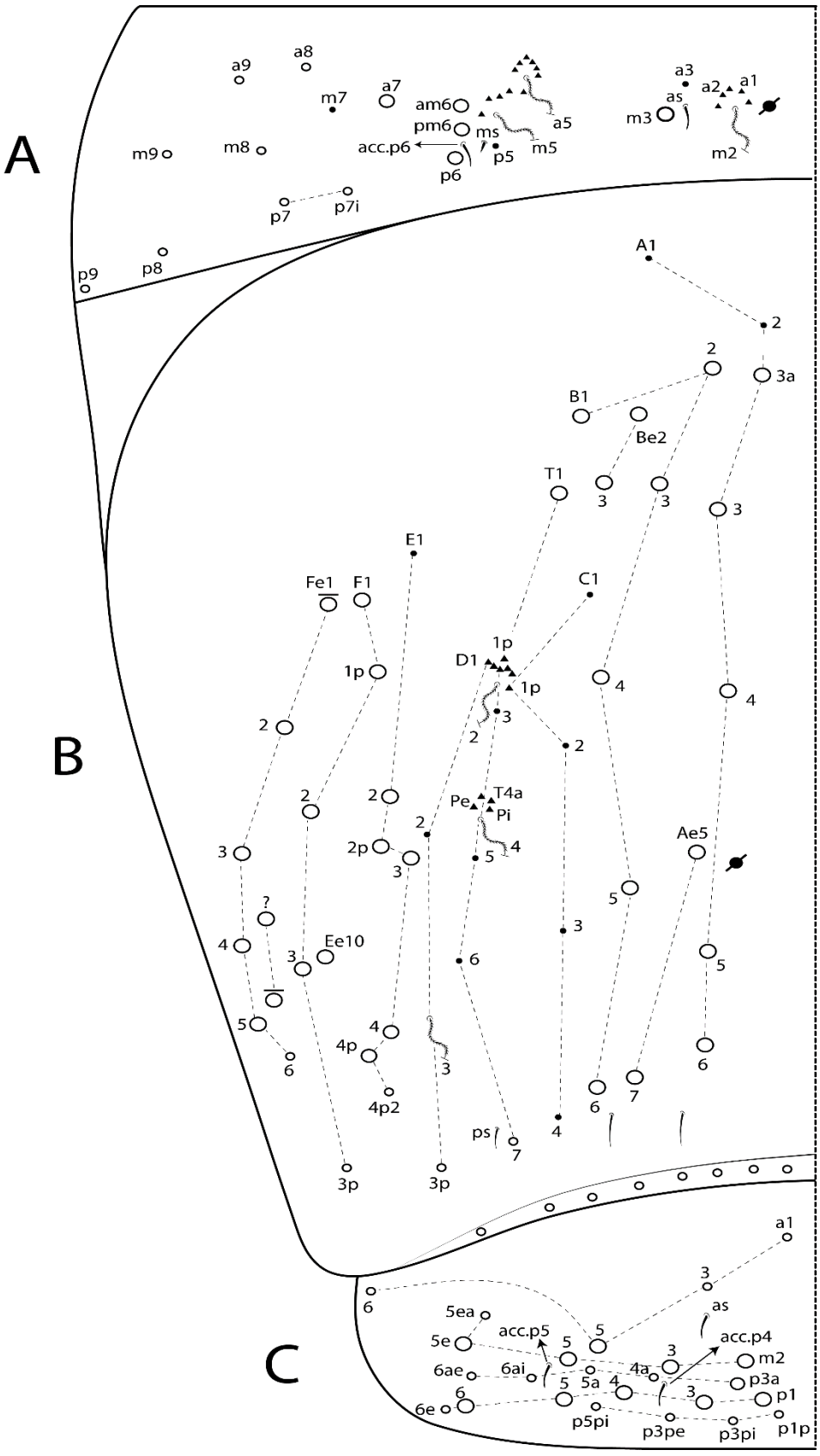

FIGURE 39A–C. *Lepidocyrtinus scheepersae* **sp. nov.**: dorsal chaetotaxy; **A**, Abd III, **B**, Abd IV; **C**, Abd V.

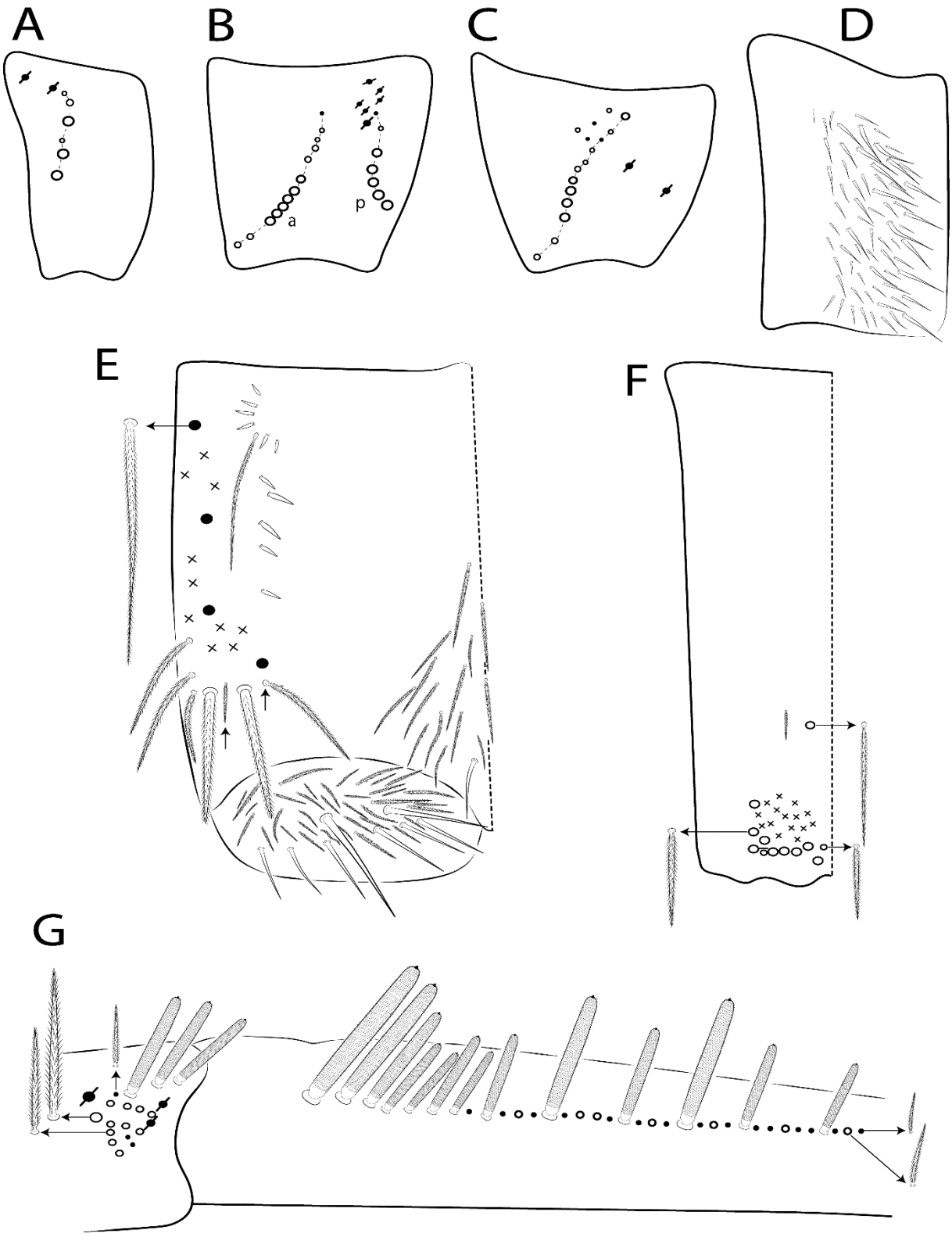

FIGURE 40A–G. *Lepidocyrtinus scheepersae* **sp. nov.**; **A**, subcoxa I; **B**, subcoxa II; **C**, subcoxa III (outer side); **D**, trochanteral organ (inner side); **E**, collophore chaetotaxy (lateral view); **F**, manubrium ventral chaetotaxy; **G**, chaetotaxy of the manubrial plate and proximal dens (lateral view).

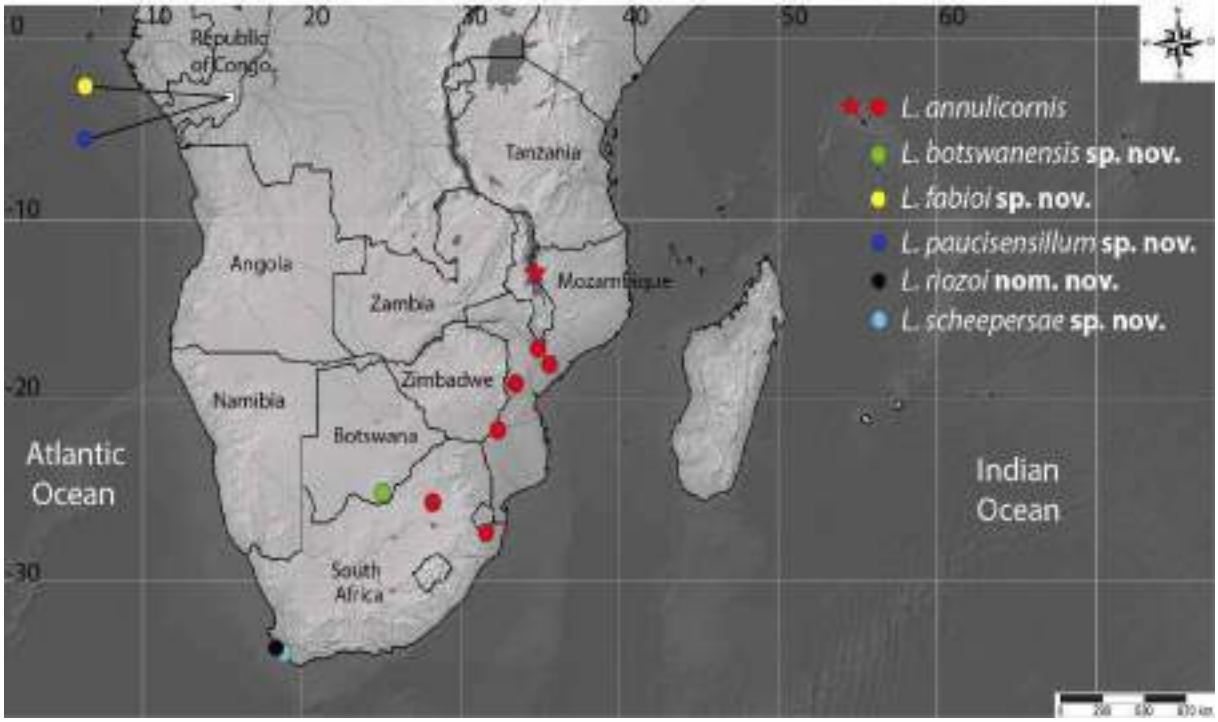

FIGURE 41. Records map of *Lepidocyrtinus* species from African continent, including type locality (star) of *L. annulicornis* **comb. rev.** (*sensu* Coates 1968); records of *L. barnardi* **stat. nov.** and *L. dayi* **stat. nov.** not inserted.

Key to *Lepidocyrtinus* species from African continent

1 Abd I with 3 or less central mac (Fig. 30C) … 2

- Abd I with 5 or more central mac (Fig. 11A, 38C) … 9

2 Th II with 3 central; Abd I devoid of mac … 3

- Th II with 4 or more central; Abd I with at least 1 central mac (Fig. 30B–C) … 4

3 Antennae smaller than body length; Th II with 3 central triangle shaped (probably **p1**, **p1p** and **p2**); trochanteral organ with about 20 spine-like chaetae … *L. metala* (Coates, 1968) **comb. nov.**

- Antennae larger than body length; Th II with 3 central linear shaped (probably **p1**, **p2** and **p3**); trochanteral organ with about 30 spine-like chaetae … *L. tsikama* (Coates, 1968) **comb. nov.**

4 Abd I–II with 1 and 3 central mac, respectively (Figs 30C–D) … 5
- Abd I–II with 2–3 and 4 central mac, respectively (Fig. 24D) … 6

5 Ant III not annulated; Th II with 4–5 posterior mac (Fig. 30A); Th III with 4 central mac (Fig. 30B) … *L. fabioi* **sp. nov.**
- Ant III annulated; Th II with 8 posterior mac; Th III with 6 central mac … *L. rykei* (Coates, 1968) **comb. nov.**

6 Abd I with 2 central mac … 7
- Abd I with 3 central mac … 8

7 Th II with 8 posterior mac; Th III with 4 central mac (as Fig. 30B) … *L. annela* (Coates, 1968) **comb. nov.**
- Th II with 10 posterior mac; Th III with 8 central mac … *L. mathewsi* (Coates, 1968) **comb. nov.**

8 Th III with 7 central mac, **p1i** and **p3** mac absent … *L. vaneedeni* (Coates, 1968) **comb. nov.**
- Th III with 9 central mac, **p1i** and **p3** mac present … *L. metarsiosa* (Coates, 1968) **comb. nov.**

9 Abd I with 6–7 central mac (Fig. 38C) … 10
- Abd I with 5 central mac (Fig. 11A) … 13

10 Th II with 6 median mac in **m1**–**2** complex (Fig. 38A); Abd I with 6 central mac (Fig. 38C) … 11
- Th II with 5 median mac in **m1**–**2** complex (as Fig. 12A); Abd I with 7 central mac … *L. lindei* (Coates, 1968) **comb. nov.**

11 Th III with 11 or less central mac (Fig. 15B); ventral manubrium only with ciliate chaetae (Fig. 17F); dens with 10 or more blunt chaetae (Fig. 17G) … 12
- Th III with 12 central mac; ventral manubrium with 3 distal smooth chaetae; dens with 2–3 blunt chaetae … *L. marephila* (Coates, 1968) **comb. nov.**

12 Body with one transverse band on Abd III and one spots central on Abd IV (Fig. 13A); head mac **Pp5** present (Fig. 14F); Th II normal and with **m4i** mac (Fig. 15A); Abd IV with 10–11 central mac (Fig. 16B) … *L. barnardi* (Womersley, 1934) **stat. nov.**

- Body pale (Fig. 13F); head mac **Pp5** absent (Fig. 37D); Th II projected anteriorly and without **m4i** mac (Fig. 38A); Abd IV with 16 central mac (Fig. 39B) … *L. scheepersae* **sp. nov.**

13 Th II with 5 median mac in **m1**–**2** complex (Fig. 34A) … 14

- Th II with 6 median mac in **m1**–**2** complex (Fig. 24A) … 15

14 Th II with **p3** mac; Th III with **p1p2** mac (Fig. 12A) … *L. riozoi* **nom. nov.**

- Th II with **p3** mic; Th III without **p1p2** mac (Fig. 34A–B) … *L. paucisensillum* **sp. nov.**

15 Antennae clearly smaller than the trunk (Fig. 13B); Th III with 11 central mac (Fig. 19B) … 16

- Antennae subequal to trunk length (Fig. 13A, C); Th III with 9 or less central mac (Fig. 24B) … 17

16 Ant III annulated; Th II with 18–20 posterior mac (Fig. 19A); ungues apical tooth absent … *L. dayi* (Yosii, 1959) **stat. nov.**

- Ant III normal; Th II with 16 or less posterior mac; ungues apical tooth present (as Fig. 12C) … *L. grisea* (Womersley, 1934) **comb. nov.**

17 Body pale (Fig. 13C); Th III with 9 central mac (Fig. 24B) … 18

- Head and Th II anteriorly dark; Th III with 8 central mac … *L. capensis* Womersley, 1934 **comb. rev.**

18 Femur and tibiotarsus III distally with dark violet pigments; manubrial plate with 2–3 blunt mac (Fig. 27C) … *L. annulicornis* (Börner, 1903) **comb. rev.**

- Legs pale (Fig. 13C); manubrial plate with 1 blunt mac (Fig. 27C) … *L. botswanensis* **sp. nov.**

Remarks. Species as *L. armillata* (Wahlgren, 1908) **comb. nov.**, *L. aethiopica* (Denis, 1924) **comb. rev.** and *L. annulipes* Handschin, 1929 **comb. rev.** are transferred here to *Lepidocyrtinus* due the presence of ungues outer pair of large laterobasal teeth plus their macrochaetotaxy pattern, at least provided to *L. annulipes* (see Wahlgren 1908: 6, Denis 1924: 257, Handschin 1929: 20 and Coates 1968: 443). However, theses species need to be reviewed, since the original descriptions are insufficient to establish a specific diagnosis. In this sense, *Seira laeta* (Börner, 1908) and *Seira flavovirens* (Börner, 1903) also present poor descriptions which are unable to clarify their positions among the Seirinae. For this reason both are maintained here as *Seira* s. lat.

Species from Madagascar

***Lepidocyrtinus voeltzkowi* (Börner, 1907) comb. rev.**
Figs 42–46, 64

Pseudosira (*Mesira*) *voeltzkowi* Börner, 1907: 152, figs 8–10, Madagascar, Fianarantsoa, Ankarimbelo (as Ankarimbela mahe Ikongo, SO. Madagascar) (orig. descr.).
Sira voeltzkowi; Denis, 1925: 284 (as *voeltzkovi*, comb.)
Lepidocyrtus voeltzkowi; Womersley, 1934: 463 (comb.).
Lepidocyrtinus voeltzkowi; Delamare Deboutteville, 1948: 39 (comb.). Salmon, 1964: 490 (comb.).
Seira voeltzkowi; Yosii, 1959: 9 (comb.). Thibaud, 2008: 503 (cit.).
Lepidocyrtinus pallidus Börner, 1907: 154 (**syn. nov.**)

Typological note. The type material of *L. voeltzkowi* **comb. rev.** is probably lost, and for that reason this species has never been redescribed. Thus, here the neotype is designated, according to ICZN (2000, chapter 16, article 72.4.5.), since the specimen fits all morphological characteristics presented in the original description and was collected near (less than 50km) the locality type (Fig. 64).

Examined type material. Neotype female designed on slide (54322/CAS): Madagascar, Fianarantsoa province, Haute Matsiatra Region, Anja Community Reserve, 21°51'32"S, 046°50'40"E (Fig. 64), isleberg vegetation, 1097 m, 17-24.i.2013, M Irwin & R Harin'Hala coll.

Additional material: 1 male, 7 females and 1 juvenile on slides and 15 specimens in alcohol (54322/CAS), same data as neotype. 31 specimens in alcohol (54342/CAS), same data as neotype, except 30.iv-07.v.2012. 3 females on slides (54015, 54059, 54057/CAS): Toliara, Forêt of Kirindy, 15.5 km 64° ENE Marofandilia, 20°04'09"S, 044°39'38"E (Fig. 64), Tropical dry forest, 60 m, 12-24.ix.2008, 24.ix-01.x.2008, 25.iii-01.iv.2009, Malaise trap, BL Fisher coll.

Diagnosis. Body with dark violet pigments internally on Ant, all head, trunk and femur, sometimes parcially pigment or absent (Fig. 42); head mac **A0**, **A2**–**3**, **A5**, **M1**–**2**, **S0**–**3**, **S5**–**6** and **Pp5** present; prelabral chaetae ciliate; labial papilla E with lateral process (l.p.) apically pointed and reaching the base of apical appendage (Figs 43C–D); Th II with 13–14 anterior, 8 median (**m1ip**, **m4**–**4p** present, **m4i** mac absent) and 10–11 posterior mac (**p2ep** mac, **p3** mic); Th III–Abd II with 8–10, 4–5, 4 central mac respectively; Abd IV with 16–17 central mac and 13 lateral mac (Figs 44, 45B); ungues apical tooth present; unguiculus with all lamella acuminate (Fig. 46E); collophore anteriorly with 16 spine-like chaetae and 3 ciliate chaetae apically acuminate, posteriorly with 2 spines, smooth chaeta absent (Fig. 46F); manubrium ventrally with 2/2 subapical chaetae; manubrial plate with 3 blunt mac apically bullet-like; dens with 6–10 blunt mac apically nipple-like (Figs 46G–H).

Description. Total length (head + trunk) of specimens 2.31–3.61 (n=4), neotype 3.61 mm. Specimen pale white with dark violet strip on Ant II that extends in an inner strip until Ant IV or all it; pigments on all head and trunk, except Th II–Abd II dorsally or yet partially head and Th II–Abd III; pigments on all femur I–III or only femur III distally; head, trunk and legs sometimes depigmented; eyepatches black (Figs 42A–D). Scales present on Ant I to proximal one-third of Ant IV, dorsal and ventral head, dorsal thorax and abdomen, legs (except empodia), anterior and posterior collophore, ventral and dorsal manubrium and dens ventrally.

Head. Antennae smaller to larger than trunk length (Fig. 42A); ratio antennae: trunk = 1: 0.78–1.13 (n=4), neotype 1: 0.78; antennal segments ratio as I: II: III: IV = 1: 1.36–1.49: 2.75: 3.68–4.12, neotype 1: 1.38: 2.75: 3.68. Ant IV annulated on distal three-fourths, with apical bulb apically unilobed or bilobed. Ant III annulated on distal five-sixth, sense organ with 2 elongated rods, 3 spiny guard sens, s-blunt sens of different sizes and ciliated chaetae. Ant I dorsally with 4 median mac surrounding by ciliate guard mic, 2 spines and 4 smooth mic at base (Fig. 43A). Eye B larger, G and H smaller, others subequal, and with 5 'IO' chaetae; head dorsal macrochaetotaxy with 10–12 **An**, 4 **A**, 3 **M**, 7 **S**, 3 **Ps**, 1 **Pa** 1 **Pp** mac (Fig. 43D). Clypeal formula with 4 (**l1**–**2**), 2 (**fr**), 3 (**pf1**) ciliate chaetae, **l1**–**2** larger, **l1** apically acuminate, 2 **fr** smaller, others subequal (Fig. 43B). Prelabral chaetae ciliate and not bifurcated. Labral **p0** chaeta without median filament. Labral papillae with two inner conical projections, outer papillae absent. Maxillary palp with smooth apical

appendage (**a.a.**) and basal chaeta (**b.c.**) weakly ciliate, thicker and 1.46 larger in length than the apical. Labial papilla E with lateral process (l.p.) apically pointed and reaching the base of apical appendage (Fig. 43C). Basolateral and basomedian labial fields with chaetae **M1**–**2**, **R** (weakly smaller), **E**, **L1**–**2** ciliate. Ventral head with about 31–33 ciliate chaetae, postlabial formula with 4 (**G1**–**4**), 3 (**H2**–**4**), 4 (**J1**–**4**) chaetae, H3–4, J1–4 larger, 11–12 thin posterior chaetae of different length, and 4-5 larger chaetae, 1 basal chaetae (b.c.) surrounding the cephalic groove (Fig. 43E).

Thorax chaetotaxy (Fig. 44A–B). Th II **a**, **m** and **p** series with 13–14, 8 and 10–11 mac, respectively. Th III **a**, **m** and **p** series with 3–4, 0 and 7–8 mac, respectively. Ratio Th II: III = 2.06–1.64: 1 (n=4), neotype 1.73: 1.

Abdomen chaetotaxy (Figs 44C–D, 45A–C). Abd I **a**, **m** and **p** series with 0–1, 4 and 0 mac, respectively. Abd II **a**, **m** and **p** series with 1, 4 and 0 mac, respectively. Abd III **a**, **m** and **p** series with 0, 3 and 1 mac, respectively. Abd IV with 16–17 central mac of **A**–**T** series and 13 lateral mac of **E**–**Fe** series; 4 posterior sens (**ps** type I, others type II) and 8 posterior mes. Abd V **a**, **m** and **p** series with 1, 4 and 2/6 mac, respectively. Ratio Abd III: IV = 1: 5.54–6.90 (n= 4), neotype 1: 5.54.

Legs. Subcoxa I with 7 chaetae, 15 anterior chaetae and 2 psp; subcoxa II with an anterior row of 11 chaetae, posterior row of 6 chaetae and 4 psp; subcoxa III with one row of 13 chaetae, 2 anterior chaetae and 2 posterior psp (Fig. 46A–C). Trochanteral organ with about 54 spine-like chaetae (Fig. 46D). Tibiotarsus normal or subdivided on distal two third, outer side with 5 large chaetae and apically acuminate, inner side with 8 mac weakly ciliate. Ungues inner side with 4 teeth, 2 paired basal, 1 unpaired median subequal to basal teeth and next to apical tooth (Fig. 46E). Unguiculus with all lamellae acuminate, **pe** lamella serrated and with small proximal tooth, other lamellae smooth; ratio unguis: unguiculus = 1: 0.69. Tibiotarsal smooth chaeta 1.07 larger than unguiculus and tenent hair 0.95 smaller than unguis outer edge.

Collophore. Anterior side with 24 chaetae, 16 proximal spine-like chaetae, 1 thin and 1 normal ciliate chaeta, 3 ciliate chaetae apically acuminate and 3 mac distally; posterior side with 13 chaetae, 2 spines and 11 thin ciliate chaetae widely distributed, smooth chaetae absent; lateral flap with about 36 chaetae, 10 smooth and 15–26 ciliate (Fig. 46F).

Furcula. Manubrium ventral formula with 0, 0, 0, 2/2 (subapical), 16 (apical) ciliate chaetae plus about 19 elongated apical scales and 1 ciliate chaetae per side (Fig. 46G);

manubrial plate with 3 blunt mac ciliate and apically bullet-like, 10 ciliate chaetae of different sizes and 3 psp. Dens dorsally with one proximal row of 6–10 blunt mac finely ciliate and apically nipple-like, neotype with 6+8 (Fig. 46H).

Remarks. Börner (1907) in description of *L. voeltzkowi* **comb. rev.** reports different color patterns to the species, with dark violet pigments on body, ungues with large outer teeth and presence of inner apical tooth. These characteristics combine are diagnostic of *L. voeltzkowi* **comb. rev.**, including the depigmented body as in *L. pallidus* **syn. nov.** (Fig. 42C), and ungues apical tooth present (except in *L. briani* **sp. nov.**), in relation to other taxa from Madagascar (see the comparison among species in remarks of *L. iego* **sp. nov.**).

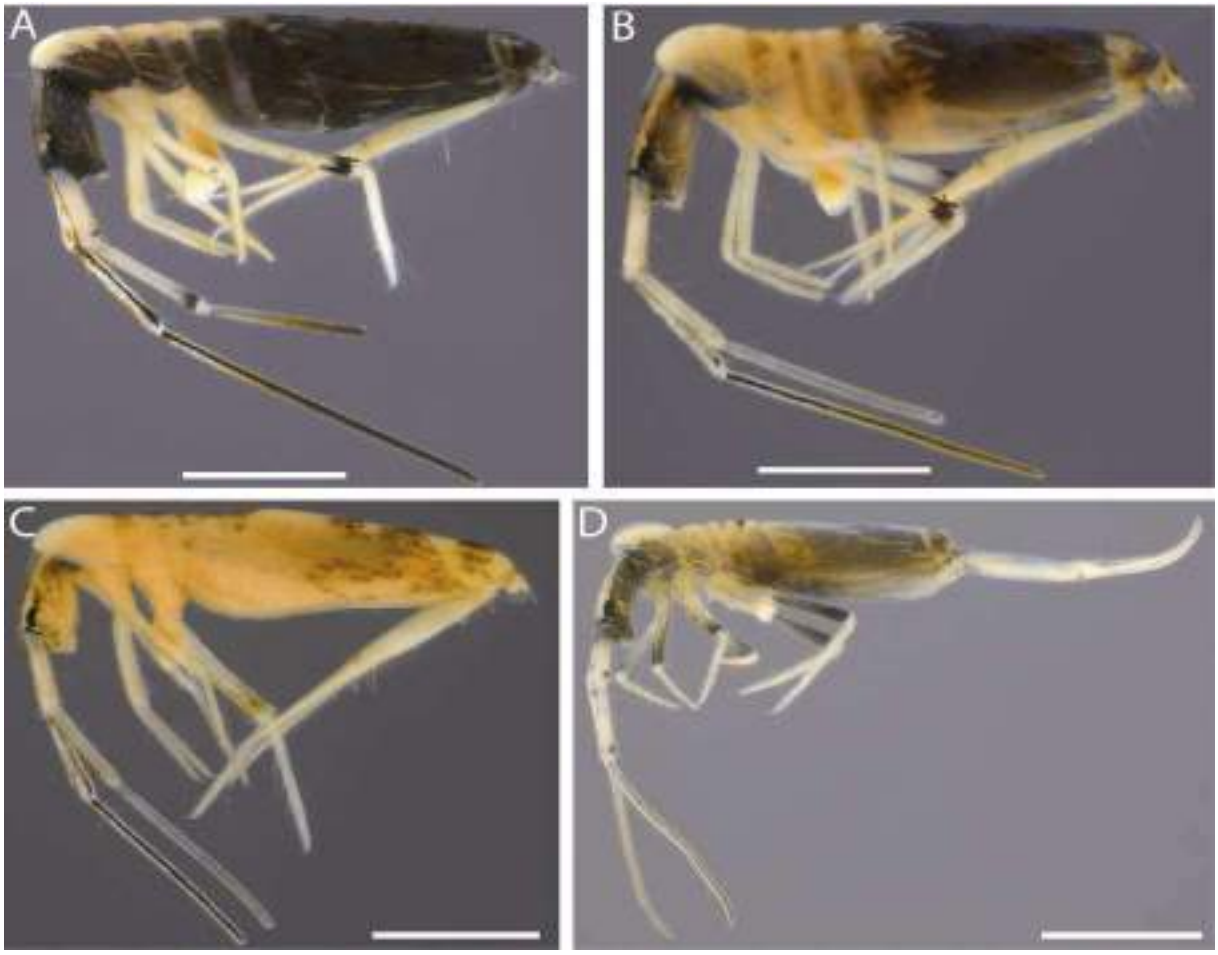

FIGURE 42A–D. *Lepidocyrtinus voeltzkowi* **comb. rev.**: habitus of specimens fixed in alcohol (lateral view), **A**–**C** specimens from ANJA Reserve (Fianarantsoa); **A**, specimen heavily pigmented; **B**, specimen partially pigmented; **C**, specimen unpigmented of *L. pallidus* **syn. nov.** (Ant IV missing); **D**, specimen from Forêt of Kirindy (Toliara). Scale bars: 1 mm.

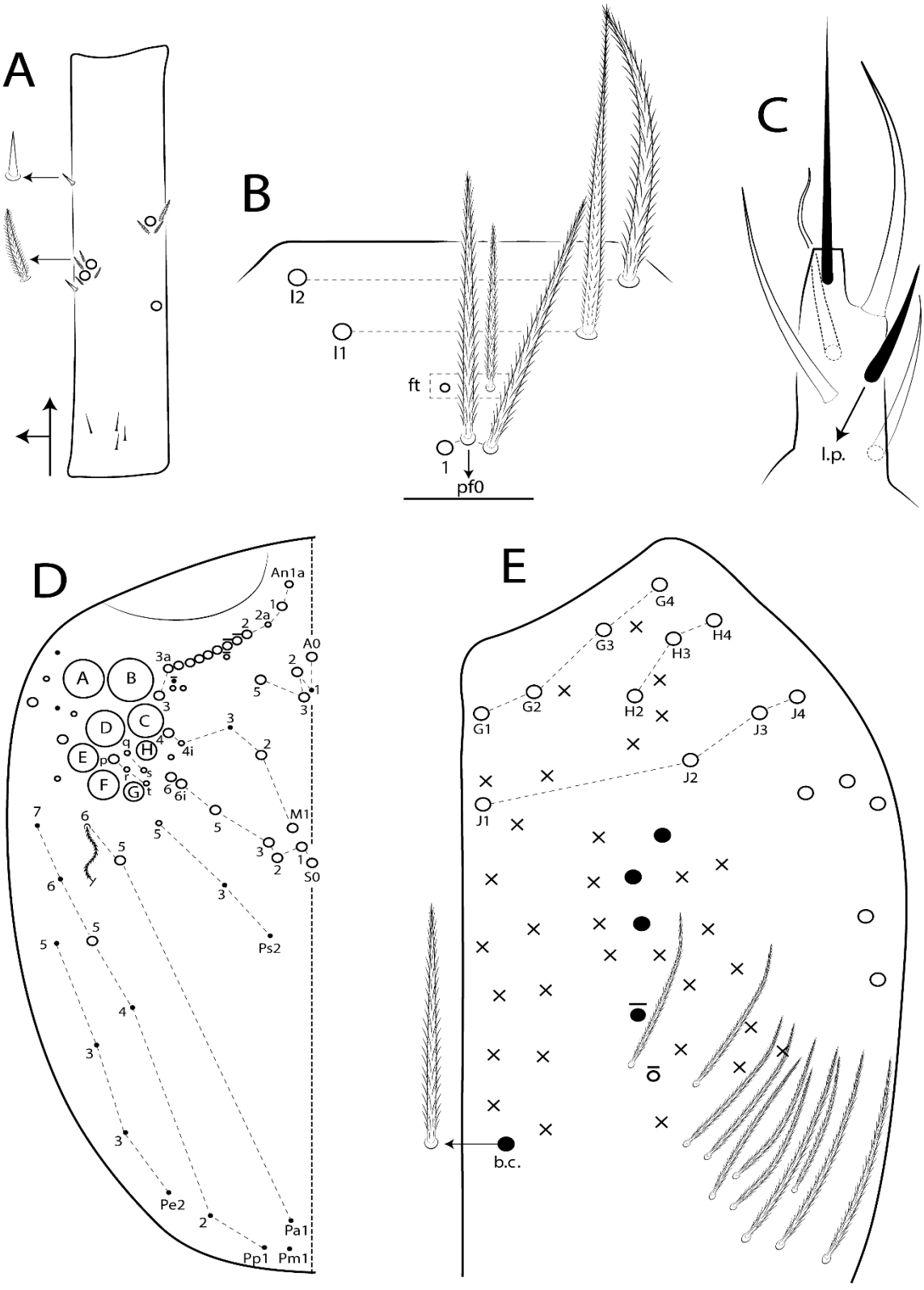

FIGURE 43A–E. *Lepidocyrtinus voeltzkowi* **comb. rev.**: head; **A**, Ant I left chaetotaxy (dorsal side); **B**, chaetotaxy of the clypeus; **C**, labial papillae E (right side), arrow indicates lateral process (**l.p.**); **D**, dorsal chaetotaxy (left side); **E**, postlabial and cephalic groove chaetotaxy (right side).

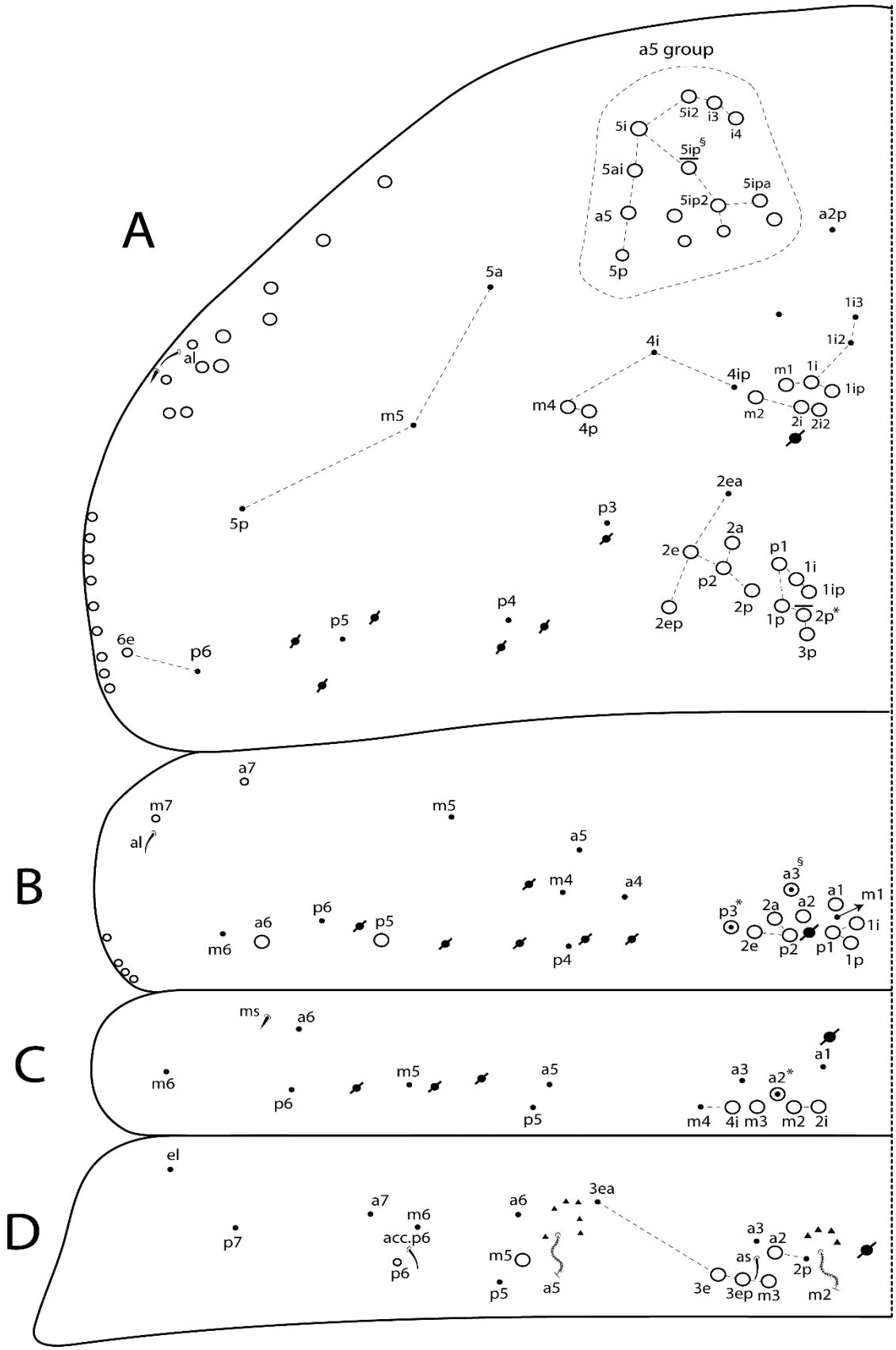

FIGURE 44A–**D.** *Lepidocyrtinus voeltzkowi* **comb. rev.**: dorsal chaetotaxy; **A**, Th II; **B**, Th III; **C**, Abd I; **D**, Abd II.

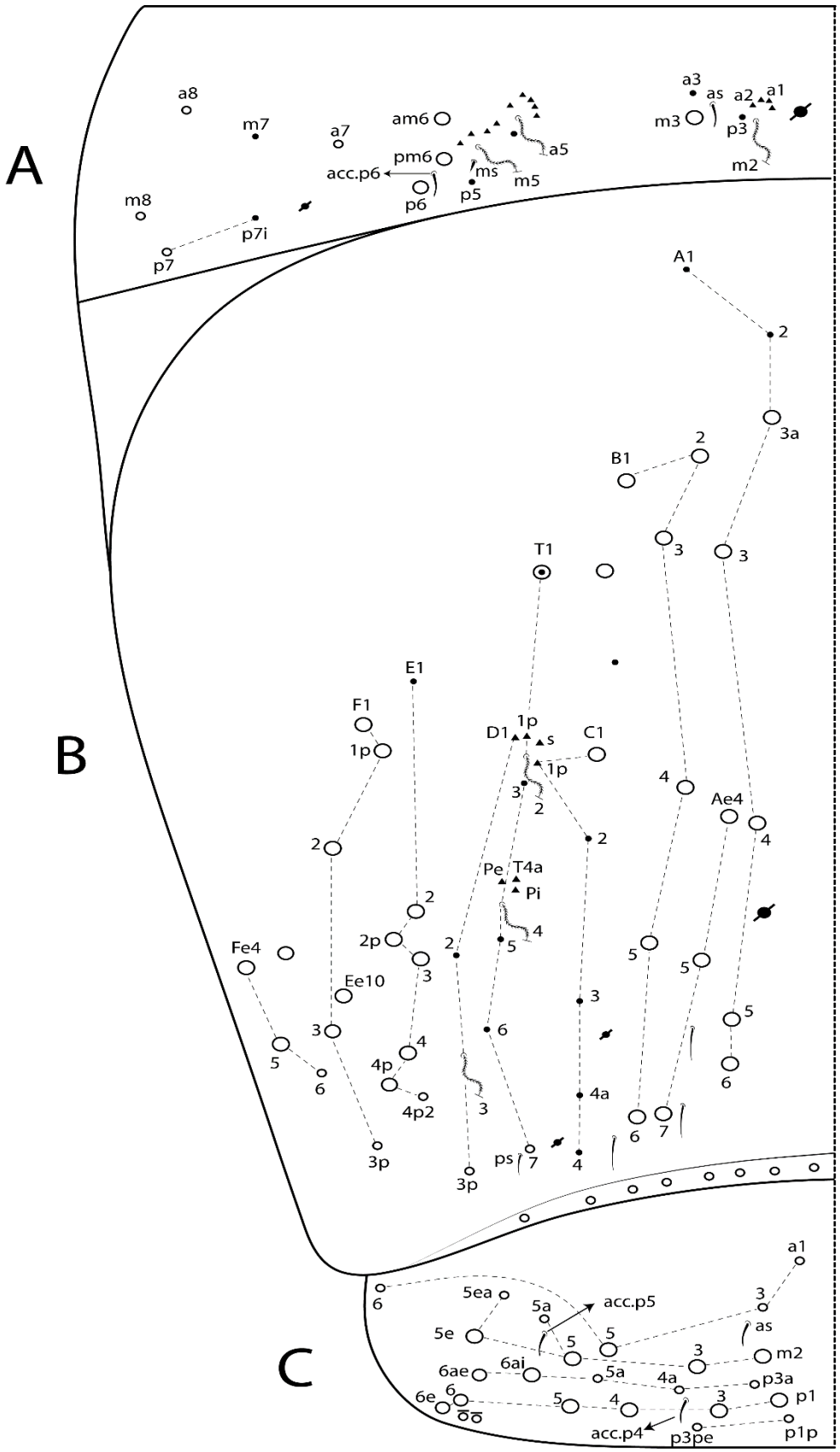

FIGURE 45A–C. *Lepidocyrtinus voeltzkowi* **comb. rev.**: dorsal chaetotaxy; **A**, Abd III, **B**, Abd IV; **C**, Abd V.

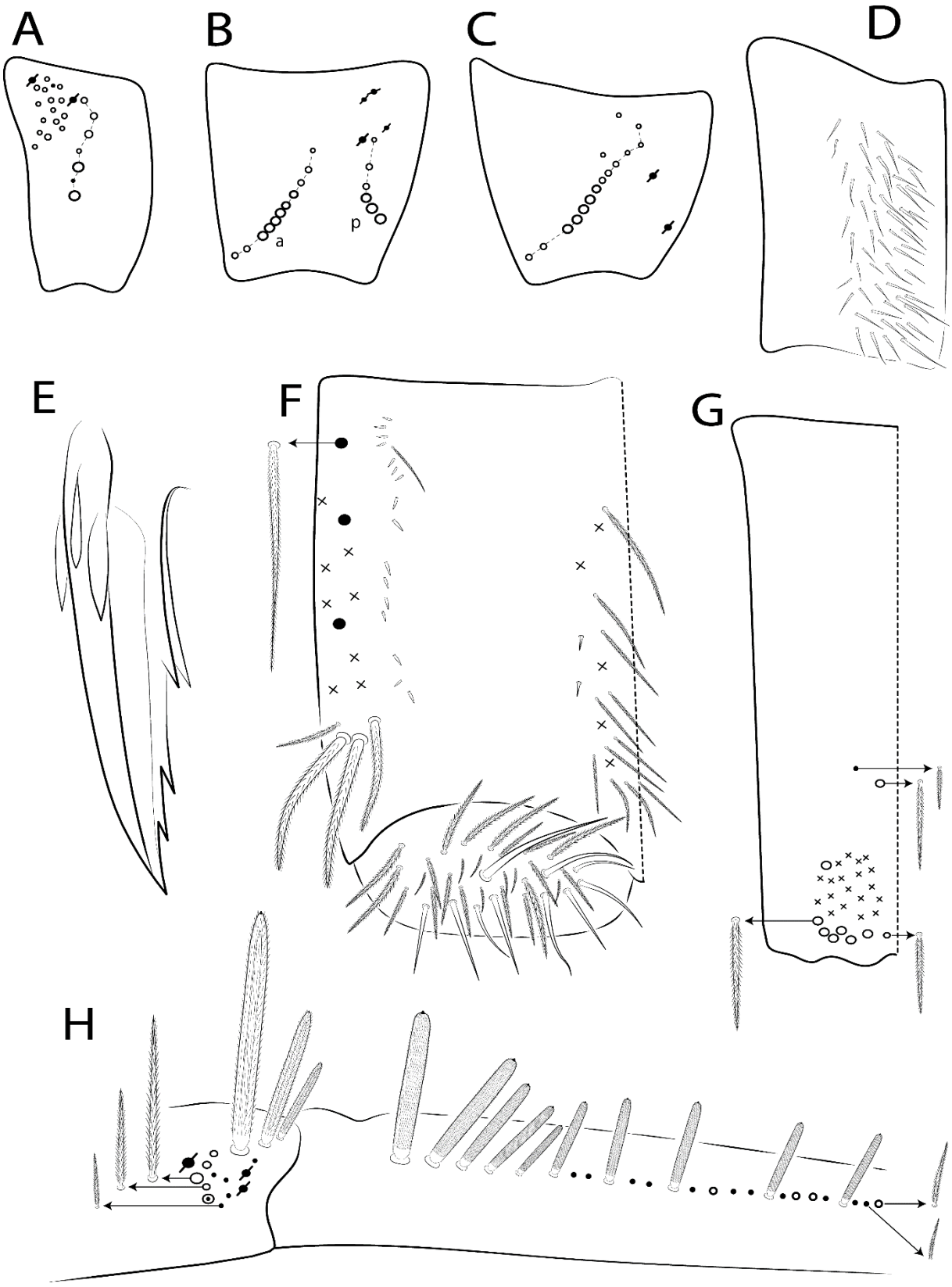

FIGURE 46A–H. *Lepidocyrtinus voeltzkowi* **comb. rev.**; **A**, subcoxa I; **B**, subcoxa II; **C**, subcoxa III (outer side); **D**, trochanteral organ (inner side); **E**, ungues III (lateral side); **F**, collophore chaetotaxy (lateral view); **G**, manubrium ventral chaetotaxy; **H**, chaetotaxy of the manubrial plate and proximal dens (lateral view).

***Lepidocyrtinus andevo* sp. nov. Cipola & Bellini**

Figs 47A, 48–52, 64

Type Material. Holotype female on slide (54085/CAS): Madagascar, Toamasina, Ankerana municipality, 18°24'23"S, 048°48'09"E (Fig. 64), Montane forest, 1108 m, 19-24.i.2012, Malaise trap, BL Fisher coll. Paratypes on slide (54085/CAS): 4 males, 5 females and juveniles and 5 specimen in alcohol, same data as holotype.

Diagnosis. Body with dark blue pigments all Ant I–IV, Th II laterally and femur I–III (Fig. 47A); head mac **A0**, **A2**–**3**, **A5**, **M1**–**2**, **S0**–**3** and **S5**–**6** present; prelabral chaetae smooth; labial papilla E with lateral process (l.p.) reduced and apically finger-shaped (Figs 48D–F); Th II with 6–7 anterior, 9 median (**m1ip**, **m4–4p** present, **m4i** mac absent) and 9–11 posterior mac (**p2ep** absent, **p3** mac); Th III–Abd II with 9–10, 2–4, 3–4 central mac respectively; Abd IV with 10–12 central mac and 14–16 lateral mac (Figs 49, 50B); ungues apical tooth absent; unguiculus with all lamella acuminate (Fig. 51E); collophore anteriorly with 9 spine-like chaetae and 4 ciliate chaetae apically acuminate, posteriorly with 10 spines, smooth chaeta present (Fig. 52A); manubrium ventrally with 0/4 subapical chaetae; manubrial plate with 2 blunt mac abruptly acuminate at apex; dens with 1–10 blunt mac apically bullet-like and abruptly acuminate at apex (Figs 52B–C).

Description. Total length (head + trunk) of specimens 3.97–5.10 (n=4), holotype 5.10 mm. Specimen pale white with pigment dark blue on Ant I–IV, lateral Th II, anterior coxa III, trochanter and femur completely, and weakly tibiotarsus; eyepatches black (Fig. 47A). Scales present on Ant I to one-quarters proximal of Ant IV, dorsal and ventral head, dorsal thorax and abdomen, legs (except empodia), anterior and posterior collophore, ventral and dorsal manubrium and dens ventrally.

Head. Antennae subequal to trunk length (Fig. 47A); ratio antennae: trunk = 1: 0.96–1.14 (n=4), holotype 1: 0.98; antennal segments ratio as I: II: III: IV = 1: 1.21–1.37: 1.18–1.47: 2.77–3.48, holotype 1: 1.23: 1.18: 2.77. Ant IV annulated on distal three-fourths, with apical bulb apically unilobed, bilobed or trilobed. Ant III sense organ with 2 elongated rods, 3 spiny guard sens, s-blunt sens of different sizes and ciliated chaetae (Fig. 48A). Ant I dorsally with 4 median mac surrounding by ciliate guard mic and 13 smooth mic at base, without spines (Fig. 48B). Eyes A and B larger, G and H smaller, others

subequal, and with 5 'IO' chaetae; head dorsal macrochaetotaxy with 15–16 **An**, 4 **A**, 3 **M**, 7 **S**, 1 **Ps** and 1 **Pa** mac (Fig. 48F). Clypeal formula with 6 (**l12**, **l1**–**2**), 15 (**fr**), 2 (**pf1**) ciliate chaetae, **l1** larger and apically acuminate, **pf0** absent, others subequal (Fig. 48C). Prelabral chaetae smooth, sometimes bifurcated. Labral **p0** chaeta sometimes with median filament (Fig. 48D). Labral papillae with two rounded projections, outer papillae absent. Maxillary palp with smooth apical appendage (**a.a.**) and basal chaeta (**b.c.**) weakly ciliate, thicker and 1.39 larger in length than the apical. Labial papilla E with lateral process (l.p.) reduced and apically finger-shaped (Fig. 48E). Basolateral and basomedian labial fields with chaetae **M1**–**2**, **R** (weakly smaller), **L1**–**2** ciliate, **e** smooth. Ventral head with about 13 ciliate chaetae, postlabial formula with 4 (**G1**–**4**), 3 (**H2**–**4**), 4 (**J1**–**4**) chaetae, **H3** sometimes thin and smaller, and 1 larger basal chaetae (b.c.) surrounding the cephalic groove (Fig. 48G).

Thorax chaetotaxy (Fig. 49A–B). Th II **a**, **m** and **p** series with 6–7, 8 and 9–11 mac, respectively, and about 20 secondary psp. Th III **a**, **m** and **p** series with 5–6, 1 and 7 mac, respectively, and about 10 secondary psp. Ratio Th II: III = 2.93–1.95: 1 (n=4), holotype 2.93: 1.

Abdomen chaetotaxy (Figs 49C–D, 50A–C). Abd I **a**, **m** and **p** series with 0–1, 2–3 and 0 mac, respectively, and about 5 secondary psp. Abd II **a**, **m** and **p** series with 1, 3–4 and 0 mac, respectively, and about 11 secondary psp. Abd III **a**, **m** and **p** series with 0, 3 and 1 mac, respectively, and about 16 secondary psp. Abd IV with 10–12 central mac of **A**–**T** series and 14–16 lateral mac of **E**–**Fe** series; about 11 secondary psp, 6 posterior sens (**ps** type I, others type II) and 5 posterior mes. Abd V **a**, **m** and **p** series with 1, 4 and 6 mac, respectively. Ratio Abd III: IV = 1: 6.65–4.78 (n= 4), holotype 1: 4.78.

Legs. Subcoxa I with 6 chaetae, 12 anterior chaetae and 2 psp; subcoxa II with an anterior row of 17 chaetae, posterior row of 10 chaetae and 4 psp; subcoxa III with one row of 13 chaetae and 2 posterior psp (Fig. 51A–C). Trochanteral organ with about 68 spine-like chaetae (Fig. 51D). Tibiotarsus III sometimes subdivided on distal two thirds, outer side with 3 proximal large chaetae and apically acuminate, inner side with 7 mac weakly ciliate. Ungues inner side with 3 teeth, 2 paired basal and 1 unpaired median subequal to basal teeth, apical tooth absent. Unguiculus with all lamellae acuminate, **pe** lamella with small proximal tooth, all lamellae smooth; ratio unguis: unguiculus = 1: 0.49. Tibiotarsal smooth chaeta 1.12 larger than unguiculus and tenent hair 0.51 smaller than unguis outer edge (Figs 51E).

Collophore. Anterior side with 20 chaetae, 9 proximal spine-like chaetae, 1 thin ciliate chaeta, 4 ciliate chaetae apically acuminate and 6 mac distally; posterior side with 28 chaetae, 10 spines, 17 thin ciliate chaetae widely distributed and 1 smooth chaetae distally; lateral flap with about 88 chaetae, 11 smooth and 77 ciliate (Fig. 52A).

Furcula. Manubrium ventral formula with 0, 0, 0, 0/4 (subapical), 14–16 (apical) ciliate chaetae plus about 35 elongated apical scales per side (Fig. 52B); manubrial plate with 2 blunt mac ciliate and abruptly acuminate at apex, 17 ciliate chaetae of different sizes and 2 psp. Dorsal dens with one proximal row of 1–10 blunt mac weakly ciliate, 3 proximal apically bullet-like and up to 7 abruptly acuminate at apex, holotype with 3+10 (Fig. 52C).

Etymology. The epithet “andevo” is honor to the black slaves that constituted about a third of the Merina society of Madagascar during the 19th century.

Remarks. *Lepidocyrtinus andevo* **sp. nov.** resembles other species from Madagascar. See the comparison among them in remarks of *L. iego* **sp. nov.**

FIGURE 47A–D. *Lepidocyrtinus* spp., habitus of specimens from Madagascar fixed in alcohol (lateral view). **A**, *L. andevo* **sp. nov.**; **B**, *L. briani* **sp. nov.**; **C**, *L. betamponensis* **sp. nov.**; **D**, *L. iego* **sp. nov.** Scale bars: 1 mm.

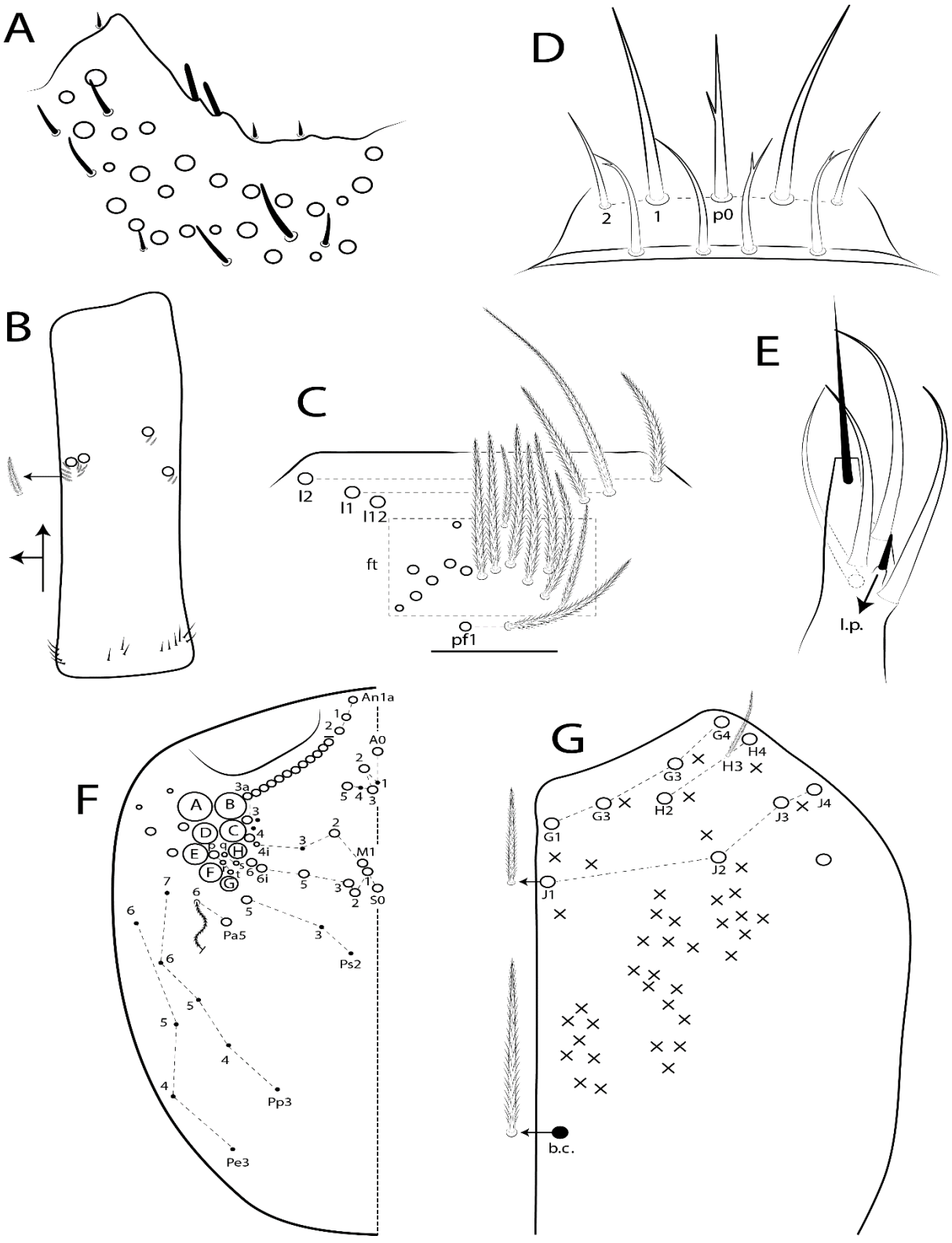

FIGURE 48A–G. *Lepidocyrtinus andevo* **sp. nov.**: head; **A**, Ant III apical organ (lateral side); **B**, Ant I left chaetotaxy (dorsal side); **C**, chaetotaxy of the clypeus; **D**, chaetotaxy prelabral and labral posterior row; **E**, labial papillae E (right side), arrow indicates lateral process (**l.p.**); **F**, dorsal chaetotaxy (left side); **G**, postlabial and cephalic groove chaetotaxy (right side).

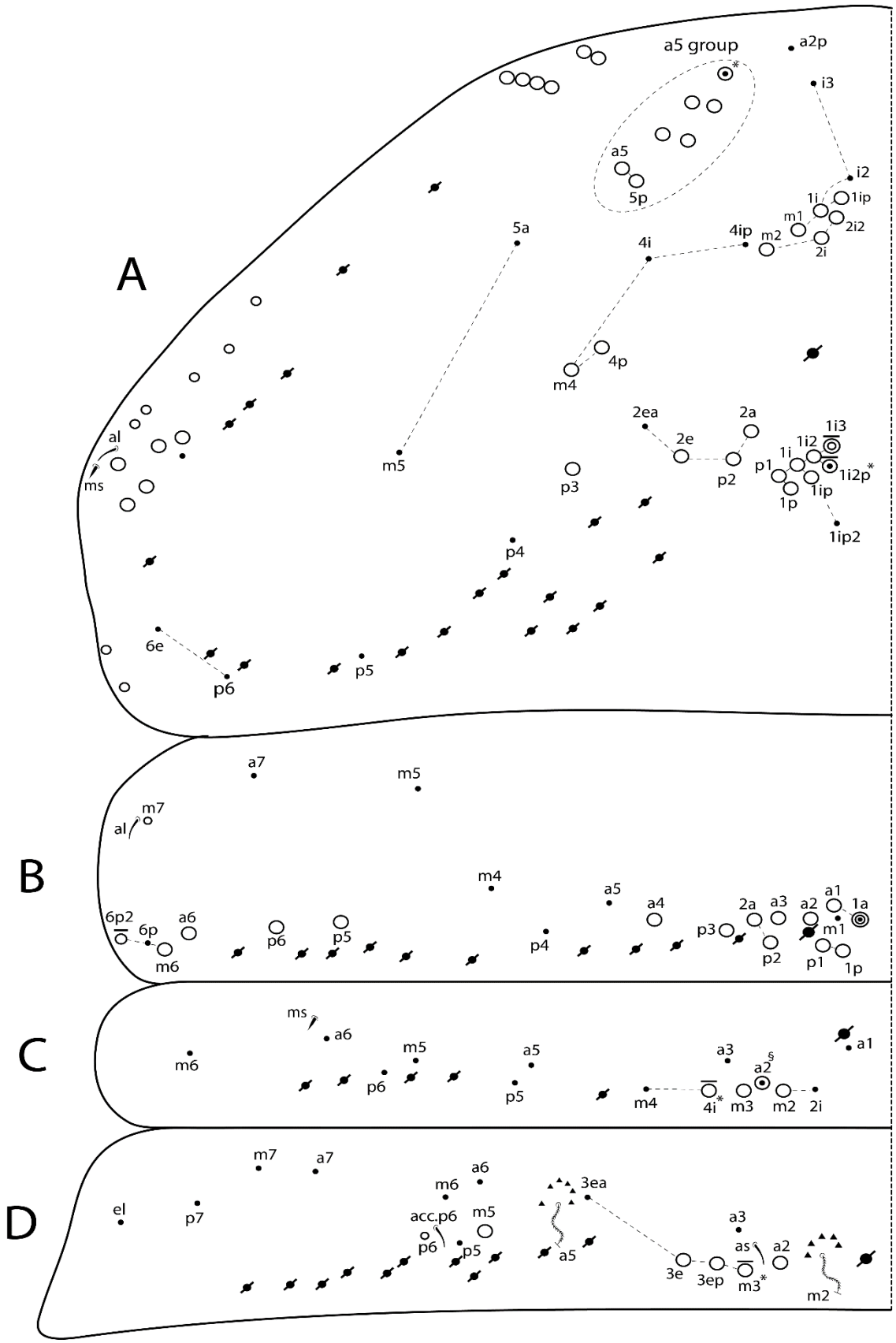

FIGURE 49A–**D.** *Lepidocyrtinus andevo* **sp. nov.**: dorsal chaetotaxy; **A**, Th II; **B**, Th III; **C**, Abd I; **D**, Abd II.

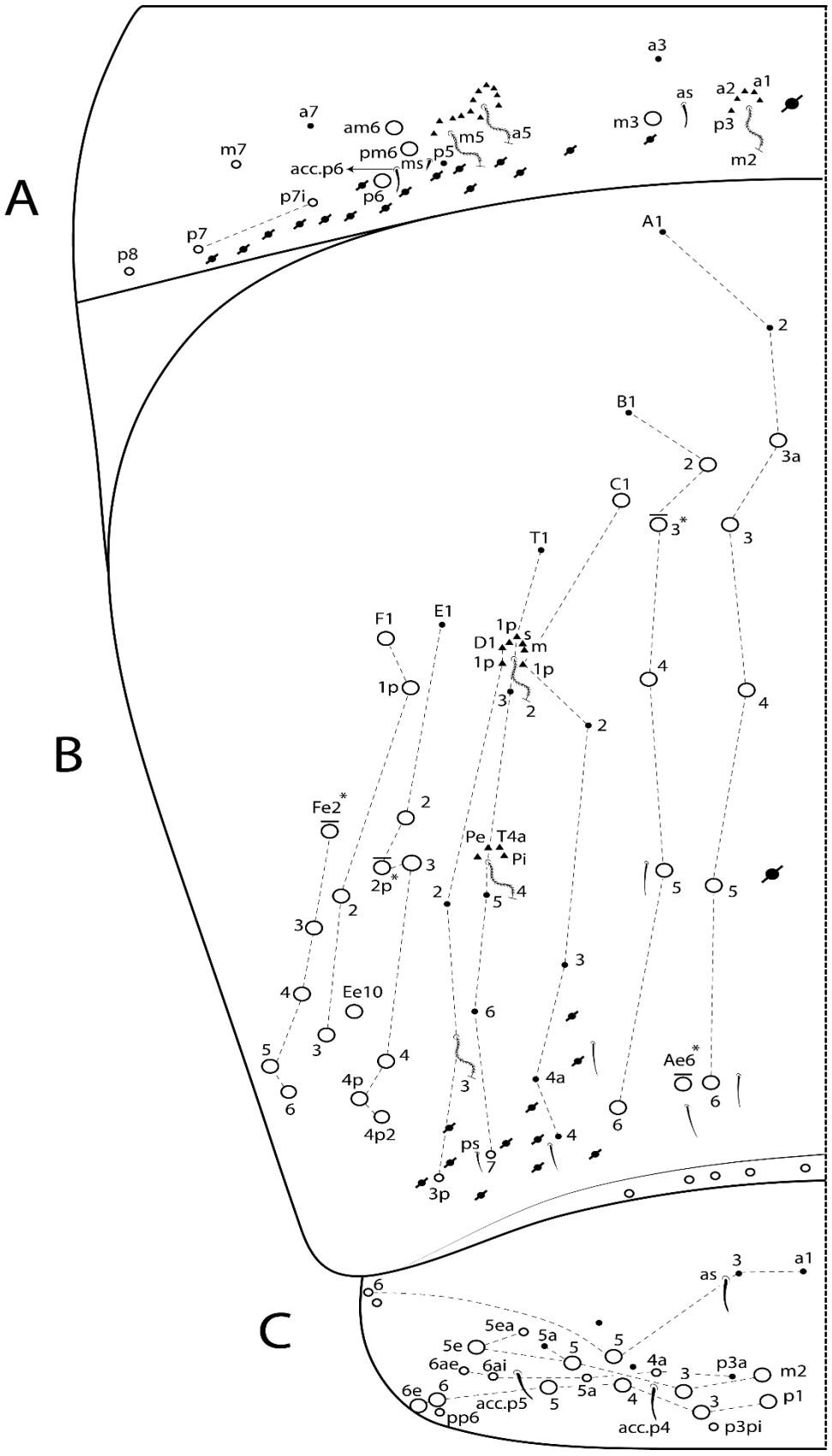

FIGURE 50A–C. *Lepidocyrtinus andevo* **sp. nov.**: dorsal chaetotaxy; **A**, Abd III, **B**, Abd IV; **C**, Abd V.

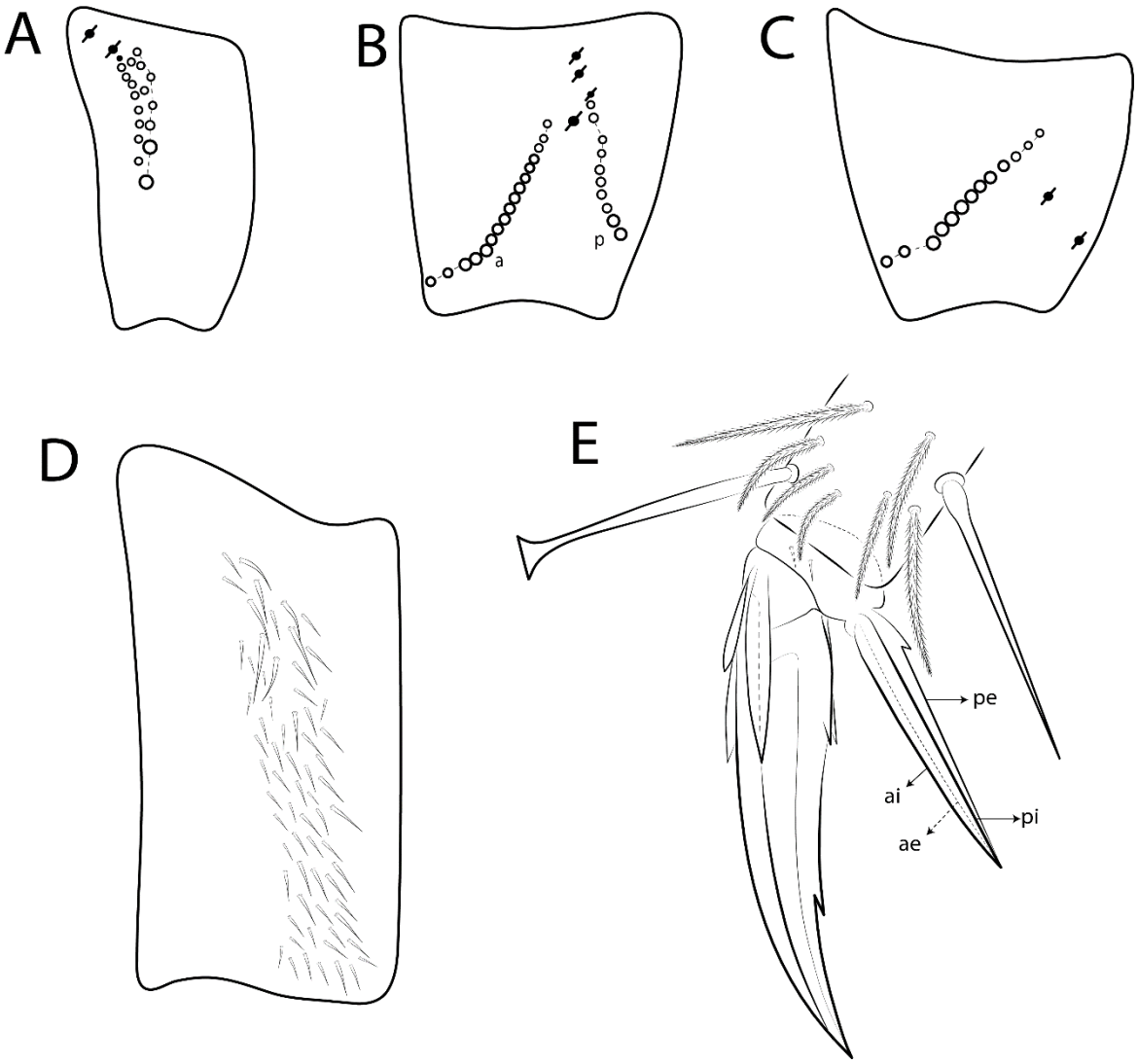

FIGURE 51A–E. *Lepidocyrtinus andevo* **sp. nov.**: legs chaetotaxy; **A**, subcoxa I; **B**, subcoxa II; **C**, subcoxa III (outer side); **D**, trochanteral organ (inner side); **E**, distal tibiotarsus and empodial complex III (posterior side).

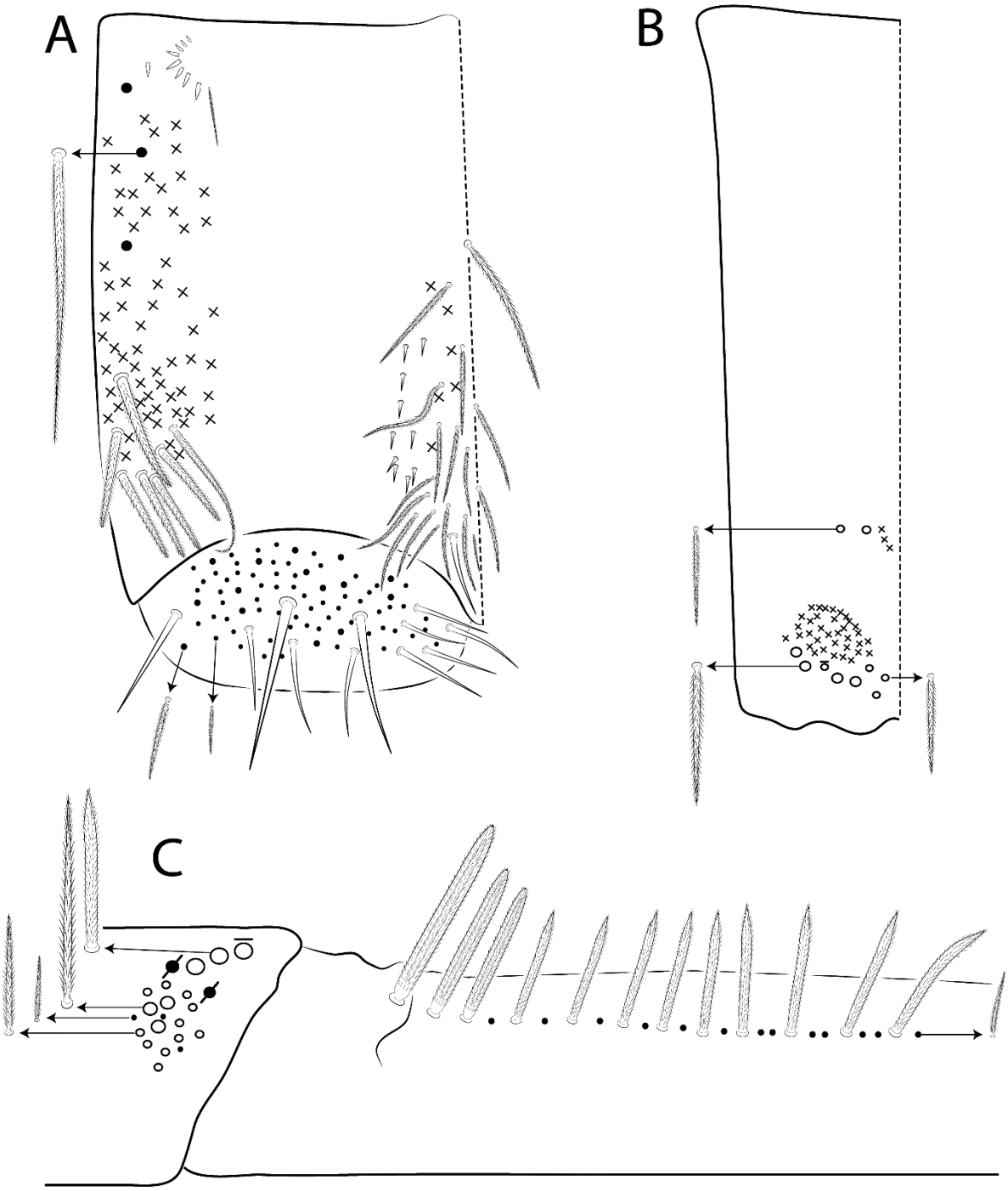

FIGURE 52A–C. *Lepidocyrtinus andevo* **sp. nov.**: **A**, collophore chaetotaxy (lateral view); **B**, manubrium ventral chaetotaxy; **C**, chaetotaxy of the manubrial plate and proximal dens (lateral view).

***Lepidocyrtinus briani* sp. nov. Cipola & Bellini**

Figs 47B, 53–56, 64

Type Material. Holotype female on slide (54095/CAS): Madagascar, Antsiranana, Daraina municipality, Binara Forest, 13°15'50"S; 049°35'57"E (Fig. 64), Rainforest, 1065 m, 18.x.2013, Malaise trap, BL Fisher coll. Paratypes on slides (54095/CAS): 1 male, 4 females and 3 specimens in alcohol, same data as holotype.

Diagnosis. Body with dark pigments on Ant II–IV and Th II laterally (Fig. 47B); head mac **A0**, **A2**–**3**, **A5**, **M1**–**2**, **S0**–**3** and **S5**–**6** present; prelabral chaetae smooth; labial papilla E with lateral process (l.p.) apically pointed and reaching the base of apical appendage (Figs 53B–C); Th II with 6–7 anterior, 8 median (**m1ip**, **m4**–**4p** present, **m4i** mac absent) and 9–10 posterior mac (**p2ep** absent, **p3** mac); Th III–Abd II with 5–7, 3, 3 central mac respectively; Abd IV with 11 central mac and 14 lateral mac (Figs 54, 55B); ungues apical tooth present; unguiculus with all lamella acuminate; collophore anteriorly with 8 spine-like chaetae and 5 ciliate chaetae apically acuminate, posteriorly with 5 spines, smooth chaeta present (Fig. 56E); manubrium ventrally with 0–2/2 subapical chaetae; manubrial plate with 2 blunt mac abruptly acuminate at apex; dens without blunt mac (Figs 56F–G).

Description. Total length (head + trunk) of specimens 2.48–3.43 (n=4), holotype 3.43 mm. Specimen pale white with pigment dark blue weakly on Ant II–IV, femur and tibiotarsus, and heavly on Th II lateral; eyepatches black (Fig. 47B). Scales present on Ant I to one seventh proximal of Ant IV, dorsal and ventral head, dorsal thorax and abdomen, legs (except empodia), anterior collophore, ventral and dorsal manubrium and dens ventrally.

Head. Antennae smaller to trunk length (Fig. 47B); ratio antennae: trunk = 1: 1.78–1.80 (n=3), holotype 1: 1.78; antennal segments ratio as I: II: III: IV = 1: 1.22–1.54: 1.42: 1.98–3.09, holotype 1: 1.25: 1.42: 1.98 (Ant III only holotype). Ant IV annulated on distal six seventh, with apical bulb apically bilobed. Ant III sense organ with 2 elongated rods, 3 spiny guard sens and s-blunt sens of different sizes. Ant I dorsally with 4 median mac not surrounding by ciliate guard mic and 3 smooth mic at base, without spines. Eyes A and B larger, G and H smaller, others subequal, and with 5 ’IO’ chaetae; head dorsal

macrochaetotaxy with 10–12 **An**, 4 **A**, 3 **M**, 7 **S** and 1 **Pa** mac (Fig. 53C). Clypeal formula with 4 (**l1**-**2**), 10 (**fr**), 3 (**pf 0**-**2**) ciliate chaetae, **l1**-**2** larger, **l1** apically acuminate, 1 **fr** smaller, others subequal (Fig. 53A). Prelabral chaetae smooth, inner chaetae rarely bifurcated. Labral **p0** chaeta sometimes with median filament. Labral papillae with two inner rounded projections, outer papillae absent. Maxillary palp with smooth apical appendage (**a.a.**) and basal chaeta (**b.c.**) weakly ciliate, thicker and 1.41 larger in length than the apical. Labial papilla E with lateral process (l.p.) apically pointed and reaching the base of apical appendage (Fig. 53B). Basolateral and basomedian labial fields with chaetae **M1**–**2**, **R**, **E**, **L1**–**2** ciliate (Fig. 53D). Ventral head with about 16 ciliate chaetae, postlabial formula with 4 (**G1**–**4**), 3 (**H2**–**4**), 4 (**J1**–**4**) chaetae, 2 larger basal chaetae (b.c.) surrounding the cephalic groove (Fig. 53D).

Thorax chaetotaxy (Fig. 54A–B). Th II **a**, **m** and **p** series with 6–7, 8 and 9–10 mac, respectively. Th III **a**, **m** and **p** series with 3–4, 1 and 3–4 mac, respectively. Ratio Th II: III = 1.96–2.48: 1 (n=4), holotype 2.48: 1.

Abdomen chaetotaxy (Figs 54C–D, 55A–C). Abd I **a**, **m** and **p** series with 0, 3 and 0 mac, respectively, and at least 1 secundary psp. Abd II **a**, **m** and **p** series with 1, 3 and 0 mac, respectively, **m3e** mic. Abd III **a**, **m** and **p** series with 0, 2–3 and 1 mac, respectively. Abd IV with 11 central mac of **A**–**T** series and 14 lateral mac of **E**–**Fe** series; 2 secundary psp, 6 posterior sens (**ps** type I, others type II) and 8 posterior mes. Abd V **a**, **m** and **p** series with 1, 4 and 6 mac, respectively. Ratio Abd III: IV = 1: 4.49–5.39 (n= 4), holotype 1: 4.49.

Legs. Subcoxa I with 7-8 chaetae, 5 anterior chaetae and 2 psp; subcoxa II with an anterior row of 14 chaetae, posterior row of 7 chaetae and 6 psp; subcoxa III with one row of 14 chaetae and 2 posterior psp (Fig. 56A–C). Trochanteral organ with about 44 spine-like chaetae (Fig. 56D). Tibiotarsus not subdivided, outer side with 6 large chaetae and apically acuminate, inner side with 13 mac weakly ciliate. Ungues inner side with 4 teeth, 2 paired basal, 1 unpaired median larger to basal teeth, and 1 minute apical tooth. Unguiculus with all lamellae acuminate, **pe** lamella serrated and with small proximal tooth, other lamellae smooth; ratio unguis: unguiculus = 1: 0.63. Tibiotarsal smooth chaeta 1.18 larger than unguiculus and tenent hair 0.69 smaller than unguis outer edge.

Collophore. Anterior side with 18 chaetae, 8 proximal spine-like chaetae, 1 thin and 2 normal ciliate chaetae, 5 ciliate chaetae apically acuminate and 2 mac distally; posterior

side with 22 chaetae, 8 spines, 13 thin ciliate chaetae widely distributed and 1 smooth chaetae distally; lateral flap with about 50 chaetae, 7 smooth and 43 ciliate (Fig. 56E).

Furcula. Manubrium ventral formula with 0, 0, 0, 0–2/2 (subapical), 14–16 (apical) ciliate chaetae plus about 20 elongated apical scales per side (Fig. 56F); manubrial plate with 2 blunt mac ciliate and abruptly acuminate at apex, 16 ciliate chaetae of different sizes and 3 psp. Dens dorsally with chaetae ciliate, without mac blunt (Fig. 56G).

Etymology. It is named after Dr. Brian L. Fisher (CAS), collector of the new species.

Remarks. *Lepidocyrtinus briani* **sp. nov.** resembles other species from Madagascar. See the comparison between them in remarks of *L. iego* **sp. nov.**

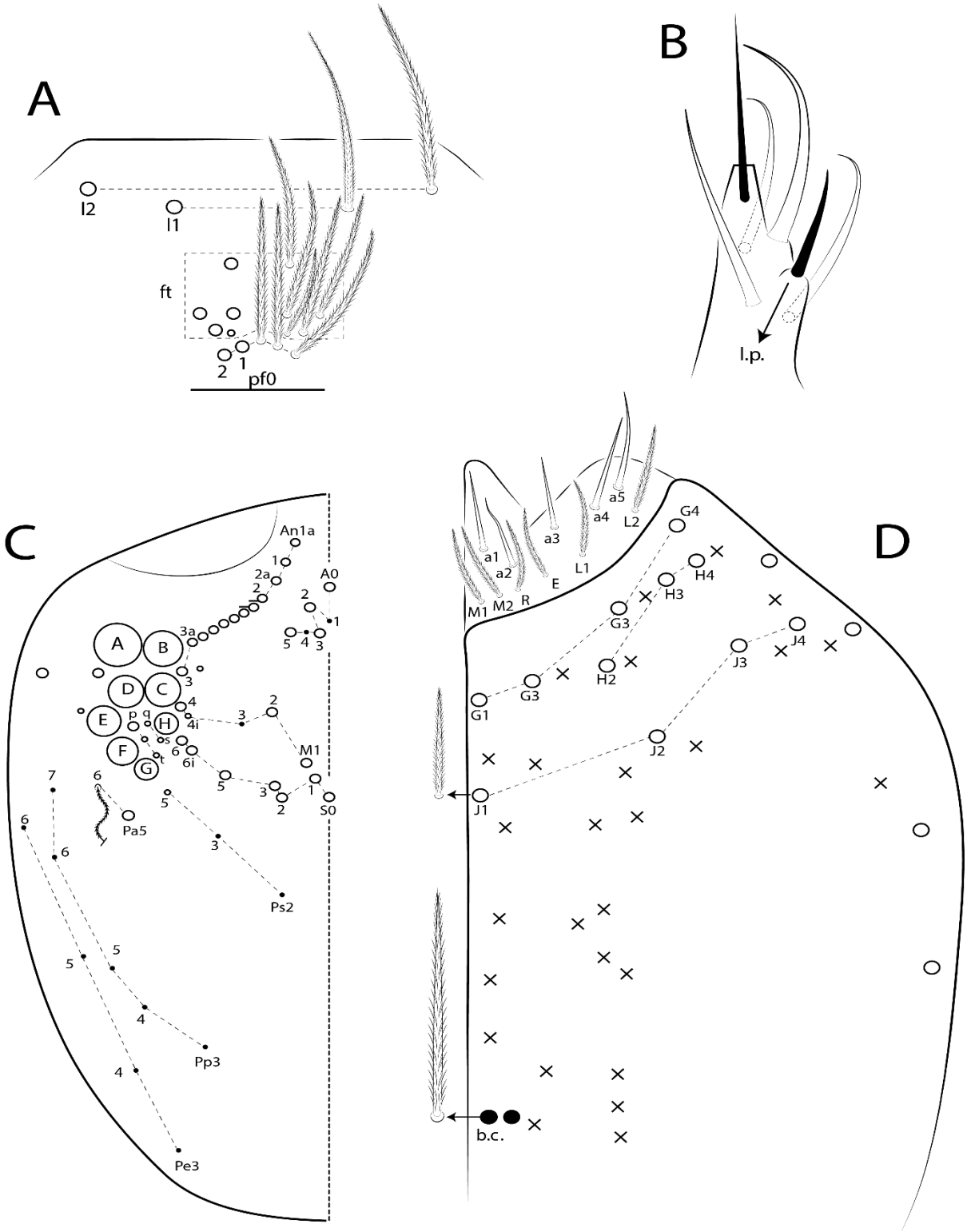

FIGURE 53A–D. *Lepidocyrtinus briani* **sp. nov.**: head; **A**, chaetotaxy of the clypeus; **B**, labial papillae E (right side), arrow indicates lateral process (**l.p.**); **C**, dorsal chaetotaxy (left side); **D**, postlabial and cephalic groove chaetotaxy (right side).

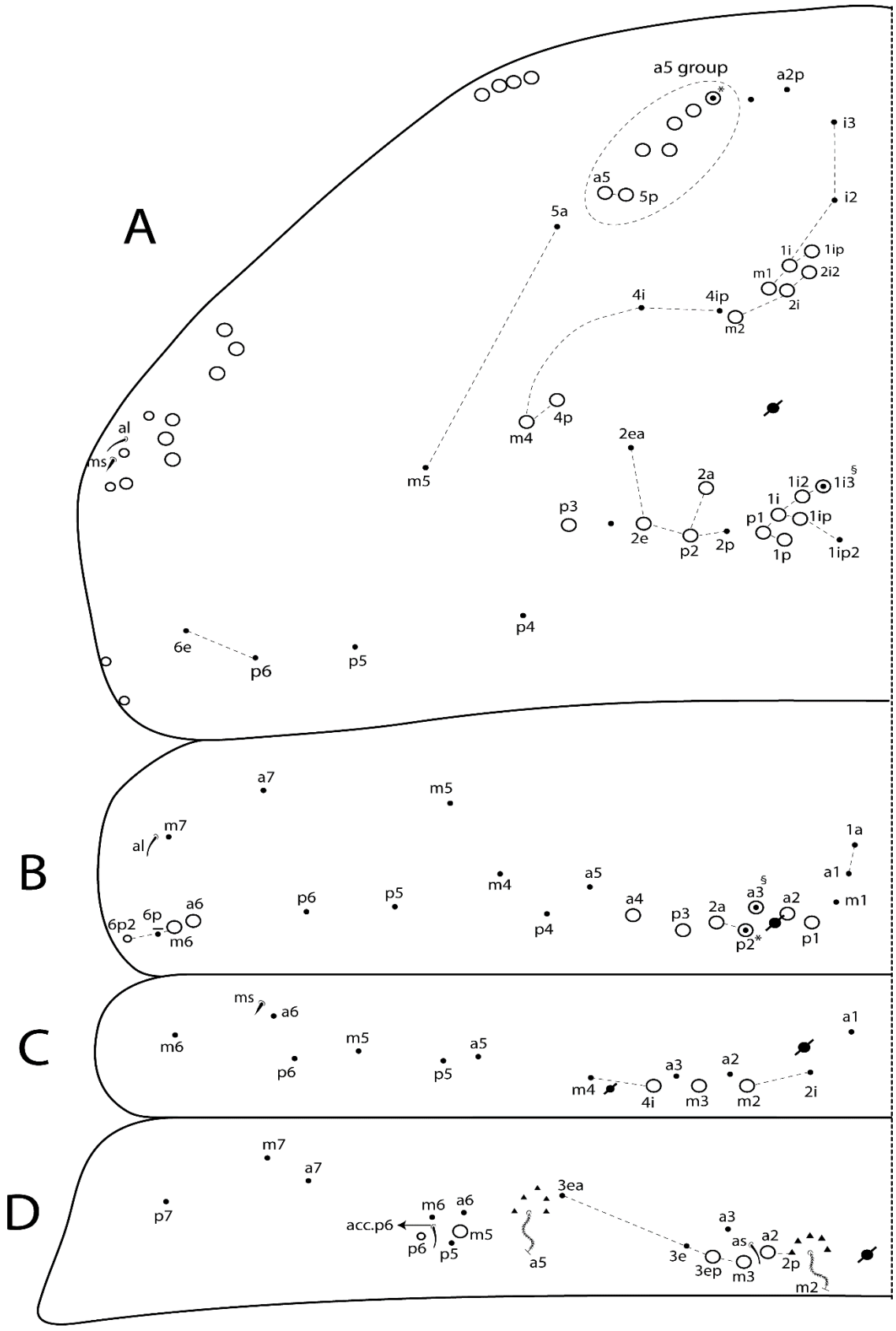

FIGURE 54A–**D.** *Lepidocyrtinus briani* **sp. nov.**: dorsal chaetotaxy; **A**, Th II; **B**, Th III; **C**, Abd I; **D**, Abd II.

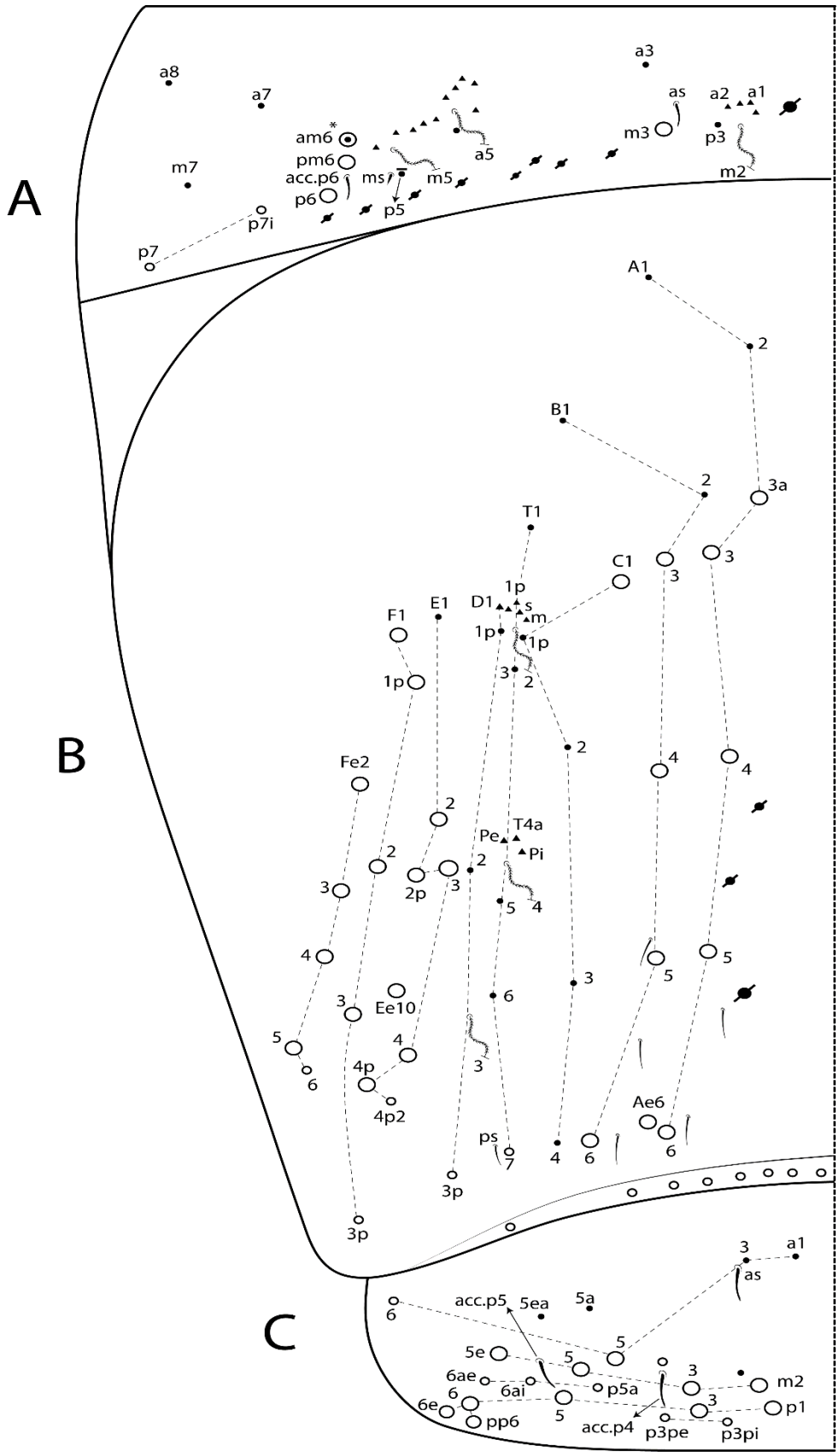

FIGURE 55A–**C.** *Lepidocyrtinus briani* **sp. nov.**: dorsal chaetotaxy; **A**, Abd III, **B**, Abd IV; **C**, Abd V.

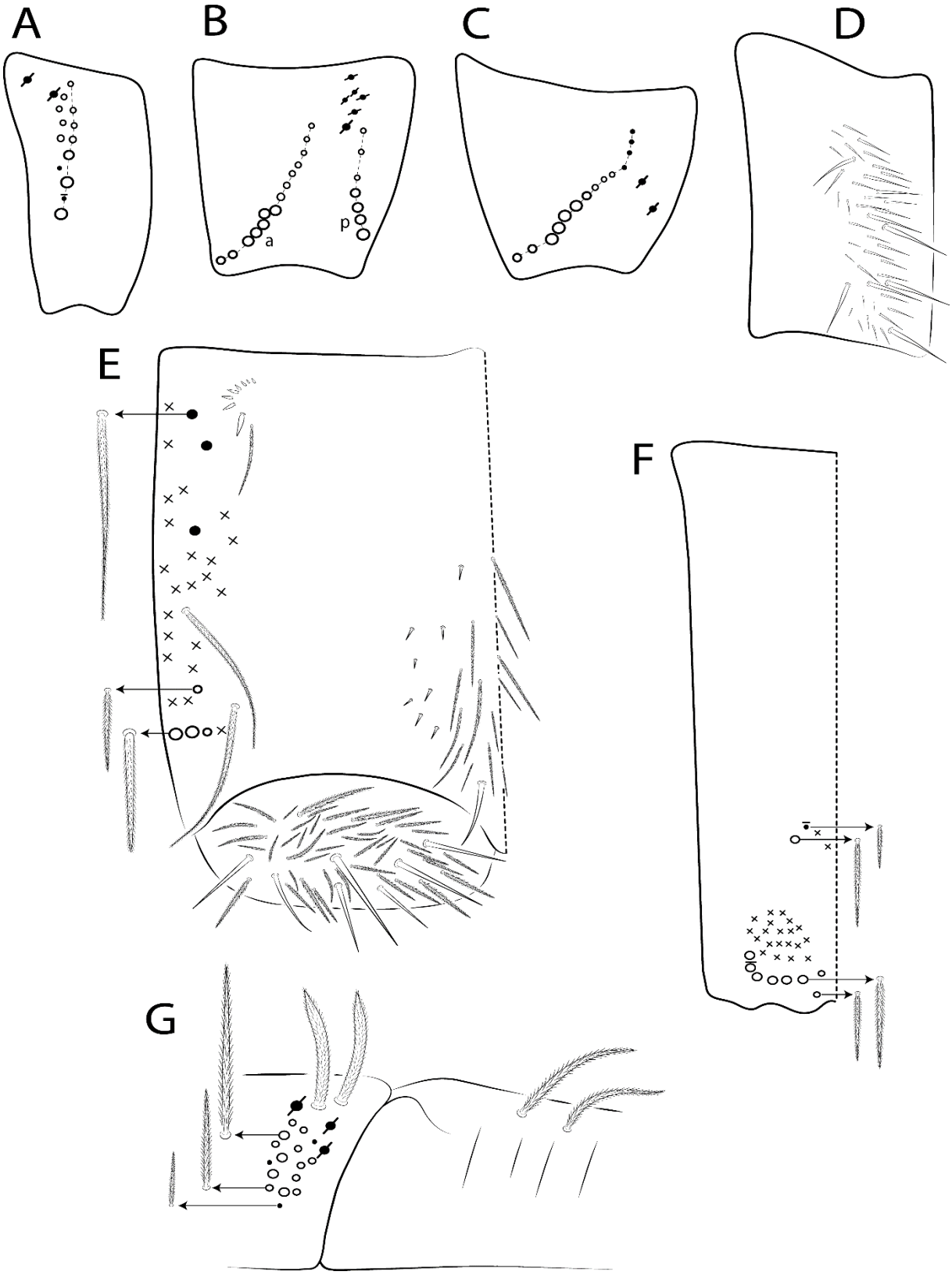

FIGURE 56A–G. *Lepidocyrtinus briani* **sp. nov.**; **A**, subcoxa I; **B**, subcoxa II; **C**, subcoxa III (outer side); **D**, trochanteral organ (inner side); **E**, collophore chaetotaxy (lateral view); **F**, manubrium ventral chaetotaxy; **G**, chaetotaxy of the manubrial plate and proximal dens (lateral view).

***Lepidocyrtinus betamponensis* sp. nov. Cipola & Bellini**

Figs 47C, 57–60, 64

Type Material. Holotype female on slide (54128/CAS): Madagascar, Toamasina, Réserve Nationale Intégrale Betampona, 17°54'58"S, 049°12'07"E (Fig. 64), Rainforest, 550 m, 24.iv-04.v.2008, Malaise trap, BL Fisher coll. Paratypes on slides (54128/CAS): 2 males, 7 females and 54 specimen in alcohol, same data as holotype. Paratypes on alcohol (54120, 54153-54, 56/CAS): 13 specimens, same data as holotype, except 3-10.viii.2008, 31.viii-07.ix.2008, 28.ix-05-x.2008, 21-28.xii.2008.

Diagnosis. Body with dark pigments on Ant II–IV and Th II laterally (Fig. 47C); head mac **A0**, **A2**–**3**, **A5**, **M1**–**2**, **S0**–**3** and **S5**–**6** present; prelabral chaetae smooth; labial papilla E with lateral process (l.p.) apically pointed and not reaching the base of apical appendage (Figs 57B–D); Th II with 5–7 anterior, 8 median (**m1ip**, **m4**–**4p** present, **m4i** mac absent) and 9–10 posterior mac (**p2ep** absent, **p3 mac**); Th III–Abd II with 8–10, 1–2, 3–4 central mac respectively; Abd IV with 12 central mac and 12–15 lateral mac (Figs 58, 59B); ungues apical tooth absent; unguiculus with all lamella acuminate; collophore anteriorly with 9 spine-like chaetae and 5–6 ciliate chaetae apically acuminate, posteriorly with 8 spines, smooth chaeta present (Fig. 60E); manubrium ventrally with 0/4 subapical chaetae; manubrial plate with 2 blunt mac abruptly acuminate at apex; dens with 5–9 blunt mac apically bullet-like and abruptly acuminate at apex (Figs 60F–G).

Description. Total length (head + trunk) of specimens 3.03–3.70 (n=4), holotype 3.70 mm. Specimen pale white with pigment dark marine blue on Ant I–IV, lateral Th II–III, femur I–II with one band and III with proximal and distal bands, and tibiotarsus completely (except distally); eyepatches black (Fig. 47C). Scales present on Ant I to one-quarters proximal of Ant IV, dorsal and ventral head, dorsal thorax and abdomen, legs (except empodia), anterior collophore, ventral and dorsal manubrium and dens ventrally.

Head. Antennae subequal or smaller to trunk length (Fig. 47C); ratio antennae: trunk = 1: 1.10–1.21 (n=3), holotype 1: 1.21; antennal segments ratio as I: II: III: IV = 1: 1.28–1.48: 1.41–1.48: 2.83–3.00, holotype 1: 1.40: 1.48: 2.85. Ant IV annulated on distal three-fourths, with apical bulb apically bilobed. Ant III sense organ with 2 short rods, 3 spiny guard sens and s-blunt sens of different sizes. Ant I dorsally with 4–5 median and 3

smooth mic at base, without spines. Eyes A and B larger, G and H smaller, others subequal, and with 5–6 'IO' chaetae; head dorsal macrochaetotaxy with 10–13 **An**, 4 **A**, 3 **M**, 7 **S** and 1 **Pa** mac (Fig. 57D). Clypeal formula with 4 (**l1**–**2**), 7 (**fr**), 5 (**pf0**–**2**) ciliate chaetae, **l1**–**2** larger, **l1** apically acuminate, 1 frontal smaller, others subequal (Fig. 57A). Prelabral chaetae smooth and sometimes with small median filament, outer chaetae rarely with two median filaments (Fig. 57B). Labral **p0** chaeta sometimes with median filament or rarely bifurcated. Labral papillae with two inner rounded projections, outer papillae absent. Maxillary palp with smooth apical appendage (**a.a.**) and basal chaeta (**b.c.**) weakly ciliate, thicker and 1.29 larger in length than the apical. Labial papilla E with lateral process (l.p.) apically pointed and not reaching the base of apical appendage (Fig. 57C). Basolateral and basomedian labial fields with chaetae **M1**–**2**, **R** (weakly smaller), **L1**–**2** ciliate, **e** smooth (Fig. 57E). Ventral head with about 16 ciliate chaetae, postlabial formula with 4 (**G1**–**4**), 3 (**H2**–**4**), 4 (**J1**–**4**) chaetae and 3 larger basal chaetae (b.c.) surrounding the cephalic groove (Fig. 57E).

Thorax chaetotaxy (Fig. 58A–B). Th II **a**, **m** and **p** series with 5–7, 8 and 9–10 mac, respectively, and about 11 secundary psp. Th III **a**, **m** and **p** series with 4–5, 1 and 7–8 mac, respectively, and about 6 secundary psp. Ratio Th II: III = 2.25–1.92: 1 (n=4), holotype 2.13: 1.

Abdomen chaetotaxy (Figs 58C–D, 59A–C). Abd I **a**, **m** and **p** series with 0, 1–2 and 0 mac, respectively, and at least 2 secundary psp. Abd II **a**, **m** and **p** series with 0–1, 4 and 0 mac, respectively, and at least 2 secundary psp. Abd III **a**, **m** and **p** series with 0, 3 and 1 mac, respectively, and about 8 secundary psp. Abd IV with 12 central mac of **A**–**T** series and 12–15 lateral mac of **E**–**Fe** series; about 9 secundary psp, 8 posterior sens (**ps** type I, others type II) and 6 posterior mes. Abd V **a**, **m** and **p** series with 1, 4 and 6 mac, respectively. Ratio Abd III: IV = 1: 4.51–5.44 (n= 4), holotype 1: 4.53.

Legs. Subcoxa I with 6 chaetae, 2 anterior chaetae and 2 psp; subcoxa II with an anterior row of 12 chaetae, posterior row of 7 chaetae and 6 psp; subcoxa III with one row of 12 chaetae and 2 posterior psp (Fig. 60A–C). Trochanteral organ with about 78 spine-like chaetae (Fig. 60D). Tibiotarsus III sometimes subdivided on distal two thirds, outer side with 4 proximal large chaetae and apically acuminate, inner side with 7 mac weakly ciliate. Ungues inner side with 3 teeth, 2 paired basal and 1 unpaired median subequal to basal teeth, apical tooth absent. Unguiculus with all lamellae acuminate, **pe** lamella with small proximal tooth, all lamellae smooth (as Fig. 51E); ratio unguis: unguiculus = 1: 0.63.

Tibiotarsal smooth chaeta 1.18 larger than unguiculus and tenent hair 0.72 smaller than unguis outer edge.

Collophore. Anterior side with 20 chaetae, 9 proximal spine-like chaetae, 1 thin and 1–2 normal ciliate chaeta, 5–6 ciliate chaetae apically acuminate and 2 mac distally; posterior side with 19 chaetae, 8 spines, 9–10 thin ciliate chaetae widely distributed and 1 smooth chaetae distally; lateral flap with about 67 chaetae, 10 smooth and 57 ciliate (Fig. 60E).

Furcula. Manubrium ventral formula with 0, 0, 0, 0/4 (subapical), 12–16 (apical) ciliate chaetae plus about 24 elongated apical scales per side (Fig. 60F); manubrial plate with 2 blunt mac ciliate and abruptly acuminate at apex, 12 ciliate chaetae of different sizes and 3 psp. Dens dorsally with one proximal row of 5–9 blunt mac weakly ciliate, 3 proximal apically bullet-like and up to 6 abruptly acuminate at apex, holotype with 7+7 (Fig. 60G).

Etymology. Refers to its type locality: Betampona Reserve, Madagascar.

Remarks. *Lepidocyrtinus betamponensis* **sp. nov.** resembles others species from Madagascar. See the comparison between them in remarks of *L. iego* **sp. nov.**

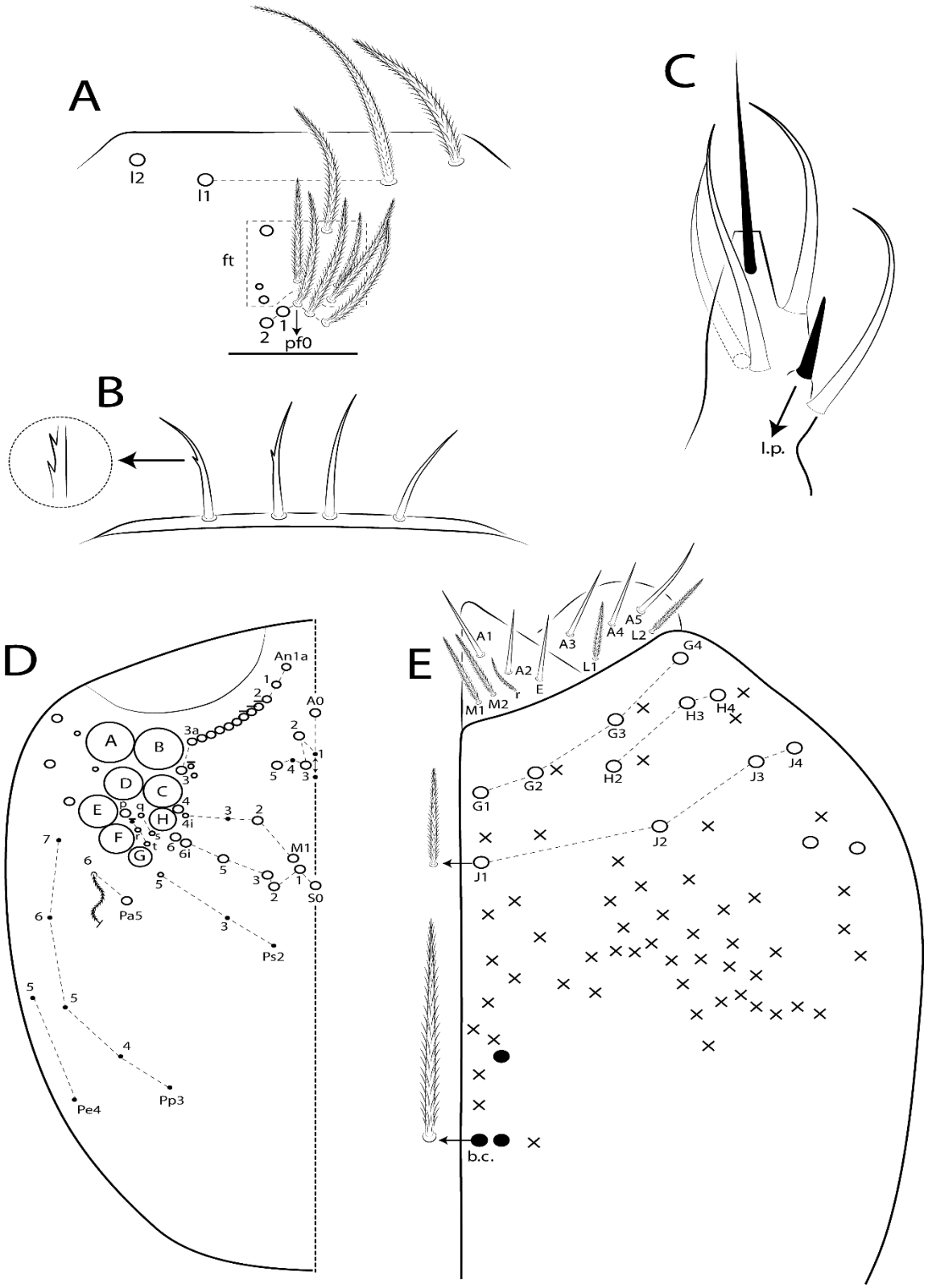

FIGURE 57A–E. *Lepidocyrtinus betamponensis* **sp. nov.**: head; **A**, chaetotaxy of the clypeus; **B**, prelabral chaetotaxy; **C**, labial papillae E (right side), arrow indicates lateral process (**l.p.**); **D**, dorsal chaetotaxy (left side); **E**, postlabial and cephalic groove chaetotaxy (right side).

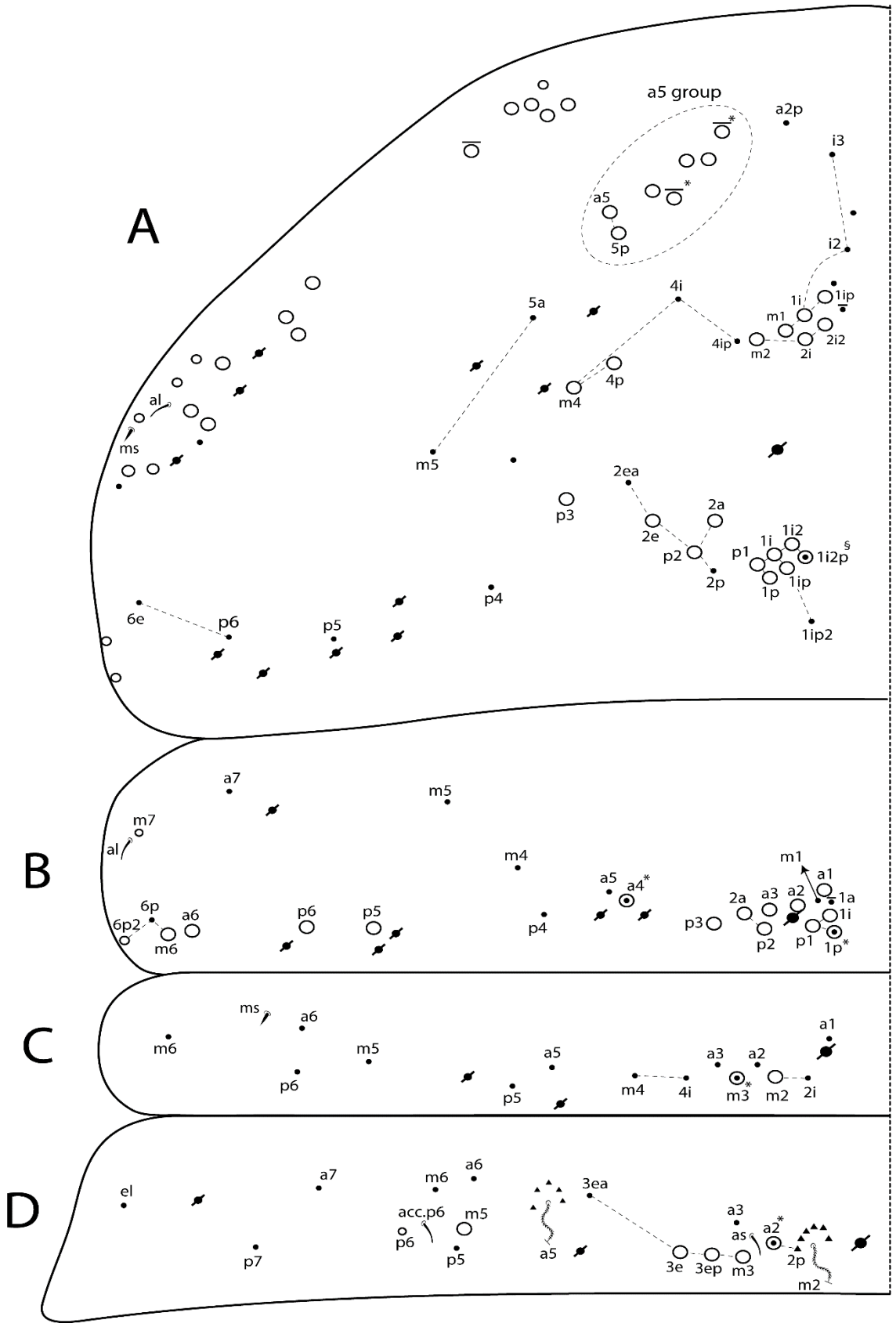

FIGURE 58A–**D.** *Lepidocyrtinus betamponensis* **sp. nov.**: dorsal chaetotaxy; **A**, Th II; **B**, Th III; **C**, Abd I; **D**, Abd II.

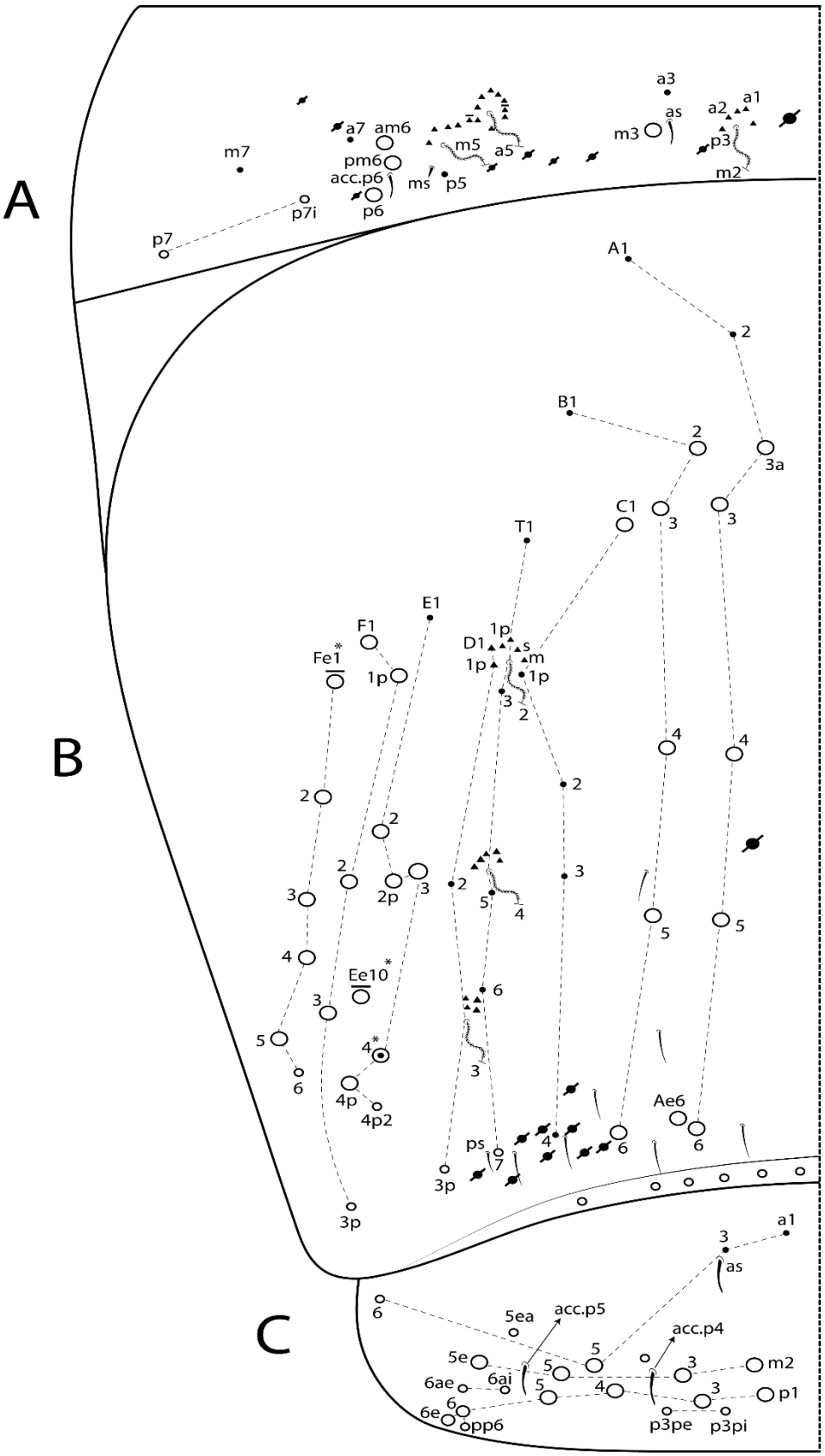

FIGURE 59A–C. *Lepidocyrtinus betamponensis* **sp. nov.**: dorsal chaetotaxy; **A**, Abd III, **B**, Abd IV; **C**, Abd V.

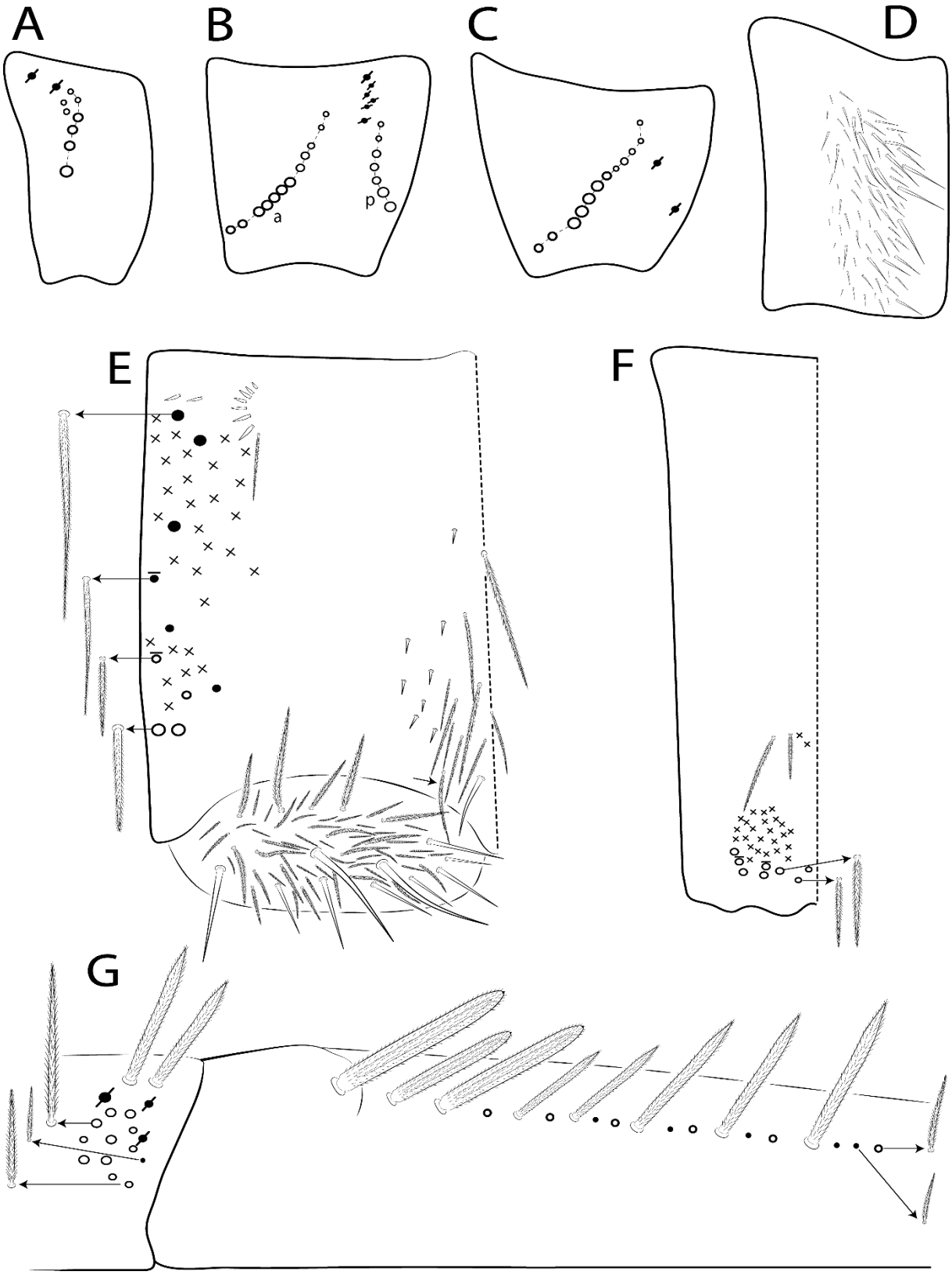

FIGURE 60A–G. *Lepidocyrtinus betamponensis* **sp. nov.**; **A**, subcoxa I; **B**, subcoxa II; **C**, subcoxa III (outer side); **D**, trochanteral organ (inner side); **E**, collophore chaetotaxy (lateral view), arrow posteriorly indicates chaeta present or absent; **F**, manubrium ventral chaetotaxy; **G**, chaetotaxy of the manubrial plate and proximal dens (lateral view).

***Lepidocyrtinus iego* sp. nov. Cipola & Bellini**

Figs 47D, 61–64

Type Material. Holotype female on slide (54107/CAS): Madagascar, Toamasina, Moramanga municipality, Andasibe-Mantadia National Park, 18°45'39"S, 048°22'17"E (Fig. 64), Rainforest, 968 m, 23-28.xi.2012, Malaise trap, BL Fisher coll. 1 paratype female on slide (54107/CAS), same data as holotype.

Diagnosis. Body pale (Fig. 47D); head mac **A0**, **A2**–**3**, **A5**, **M1**–**2**, **S0**–**3** and **S5**–**6** present; prelabral chaetae smooth; labial papilla E with lateral process (l.p.) apically pointed and distant the base of apical appendage (Figs 61B–C); Th II with 7 anterior, 8 median (**m1ip**, **m4**–**4p** present, **m4i** mac absent) and 10–11 posterior mac (**p2ep** absent, **p3 mac**); Th III–Abd II with 11, 5, 4 central mac respectively; Abd IV with 10–12 central mac and 14–16 lateral mac (Figs 62 and as 50B); ungues apical tooth absent; unguiculus with all lamella acuminate; collophore anteriorly with 8 spine-like chaetae and 6 ciliate chaetae apically acuminate, posteriorly with 6 spines, smooth chaeta present (Fig. 63E); manubrium ventrally with 0/4 subapical chaetae; manubrial plate with 2 blunt mac abruptly acuminate at apex; dens with 7–7 blunt mac apically bullet-like (Figs 63F–G).

Description. Total length (head + trunk) of specimens 2.97–3.61 (n=2), holotype 3.61 mm. Specimen pale white with vestigial dark blue pigment on distal and proximal of Ant IV; eyepatches black (Fig. 47D). Scales present on Ant I to proximal one-fifth of Ant IV, dorsal and ventral head, dorsal thorax and abdomen, legs (except empodia), anterior and posterior collophore, ventral and dorsal manubrium and dens ventrally.

Head. Antennae subequal to trunk length (Fig. 47D); ratio antennae: trunk = 1: 1.07; antennal segments ratio as I: II: III: IV = 1: 1.38: 1.38: 2.70 in holotype (Ant III – IV missing in paratype). Ant IV annulated on distal four-fifth, with apical bulb apically bilobed. Ant III sense organ with 2 rods, 3 spiny guard sens, s-blunt sens of different sizes and ciliated chaetae. Ant I dorsally with 4 median mac surrounding by ciliate guard mic and 3 smooth mic at base, without spines. Eyes A and B larger, G and H smaller, others subequal, and with 5 'IO' chaetae; head dorsal macrochaetotaxy with 11–14 **An**, 4 **A**, 3 **M**, 7 **S** and 1 **Pa** mac (Fig. 61C). Clypeal formula with 6 (**l1**–**2**), 8 (**fr**), 5 (**pf0**–**2**) ciliate chaetae, **l1**–**2** larger, **l1** apically acuminate, 2 frontal smaller, others subequal (Fig. 61A).

Prelabral chaetae smooth and not bifurcated. Labral **p0** chaeta with median filament. Labral papillae with two inner rounded projections, outer papillae absent. Maxillary palp with smooth apical appendage (**a.a.**) and basal chaeta (**b.c.**) weakly ciliate, thicker and 1.44 larger in length than the apical. Labial papilla E with lateral process (l.p.) apically pointed and distant the base of apical appendage (Fig. 61B). Basolateral and basomedian labial fields with chaetae **M1**–**2**, **R** (weakly smaller), **L1**–**2** ciliate, **e** smooth. Ventral head with about 15 ciliate chaetae, postlabial formula with 4 (**G1**–**4**), 3 (**H2**–**4**), 4 (**J1**–**4**) chaetae and 1 larger basal chaetae (b.c.) surrounding the cephalic groove (Fig. 61D).

Thorax chaetotaxy (Fig. 62A–B). Th II **a**, **m** and **p** series with 7, 8 and 10–11 mac, respectively, and about 5 secundary psp. Th III **a**, **m** and **p** series with 6, 1 and 8 mac, respectively, and about 6 secundary psp. Ratio Th II: III = 1.94–1.82: 1 (n=2), holotype 1.94: 1.

Abdomen chaetotaxy (Figs 62C–D). Abd I **a**, **m** and **p** series with 1, 4 and 0 mac, respectively, and about 5 secundary psp. Abd II **a**, **m** and **p** series with 1, 4 and 0 mac, respectively, and about 5 secundary psp. Abd III **a**, **m** and **p** series with 0, 3 and 1 mac, respectively, and about 8 secondary psp. Abd IV with 10–12 central mac of **A**–**T** series (**C1** mac or mic) and 14–16 lateral mac of **E**–**Fe** series; about 9 secondary psp, 5 posterior sens (**ps** type I, others type II) and 3 posterior mes. Abd V **a**, **m** and **p** series with 1, 4 and 6 mac, respectively. Chaetotaxy of Abd III–V similar to *L. andevo* **sp. nov.** (Figs 50A–C). Ratio Abd III: IV = 1: 5.15–5.44 (n= 2), holotype 1: 5.44.

Legs. Subcoxa I with 6 chaetae, 3-5 anterior chaetae and 2 psp; subcoxa II with an anterior row of 16 chaetae, posterior row of 8 chaetae and 4 psp; subcoxa III with one row of 13 chaetae, 1 anterior chaeta and 2 posterior psp (Fig. 63A–C). Trochanteral organ with about 51 spine-like chaetae (Fig. 63D). Tibiotarsus III normal or subdivided on slightly more than half distal, outer side with 4 large chaetae and apically acuminate, inner side with 7 mac weakly ciliate. Ungues inner side with 3 teeth, 2 paired basal and 1 unpaired median larger to basal teeth, apical tooth absent. Unguiculus with all lamellae acuminate, **pe** lamella with small proximal tooth, all lamellae smooth; ratio unguis: unguiculus = 1: 0.69. Tibiotarsal smooth chaeta 0.82 smaller than unguiculus and tenent hair 0.73 smaller than unguis outer edge.

Collophore. Anterior side with 21 chaetae, 8 proximal spine-like chaetae, 4 ciliate chaetae, 6 ciliate chaetae apically acuminate and 2 mac distally; posterior side with 10

chaetae, 6 spines, 3 thin ciliate chaetae widely distributed and 1 smooth chaetae distally; lateral flap with about 58 chaetae, 12 smooth and 46 ciliate (Fig. 63E).

Furcula. Manubrium ventral formula with 0, 0, 0, 0/4 (subapical), 12 (apical) ciliate chaetae plus about 26 elongated apical scales per side (Fig. 63F); manubrial plate with 2 blunt mac ciliate and abruptly acuminate at apex, 18 ciliate chaetae of different sizes and 3 psp. Dens dorsally with one proximal row of 4–7 blunt mac weakly ciliate and apically bullet-like, holotype with 4+6 (Fig. 63G).

Etymology. "iego" (in apposition) is the nickname for Msc. Diego Dias da Silva (INPA), who helped providing usspecimens from Madagascar.

Remarks. The four new species here described from Madagascar are similar to each other in habitus, general morphology and dorsal chaetotaxy patterns (Figs 47–61). However, they differ from each other by color pattern as: heavily pigmented in *L. andevo* **sp. nov.**, partially pigmented in *L. briani* **sp. nov.** and *L. betamponensis* **sp. nov.**, and reduced in *L. iego* **sp. nov.** (Fig. 47). The head morphology of all new species lack **Pp5** mac (present in *L. voeltzkowi* **comb. rev.,** Fig. 43D), labial papilla E with lateral process reduced in *L. andevo* **sp. nov.**, *L. betamponensis* **sp. nov.** and *L. iego* **sp. nov.** (reaching the base of apical appendage in *L. voeltzkowi* **comb. rev.** and *L. briani* **sp. nov.**), basomedian labial field with chaeta **E** ciliate in *L. voeltzkowi* **comb. rev.** and *L. briani* **sp. nov.** (smooth in *L. andevo* **sp. nov.**, *L. betamponensis* **sp. nov.** and *L. iego* **sp. nov**.), and ventral cephalic groove with 1 basal chaeta in *L. voeltzkowi* **comb. rev.**, *L. andevo* **sp. nov.** and *L. iego* **sp. nov.** (2 in *L. betamponensis* **sp. nov.** and *L. briani* **sp. nov.**).

The dorsal chaetotaxy of Madagascar species differ in: *L. voeltzkowi* **comb. rev.** Th II with more than 12 anterior mac in **a5** group (7 or less on the four new species) and posteriorly with **p3** mic and **p2ep** mac (opposite in the four new species) (Figs 44A, 49A, 54A, 58A, 62A). In Th III there are 2 lateral mac in *L. voeltzkowi* **comb. rev.** and *L. briani* **sp. nov.**, while in the other new species there are 4 mac. Other differences in Th III are: **a5** mac present only in *L. iego* **sp. nov.**, **a1** and **p1i** mac absent in *L. briani* **sp. nov.** and **a4** in *L. voeltzkowi* **comb. rev.** (Figs 44B, 49B, 54B, 58B, 62B).

Concerning the body appendages, Madagascar species differ in number of spine-like chaetae on trochanteral organ and ungues apical tooth (present in *L. briani* **sp. nov.** and *L. voeltzkowi* **comb. rev.**, Fig 46E). The collophore anteriorly differs by 6 distal mac

present in *L. andevo* **sp. nov.** (3 in *L. voeltzkowi* **comb. rev.** and 2 in the other three new species) and about 16 spine-like chaetae in *L. voeltzkowi* **comb. rev.** (less in the four new species). On the posterior face of collophore the species differ by 10 spines present in *L. andevo* **sp. nov.** (8 in *L. briani* **sp. nov.** and *L. betamponensis* **sp. nov.**, 6 in *L. iego* **sp. nov.**, 2 in *L. voeltzkowi* **comb. rev.**) and smooth chaeta present in the four new species (absent in *L. voeltzkowi* **comb. rev.**). Finally, in dens they differ by blunt mac: apically nipple-like in *L. voeltzkowi* **comb. rev.**, bullet-like and/or abruptly acuminate at apex in *L. andevo* **sp. nov.**, *L. betamponensis* **sp. nov.** and *L. iego* **sp. nov.** (only bullet-like in this species), and such chaetae completely absent in *L. briani* **sp. nov.**

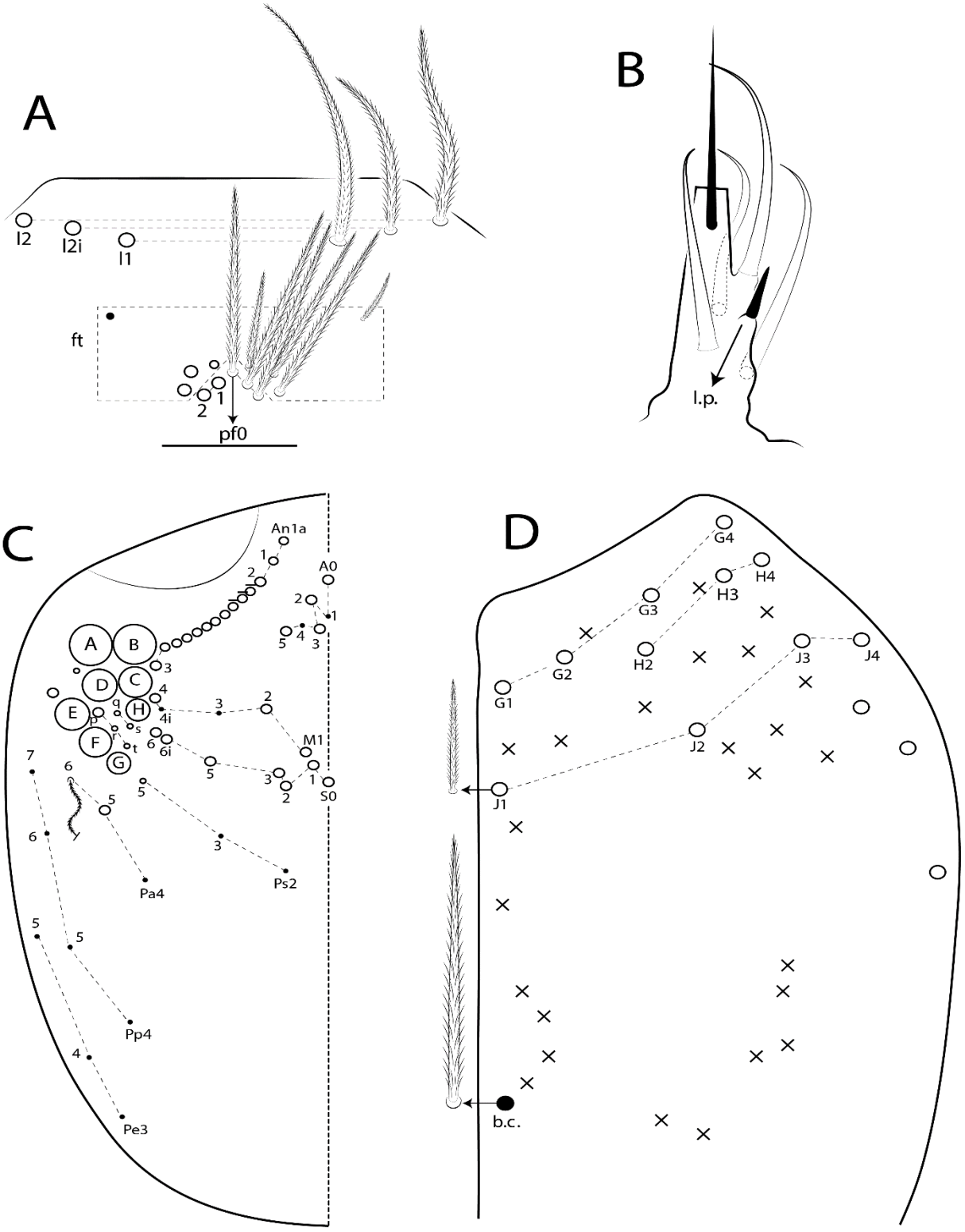

FIGURE 61A–D. *Lepidocyrtinus iego* **sp. nov.**: head; **A**, chaetotaxy of the clypeus; **B**, labial papillae E (right side), arrow indicates lateral process (**l.p.**); **C**, dorsal chaetotaxy (left side); **D**, postlabial and cephalic groove chaetotaxy (right side).

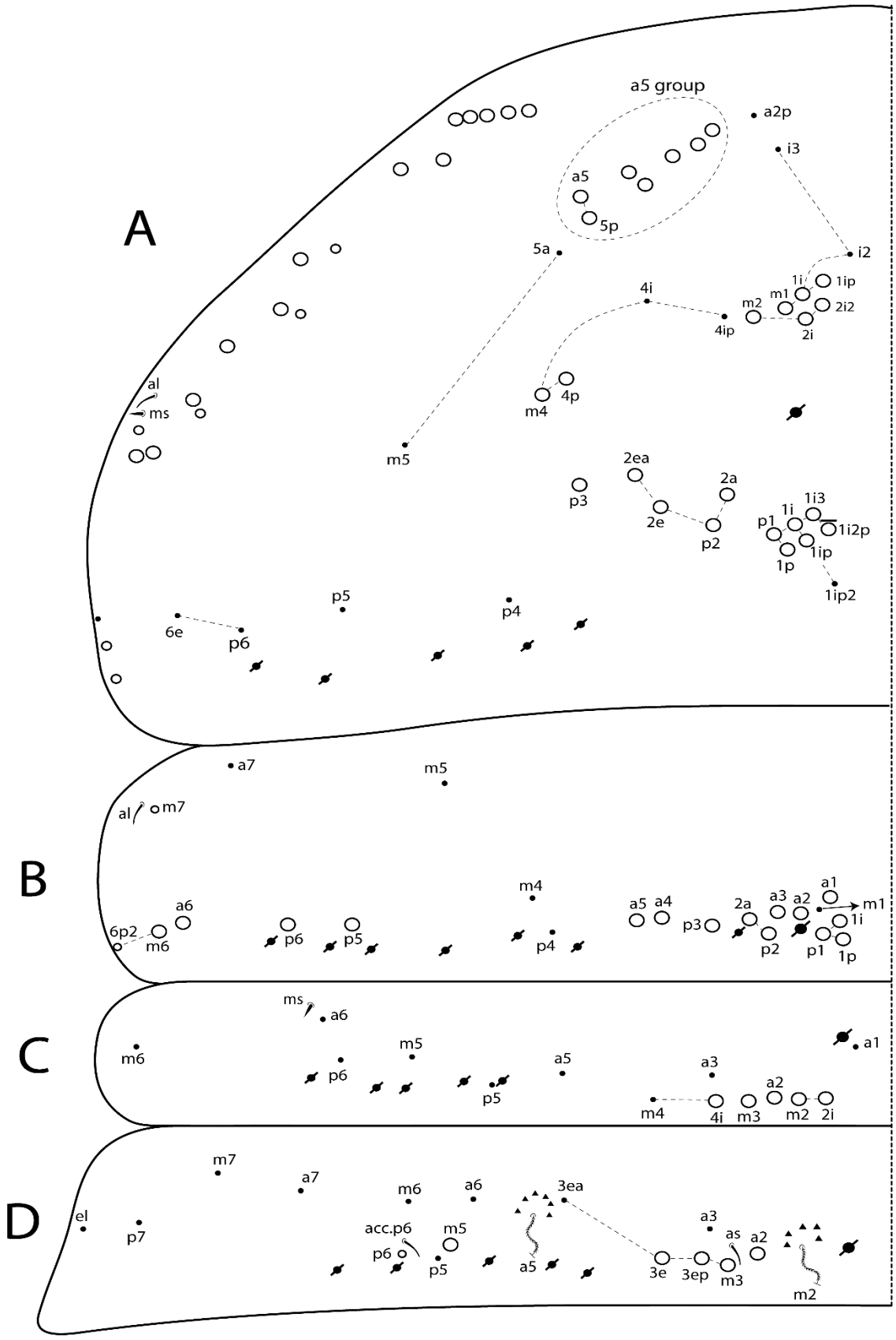

FIGURE 62A–D. *Lepidocyrtinus iego* **sp. nov.**: dorsal chaetotaxy; **A**, Th II; **B**, Th III; **C**, Abd I; **D**, Abd II.

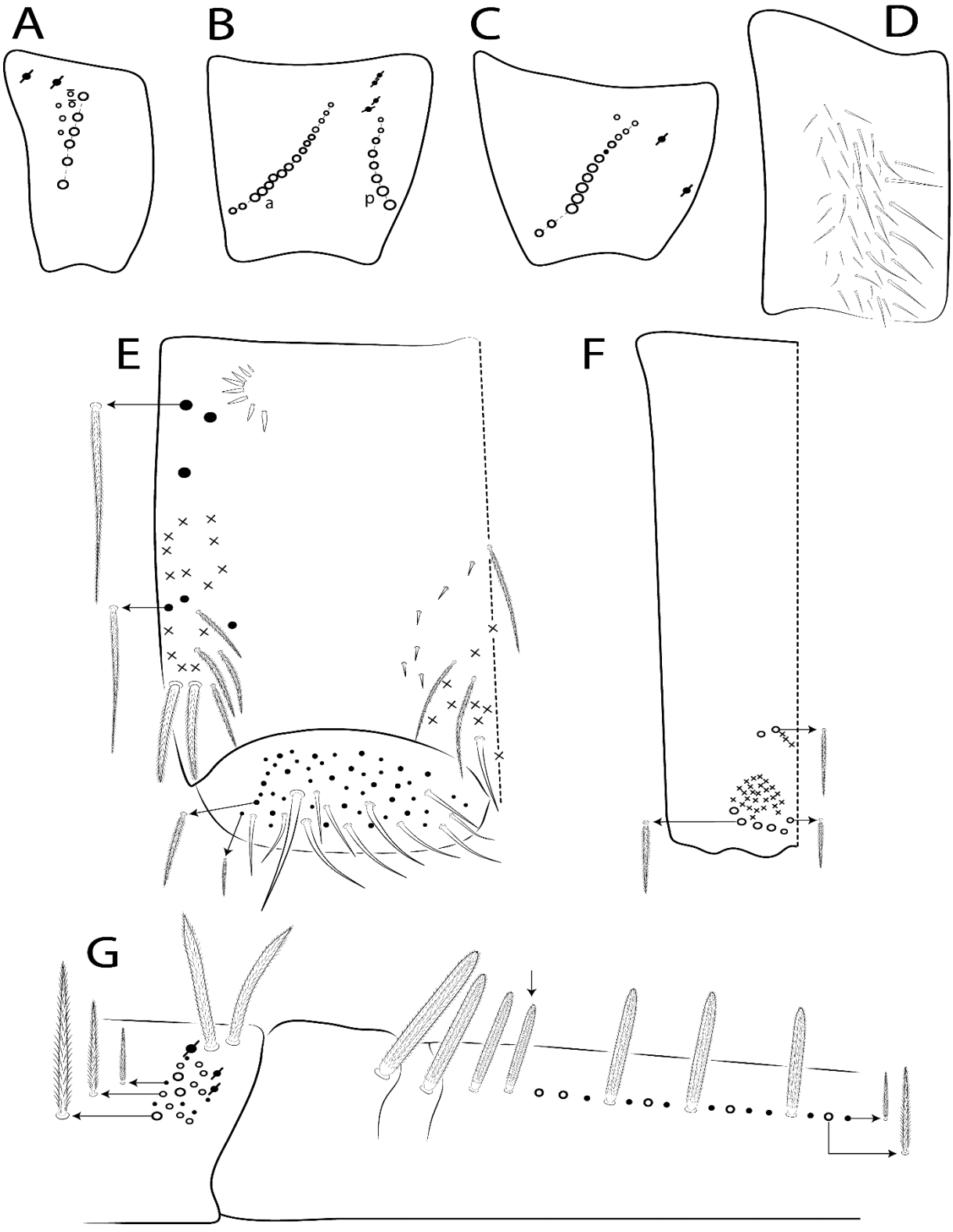

FIGURE 63A–G. *Lepidocyrtinus iego* **sp. nov.**; **A**, subcoxa I; **B**, subcoxa II; **C**, subcoxa III (outer side); **D**, trochanteral organ (inner side); **E**, collophore chaetotaxy (lateral view); **F**, manubrium ventral chaetotaxy; **G**, chaetotaxy of the manubrial plate and proximal dens (lateral view), arrow indicates blunt chaetae present or absent.

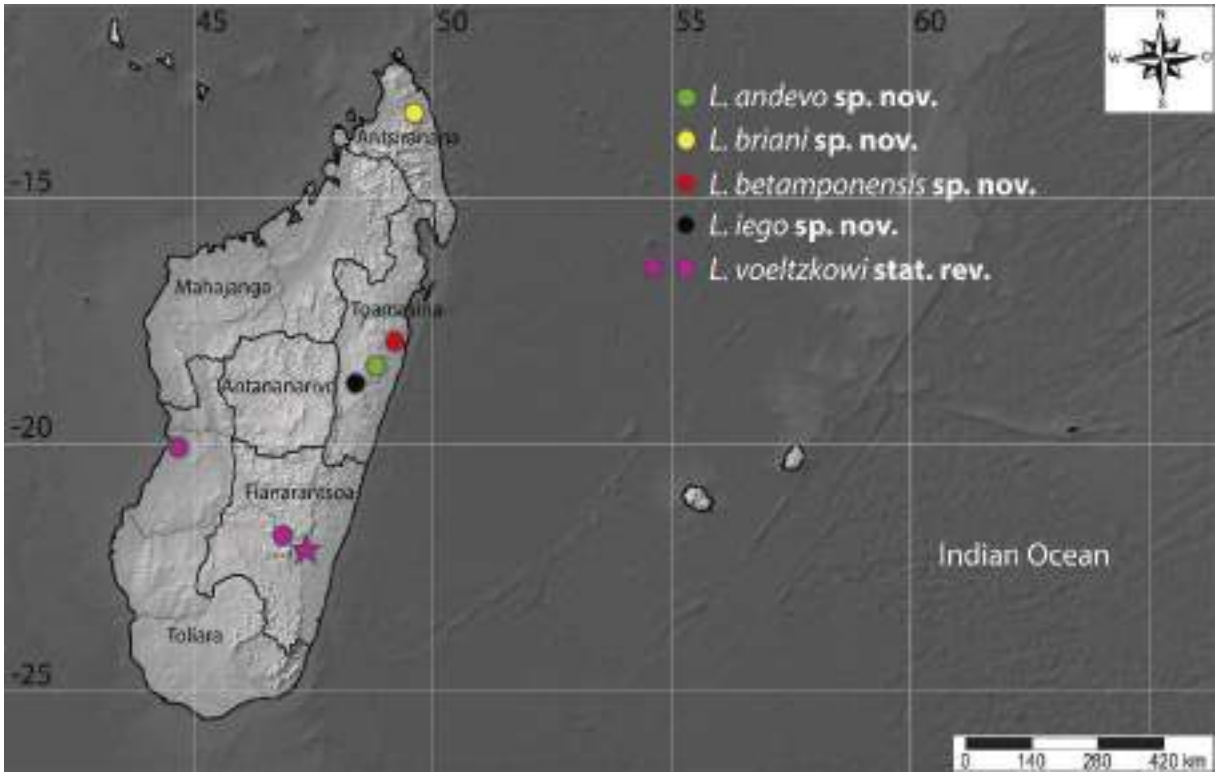

FIGURE 64. Records map of *Lepidocyrtinus* species from Madagascar, including type locality (star) of *L. voeltzkowi* **comb. rev.**

Key to *Lepidocyrtinus* species from Madagascar

1 Ant II–III completely pigmented, diffuse or absent (Fig. 47); head with **Pp5** mic (Fig. 48F); Th II with 7 or less anterior mac (**a5** group), posteriorly with **p3** mac and **p2ep** absent (Fig. 49A) … 2

- Ant II–III with inner dark violet strip (Fig. 42); head with **Pp5** mac (Fig. 43D); Th II with more than 12 anterior mac (**a5** group), posteriorly with **p3** mic and **p2ep** mac (Fig. 44A) … *L. voeltzkowi* (Börner, 1907) **comb. rev.**

2 Labial papilla E with lateral process distant the base of apical appendage (Fig. 48E, 57C); basomedian labial field with chaetae **e** smooth (Fig. 57E); Th III with 4 lateral mac (Fig. 58B); Abd II with **m3e** mac (Fig. 58D); ungues apical tooth absent (Fig. 51E); dens dorsally with blunt mac (Figs 52C, 60G) … 3

- Labial papilla E with lateral process reaching the base of apical appendage (Fig. 53B); basomedian labial field with chaetae **E** ciliate (Fig. 53D); Th III with 2 lateral mac (Fig.

54B); Abd II with **m3e** mic (Fig. 54D); ungues apical tooth present (Fig. 46E); dens dorsally devoid of blunt mac (Fig. 56G) … *L. briani* **sp. nov.**

3 Body with pigments, at least on Ant II–IV, Th II laterally and femur III distally (Figs 47A, C); Th III with only **a4** mac present or absent (Fig. 49B), Abd I with 4 or less central mac (Fig. 49C, 58C) … 4
- Body pale (Fig. 47D); Th III with **a4** and **a5** mac (Fig. 62B), Abd I with 5 central mac (Fig. 62C) … *L. iego* **sp. nov.**

4 Femur I–III completely pigmented (Fig. 47A); ventral head with 1 larger basal chaetae in cephalic groove (Fig. 48G); Abd I often with 3 central mac, rarely with 4 mac (**a2** often mic) (Fig. 49C); collophore anteriorly with 6 distal mac (Fig. 52A) … *L. andevo* **sp. nov.**
- Femur I–III distally pigmented (Fig. 47C); ventral head with 2 larger basal chaetae in cephalic groove (Fig. 57E); Abd I often with 2 central mac, rarely with 1 mac (**m3** often mac) (Fig. 58C); collophore anteriorly with 2 distal mac (Fig. 60E) … *L. betamponensis* **sp. nov.**

***Lepidocyrtinus dapeste* Santos & Bellini, 2018 stat. nov.**

Fig. 137

Seira (*Lepidocyrtnus*) *dapeste* Santos & Bellini, 2018: 15-25, figs 23-57, Brazil, Rio Grande do Norte, Natal (Fig, 137) (orig. descr.), examined.

Examined type material. All type series (CC/UFRN).

Diagnosis. Body with yellowish and dark bands on Ant and head laterally, femur with dark bands and tibiotarsus yellowish; head mac **A0**, **A2**, **M1**–**2**, **S0**–**3** and **S5**–**6** present; prelabral chaetae ciliate; labial papilla E with lateral process (l.p.) apically pointed and not reaching the base of apical appendage; Th II with 14–19 anterior, 7 median (**m1ip** and **m4** present, **m4i** and **m4p** mac absent) and 12–13 posterior mac (**p3** mac); Th III–Abd II with 7–9, 3–5, 4 central mac respectively; Abd IV with 13–16 central mac and 11–12 lateral mac; ungues apical tooth present; unguiculus with all lamella acuminate; collophore anteriorly with 7 spine-like chaetae and 3 ciliate chaetae apically acuminate, posteriorly with 2 spines, smooth chaeta present; manubrium ventrally with 0/2 subapical chaetae; manubrial plate with 2–3 blunt mac apically nipple-like; dens with 4–8 blunt mac apically nipple-like (see Bellini *et al.* 2018).

Remarks. *Lepidocyrtinus dapeste* **stat. nov.** resembles *L. hylaeus* **sp. nov.** in color pattern, chaetotaxy and overall morphology (see remarks of the later species).

***Lepidocyrtinus diamantinae* (Godeiro & Bellini, 2015) comb. nov.**

Figs 65A, 66–69, 136

Seira diamantinae Godeiro & Bellini, 2015: 215–221, figs 6–10, Brazil, Bahia, Abaíra, Chapada Diamantina (orig. descr.), examined. Bellini *et al.* 2018: 26 (compared).

Typological note. In the original description the paratypes were designed as 5 males and 6 females, but there are 6 males and 2 females, all on slides.

Examined type material. All type series (CC/UFRN).

Other examined material. 5 specimens in alcohol (CC/UFRN): Brazil, Bahia, Abaíra municipality, Chapada Diamantina, 13°17'7"S, 41°42'10"W (Fig. 136), 863 m, 1–6.xi.2013, entomological aspirator, BC Bellini & AS Ferreira coll. 1 male on slide and 1 specimen in alcohol (INPA): Ceará, Guaramiranga municipality, west urban region, 04°15'37"S, 38°56'04"W (Fig. 136), 886 m, 17-19.vi.2015, Malaise trap, D Nogueira coll.

Diagnosis. Body with dark bands on Ant, head laterally, Th II–Abd I, Abd IV–V and legs (Fig. 65A); head mac **A0**, **A2**, **A5**, **M1**–**2**, **S0**–**3** and **S5**–**6** present; prelabral chaetae ciliate; labial papilla E with lateral process (l.p.) apically gently pointed and surpass the base of apical appendage (Figs 66B–C); Th II with 16–17 anterior, 7 median (**m1ip** and **m4** present, **m4i** and **m4p** mac absent) and 12 posterior mac (**p3** mac); Th III–Abd II with 6, 4, 4 central mac respectively; Abd IV with 14–15 central mac and 11–14 lateral mac (Figs 67, 68B); ungues apical tooth present; unguiculus with all lamella acuminate; collophore anteriorly with 9 spine-like chaetae and 3 ciliate chaetae apically acuminate, posteriorly with 5 spines, smooth chaeta present (Fig. 69E); manubrium ventrally with 2/2 subapical chaetae; manubrial plate with 3 blunt mac apically nipple-like; dens with 9–13 blunt mac apically nipple-like (Figs 69F–G).

Redescription. Total length (head + trunk) of specimens 2.20–3.10 mm (n=4), holotype 2.20 mm. Specimens pale white with dark pigments on Ant IV, distal and proximal Ant III, proximal Ant II, lateral borders of head to Abd I laterally, Abd IV and V with one lateral spots, trochanter I–III, distal and proximal femur, and distal tibiotarsus I–II; eyespatches black (Fig. 65A). Scales present on Ant I to proximal one-thirds of Ant IV, dorsal and ventral head, dorsal thorax and abdomen, legs (except empodia), anterior collophore, dorsal and ventral manubrium and dens ventrally.

Head. Antennae larger than trunk length (Fig. 65A); ratio antennae: trunk = 1: 0.83–0.87 (n=4), holotype 1: 0.84; antennal segments ratio as I: II: III: IV = 1: 1.12–1.38: 1.08–1.24: 2.22–3.04, holotype 1: 1.38: 1.24: 3.04. Ant IV annulated on distal two-thirds, with

apical bulb apically unilobed or bilobed. Ant III sense organ with 2 rods, 3 spiny guard sens and s-blunt sens of different sizes. Ant I dorsally with 4 median mac, 2 spines and 3 smooth mic at base. Eye B larger, G and H smaller, others subequal, and with 5 'IO' chaetae; head dorsal macrochaetotaxy with 9–11 **An**, 3 **A**, 3 **M**, 7 **S** and 1 **Pa** mac, **A3** as mic, **S4** absent (Fig. 66C). Clypeal formula with 4 (**l1**–**2**), 5 (**fr**), 3 (**pf0**–**1**) ciliate chaetae, **l1**–**2** larger, **l1** apically acuminate, 2 frontal smaller, others subequal (Fig. 66A). Prelabral chaetae ciliate and not bifurcate. Labral **p0** chaeta sometimes with median filament. Labral papillae with two inner conical projections, outer papillae absent. Maxillary palp with smooth apical appendage (**a.a.**) and basal chaeta (**b.c.**) weakly ciliate, thicker and 1.18 larger in length than the apical. Labial papilla E with lateral process (l.p.) apically gently pointed and surpass the base of apical appendage (Fig. 66B). Basolateral and basomedian labial fields with chaetae **M1**–**2**, **E**, **L1**–**2** ciliate, **r** reduced (as Fig. 82F). Ventral head with about 26 ciliate chaetae, postlabial formula with 4 (**G1**–**4**), 3 (**H2**–**4**), 4 (**J1**–**4**) chaetae, 2 thin posterior chaetae, and 4 larger chaetae, 1 basal chaetae (b.c.) surrounding the cephalic groove (Fig. 66D).

Thorax chaetotaxy (Fig. 67A–B). Th II **a**, **m** and **p** series with 16–16, 7 and 12 mac, respectively. Th III **a**, **m** and **p** series with 2, 1 and 5 mac, respectively. Ratio Th II: III = 2.38–1.72: 1 (n=4), holotype 2.38: 1.

Abdomen chaetotaxy (Figs 67C–D, 68A–C). Abd I **a**, **m** and **p** series with 1, 3 and 0 mac, respectively, **m4** absent. Abd II **a**, **m** and **p** series with 1, 4 and 0 mac, respectively. Abd III **a**, **m** and **p** series with 1, 3 and 2 mac, respectively. Abd IV with 14–15 central mac of **A**–**T** series and 11–14 lateral mac of **E**–**Fe** series; 7 posterior sens (**ps** type I, others type II) and 8 posterior mes. Abd V **a**, **m** and **p** series with 1, 4 and 6 mac, respectively. Ratio Abd III: IV = 1: 4.25–6.24 (n= 4), holotype 1: 6.24.

Legs. Subcoxa I with 5-6 chaetae and 2 psp; subcoxa II with an anterior row of 10 chaetae, posterior row of 2 chaetae and 6 psp; subcoxa III with one row of 10-11 chaetae, 1 anterior chaeta and 2 posterior psp (Fig. 69A–C). Trochanteral organ with about 37 spine-like chaetae (Fig. 69D). Tibiotarsus III rarely subdivided on distal two third, outer side with 5 larger ciliate chaetae and apically acuminate, inner side with 7 mac weakly ciliate. Ungues inner side with 4 teeth, 2 paired basal, 1 unpaired median subequal to basal teeth and 1 small unpaired apical. Unguiculus with all lamellae acuminate, **pe** lamella serrated and with small proximal tooth, other lamellae smooth; ratio unguis: unguiculus = 1: 0.63.

Tibiotarsal smooth chaeta 1.41 larger than unguiculus and tenent hair 0.96 smaller than unguis outer edge.

Collophore. Anterior side with 18 chaetae, 9 proximal spine-like chaetae, 1 thin and 3 normal ciliate chaetae, 3 ciliate chaetae apically acuminate and 2 mac distally; posterior side with 15 chaetae, 5 spines, 9 thin ciliate chaetae widely distributed and 1 smooth chaetae distally; lateral flap with about 29 chaetae, 6 smooth and 23 ciliate (Fig. 66E).

Furcula. Manubrium ventral formula with 0, 2, 2, 2/2 (subapical), 16 (apical) ciliate chaetae of different sizes plus about 15 elongated apical scales per side (Fig. 66F); manubrial plate with 3 blunt mac finely ciliate and apically nipple-like, 6–7 ciliate chaetae of different sizes and 3 psp. Dens dorsally with one proximal row of 9–13 blunt mac finely ciliate and apically nipple-like, holotype with 11+10 (Fig. 66G).

Remarks. *Lepidocyrtinus diamantinae* **comb. nov.** resembles *L. prodigus* **comb. nov.** in pattern color, chaetotaxy and morphology in general (see remarks of this species).

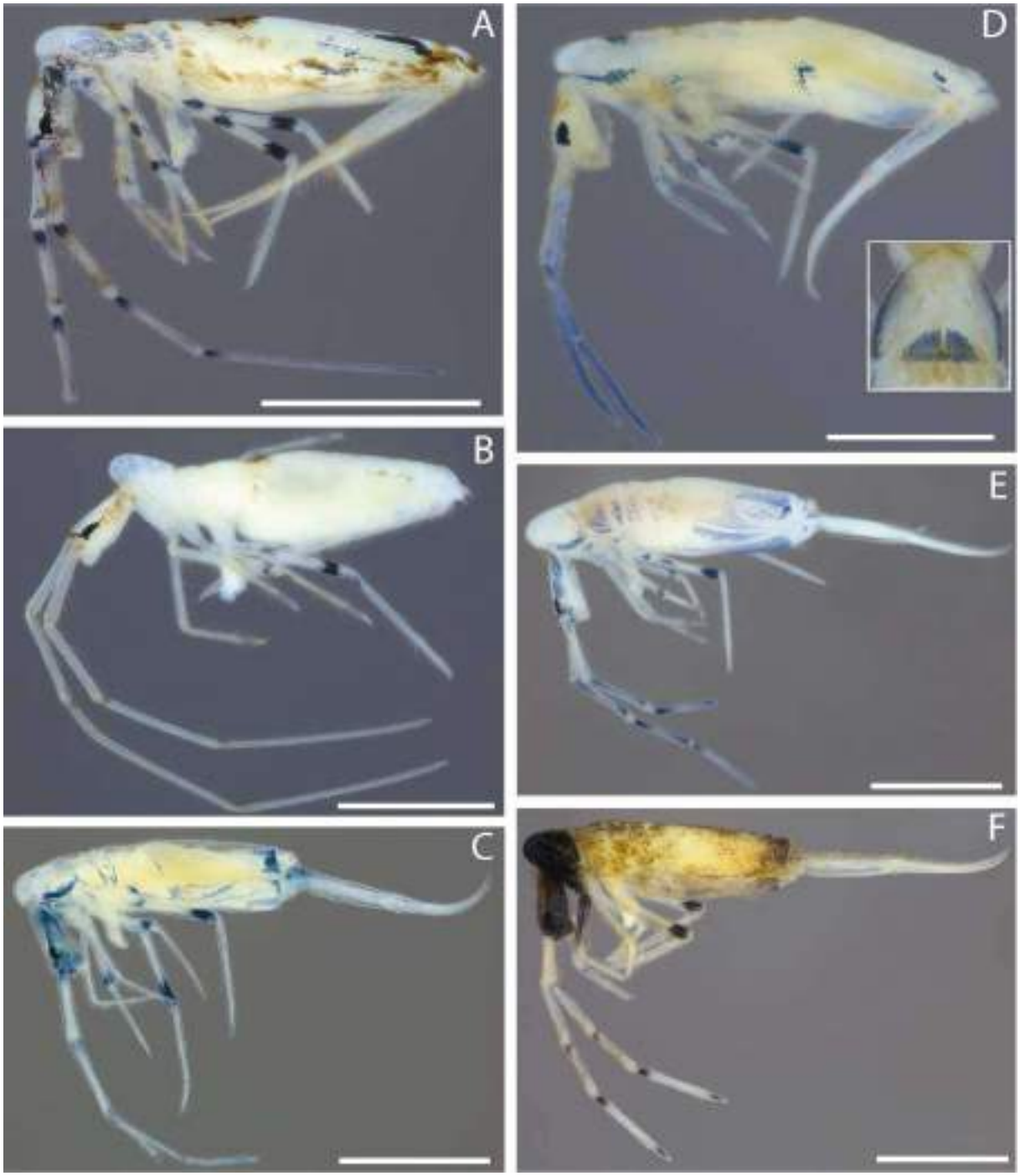

FIGURE 65A–F. *Lepidocyrtinus* spp., habitus of specimens fixed in alcohol (lateral view). **A**, *L. diamantinae* **comb. nov.**; **B**, *L. harena* **comb. nov.**; **C**, *L. nigrans* **comb. nov.**; **D**, *L. paraibensis* **comb. nov.** (square show pigments on Th II–III, dorsal view); **E**, *L. prodigus* **comb. nov.**; **F**, *L. pulcher* **comb. rev.** Scale bars: **A**–**C**, **E**–**F** (1 mm), **D** (0.5 mm).

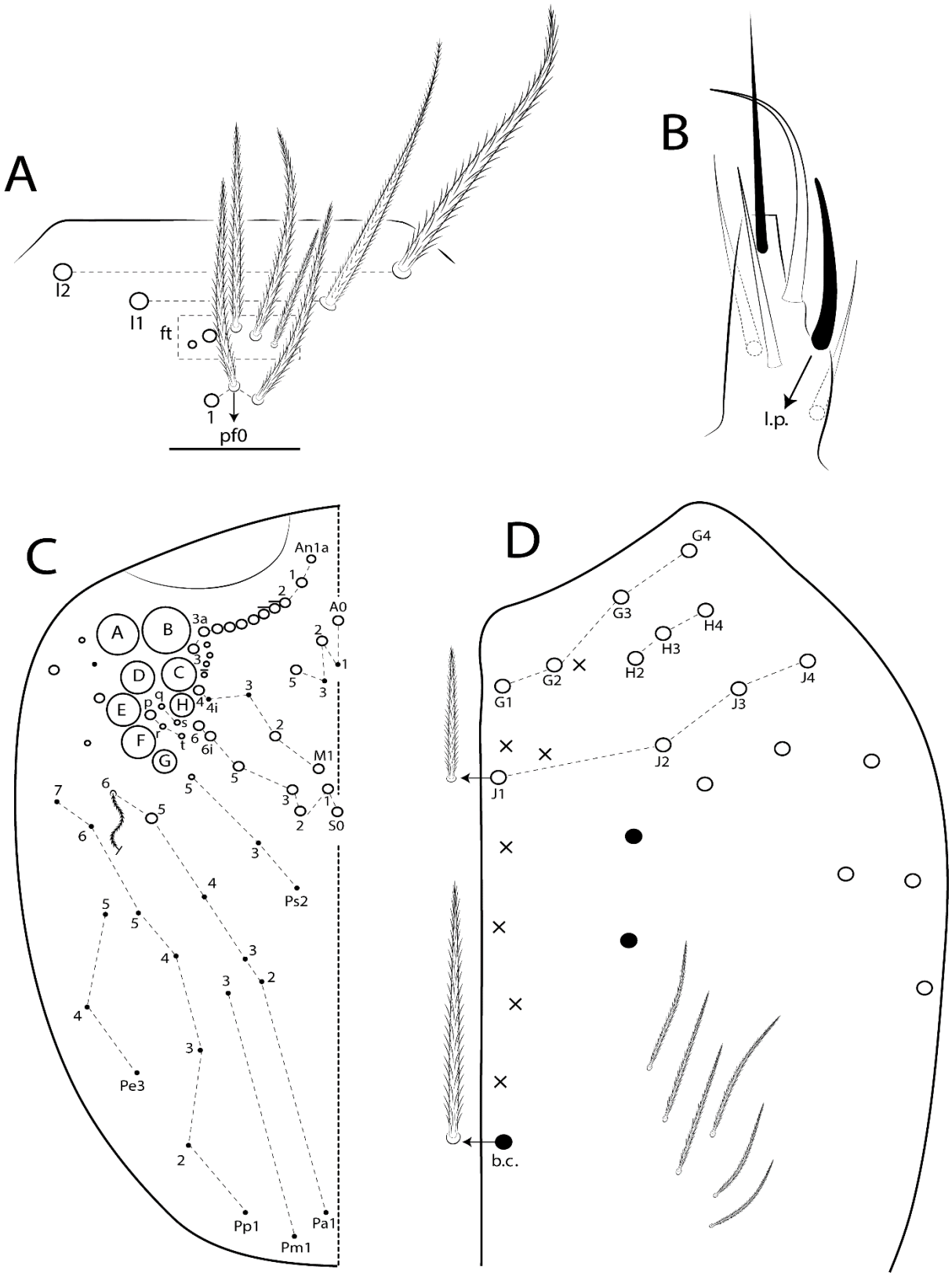

FIGURE 66A–D. *Lepidocyrtinus diamantinae* **comb. nov.**: head; **A**, chaetotaxy of the clypeus; **B**, labial papillae E (right side), arrow indicates lateral process (**l.p.**); **C**, dorsal chaetotaxy (left side); **D**, postlabial and cephalic groove chaetotaxy (right side).

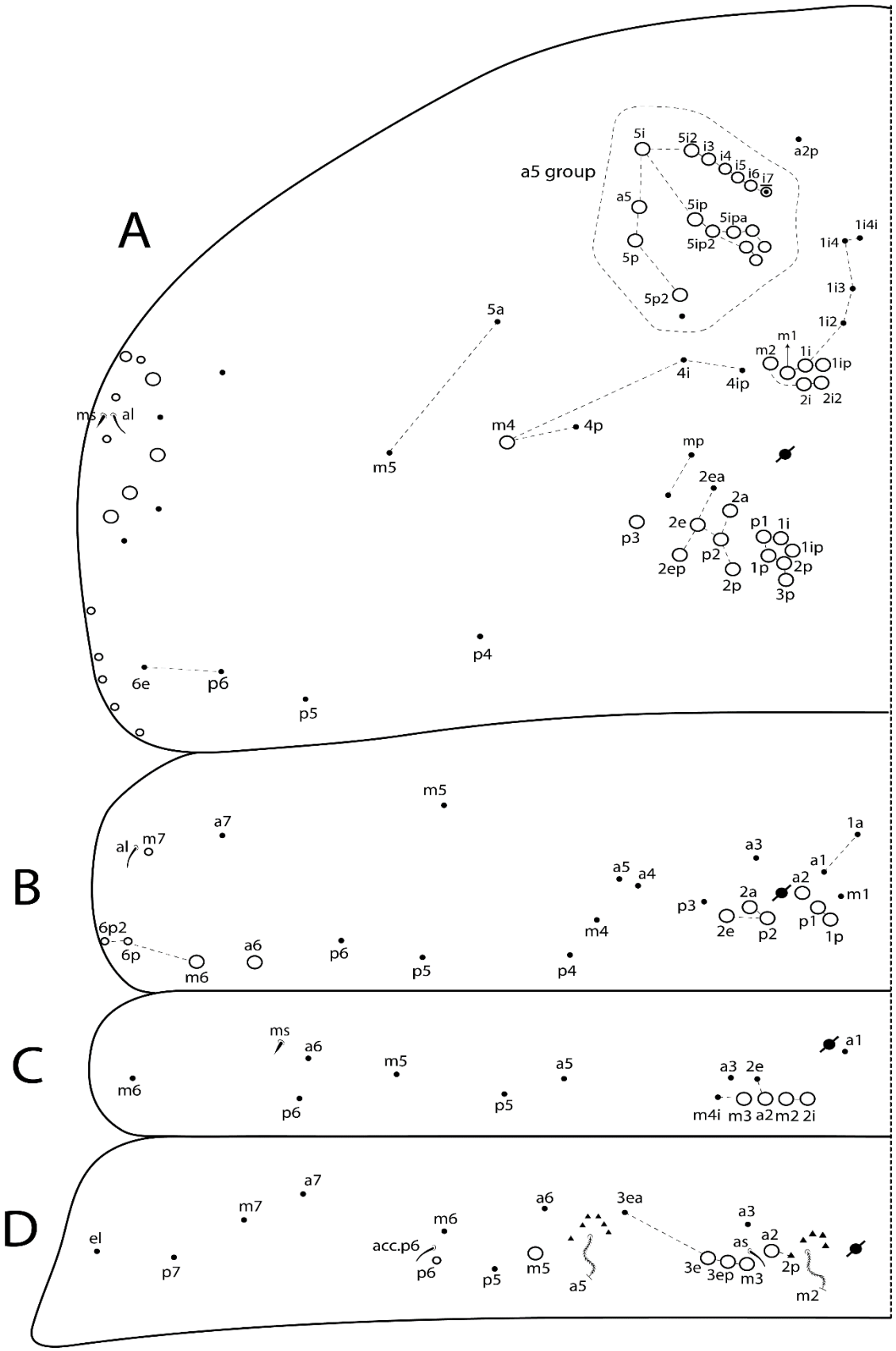

FIGURE 67A–**D.** *Lepidocyrtinus diamantinae* **comb. nov.**: dorsal chaetotaxy; **A**, Th II; **B**, Th III; **C**, Abd I; **D**, Abd II.

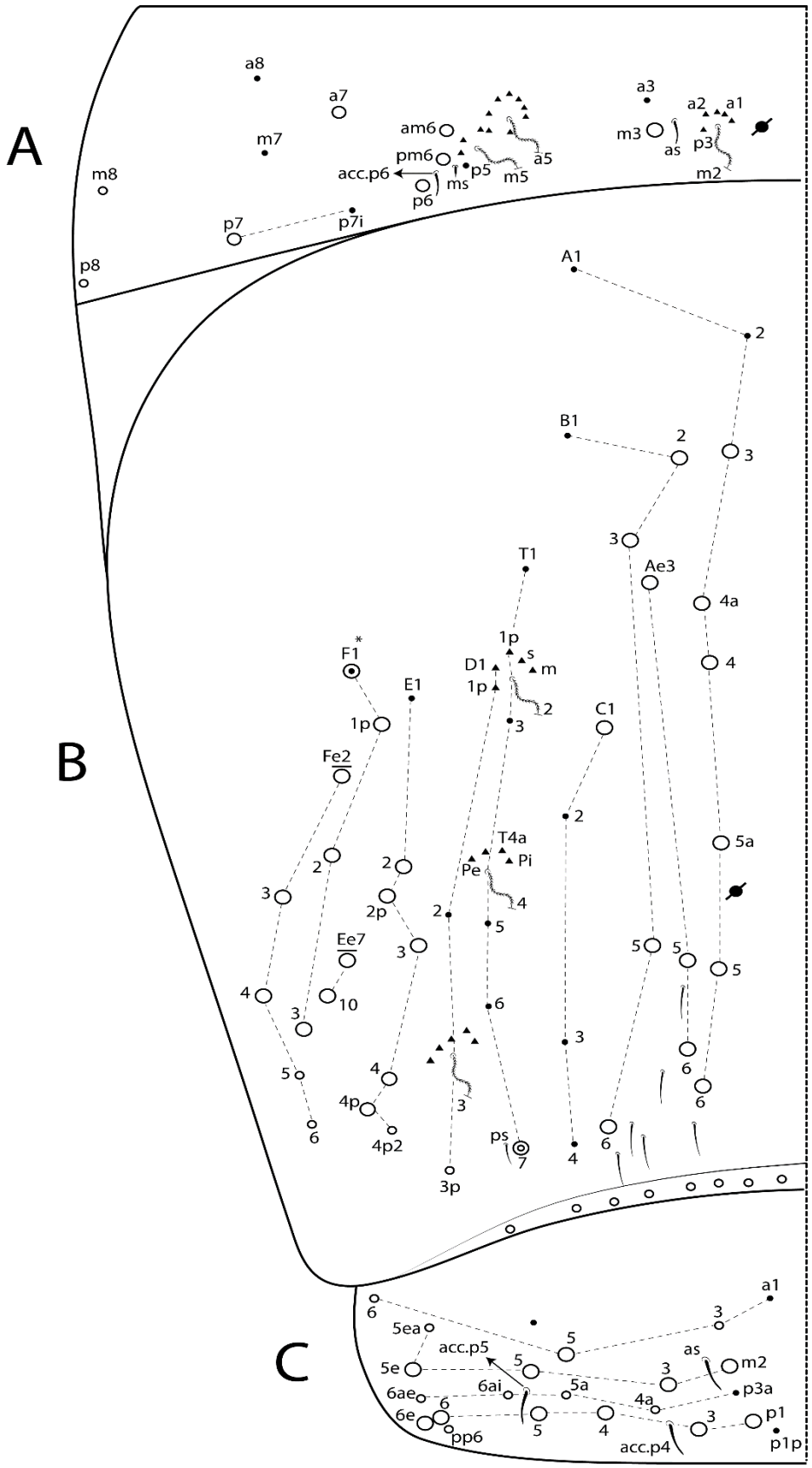

FIGURE 68A–C. *Lepidocyrtinus diamantinae* **comb. nov.**: dorsal chaetotaxy; **A**, Abd III, **B**, Abd IV; **C**, Abd V.

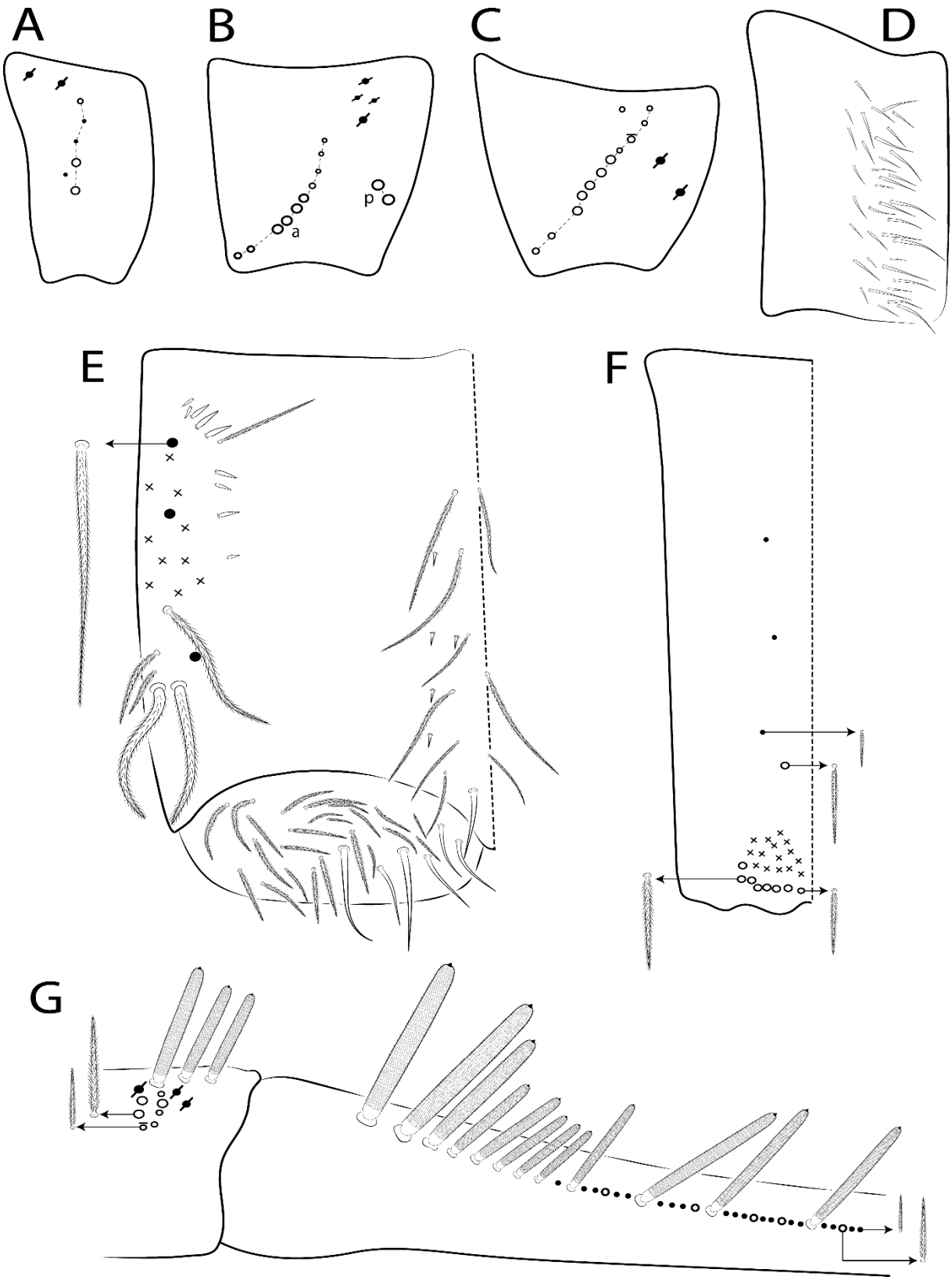

FIGURE 69A–G. *Lepidocyrtinus diamantinae* **comb. nov.**: **A**, subcoxa I; **B**, subcoxa II; **C**, subcoxa III (outer side); **D**, trochanteral organ (inner side); **E**, collophore chaetotaxy (lateral view); **F**, manubrium ventral chaetotaxy; **G**, chaetotaxy of the manubrial plate and proximal dens (lateral view).

***Lepidocyrtinus harena* (Godeiro & Bellini, 2014) comb. nov.**

Figs 65B, 70–73, 136

Seira harena Godeiro & Bellini, 2014: 144-149, figs 10-13, Brazil, Paraíba, Areia (orig. descr.), examined. Godeiro & Bellini 2015: 220 (compared). Bellini *et al*. 2018: 26 (compared).

Typological note. In original description were reported as paratypes 2 males and 3 females, but we counted more 3 males and 1 juvenile along with paratypes slides.

Examined type material: All type series (CC/UFRN).

Other examined material: 4 females and 1 juvenile of 1st instar on slides and 7 specimens in alcohol (CC/UFRN): Brazil, Paraíba, Bananeiras municipality, Reserva Ecológica Estadual de Goiamunduba, 06°44'S, 35°36'W, 470 m, 18.iii.2014, entomological beating tray, DD Silva coll. 1 specimen in alcohol, *idem*, except 19.iii.2014, pitfall trap. 2 females on slides (CC/UFRN): Rio Grande do Norte, Natal municipalitity, "Parque Estadual das Dunas", 05°50'33"S, 35°11'37"W, 66 m, 15-ii-2013, entomological aspirator, M Meira & DD Silva coll.

Diagnosis. Body with dark blue bands on distal and proximal region of the femur and tibiotarsus (Fig. 65B); head mac **A0**, **A2**, **A5**, **M1**–**2**, **S3** and **S6** present; prelabral chaetae ciliate; labial papilla E with lateral process (l.p.) apically pointed and distant the base of apical appendage (Figs 70B–C); Th II with 9 anterior, 6 median (**m4i** present, **m1ip** and **m4**–**4p** mac absent) and 4–5 posterior mac (**p2ep** and **p3** mic); Th III–Abd II with 3, 2, 3 central mac respectively; Abd IV with 13–14 central mac and 10–11 lateral mac (Figs 71, 72B); ungues apical tooth present; unguiculus I–II with **ai** lamella truncate (Fig. 73E), III acuminate; collophore anteriorly with 6 spine-like chaetae and 4 ciliate chaetae apically acuminate, posteriorly with 5 spines, smooth chaeta present (Fig. 73F); manubrium ventrally with 2/4 subapical chaetae; manubrial plate with 3 blunt mac apically nipple-like; dens with 16–19 blunt mac apically nipple-like (Figs 73G–H).

Description. Total length (head + trunk) of specimens 2.91–3.53 mm (n=4), holotype 3.25 mm. Specimens pale white with dark blue pigments on proximal Ant III–IV, anterior head, trochanter III, proximal and distal part of the femur and tibiotarsus; eyespatches black (Fig. 65B). Scales present on Ant I to proximal one- thirds of Ant IV, dorsal and ventral head, dorsal thorax and abdomen, legs (except empodia), anterior collophore, dorsal and ventral manubrium and dens ventrally.

Head. Antennae subequal or larger than trunk length (Fig. 65B); ratio antennae: trunk = 1: 0.74–0.99 (n=4), holotype 1: 0.87; antennal segments ratio as I: II: III: IV = 1: 1.04–1.19: 1.50–1.52: 2.45–3.01, holotype 1: 1.04: 1.50: 2.45. Ant IV annulated on distal two-thirds, apical bulb apically unilobed or bilobed. Ant III sense organ with 2 rods, 3 spiny guard sens, s-blunt sens of different sizes. Ant I dorsally with 4 median mac, 2 spines and 3 smooth mic at base. Eye B larger, G and H smaller, others subequal, and with 5 'IO' chaetae; head dorsal macrochaetotaxy with 9–11 **An**, 3 **A**, 3 **M**, 3 **S**, 1 **Ps** and 1 **Pa** mac, **A3**, **S2** and **S6i** as mic, **S0**–**1** and **S4** absent (Fig. 70C). Clypeal formula with 4 (**l1**–**2**), 4 (**fr**), 5 (**pf0**–**2**) ciliate chaetae, **l1**–**2** larger, **l1** apically acuminate, 2 frontal smaller, others subequal (Fig. 70A). Prelabral chaetae ciliate and not bifurcate. Labral **p0** chaeta sometimes with median filament. Labral papillae with two inner conical projections, outer papillae absent. Maxillary palp with smooth apical appendage (**a.a.**) and basal chaeta (**b.c.**) weakly ciliate, thicker and 1.18 larger in length than the apical. Labial papilla E with lateral process (l.p.) apically pointed and distant the base of apical appendage (Fig. 70B). Basolateral and basomedian labial fields with chaetae **M1**–**2**, **E**, **L1**–**2** ciliate, **r** reduced (as Fig. 82F). Ventral head with about 24 ciliate chaetae, postlabial formula with 4 (**G1**–**4**), 3 (**H2**–**4**), 3 (**J1**–**3**) chaetae, 7 thin posterior chaetae, and 3 larger chaetae, 1 basal chaetae (b.c.) surrounding the cephalic groove (Fig. 70D).

Thorax chaetotaxy (Fig. 71A–B). Th II **a**, **m** and **p** series with 9, 6 and 4–5 mac, respectively. Th III **a**, **m** and **p** series with 0, 1 and 3 mac, respectively. Ratio Th II: III = 2.47–1.72: 1 (n=4), holotype 1.72: 1.

Abdomen chaetotaxy (Figs 71C–D, 72A–C). Abd I **a**, **m** and **p** series with 0, 2 and 0 mac, respectively, **m2i** and **m4i** absent. Abd II **a**, **m** and **p** series with 1, 3 and 0 mac, respectively, **m3e** mic. Abd III **a**, **m** and **p** series with 1, 3 and 3 mac, respectively. Abd IV with 13–14 central mac of **A**–**T** series and 10–11 lateral mac of **E**–**Fe** series; 3 posterior sens (**ps** type I, others type II) and 8 posterior mes. Abd V **a**, **m** and **p** series with 1, 4 and 6 mac, respectively. Ratio Abd III: IV = 1: 4.88–6.51 (n= 4), holotype 1: 5.17.

Legs. Subcoxa I with 4 chaetae, 1 posterior chaetae and 2 psp; subcoxa II with an anterior row of 11 chaetae, posterior row of 2 chaetae and 3 psp; subcoxa III with one row of 12 chaetae and 2 posterior psp (Fig. 73A–C). Trochanteral organ with about 62 spine-like chaetae (Fig. 73D). Tibiotarsus not subdivided, outer side with 4 proximal larger ciliate chaetae and apically acuminate, inner side with 5 mac weakly ciliate. Ungues inner side with 4 teeth, 2 paired basal, 1 unpaired median subequal to basal teeth and 1 small unpaired apical. Unguiculus I–II with **ai** lamella truncate (Fig. 73E), III acuminate, **pe** lamella serrated and with small proximal tooth, other lamellae acuminate and smooth; ratio unguis: unguiculus = 1: 0.75. Tibiotarsal smooth chaeta 1.31 larger than unguiculus and tenent hair 1.30 smaller than unguis outer edge.

Collophore. Anterior side with 15–17 chaetae, 7 proximal spine-like chaetae, 1 thin and 1–3 normal ciliate chaetae, 4 ciliate chaetae apically acuminate and 2 mac distally; posterior side with 17 chaetae, 5 spines, 2 mic and 9 thin ciliate chaetae widely distributed and 1 smooth chaetae distally; lateral flap with about 47 chaetae, 5 smooth and 42 ciliate (Fig. 73F).

Furcula. Manubrium ventral formula with 0, 2, 2, 2/4 (subapical), 16-18 (apical) ciliate chaetae of different sizes plus about 13 elongated apical scales per side (Fig. 73G); manubrial plate with 3 blunt mac finely ciliate and apically nipple-like, 6 ciliate chaetae of different sizes and 3 psp. Dens dorsally with one proximal row of 16–19 blunt mac finely ciliate and apically nipple-like, holotype with 16+18 (Fig. 73H).

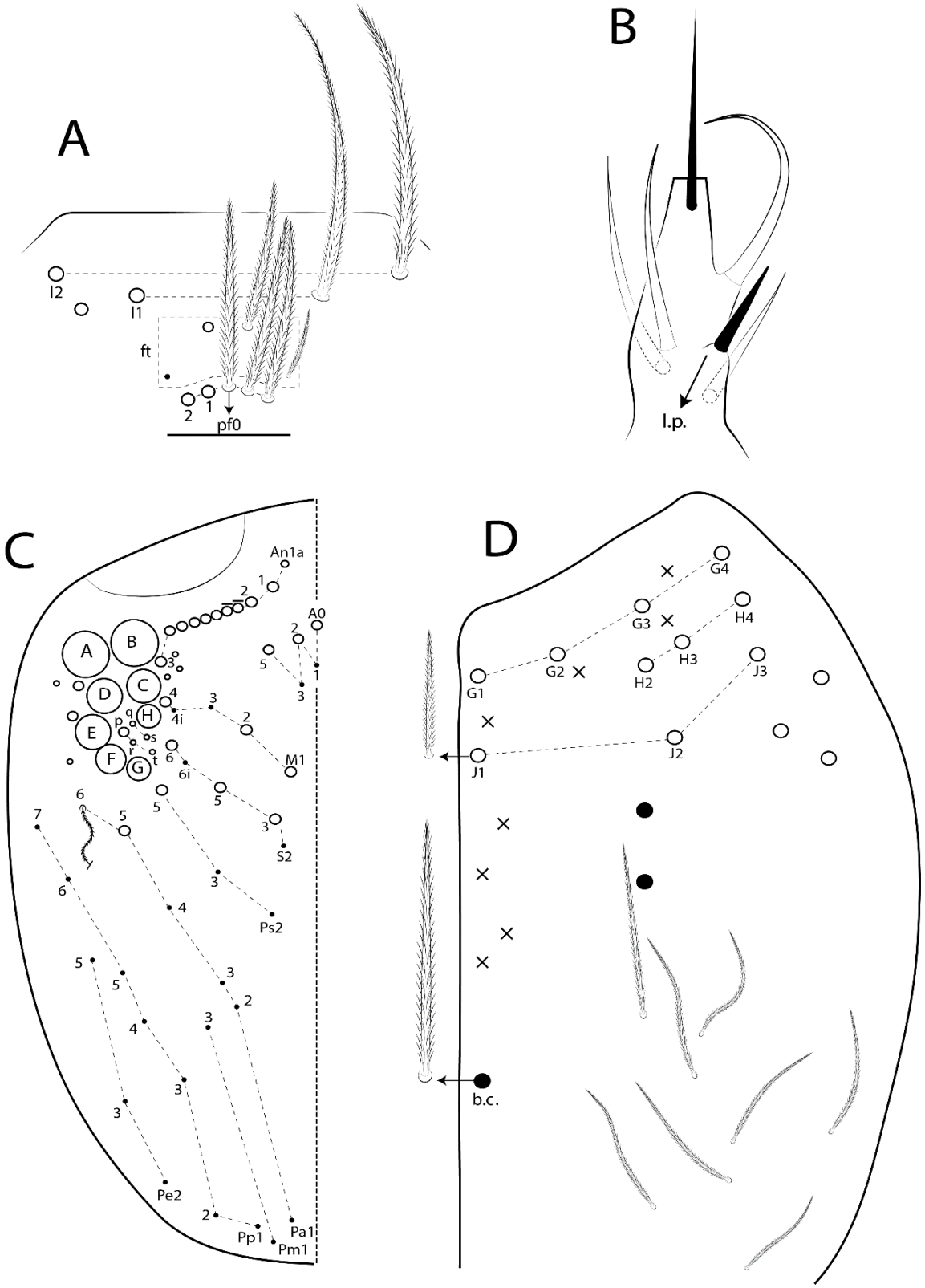

FIGURE 70A–D. *Lepidocyrtinus harena* **comb. nov.**: head; **A**, chaetotaxy of the clypeus; **B**, labial papillae E (right side), arrow indicates lateral process (**l.p.**); **C**, dorsal chaetotaxy (left side); **D**, postlabial and cephalic groove chaetotaxy (right side).

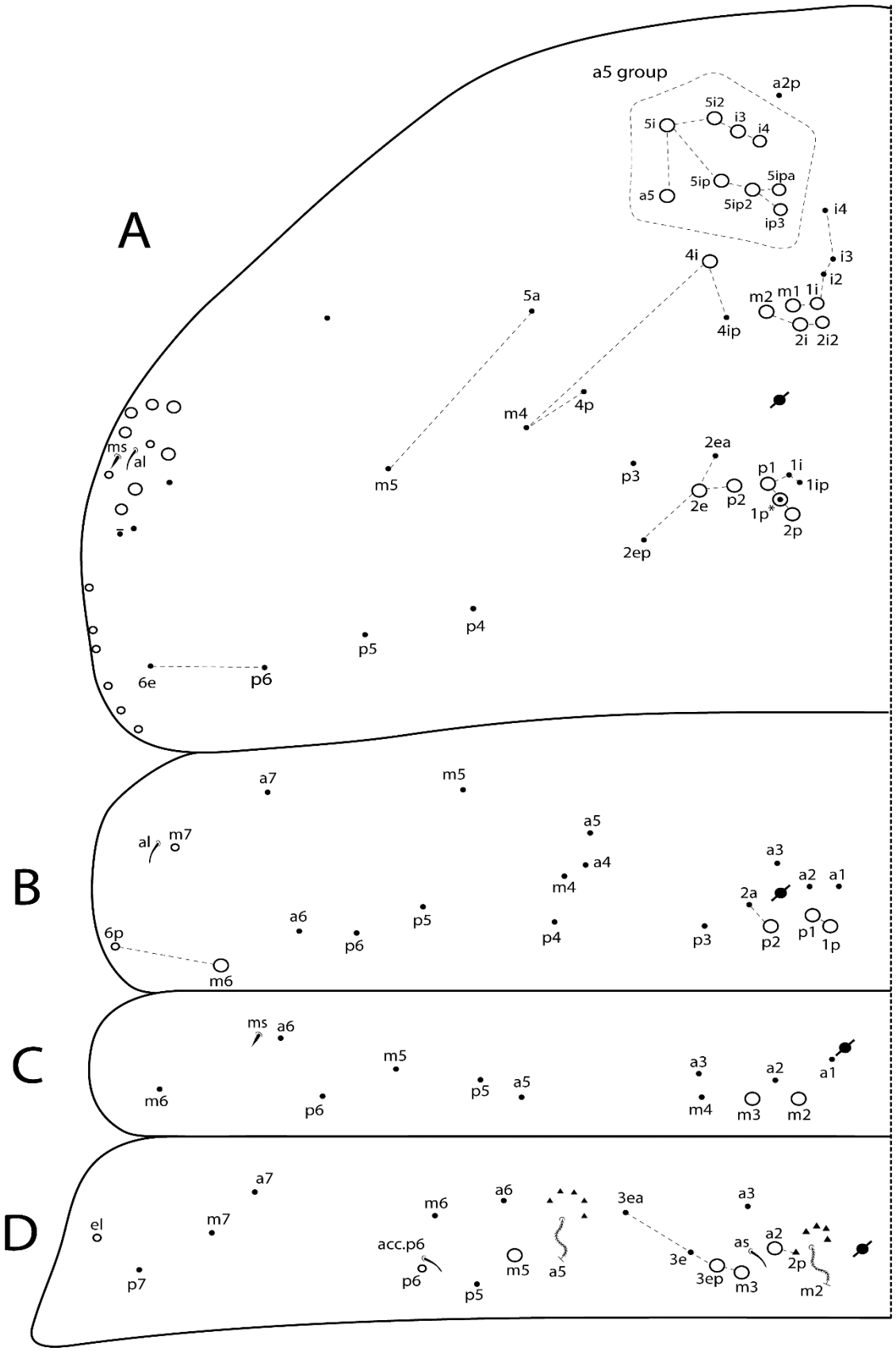

FIGURE 71A–D. *Lepidocyrtinus harena* **comb. nov.**: dorsal chaetotaxy; **A**, Th II; **B**, Th III; **C**, Abd I; **D**, Abd II.

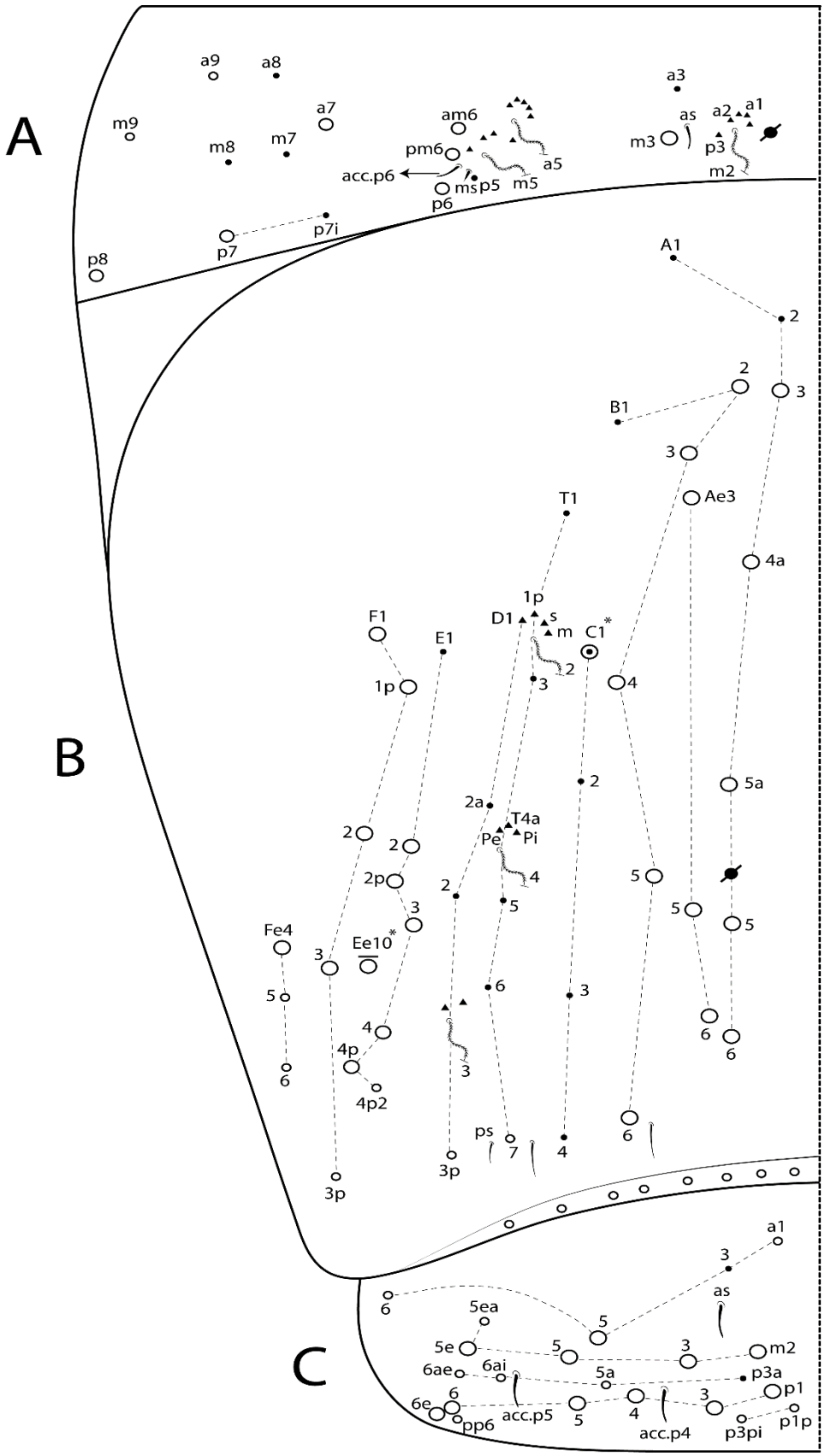

FIGURE 72A–**C.** *Lepidocyrtinus harena* **comb. nov.**: dorsal chaetotaxy; **A**, Abd III, **B**, Abd IV; **C**, Abd V.

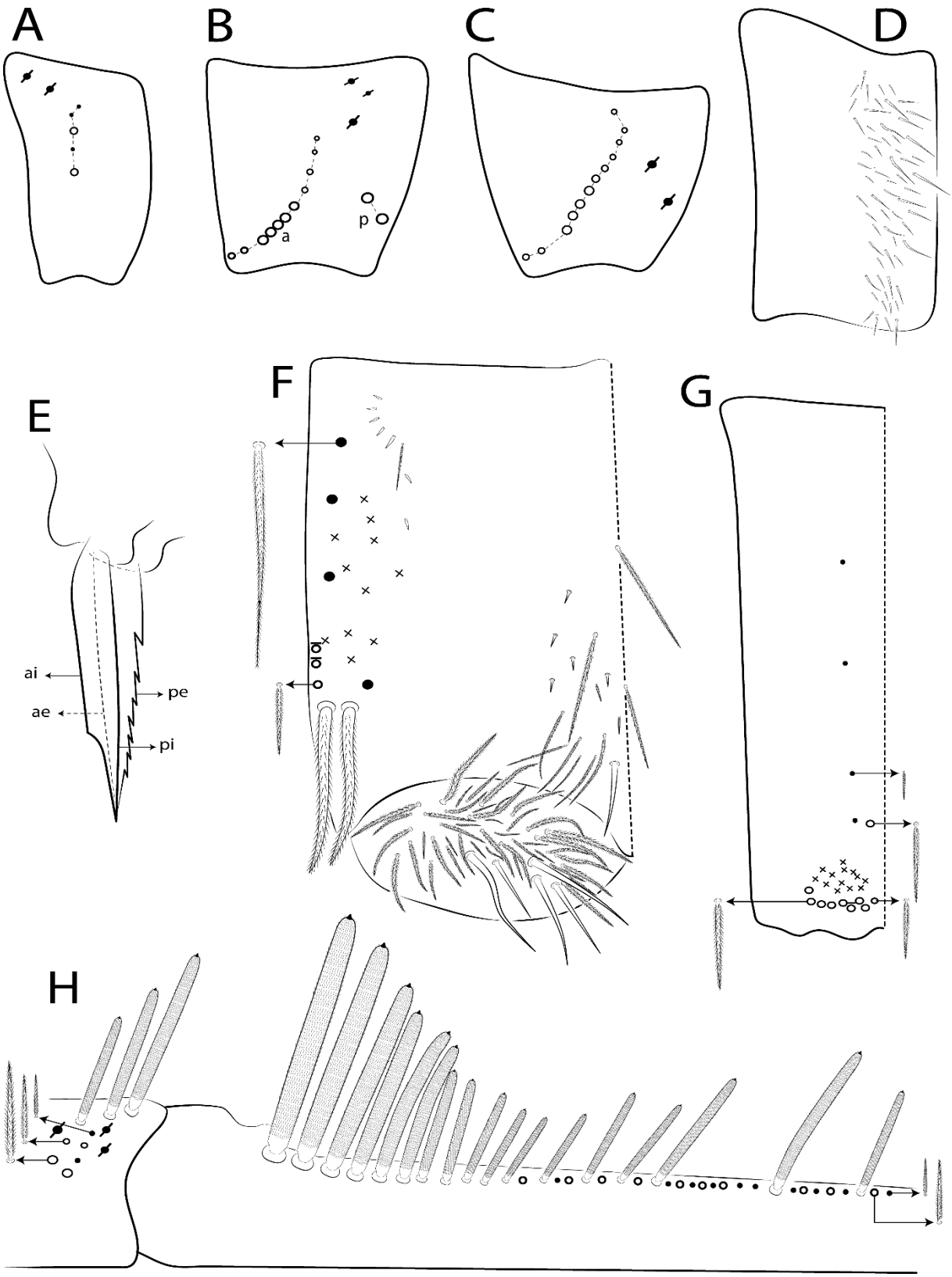

FIGURE 73A–G. *Lepidocyrtinus harena* **comb. nov.**: **A**, subcoxa I; **B**, subcoxa II; **C**, subcoxa III (outer side); **D**, trochanteral organ (inner side); **E**, collophore chaetotaxy (lateral view); **F**, manubrium ventral chaetotaxy; **G**, chaetotaxy of the manubrial plate and proximal dens (lateral view).

***Lepidocyrtinus nigrans* (Arlé, 1959) comb. nov.**

Figs 65C, 74–77, 138

Ctenocyrtinus nigrans Arlé, 1959: 174-175, fig. 157, Brazil, Mato Grosso, Alto Xingu, Porto Aipatse, Rio Kuluene (orig. descr.). Mari Mutt & Bellinger 1990: 107 (cat.).
Seira nigrans; Christiansen & Bellinger 2000: 66, fig. 53 (comb.). Culik & Zeppelini 2003: 1129 (cat.). Bellini & Zeppelini 2004: 588 (cat.). Zeppelini & Bellini 2006: 28 (cit.). Bellini & Zeppelini 2008a: 726 (cit.). Bellini & Zeppelini 2009a: 269, 271 (cit. and key). Bellini & Zeppelini 2009b: 388 (cat.). Abrantes *et al.* 2010: 10 (cat.). Bellini & Zeppelini 2011: 560 (cit.). Abrantes *et al.* 2010: 10 (cat.). Cipola *et al.* 2014a: 489 (cit.). Godeiro & Bellini 2014: 132, 149 (cit.). Godeiro & Bellini 2015: 220 (cit.). Bellini *et al.* 2018: 26 (compared).

Typological note. The holotype of *Ctenocyrtinus nigrans* deposited at MNRJ were lost (Mendonça, personal communication). We found 4 specimens belonging to the same sample (MNRJ/436) from which the holotype but which was not reported in the original description. The neotype this sample was designated, according to ICZN (2000, chapter 16, article 72.4.5.).

Examined type material. Neotype male designed on slide (MNRJ/436): Brazil, Mato Grosso, Canarana municipality, National Park of "Xingu ", River “Kuluene”, seaport “Aipatse”, 13°18'S, 52°59'W, 02.xii.1958, R Arlé coll.

Other examined material: 1 male and 2 females on slides (MNRJ/436): same data as neotype.

Diagnosis. Body with dark blue spots on Ant, trunk, distal femora and all head (Fig. 65C); head mac **A0**, **A2**–**3**, **A5**, **M1**–**2** and **S0**–**6** present; prelabral chaetae ciliate (Fig. 74B–C); Th II with 21–26 anterior, 7 median (**m1ip** and **m4** present, **m4i** and **m4p** mac absent) and 13 posterior mac (**p3** mac); Th III–Abd II with 9, 5, 4 central mac respectively; Abd IV with 11–13 central mac and 15 lateral mac (Figs 75, 76B); ungues apical tooth present; unguiculus with all lamella acuminate; manubrial plate and dens with blunt mac apically nipple-like.

Description. Total length (head + trunk) of specimens 2.41–3.49 mm (n=4), neotype 2.89 mm. Specimens pale white with dark blue pigments on proximal Ant I–III, distal Ant IV, head, Th I, lateral of the Th II to Abd IV, posterior Abd IV, coxa I, trochanter III, distal femur I–III, and proximal manubrium; eyespatches black (Fig. 65C). Scales present on Ant I to one-fourth proximal of Ant IV, dorsal and ventral head, dorsal thorax and abdomen, legs (except empodia), anterior and posterior collophore, ventral and dorsal manubrium and dens ventrally.

Head. Antennae larger than trunk length (Fig. 65C); ratio antennae: trunk in neotype = 1: 0.85; antennal segments ratio as I: II: III: IV = 1: 1.13: 1.10: 2.44. Ant IV annulated on distal three-fourths, with apical bulb bilobed. Ant III sense organ with 2 rods, at least 2 spiny guard sens, s-blunt sens of different sizes and ciliated chaetae. Ant I dorsally with 4 median mac, 2 spines and 3 smooth mic at base. Eyes A and B larger, G and H smaller, others subequal, and with 5 'IO' chaetae; head dorsal macrochaetotaxy with 10–12 **An**, 4 **A**, 3 **M**, 8 **S** and 1 **Pa** mac (Fig. 74C). Clypeal formula with 4 (**l1**–**2**), 5 (**fr**), 3 (**pf0**–**1**) ciliate chaetae, **l1**–**2** larger, **l1** apically acuminate, others subequal (Fig. 74A). Prelabral chaetae ciliate, inner chaetae bifurcated unequal, outer chaetae normal (Fig. 74B). Labral **p0** chaeta without median filament. Labral papillae with two inner conical projections, outer papillae absent. Maxillary palp with smooth apical appendage (**a.a.**) and basal chaeta (**b.c.**) weakly ciliate, thicker and 1.10 larger in length than the apical. Basolateral and basomedian labial fields with chaetae **M1**–**2**, **E**, **L1**–**2** ciliate, **r** reduced (as Fig. 82F). Ventral head with about 19 ciliate chaetae, postlabial formula with 4 (**G1**–**4**), 2 (**H3**–**4**), 4 (**J1**–**4**) chaetae, 5 thin posterior chaetae, and 4 larger chaetae, 1 basal chaetae (b.c.) surrounding the cephalic groove (Fig. 74D).

Thorax chaetotaxy (Fig. 75A–B). Th II **a**, **m** and **p** series with 21–26, 7 and 13 mac, respectively. Th III **a**, **m** and **p** series with 3, 1 and 7 mac, respectively. Ratio Th II: III = 2.16–1.50: 1 (n=4), neotype 1.50: 1.

Abdomen chaetotaxy (Figs 75C–D, 76A–C). Abd I **a**, **m** and **p** series with 1, 4 and 0 mac, respectively, **m4** absent. Abd II **a**, **m** and **p** series with 1, 4 and 0 mac, respectively. Abd III **a**, **m** and **p** series with 1, 3 and 2 mac, respectively. Abd IV with 11–13 central mac of **A**–**T** series, and 15 lateral mac of **E**–**Fe** series; 6 posterior sens (**ps** type I, others type II) and 7 posterior mes. Abd V **a**, **m** and **p** series with 1, 4/1 and 4 mac, respectively. Ratio Abd III: IV = 1: 5.11–5.54 (n= 4), neotype 1: 5.11.

Legs. Subcoxa I with 4 chaetae and 2 psp; subcoxa II with an anterior row of 11 chaetae, posterior row of 5 chaetae and 3 psp; subcoxa III with one row of 12 chaetae and 2 posterior psp (Fig. 77A–C). Ungues inner side with 4 teeth, 2 paired basal, 1 unpaired median subequal to basal teeth and 1 small unpaired apical. Unguiculus with all lamellae acuminate, **pe** lamella serrated and with small proximal tooth, other lamellae smooth; ratio unguis: unguiculus = 1: 0.63. Tibiotarsal smooth chaeta 0.7 smaller than unguiculus and tenent hair 0.92 smaller than unguis. Manubrial plate and dens with blunt mac finely ciliate and apically nipple-like, but it is not possible to determine the number due to the poor condition of the specimens.

Remarks. *Lepidocyrtinus nigrans* **comb. nov.** resembles *L. chavarii* **sp. nov.** and *L. paduai* **sp. nov.** in chaetotaxy and morphology in general (see remarks of these two species).

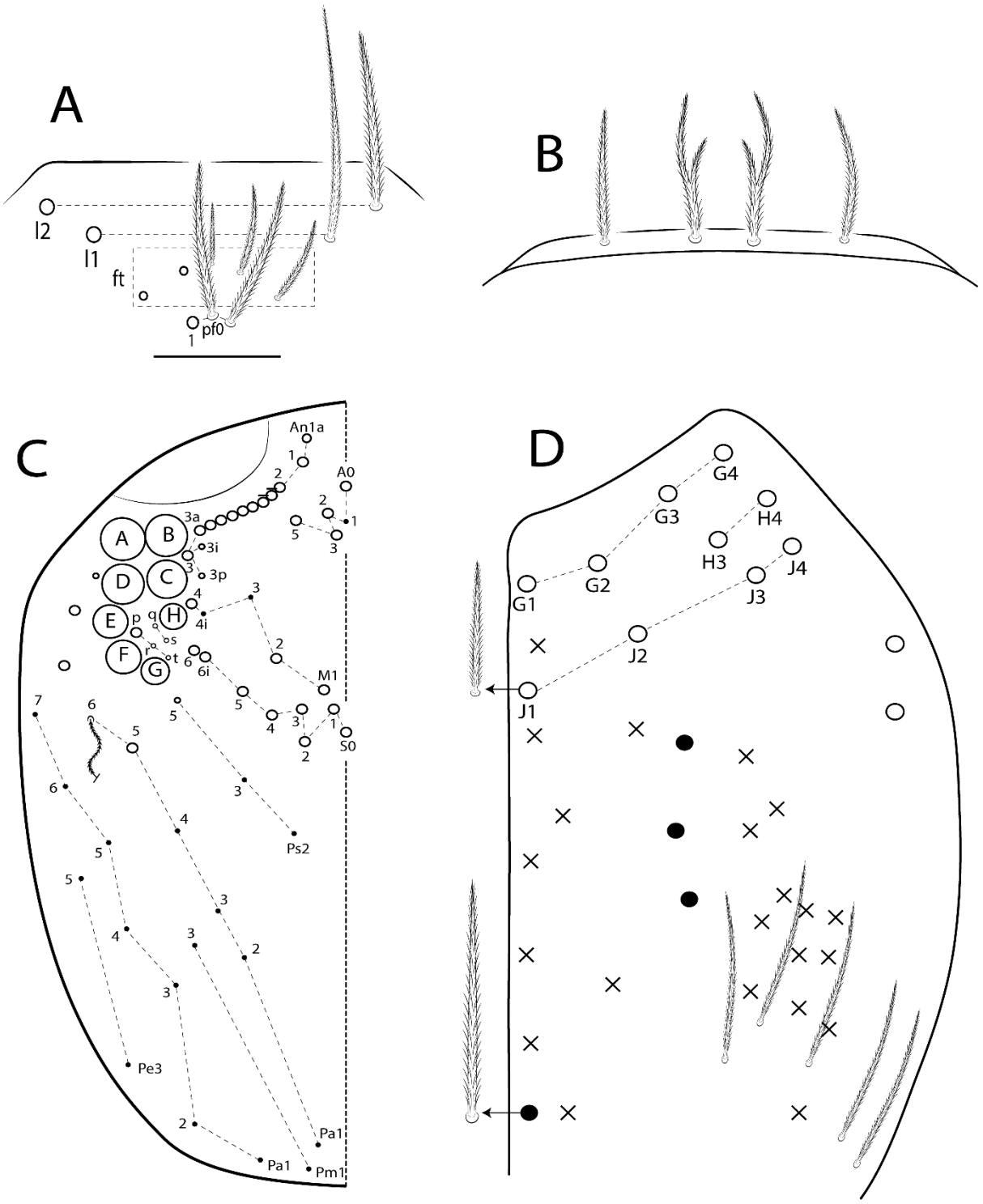

FIGURE 74A–D. *Lepidocyrtinus nigrans* **comb. nov.**: head; **A**, chaetotaxy of the clypeus; **B**, prelabral chaetotaxy (dorsal view); **C**, dorsal chaetotaxy (left side); **D**, postlabial and cephalic groove chaetotaxy (right side).

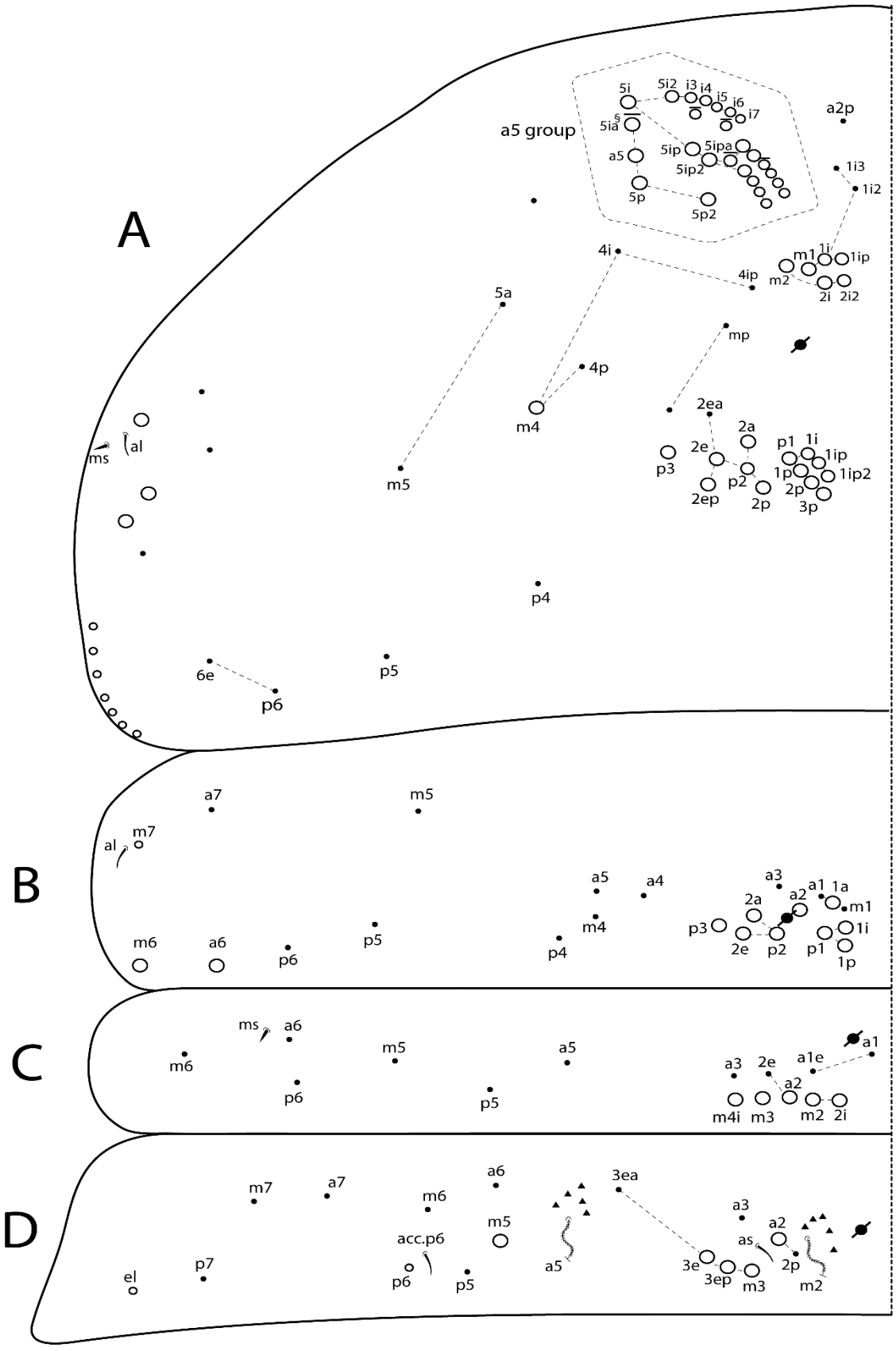

FIGURE 75A–D. *Lepidocyrtinus nigrans* **comb. nov.**: dorsal chaetotaxy; **A**, Th II; **B**, Th III; **C**, Abd I; **D**, Abd II.

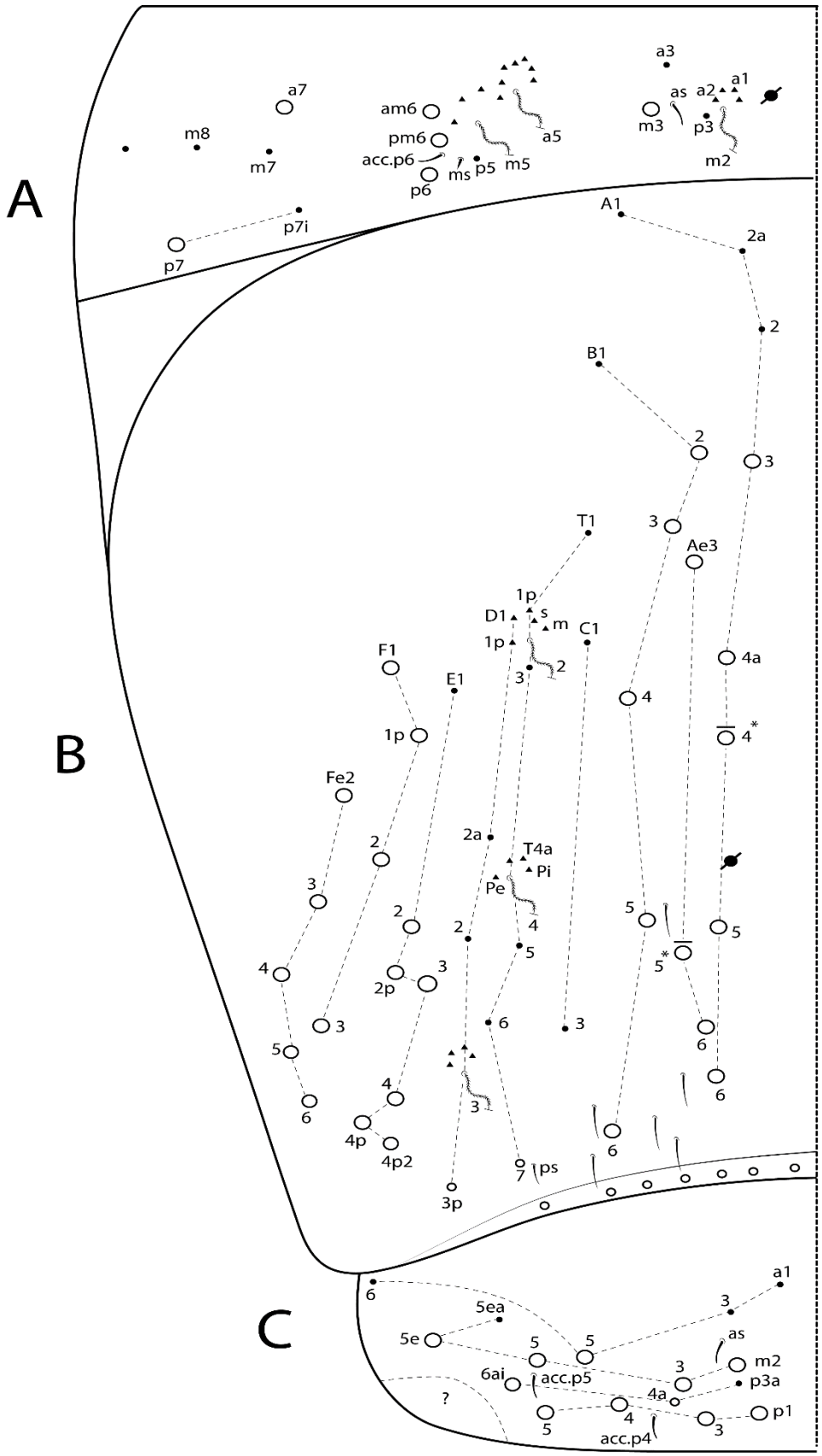

FIGURE 76A–C. *Lepidocyrtinus nigrans* **comb. nov.**: dorsal chaetotaxy; **A**, Abd III, **B**, Abd IV; **C**, Abd V.

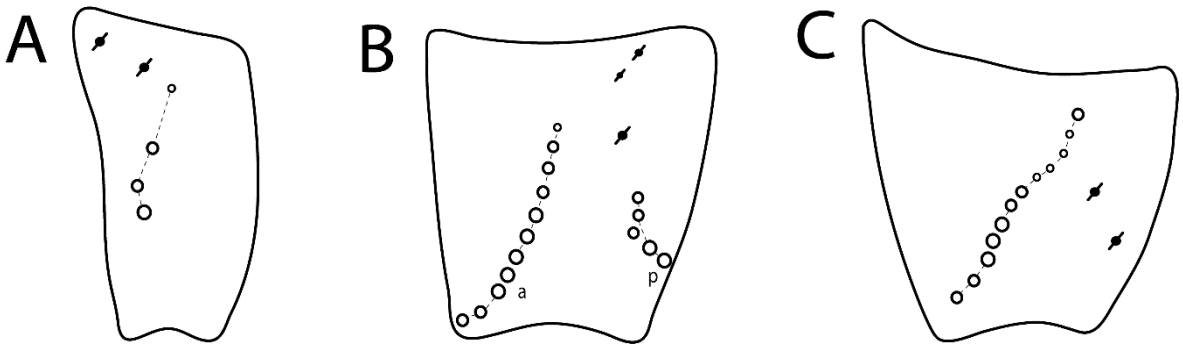

FIGURE 77A–G. *Lepidocyrtinus nigrans* **comb. nov.**: **A**, subcoxa I; **B**, subcoxa II; **C**, subcoxa III (outer side).

***Lepidocyrtinus paraibensis* (Bellini & Zeppelini, 2009) comb. nov.**
Figs 65D, 78–81, 137

Seira paraibensis Bellini & Zeppelini, 2009a: 267, figs 1–3, Brazil, Paraíba, Areia (orig. descr.), examined. Abrantes *et al.* 2010: 10 (cat.). Santos-Rocha *et al.* 2011: 3 (record). Abrantes *et al.* 2012: 12 (cat.). Baquero *et al.* 2015: 31 (cit.). Cipola *et al.* 2014: 492 (compared). Godeiro & Bellini 2014: 131-132, 138-139, 144 (compared and cat.). Godeiro & Bellini 2015: 221 (descr.)

Typological note. In the original description the type material was designed as 4 males and 4 females, but all type specimens of *L. paraibensis* **comb. nov.** are females, and there are also 1 female of *L. harena* **comb. nov.,** both from the same locality.

Examined type material: All type series (MNRJ/3167).

Others examined material: 1 male, 6 females and 1 juvenile on slides (CC/UFRN): Brazil, Paraiba, Areia municipality, State Park "Mata do Pau-Ferro", 06°57'51"S, 35°44'58"W (Fig. 137), 629 m, 24-27.xi.2011, Entomological aspirators , BC Bellini coll. 1 female on slide and 14 specimens in alcohol (INPA): Alagoas, Maceió municipality, Parque Municipal de Maceió, 09°36'44"S, 35°45'40"W (Fig. 137), 29 m, xi.2010, Pitfall trap, IPS Santos coll. 4 females on slides and 47 specimens in alcohol (CC/UFRN): Rio Largo municipality, Universidade Federal de Alagoas, Centro de Ciências Agrárias, 09°27'50"S, 35°50'02"W (Fig. 137), 140 m, xi.2010, Pitfall trap, IPS Santos coll. 1 male and 2 females on slides (CC/UFRN): Rio Grande do Norte, Natal municipality, Parque Estadual Dunas de Natal, 12°49'12"S, 35°11'16"W (Fig. 137), 14 m, 15.ii.2013, Pitfall trap, M Meira & DD Silva coll. 1 female on slide (CC/UFRN): Campus Central of UFRN, "Mata do Sagui", 05°50’34.30”S, 35°12’04.63”W, 47 m, 03.vi.2015, entomological aspirator, NM Santos & P Souza coll.

Diagnosis. Th II posteriorly with one dark blue spots half-moon shape interrupted anteriorly (Fig. 65D); head mac **A0**, **A2**–**3**, **A5**, **M1**–**2** and **S0**–**6** present; prelabral chaetae ciliate or smooth; labial papilla E with lateral process (l.p.) apically finger-shape and not reaching the base of apical appendage (Figs 78C–D); Th II with 9 anterior, 9 median

(**m1ip**, **m4i**–**4p** present) and 9–10 posterior mac (**p2ep** mic, **p3** mac); Th III–Abd II with 6–7, 3, 3 central mac respectively; Abd IV with 12–14 central mac and 10 lateral mac (Figs 79, 80B); ungues apical tooth present; unguiculus with **ai** lamella truncate (Fig. 81D); collophore anteriorly with 6 spine-like chaetae and 3 ciliate chaetae apically acuminate, posteriorly with 4 spines, smooth chaeta present (Fig. 81E); manubrium ventrally with 2/4 subapical chaetae; manubrial plate with 3 blunt mac apically nipple-like; dens without blunt mac (Figs 81F–G).

Description. Total length (head + trunk) of specimens 1.79–2.11 mm (n=4), holotype 2.05 mm. Specimens pale white with dark blue pigments on proximal Ant II–IV, Ant I weakly, Th II with one posterior spots half-moon shape interrupted anteriorly, laterally Th II–III and Abd III, Abd IV latero-posterior, femur I–III distally, and most proximal part of tibiotarsus I–II; eyespatches black (Fig. 65D). Scales present on Ant I to one- fifthth proximal of Ant IV, dorsal and ventral head, dorsal thorax and abdomen, legs (except empodia), anterior collophore, manubrium and dens ventrally.

Head. Antennae smaller to trunk length (Fig. 65D), ratio antennae: trunk = 1: 1.25–1.33; antennal segments ratio as I: II: III: IV = 1: 1.25–1.95: 1.49–2.26: 2.39–3.37 (n=4), not measured in holotype. Ant IV annulated on distal four- fifths, with apical bulb bilobed. Ant III sense organ with 2 elongated rods, 3 spiny guard sens, s-blunt sens of different sizes and ciliated chaetae. Ant I dorsally with 1 median mac, 2 spines and 4 smooth mic at base (Fig. 78A). Eyes A, B, D and E larger, G smaller, others subequal, and with 5 'IO' chaetae; head dorsal macrochaetotaxy with 7 **An**, 4 **A**, 3 **M**, 8 **S** and 1 **Pa** mac (Fig. 78D). Clypeal formula with 4 (**l1**–2), 6 (**fr**), 3 (**pf0**–**1**) ciliate chaetae, **l1**–**2** larger, **l1** apically acuminate, 2 **fr** smaller, others subequal (Fig. 78B). Prelabral chaetae ciliate or smooth and not bifurcate. Labral **p0** chaeta without median filament. Labral papillae with two inner conical projections, outer papilla absent. Maxillary palp with apical appendage (a.a.) and basal chaeta (b.c.) weakly ciliate, thicker and 1.28 larger than the apical. Basolateral and basomedian labial fields with chaetae **M1**–**2**, **E**, **L1**–**2** ciliate, **r** reduced (as Fig. 82F), **M2** sometimes absent. Ventral head with about 14 ciliate chaetae, postlabial formula with 4 (G1–4), 3 (H3–4), 4 (J1–4) chaetae, 1 larger basal chaetae (b.c.) surrounding the cephalic groove (Fig. 78E).

Thorax chaetotaxy (Fig. 79A–B). Th II **a**, **m** and **p** series with 9, 9 and 9–10 mac, respectively. Th III **a**, **m** and **p** series with 3, 1 and 4–5 mac, respectively. Ratio Th II: III = 1.64–1.43: 1 (n=3), not measured in holotype

Abdomen chaetotaxy (Figs 79C–D, 80A–C). Abd I **a**, **m** and **p** series with 1, 2 and 0 mac, respectively, **m2i** and **m4i** absent. Abd II **a**, **m** and **p** series with 1, 3 and 0 mac, respectively, **m3e** mic. Abd III **a**, **m** and **p** series with 0, 3 and 1 mac, respectively. Abd IV with 12–14 central mac of **A**–**T** series, and 10 lateral mac of **E**–**Fe** series; 5 posterior sens (**ps** type I, others type II) and 7 posterior mes. Abd V **a**, **m** and **p** series with 1, 4 and 6 mac, respectively. Ratio Abd III: IV = 1: 3.03–4.07 (n=3), not measured in holotype.

Legs. Subcoxa I with 4 chaetae and 2 psp; subcoxa II with an anterior row of 10 chaetae, posterior row of 2 chaetae and 3 psp; subcoxa III with one row of 9 chaetae and 2 posterior psp (Fig. 81A–C). Trochanteral organ with about 32 spine-like chaetae. Tibiotarsus not subdivided, outer side with 3 proximal larger ciliate chaetae and apically acuminate, inner side with 5 mac weakly ciliate. Ungues inner side with 4 teeth, 2 paired basal, 1 unpaired median larger to basal teeth and 1 small unpaired apical. Unguiculus with **ai** lamella truncate, **pe** lamella serrated and with small proximal tooth, other lamellae acuminate and smooth; ratio unguis: unguiculus = 1: 0.68. Tibiotarsal smooth chaeta 1.12 larger than unguiculus and tenent hair 1.03 larger than unguis outer edge (Fig. 81D).

Collophore. Anterior side with 13 chaetae, 6 proximal spine-like chaetae, 1 thin and 1 normal ciliate chaeta, 3 ciliate chaetae apically acuminate and 2 mac distally; posterior side with 6 chaetae, 4 spines, 1 thin ciliate chaetae and 1 smooth chaetae distally; lateral flap with about 19 chaetae, 2 smooth and 17 ciliate (Fig. 81E).

Furcula. Manubrium ventral formula with 1, 2, 2, 2/4 (subapical), 14 (apical) ciliate chaetae of different sizes plus at least 10 elongated apical scales per side (Fig. 81F); manubrial plate with 3 blunt mac finely ciliate and apically nipple-like, 6 ciliate chaetae of different sizes and 3 psp (Fig. 81G). Dens dorsally without blunt mac.

Remarks. *Lepidocyrtinus paraibensis* **comb. nov.** resembles *L. pseudoannulata* (Bellini & Zeppelini, 2008) **comb. nov.** and *L. primaria* (Godeiro & Bellini, 2014) **comb. nov.** in color pattern of Th II, with one posterior spot half-moon shaped, interrupted anteriorly; dorsal chaetotaxy of head with 7 **An** mac, **S4** mac and **A4** mic; Th III–Abd II with 7, 3 and 3 central mac, respectively; unguiculus with **ai** lamella truncate, and dens without blunt mac (Figs 65D, 78D, 79B–D, 81D, G). However, *L. paraibensis* **comb. nov.**

differs from these species by Th II with 9 anterior mac (7 in *L. primaria* **comb. nov.**), mac **p2ep** absent (present in *L. pseudoannulata* **comb. nov.**), and Abd IV with up 14 central mac (12 or less in *L. pseudoannulata* **comb. nov.** and *L. primaria* **comb. nov.**) (Figs 79A, 80B). Due to this similarity among the three species they will be called here *pseudoannulata* complex.

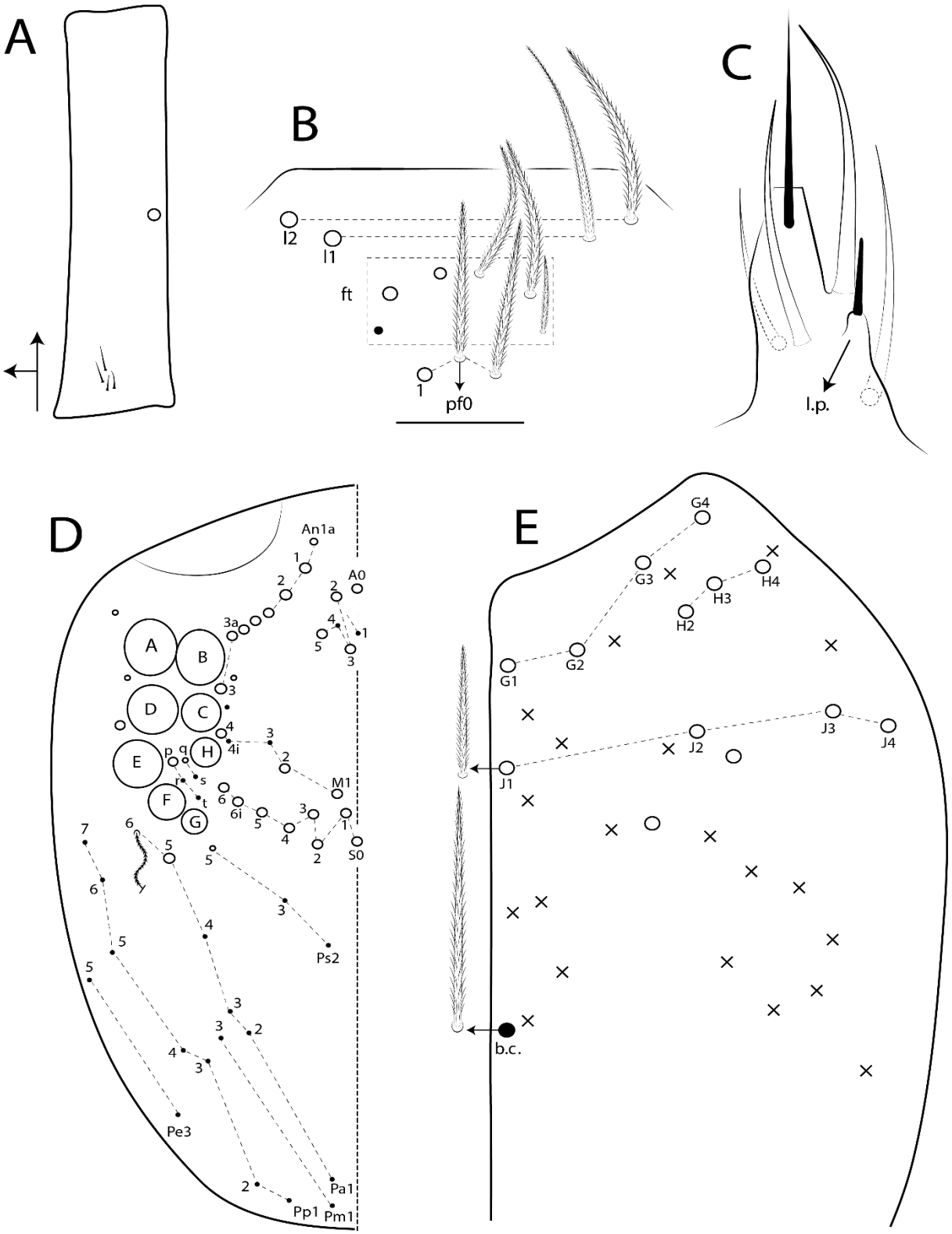

FIGURE 78A–E. *Lepidocyrtinus paraibensis* **comb. nov.**: head; **A**, Ant I left chaetotaxy (dorsal side); **B**, chaetotaxy of the clypeus; **C**, labial papillae E (right side), arrow indicates lateral process (**l.p.**); **D**, dorsal chaetotaxy (left side); **E**, postlabial and cephalic groove chaetotaxy (right side).

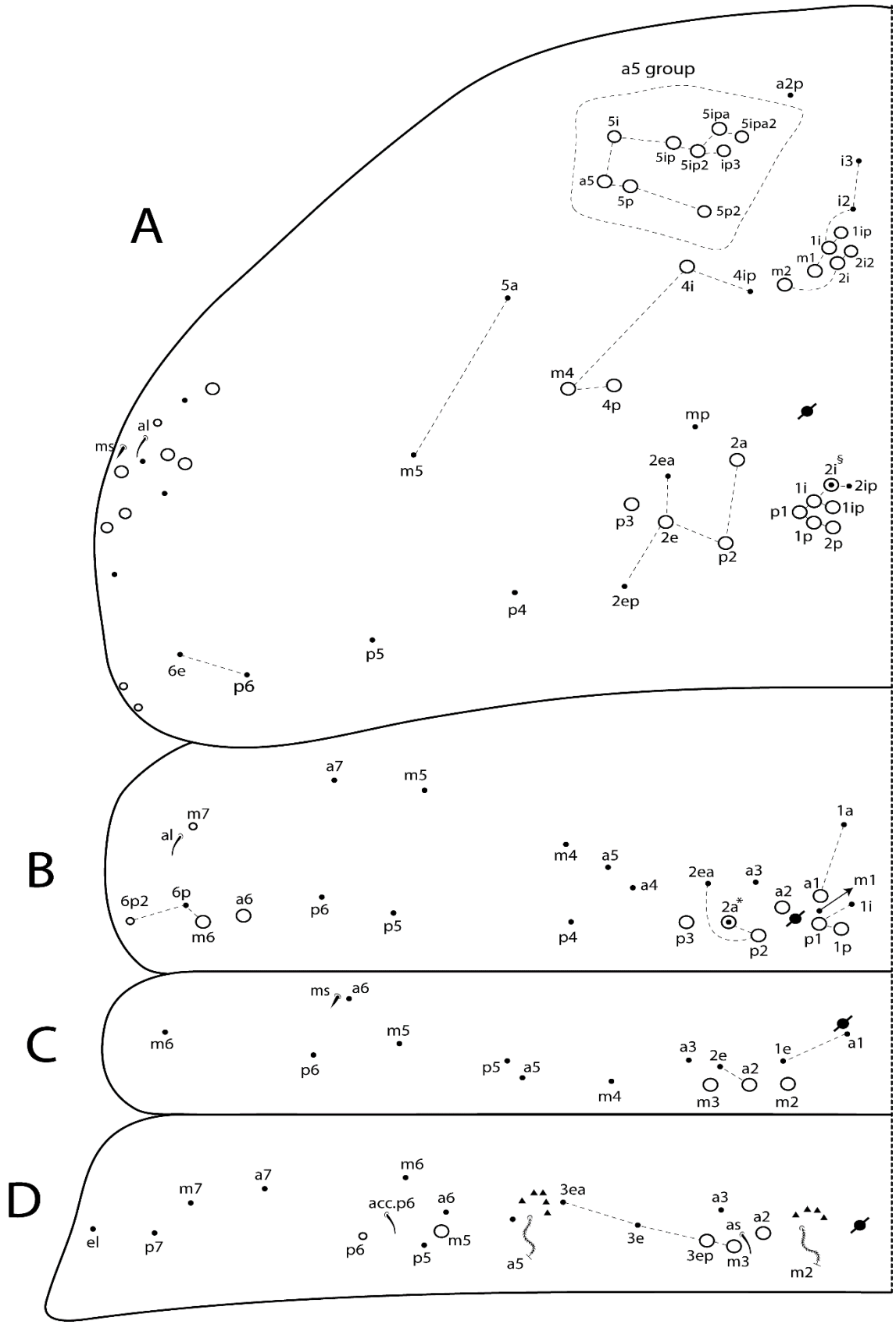

FIGURE 79A–D. *Lepidocyrtinus paraibensis* **comb. nov.**: dorsal chaetotaxy; **A**, Th II; **B**, Th III; **C**, Abd I; **D**, Abd II.

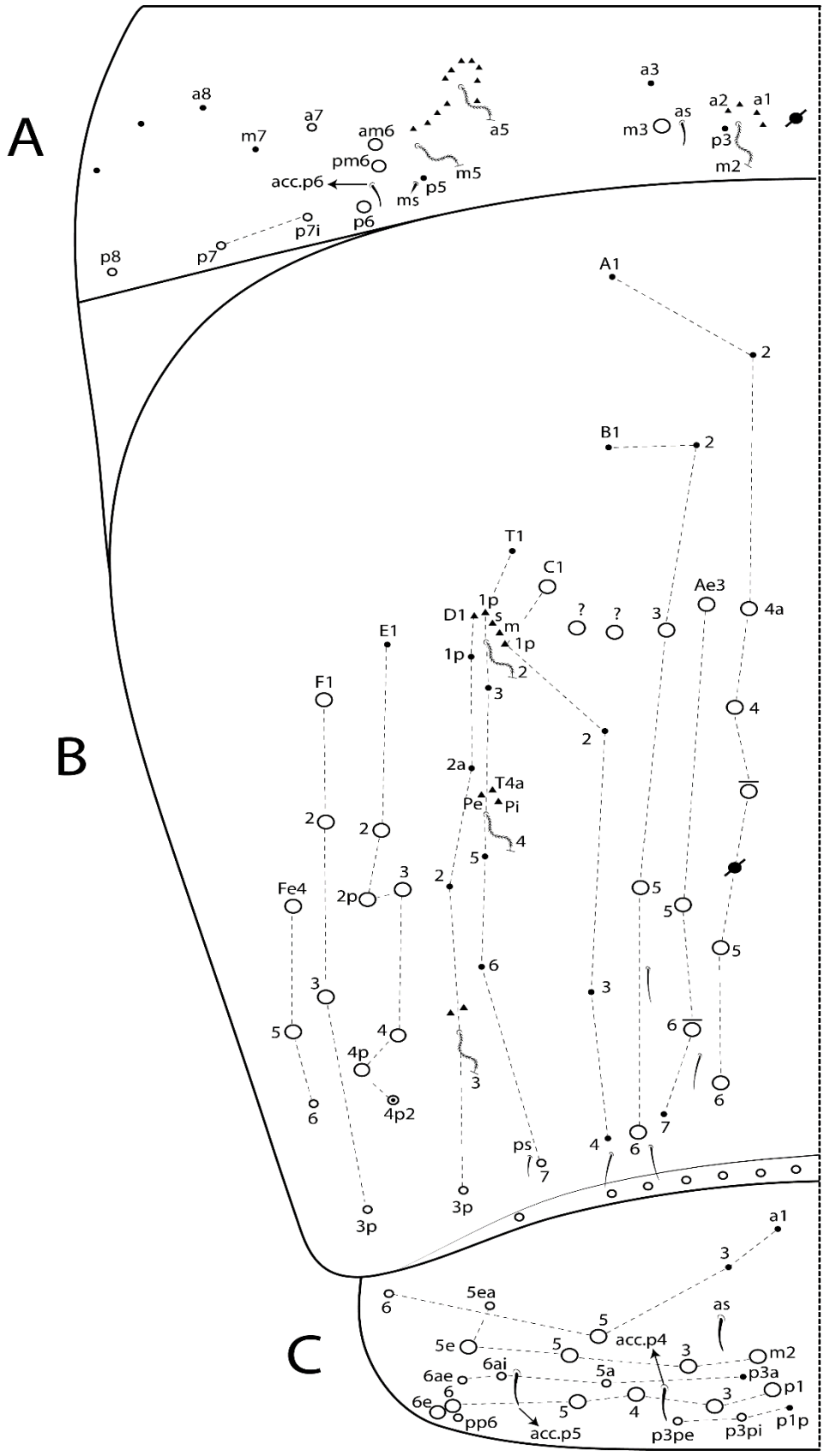

FIGURE 80A–C. *Lepidocyrtinus paraibensis* **comb. nov.**: dorsal chaetotaxy; **A**, Abd III, **B**, Abd IV; **C**, Abd V.

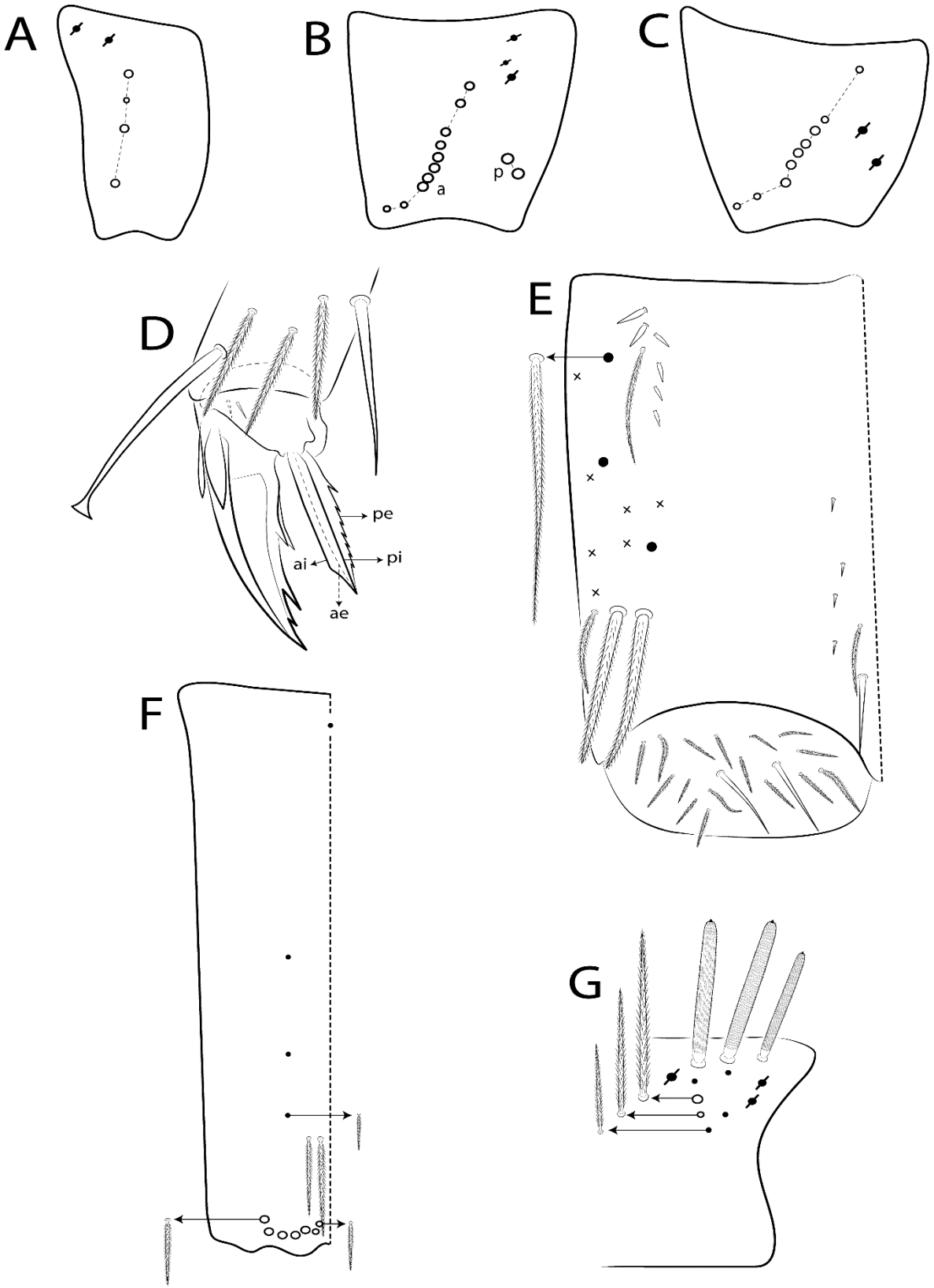

FIGURE 81A–G. *Lepidocyrtinus paraibensis* **comb. nov.**: **A**, subcoxa I; **B**, subcoxa II; **C**, subcoxa III (outer side); **D**, distal tibiotarsus and empodial complex III (posterior side); **E**, collophore chaetotaxy (lateral view); **F**, manubrium ventral chaetotaxy; **G**, chaetotaxy of the manubrial plate (lateral view).

***Lepidocyrtinus primaria* (Godeiro & Bellini, 2014) comb. nov.**

Fig. 137

Seira primaria Godeiro & Bellini, 2014: 139-144, figs 6-9, Brazil, Ceará, Crato (Fig. 137) (orig. descr.), examined. Godeiro & Bellini 2015: 225 (compared).

Examined type material: All type series (CC/UFRN).

Other examined material: 2 females on slides and 14 specimens in alcohol (CC/UFRN): Ceará, Barbalha municipality, Geopark Araripe, stream of "meio", 07°21’59”S, 39°19’47”W (Fig. 137), 784 m, 07.ii.2011, entomological aspirator, BC Bellini coll.

Diagnosis Th II posteriorly with one dark blue spots half-moon shape interrupted anteriorly (as Fig. 65D); head mac **A0**, **A2**–**3**, **A5**, **M1**–**2** and **S0**–**6** present (as Fig. 78D); prelabral chaetae smooth; Th II with 7 anterior, 9 median (**m1ip**, **m4i–4p** present) and 8–9 posterior mac (**p2ep** mic, **p3** mac) (as Fig. 79A); Th III–Abd II with 7, 3, 3 central mac respectively, Abd IV with 12 central mac and 10 lateral mac; ungues apical tooth present; unguiculus with **ai** lamella truncate (as Fig. 81D); manubrium ventrally with 2/4 subapical chaetae; manubrial plate with 3 blunt mac apically nipple-like; dens without blunt mac.

Remarks. In the original description, the coloration of *L. primaria* **comb. nov.** was omitted, but it is quite the same of *L. paraibensis* **comb. nov.** (Fig. 65D). *Lepidocyrtinus primaria* **comb. nov.** resembles *L. paraibensis* **comb. nov.** and *L. pseudoannulata* **comb. nov.** See the comparison among them in remarks of *L. paraibensis* **comb. nov.**

***Lepidocyrtinus pseudoannulata* (Bellini & Zeppelini, 2008) comb. nov.**

Fig. 136

Seira pseudoannulata Bellini & Zeppelini, 2008b: 49-51, figs 3, 4C, Brazil, Paraíba, Mataraca (Fig. 136) (orig. descr.), examined. Bellini & Zeppelini, 2009a: 267 (compared). Godeiro & Bellini, 2014: 138 (compared). Godeiro & Bellini, 2015: 225 (compared).

Examined type material: All type series (MNRJ).

Other examined material: 1 male and 1 female on slides and 10 specimens in alcohol (INPA): Bahia, Salvador municipality, neighborhood “Patamares”, condominium “Colina C”, 12°57'01"S, 38°24'30"W (Fig. 136), 14 m, 19-23.x.2017, Malaise trap, T Mahlmann coll.

Diagnosis. Th II posteriorly with one dark blue spots half-moon shape interrupted anteriorly (as Fig. 65D); head mac **A0**, **A2**–**3**, **A5**, **M1**–**2** and **S0**–**6** present (as Fig. 78D); prelabral chaetae smooth; labial papilla E with lateral process (l.p.) apically finger-shape and reaching the base of apical appendage; Th II with 9 anterior, 9 median (**m1ip**, **m4i–4p** present) and 10 posterior mac (**p2ep** and **p3** present); Th III–Abd II with 7, 3, 3 central mac respectively; Abd IV with 11 central mac and 10 lateral mac; ungues apical tooth present; unguiculus with **ai** lamella truncate (as Fig. 81D); collophore anteriorly with 6 spine-like chaetae and 3 ciliate chaetae apically acuminate, posteriorly with 2 spines, smooth chaeta present; manubrium ventrally with 2/4 subapical chaetae; manubrial plate and dens without blunt mac.

Remarks. *Lepidocyrtinus pseudoannulata* **comb. nov.** resembles *L. paraibensis* **comb. nov.** and *L. primaria* **comb. nov.** See the comparison among them in remarks of *L. paraibensis* **comb. nov.**

***Lepidocyrtinus prodigus* (Arlé, 1959) comb. nov.**
Figs 65E, 82–88, 138

Ctenocyrtinus prodigus Arlé, 1959: 171-174, figs 144–154, Brazil, Rio de Janeiro, São Gonçalo (orig. descr.). Mari Mutt & Bellinger 1990: 107 (cat.).
Seira prodiga; Christiansen & Bellinger 2000: 70, figs 27C, 56, São Paulo (comb.). Culik & Zeppelini, 2003: 1129 (cat.). Bellini & Zeppelini 2008b: 45, 49 (compared). Bellini & Zeppelini 2009a: 269, 271 (cat. and key). Bellini & Zeppelini 2009b: 388 (record). Abrantes *et al.* 2010: 10 (cat.). Abrantes *et al.* 2012: 12 (cat.). Godeiro &

Bellini 2014: 138-139 (compared). Godeiro & Bellini 2015: 220 (cit.). Bellini *et al.* 2018: 25 (compared).

Typological note. The type material (sample MNRJ/288) of *Ctenocyrtinus prodigus* deposited at MNRJ was lost (Mendonça, personal communication), but we found 7 specimens of the type locality (sample MNRJ/228). The neotype was designated from specimens, according to ICZN (2000) (see chapter 16, article 75.3.4 and 75.3.6., and article 76).

Examined type material. Neotype female designed on slide (MNRJ/228): Brazil, Rio de Janeiro, São Gonçalo municipality, farm "Colubandê", 22°50'S, 43°00'W (Fig. 138), in shrubs, 30 m, 14.iv.1957, R Arlé coll.

Additional material: 1 male, 1 female and 1 juvenile on slides and 3 specimens in alcohol (MNRJ/228): same data as neotype. 3 males, 3 females and 1 juvenile on slides and 3 specimens in alcohol (MNRJ/2487): Brazil, Rio de Janeiro, Macaé municipality, Parque Nacional da Restinga de Jurubatiba, 22°17'16.11"S, 41°40'34.01"W (Fig. 138), 12 m, 06-18.viii.2010, entomological aspirator, TC Silveira coll. 1 female on slide (UFRN): Rio de Janeiro municipality, Camorim burg, 22°58'S, 43°24'W (Fig. 138), 19.i.2013, entomological aspirator, TC Silveira coll.

Diagnosis. Body with dark bands on Ant, head laterally ans sometimes to Abd II and Abd IV posteriorlly, and legs (Fig. 65E); head mac **A0**, **A2**–**3**, **A5**, **M1**–**2**, **S0**–**3** and **S5–6** present; prelabral chaetae ciliate; labial papilla E with lateral process apically finger-shaped and reaching the base of apical appendage (Figs 82D, 83B); Th II with 19–25 anterior, 7 median (**m1ip** and **m4** present, **m4i** and **m4p** mac absent) and 9 posterior mac (**p2ep** and **p3** mic); Th III–Abd II with 6, 4, 4 central mac respectively; Abd IV with 15–16 central mac and 13–15 lateral mac (Figs 84, 85B); ungues apical tooth present; unguiculus with all lamella acuminate (Figs 86E–F); collophore anteriorly with 7 spine-like chaetae and 4 ciliate chaetae apically acuminate, posteriorly with 4 spines, smooth chaeta present (Fig. 88A); manubrium ventrally with 2/2 subapical chaetae; manubrial plate with 2–3 blunt mac apically nipple-like; dens with 5–12 blunt mac apically nipple-like (Figs 88B–C).

Description. Total length (head + trunk) of specimens 3.56–4.10 mm (n=3), holotype 4.10 mm. Specimens pale white with dark blue pigments on proximal Ant II– IV, head with one lateral band, Th II laterally to Abd IV posteriorly (sometimes absent), tibiotarsus I–II distally, and distal trochanter III and proximal femur III; eyespatches black (Fig. 65E). Scales present on Ant I to proximal four-fifths of Ant IV, dorsal and ventral head, dorsal thorax and abdomen, legs (except empodia), anterior and posterior collophore, dorsal and ventral manubrium and dens ventrally.

Head. Antennae subequal than trunk length (Fig. 65E); ratio antennae: trunk = 1: 1.02 (Ant IV present only in neotype); antennal segments ratio as I: II: III: IV = 1: 1.09–1.19: 1.04–1.08: 1.74, holotype 1: 1.09: 1.04: 1.74. Ant IV annulated on distal four-fifths, with apical bulb apically unilobed or bilobed (Fig. 82A). Ant III sense organ with 2 club-shaped, 3 spiny guard sens and s-blunt sens of different sizes (Fig. 82B). Ant I dorsally with 4 median mac, 2 spines and 3 smooth mic at base (Fig. 82C). Eye A and B larger, G and H smaller, others subequal, and with 5 'IO' chaetae; head dorsal macrochaetotaxy with 11 **An**, 4 **A**, 3 **M**, 7 **S** and 1 **Pa** mac, **S4** absent (Fig. 83B). Clypeal formula with 4 (**l1**–**2**), 5 (**fr**), 3 (**pf0**–**1**) ciliate chaetae, **l1**–**2** larger, **l1** apically acuminate, others subequal. Prelabral chaetae ciliate, inner chaetae bifurcate or not. Labral **p0** chaeta sometimes with median filament. Labral papillae with two inner conical projections, outer papillae absent. Maxillary palp with smooth apical appendage (**a.a.**) and basal chaeta (**b.c.**) weakly ciliate, thicker and 1.52 larger in length than the apical (Figs 82E). Labial papilla E with lateral process (l.p.) apically finger-shaped and reaching the base of apical appendage (Fig. 82D). Basolateral and basomedian labial fields with chaetae **M1**–**2**, **E**, **L1**–**2** ciliate, **r** reduced (Fig. 82F). Ventral head with about 30 ciliate chaetae, postlabial formula with 4 (**G1**–**4**), 3 (**H2**–**4**), 4 (**J1**–**4**) chaetae, 11 thin posterior chaetae, 1 basal chaetae (b.c.) larger surrounding the cephalic groove (Fig. 82F).

Thorax chaetotaxy (Fig. 84A–B). Th II **a**, **m** and **p** series with 19–25, 7 and 9 mac, respectively. Th III **a**, **m** and **p** series with 3, 1 and 4 mac, respectively. Ratio Th II: III = 2.30–1.90: 1 (n=3), holotype 1.81: 1.

Abdomen chaetotaxy (Figs 84C–D, 85A–C). Abd I **a**, **m** and **p** series with 1, 3 and 0 mac, respectively, **m4i** absent. Abd II **a**, **m** and **p** series with 1, 4 and 0 mac, respectively. Abd III **a**, **m** and **p** series with 2, 4 and 2 mac, respectively. Abd IV with 15–16 central mac of **A**–**T** series and 13–15 lateral mac of **E**–**Fe** series; 12 posterior sens (**ps** type I, others

type II) and 8 posterior mes. Abd V **a**, **m** and **p** series with 1, 4 and 6 mac, respectively. Ratio Abd III: IV = 1: 4.70–5.50 (n= 3), holotype 1: 4.70.

Legs. Subcoxa I with 5 chaetae and 2 psp; subcoxa II with an anterior row of 12 chaetae, posterior row of 4 chaetae, 2 anterior chaetae (present or absent) and 4 psp; subcoxa III with one row of 12–14 chaetae and 2 posterior psp (Fig. 86A–C). Trochanteral organ with about 43 spine-like chaetae (Fig. 86D). Tibiotarsus not subdivided, outer side with 8 larger ciliate chaetae and apically acuminate, inner side with 7 mac weakly ciliate (87B). Ungues inner side with 4 teeth, 2 paired basal, 1 unpaired median subequal to basal teeth and 1 smaller unpaired apical. Unguiculus with all lamellae acuminate, **pe** lamella serrated and with small proximal tooth, other lamellae smooth; ratio unguis: unguiculus = 1: 0.60. Tibiotarsal smooth chaeta 1.28 larger than unguiculus and tenent hair 0.85 smaller than unguis outer edge (Figs 86E–G).

Collophore. Anterior side with 16 chaetae, 7 proximal spine-like chaetae, 1 thin and 2 normal ciliate chaetae, 4 ciliate chaetae apically acuminate and 2 mac distally; posterior side with 8 chaetae, 4 spines, 3 thin ciliate chaetae widely distributed and 1 smooth chaetae distally; lateral flap with about 30 chaetae, 7 smooth and 23 ciliate (Fig. 88A).

Furcula. Manubrium ventral formula with 0, 2, 2, 2/2 (subapical), 20 (apical) ciliate chaetae of different sizes plus about 21 elongated apical scales per side (Fig. 88B); manubrial plate with 2–3 blunt mac finely ciliate and apically nipple-like, 8 ciliate chaetae of different sizes and 3 psp. Dens dorsally with one proximal row of 5–12 blunt mac finely ciliate and apically nipple-like, holotype with 10+12 (Fig. 88C).

Remarks. *Lepidocyrtinus prodigus* **comb. nov.** resembles *L. diamantinae* **comb. nov.** in color pattern with blue spots on antennae, trunk laterally and legs, head mac **S4** absent, Th II mac **m4i** and **m4p** mac absent, Th III–Abd II with 6, 4, 4 central mac respectively, and morphology in general (Figs 65A, E, 83–88). However, *L. prodigus* **comb. nov.** differs from this species in dorsal chaetotaxy by head mac **A3** present and Th II mac **p2a**, **p2ep** and **p3** absent (opposite in *L. diamantinae* **comb. nov.**). In this same sense, both species have 6 central mac on Th III, but the homology between them are different: *L. prodigus* **comb. nov.** has **a1a** mac and **p2a** mic, while *L. diamantinae* **comb. nov.** has **a1a** mic and **p2a** mac (Figs 67B, 84B). In addition, on Abd IV only *L. prodigus* **comb. nov.** has **B4** mac (Fig. 85B). Other features of *L. prodigus* **comb. nov.** which still differ are: collophore anteriorly with 7 spine-like chaetae and 4 chaetae apically acuminate,

and posteriorly with 4 spines; while in *L. diamantinae* **comb. nov.** there are anteriorly 9 spine-like chaetae and 3 chaetae apically acuminate, and posteriorly 5 spines.

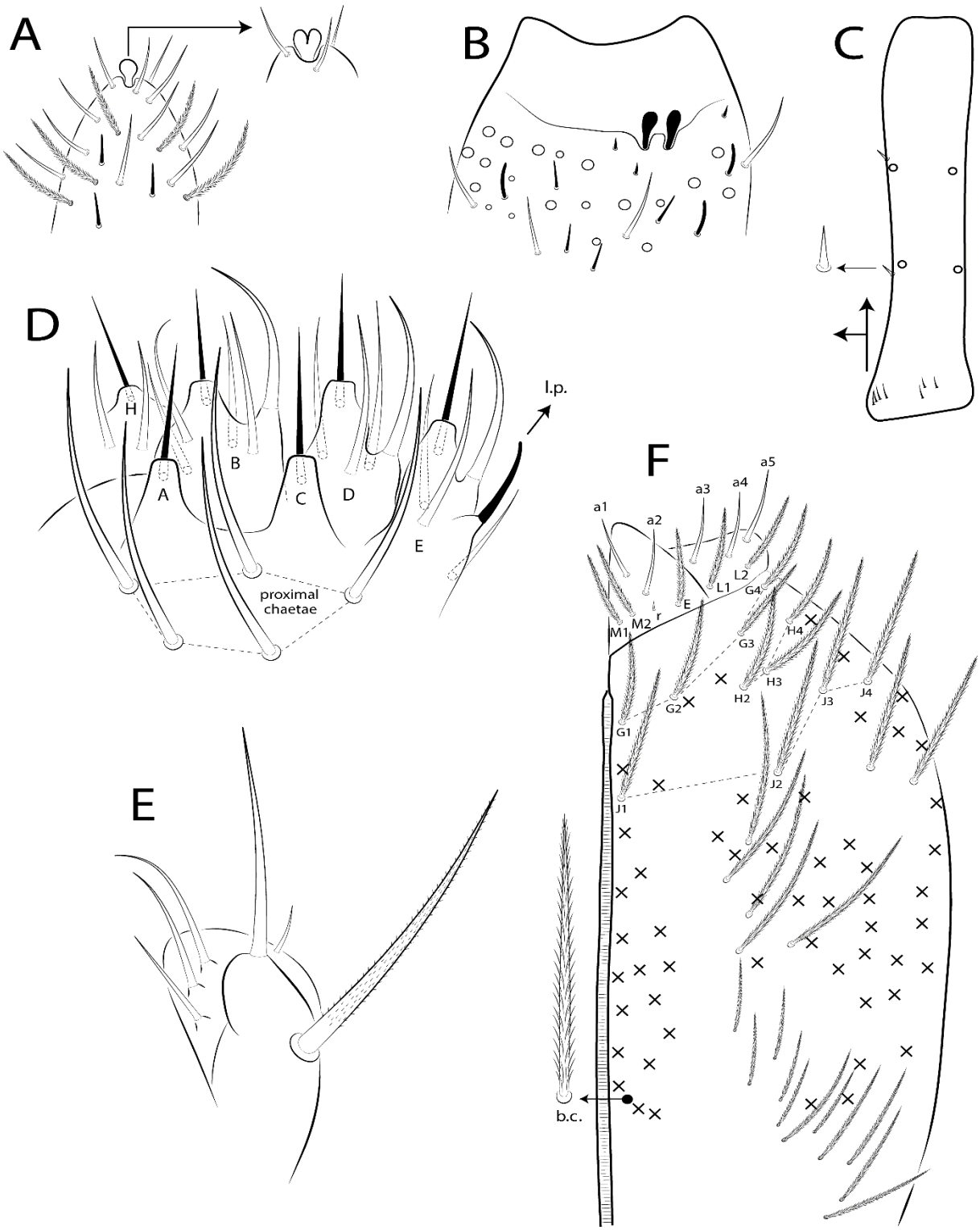

FIGURE 82A–D. *Lepidocyrtinus prodigus* **comb. nov.**: head (right side); **A**, apex of Ant IV; **B**, Ant III apical organ (lateral side); **C**, Ant I left chaetotaxy (dorsal side); **D**, labial papillae, A–E main papillae and H main hypostomal papillae, arrow indicates lateral process (**l.p.**) of papilla E; **E**, maxillary palp and outer lobe; **F**, basomedian and basolateral labial fields, postlabial and cephalic groove chaetotaxy (right side).

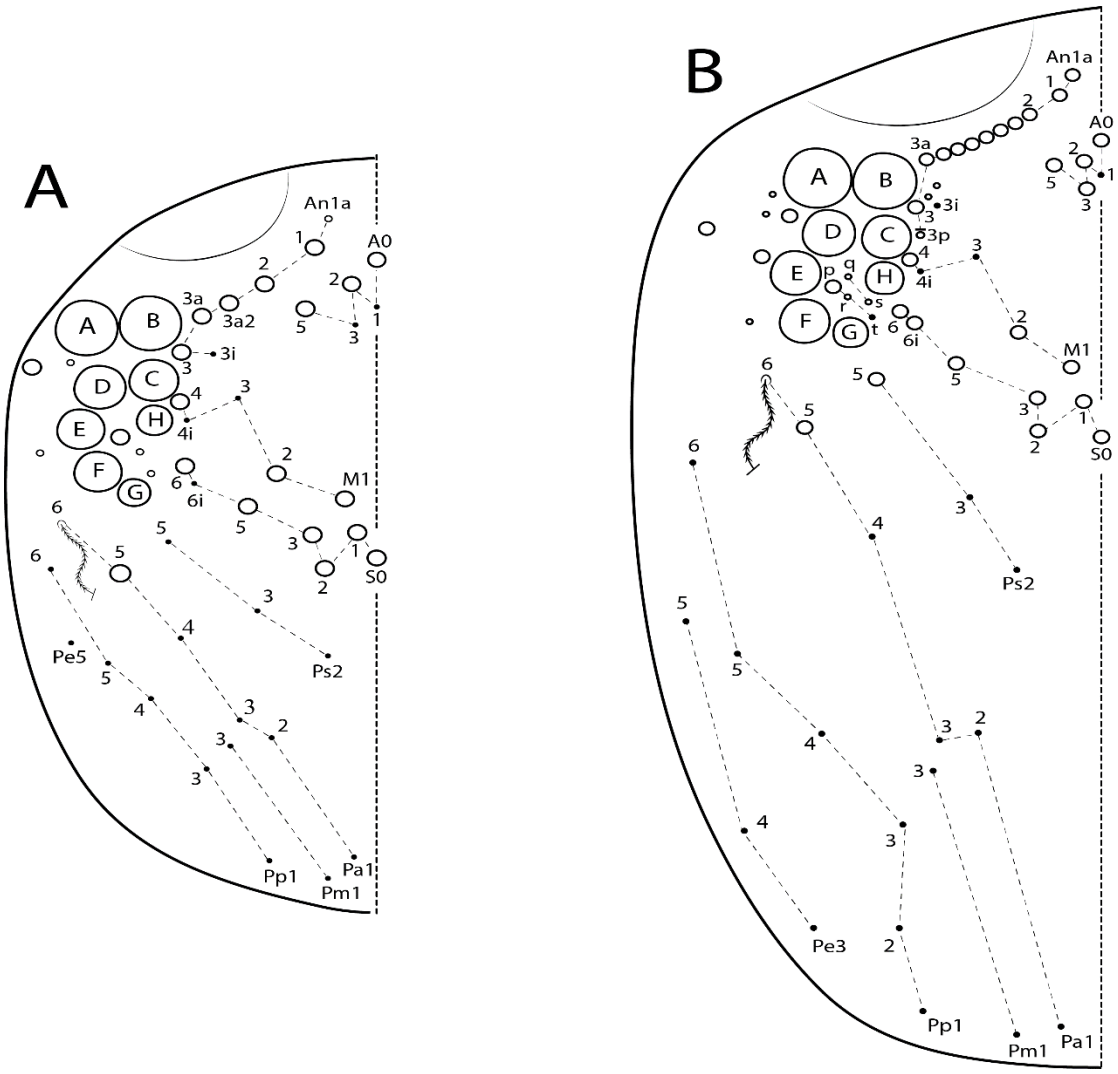

FIGURE 83A–B. *Lepidocyrtinus prodigus* **comb. nov.**: head dorsal chaetotaxy (left side); **A**, 3rd instar; **B**, adult.

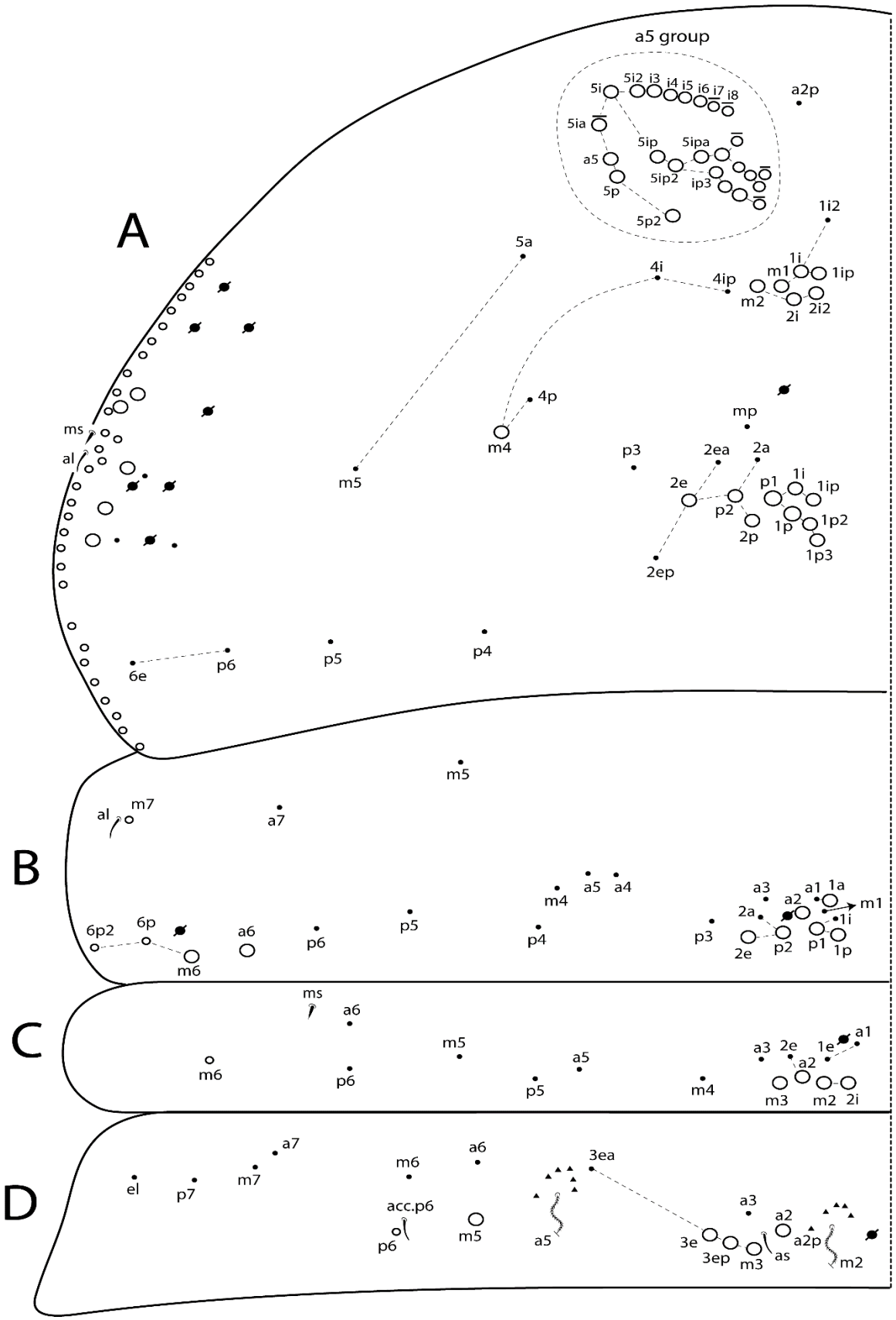

FIGURE 84A–D. *Lepidocyrtinus prodigus* **comb. nov.**: dorsal chaetotaxy; **A**, Th II; **B**, Th III; **C**, Abd I; **D**, Abd II.

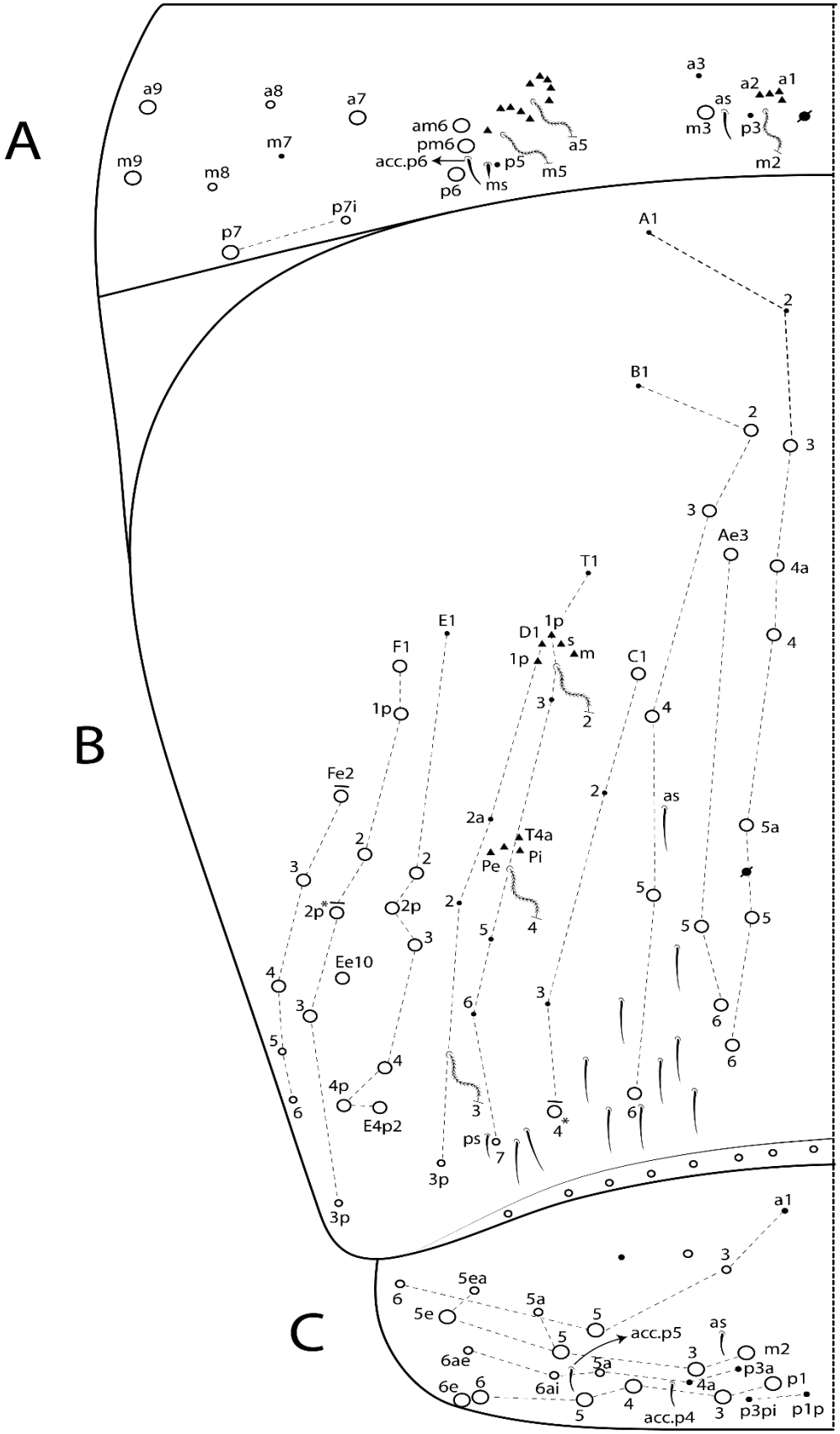

FIGURE 85A–**C.** *Lepidocyrtinus prodigus* **comb. nov.**: dorsal chaetotaxy; **A**, Abd III, **B**, Abd IV; **C**, Abd V.

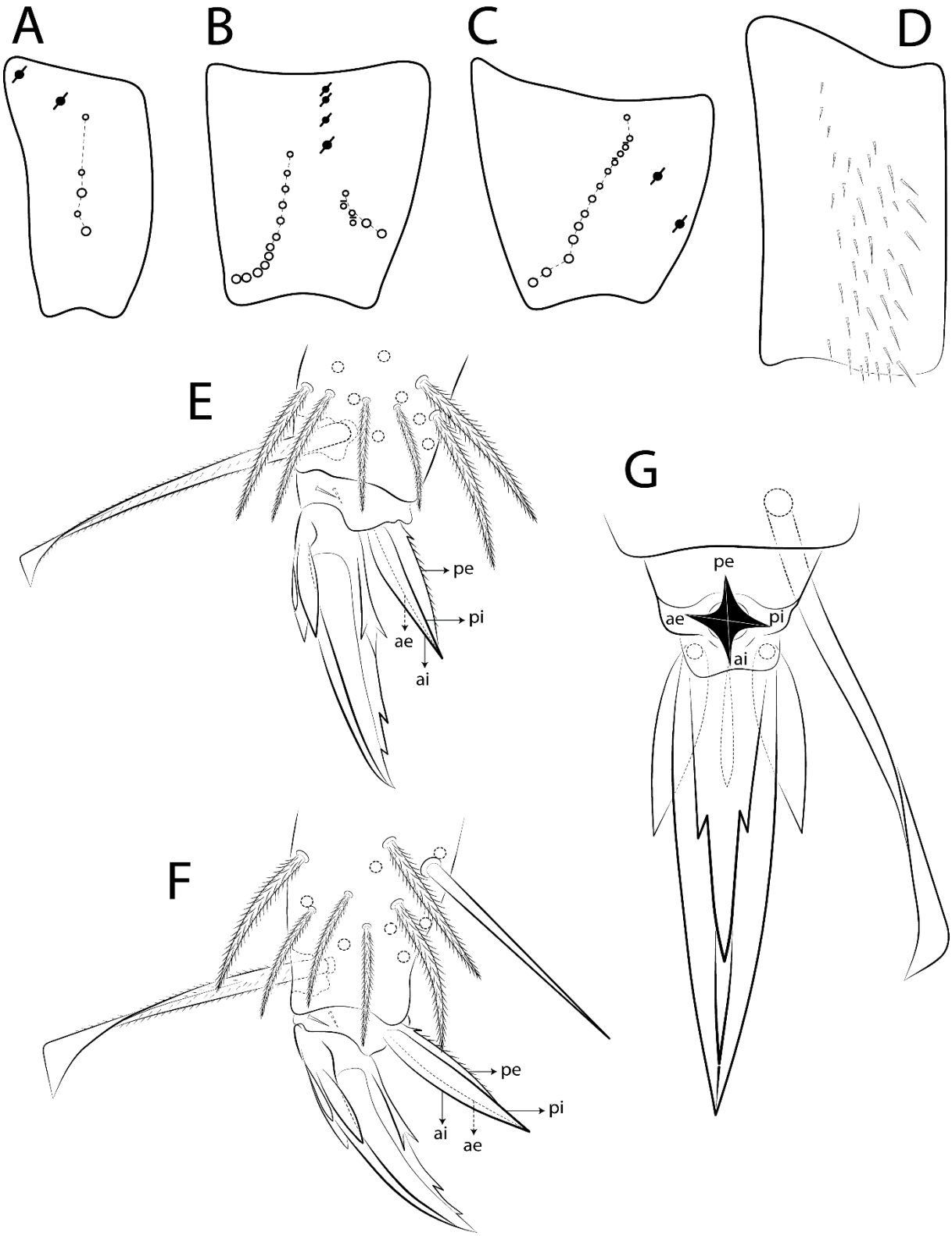

FIGURE 86A–G. *Lepidocyrtinus prodigus* **comb. nov.**: legs chaetotaxy; **A**, subcoxa I; **B**, subcoxa II; **C**, subcoxa III (outer side); **D**, trochanteral organ (inner side); **E**–**G**, distal tibiotarsus and empodial complex: **E**, complex I (posterior side), **F**, complex III (posterior side), **G**, complex III (inner side).

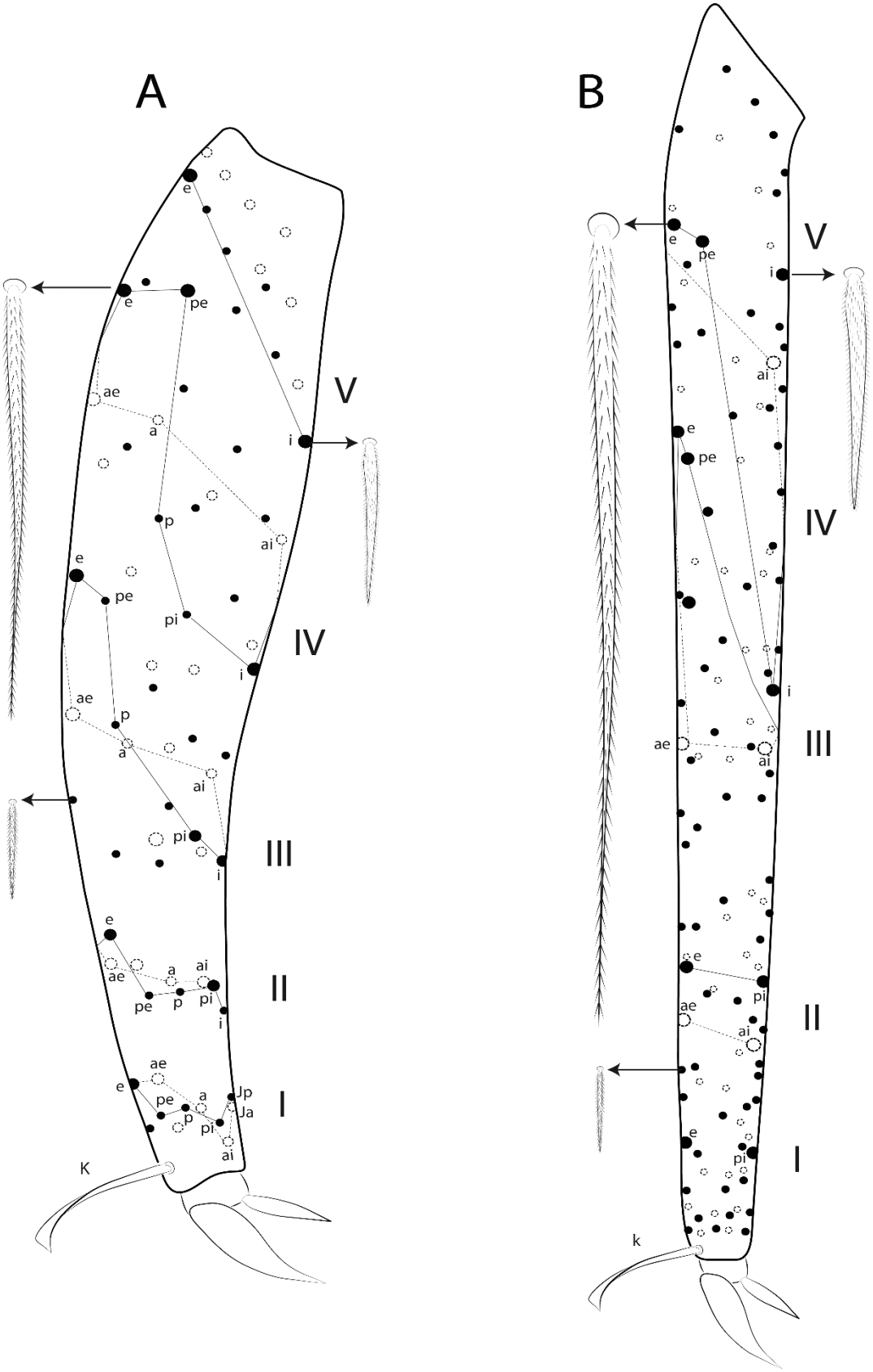

FIGURE 87A–B. *Lepidocyrtinus prodigus* **comb. nov.**: chaetotaxy of leaf tibiotarsus I (posterior side); **A**, 3rd instar; **B**, adult.

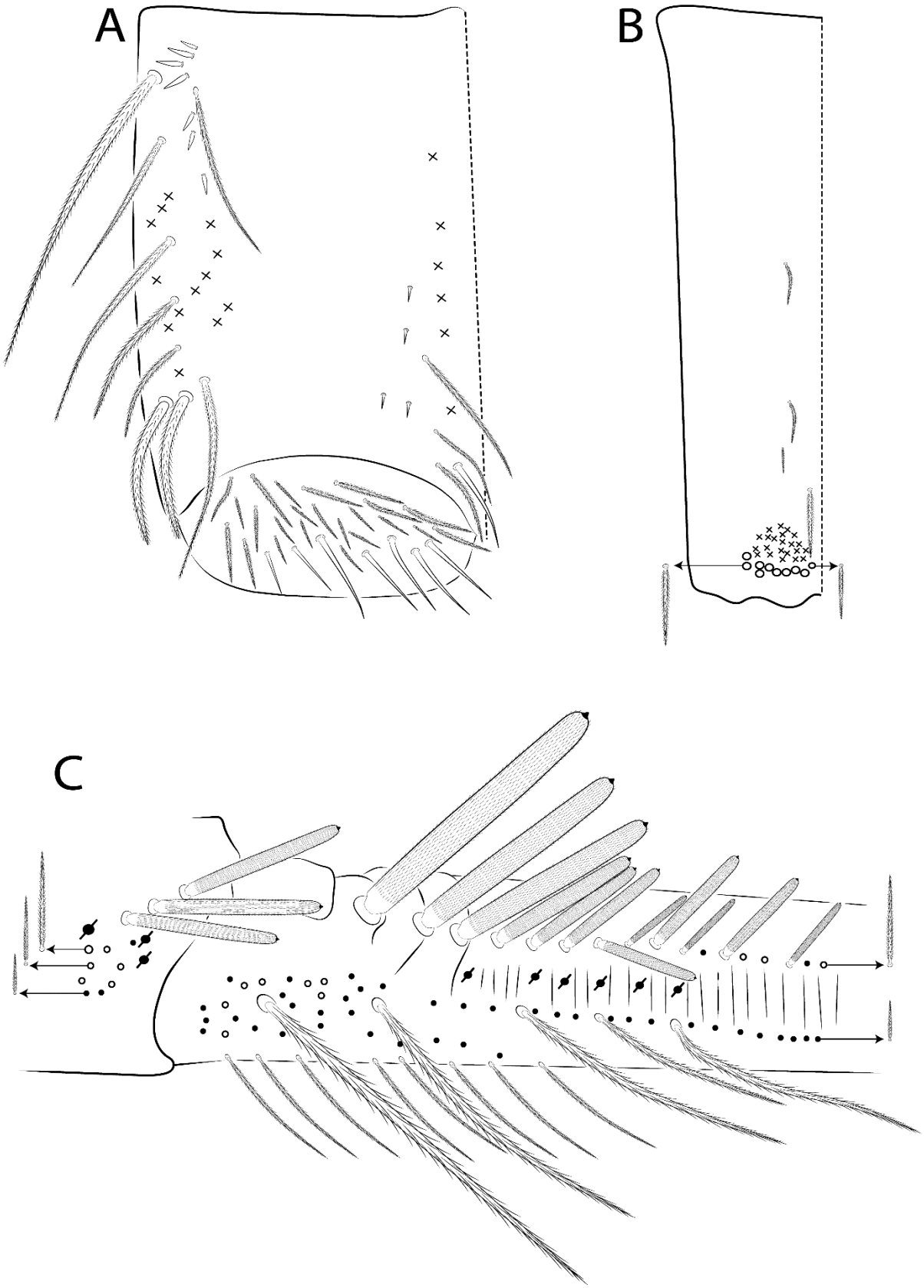

FIGURE 88A–C. *Lepidocyrtinus prodigus* **comb. nov.**: **A**, collophore chaetotaxy (lateral view); **B**, manubrium ventral chaetotaxy; **C**, chaetotaxy of the manubrial plate and proximal dens (lateral view).

***Lepidocyrtinus pulcher* Handschin, 1924 comb. rev.**

Figs 65F, 89–92, 138

Lepidocyrtinus pulcher Handschin, 1924: 15-17, fig. 2, Brazil, Santa Catarina, Blumenau (orig. descr.), not examined. Arlé, 1959: 173 (compared).

Seira pulchra; Yosii 1959: 22 (comb.). Mari Mutt & Bellinger 1990: 107 (cat., as *pulcher*). Bellini & Zeppelini 2009a: 269 (cat.). Abrantes *et al.* 2010: 10 (cat.). Abrantes *et al.* 2012: 12 (cat.). Godeiro & Bellini 2014: 132 (cat.). Bellini *et al.* 2018: 26 (cit.).

Drepanosira pulchra; Christiansen & Bellinger 2000: 42 (comb.).

Typological note. The type material of *L. pulcher* **comb. rev.** was not found and it is possibly lost. The material used in the redescription here is not from the type locality. For this reason, new collections must be performed at Blumenau municipality, Santa Catarina state to verify if specimens from the type locality correspond to our specimens from Paraná state, described here.

Examined material. 3 males, 7 females and 3 juveniles on slides 27 specimens in alcohol (INPA): Brazil, Paraná, Rancho Alegre municipality, farm “Congonhas”, 22°59'08"S, 50°56'13"W (Fig. 138), in reforestation, 338 m, Pitfall trap, iii.2015, BP Silva coll. 1 specimens in alcohol (INPA): Londrina, farm "Duas Irmãs", road of “Limoeiro”, 23°20'57"S, 51°04'55"W (Fig. 138), rural area, 517 m, Pitfall trap, 23-25.i.2015, NG Cipola & ACS Xavier coll.

Diagnosis. Body with dark spots on Ant III–IV, femur I, distal femur III and all head and Th II (Fig. 65F); head mac **A0**, **A3**, **A5**, **M1**–**2**, **S0**–**1** and **S3**–**6** present, **S2** rarely mic; prelabral chaetae ciliate; labial papilla E with lateral process (l.p.) apically pointed and almost reaching the base of apical appendage (Figs 89C–D); Th II with 31–33 anterior, 7 median (**m1ip** and **m4** present, **m4i** and **m4p** mac absent) and 13–14 posterior mac (**p2ep** and **p3** mac); Th III–Abd II with 8, 5, 4 central mac respectively; Abd IV with 14–15 central mac and 14 lateral mac (Figs 90, 91B); ungues apical tooth present; unguiculus with all lamella acuminate; collophore anteriorly with 7 spine-like chaetae and 5 ciliate

chaetae apically acuminate, posteriorly with 6 spines, smooth chaeta present (Fig. 92E); manubrium ventrally with 2/2 subapical chaetae; manubrial plate with 3 blunt mac apically nipple-like; dens with 9–15 blunt mac apically nipple-like (Figs 92F–G).

Description. Total length (head + trunk) of specimens 2.96–3.28 mm (n=4). Specimens pale white with dark pigments on distal and proximal Ant IV, distal Ant III, proximal Ant I, head, Th I–II, posterior Abd IV to V, coxa I to proximal femur I, and distal femur III; eyespatches black (Fig. 65F). Scales present on Ant I to proximal one- thirds of Ant IV, dorsal and ventral head, dorsal thorax and abdomen, legs (except empodia), anterior collophore, dorsal and ventral manubrium and dens ventrally.

Head. Antennae subequal or larger than trunk length (Fig. 65F); ratio antennae: trunk = 1: 1.01–1.09; antennal segments ratio as I: II: III: IV = 1: 1.10–1.29: 1.02–1.14: 1.79–2.42 (n=3). Ant IV annulated on distal two-thirds, with apical bulb apically bilobed. Ant III sense organ with 2 rods, 3 spiny guard sens, s-blunt sens of different sizes and ciliated chaetae. Ant I dorsally with 3 median mac, 2 spines and 3 smooth mic at base (Fig. 89A). Eye B larger, G and H smaller, others subequal, and with 5 'IO' chaetae; head dorsal macrochaetotaxy with 11–13 **An**, 2 **A**, 3 **M**, 7–8 **S** and 1 **Pa** mac, **A2** and **A5** as mic, **S2** as mic in one specimen (Fig. 89D). Clypeal formula with 4 (**l1**–**2**), 4 (**fr**), 5 (**pf0**–**2**) ciliate chaetae, **l1**–**2** larger, **l1** apically acuminate, others subequal (Fig. 89B). Prelabral chaetae ciliate, inner chaetae bifurcate equal or unequal, outer chaetae normal (common) or discretely bifurcated. Labral **p0** chaeta sometimes with median filament. Labral papillae with two inner conical projections, outer papillae absent. Maxillary palp with smooth apical appendage (**a.a.**) and basal chaeta (**b.c.**) weakly ciliate, thicker and 1.16 larger in length than the apical. Labial papilla E with lateral process (l.p.) apically pointed and almost reaching the base of apical appendage (Fig. 89C). Basolateral and basomedian labial fields with chaetae **M1**–**2**, **E**, **L1**–**2** ciliate, **r** reduced (as Fig. 82F). Ventral head with about 22 ciliate chaetae, postlabial formula with 4 (**G1**–**4**), 3 (**H2**–**4**), 4 (**J1**–**4**) chaetae, **H3**–**4**, **J1**–**4** larger, 4 thin posterior chaetae, and 3 larger chaetae, 1 basal chaetae (b.c.) surrounding the cephalic groove (Fig. 89E).

Thorax chaetotaxy (Fig. 90A–B). Th II **a**, **m** and **p** series with 31–33, 7 and 13–14 mac, respectively. Th III **a**, **m** and **p** series with 3, 1 and 6 mac, respectively. Ratio Th II: III = 2.31–1.71: 1 (n=4).

Abdomen chaetotaxy (Figs 90C–D, 91A–C). Abd I **a**, **m** and **p** series with 1, 4 and 0 mac, respectively. Abd II **a**, **m** and **p** series with 1, 4 and 0 mac, respectively. Abd III **a**, **m** and **p** series with 1, 3 and 3 mac, respectively. Abd IV with 14–15 central mac of **A**–**T** series and 14 lateral mac of **E**–**Fe** series; 8 posterior sens (**ps** type I, others type II) and 8 posterior mes. Abd V **a**, **m** and **p** series with 1, 4 and 6 mac, respectively. Ratio Abd III: IV = 1: 3.94–5.62 (n=4).

Legs. Subcoxa I with 5 chaetae, 1 anterior chaetae and 2 psp; subcoxa II with an anterior row of 11 chaetae, posterior row of 5 chaetae and 4 psp; subcoxa III with one row of 11 chaetae and 2 posterior psp (Fig. 92A–C). Trochanteral organ with about 81 spine-like chaetae (Fig. 92D). Tibiotarsus III sometimes subdivided on distal two third, outer side with 4 proximal larger ciliate chaetae and apically acuminate, inner side with 9 mac weakly ciliate. Ungues inner side with 4 teeth, 2 paired basal, 1 unpaired median larger to basal teeth and 1 small unpaired apical. Unguiculus with all lamellae acuminate, **pe** lamella serrated and with small proximal tooth, other lamellae smooth; ratio unguis: unguiculus = 1: 0.71. Tibiotarsal smooth chaeta 1.38 larger than unguiculus and tenent hair 0.84 smaller than unguis outer edge.

Collophore. Anterior side with 19 chaetae, 7 proximal spine-like chaetae, 1 thin and 4 normal ciliate chaetae, 5 ciliate chaetae apically acuminate and 2 mac distally; posterior side with 18 chaetae, 6 spines, 11 thin ciliate chaetae widely distributed and 1 smooth chaetae distally; lateral flap with about 45 chaetae, 13 smooth and 32 ciliate (Fig. 92E).

Furcula. Manubrium ventral formula with 0, 0, 2, 2/2 (subapical), 22 (apical) ciliate chaetae of different sizes plus about 31 elongated apical scales per side (Fig. 92F); manubrial plate with 3 blunt mac finely ciliate and apically nipple-like, 12 ciliate chaetae of different sizes and 3 psp. Dens dorsally with one proximal row of 9–15 blunt mac finely ciliate and apically nipple-like (Fig. 92G).

Remarks. The color pattern of *L. pulcher* **comb. rev.** with dark pigments on head to Th II resembles others species as *L. boy* **sp. nov.** and *L. pseudopulcher* **sp. nov.** (Figs 65F, 93, 109), but they differ by dense macrochaetotaxy in *L. pulcher* **comb. rev.**, while in *L. boy* **sp. nov.** and *L. pseudopulcher* **sp. nov.** the number of dorsal mac is reduced (see remarks of these species).

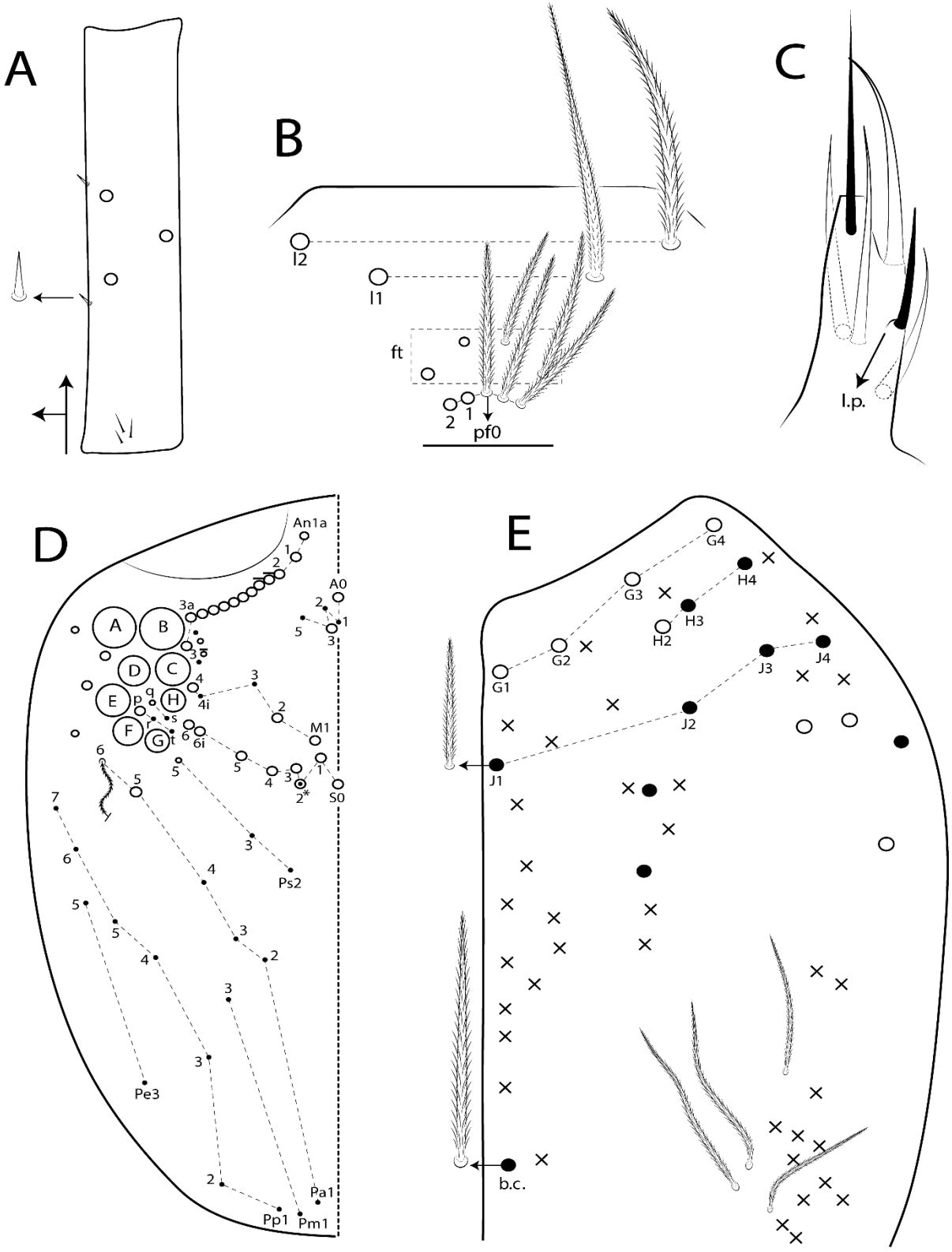

FIGURE 89A–E. *Lepidocyrtinus pulcher* **comb. rev.**: head; **A**, Ant I left chaetotaxy (dorsal side); **B**, chaetotaxy of the clypeus; **C**, labial papillae E (right side), arrow indicates lateral process (**l.p.**); **D**, dorsal chaetotaxy (left side); **E**, postlabial and cephalic groove chaetotaxy (right side).

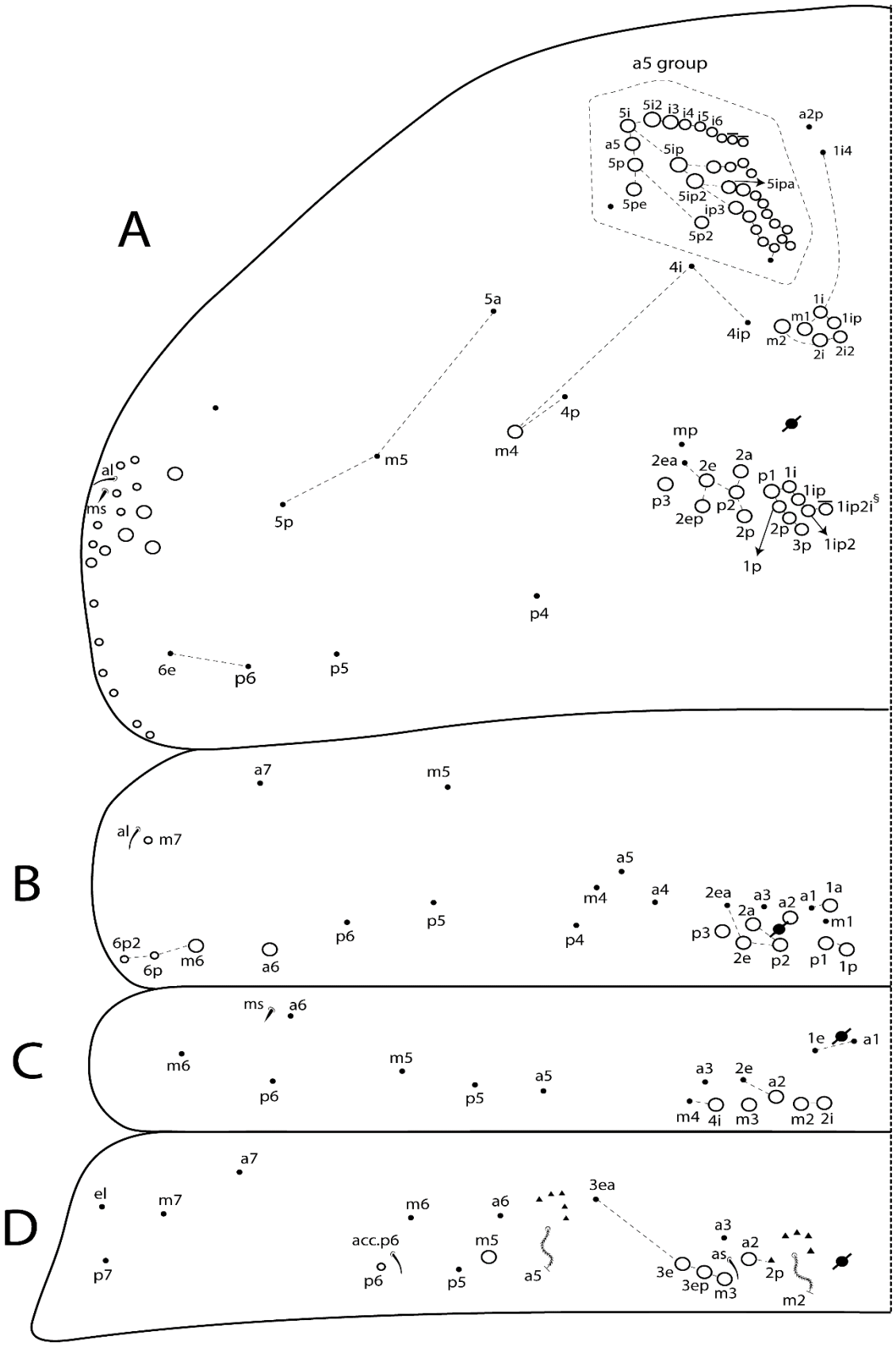

FIGURE 90A–D. *Lepidocyrtinus pulcher* **comb. rev.**: dorsal chaetotaxy; **A**, Th II; **B**, Th III; **C**, Abd I; **D**, Abd II.

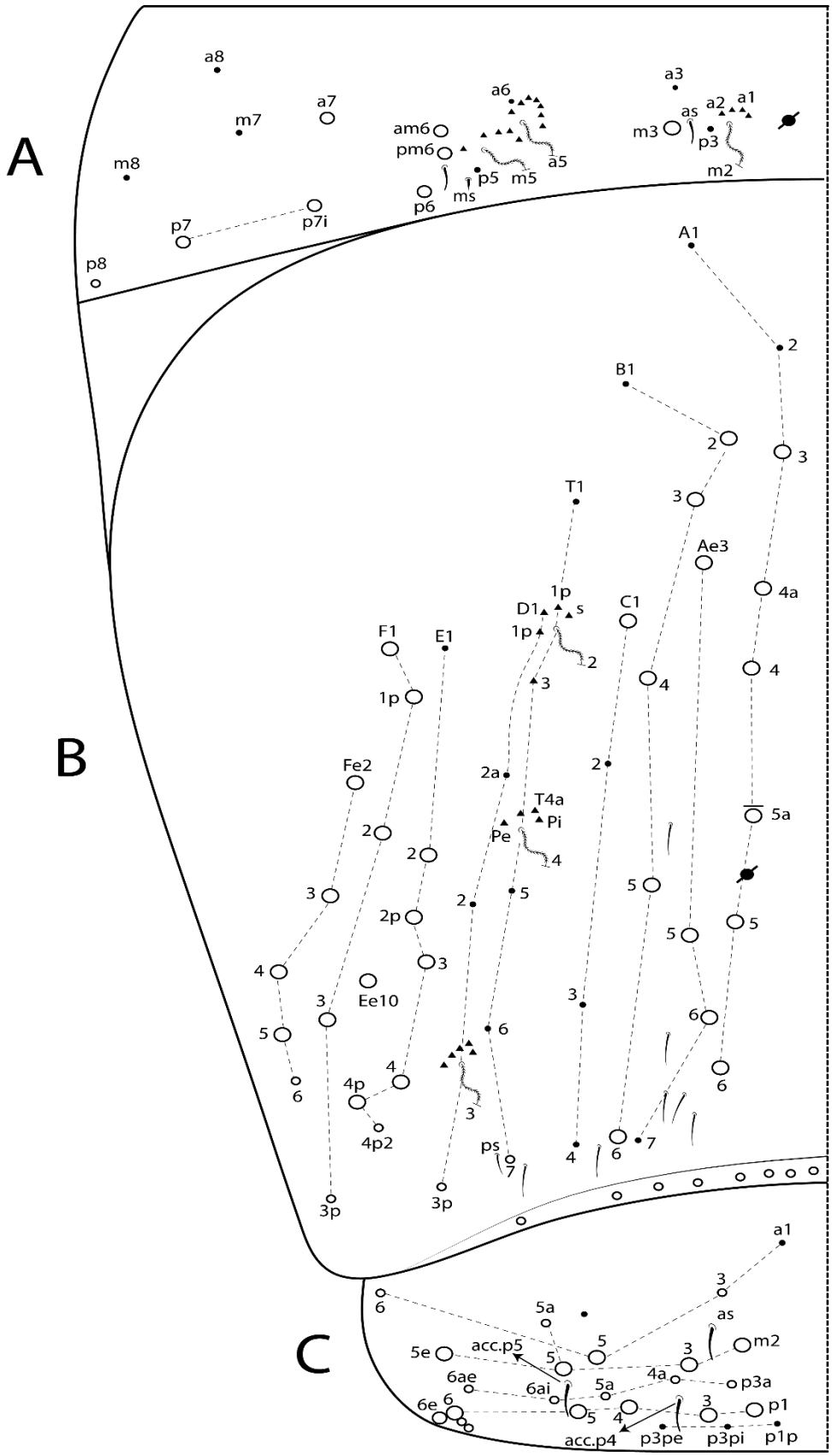

FIGURE 91A–C. *Lepidocyrtinus pulcher* **comb. rev.**: dorsal chaetotaxy; **A**, Abd III, **B**, Abd IV; **C**, Abd V.

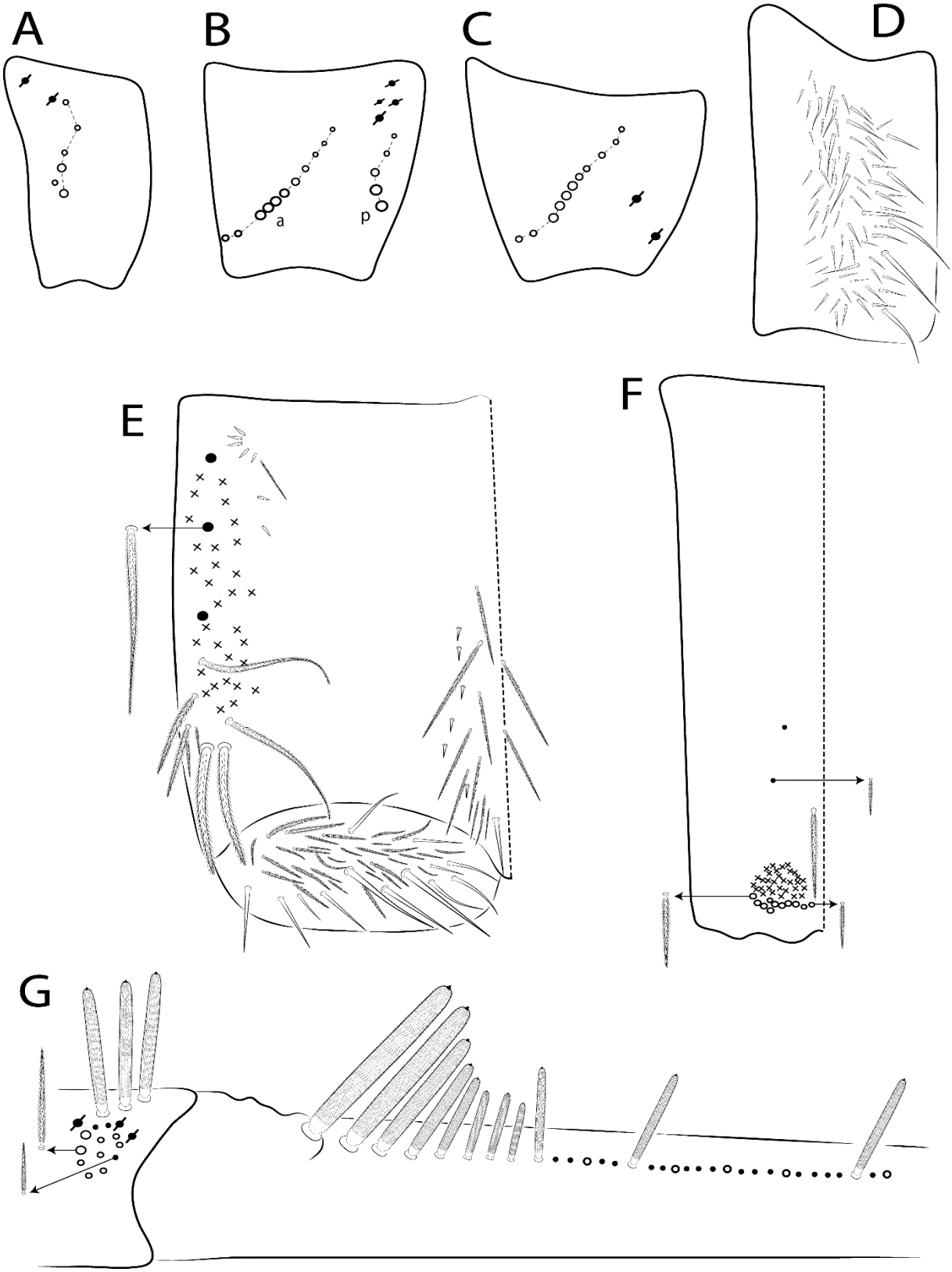

FIGURE 92A–G. *Lepidocyrtinus pulcher* **comb. rev.**: **A**, subcoxa I; **B**, subcoxa II; **C**, subcoxa III (outer side); **D**, trochanteral organ (inner side); **E**, collophore chaetotaxy (lateral view); **F**, manubrium ventral chaetotaxy; **G**, chaetotaxy of the manubrial plate (lateral view).

***Lepidocyrtinus xinguensis* (Arlé, 1959) comb. nov.**

Fig. 136

Ctenocyrtinus prodigus xinguensis Arlé, 1959: 174, figs 155–156, Brazil, Mato Grosso, Alto Xingú, Aldeia Camaiurá (orig. descr.). Mari Mutt & Bellinger 1990: 107 (as subspecies of *S. prodiga*).

Seira xinguensis; Christiansen & Bellinger 2000: 73, fig. 62 (comb.). Bellini & Zeppelini 2008b: 49 (compared). Bellini & Zeppelini 2009a: 269, 271, fig. 4H (cit. and key). Bellini & Zeppelini 2009b: 388 (cat.). Abrantes *et al.* 2010: 10 (cat.). Abrantes *et al.* 2012: 12 (cat.). Cipola *et al.* 2014a: 489 (cit.). Godeiro & Bellini 2014: 132, 149 (cit.). Godeiro & Bellini 2015: 220 (cit.). Bellini *et al.* 2018: 26 (compared).

Typological note. The type material (sample MNRJ/414) of *Ctenocyrtinus xinguensis* deposited at MNRJ was lost (Mendonça, personal communication), and we did not reach specimens from the type locality, Alto Xingú, Mato Grosso (Fig. 136). Consequently, at this moment the specific diagnosis of this species is uncertain, until specimens from the type locality are collected and their morphology is revealed according to the current taxonomy. However, *L. xinguensis* **comb. nov.** is transferred here due to the presence of typical characteristics of *Lepidocyrtinus* as long antennae, Th II strongly projected anteriorly, and ungues outer side with a pair of large laterobasal teeth (Arlé 1959).

***Lepidocyrtinus boy* sp. nov. Cipola & Bellini**

Figs 93–97, 136

Type Material. Holotype female on slide (MNRJ): Brazil, Rio de Janeiro, Teresópolis municipality, National Park of "Serra dos Orgãos", 22°26'55.1"S, 43°00'16.4"W (Fig. 136), Atlantic Forest, 1246 m, i-2015, Malaise trap, RF Monteiro & eq. coll. Paratypes on slides 2 females ans 1 juvenile (MZUSP): Itatiaia municipality, National Park of "Itatiaia", reception of Park, 22°27'17"S, 44°36'35"W (Fig. 136), Atlantic Forest, 762m, 7-14.i.2016, Malaise trap, D Amorim coll.

Diagnosis. Body with one dark strip on Ant II–IV, femur and tibiotarsus III, and dark pigments on head to Th II, and one transverse band on Abd IV posteriorly (Fig. 93); head mac **M1** and **S6** present, **A0** mac or mic; prelabral chaetae ciliate; labial papilla E with lateral process (l.p) apically pointed and reaching the base of apical appendage (Fig. 94D); Th II with 16–23 anterior, 6 median (**m1ip** mac, **m4i**–**4p** mac absent) and 11 posterior mac (**p2ep** mac, **p3** mic); Th III–Abd II with 2–3, 3, 3 central mac respectively; Abd IV with 13 central mac and 11 lateral mac (Figs 95, 96B); ungues apical tooth present; unguiculus with all lamella acuminate; collophore anteriorly with 9 spine-like chaetae and 4 ciliate chaetae apically acuminate, posteriorly with 7–8 spines, smooth chaeta present (Fig. 97E); manubrium ventrally with 2/0 subapical chaetae; manubrial plate with 3 blunt mac apically nipple-like; dens with 10–13 blunt mac apically nipple-like (Figs 97F–G).

Description. Total length (head + trunk) of specimens 2.76–3.31 mm (n=4), holotype 3.31 mm. Specimens pale white with dark pigments on the distal half of the Ant IV that extends in an inner strip until Ant II, head (except dorso-anterior side with irregular unpigmented areas), Th II, Abd IV posteriorly with a transverse band, proximal coxa I, femur III and proximal half of the tibiotarsus III with an outer strip; eyespatches black (Fig. 93). Juveniles with pigments weakly in head and Th II and spot absent on tibiotarsus III. Scales present on Ant I to one quarter proximal of Ant IV, dorsal and ventral head, dorsal thorax and abdomen, legs (except empodia), anterior collophore, dorsal and ventral manubrium and dens ventrally.

Head. Antennae subequal to trunk length (Fig. 93); ratio antennae: trunk = 1: 0.95–1.01 (n=3), holotype 1: 0.96; antennal segments ratio as I: II: III: IV = 1: 1.06–1.09: 1.06–1.14: 2.33–2.60, holotype 1: 1.07: 1.06: 2.33. Ant IV annulated on distal three-fourths, with apical bulb apically bilobed. Ant III sense organ with 2 rods, 3 spiny guard sens, s-blunt sens of different sizes and ciliated chaetae (Fig. 94A). Ant I dorsally with 4 median mac, 1 spine and 3 smooth mic at base (Fig. 94B). Eyes A and B larger, G and H smaller, others subequal, and with 5 'IO' chaetae; head dorsal macrochaetotaxy with 10 **An**, 0–1 **A**, 2 **M**, 2 **S** and 1 **Pa** mac (Fig. 94D). Clypeal formula with 4 (**l1**–**2**), 4 (**fr**), 5 (**pf0**–**2**) ciliate chaetae, **l1**–**2** larger, **l1** apically acuminate, 2 frontal smaller, others subequal (Fig. 94C). Prelabral chaetae ciliate and not bifurcated. Labral **p0** chaeta without median filament. Labral papillae with two inner conical projections, outer papillae absent. Maxillary palp with smooth apical appendage (**a.a.**) and basal chaeta (**b.c.**) weakly ciliate, thicker and 1.09 larger in length than the apical. Labial papilla E with lateral process (l.p.) apically pointed and reaching the base of apical appendage. Basolateral and basomedian labial fields with chaetae **M1**–**2**, **E**, **L1**–**2** ciliate, **r** reduced (as Fig. 82F). Ventral head with about 26 ciliate chaetae, postlabial formula with 4 (**G1**–**4**), 3 (**H2**–**4**), 4 (**J1**–**4**) chaetae, 5 thin posterior chaetae, and 5 larger chaetae, 1 basal chaetae (b.c.) surrounding the cephalic groove (Fig. 94E).

Thorax chaetotaxy (Fig. 95A–B). Th II **a**, **m** and **p** series with 16–23, 6 and 11 mac, respectively; **m4** and **m4i** mac absent. Th III **a**, **m** and **p** series with 0, 1 and 2–3 mac, respectively; **p1p** rarely absent. Ratio Th II: III = 2.63–1.64: 1 (n=3), holotype 2.63: 1.

Abdomen chaetotaxy (Figs 95C–D, 96A–C). Abd I **a**, **m** and **p** series with 0, 3 and 0 mac, respectively. Abd II **a**, **m** and **p** series with 1, 3 and 0 mac, respectively, **m3e** mic. Abd III **a**, **m** and **p** series with 1, 3 and 2 mac, respectively. Abd IV with 13 central mac of **A**–**T** series and 11 lateral mac of **E**–**Fe** series; 4 posterior sens (**ps** type I, others type II) and 8 posterior mes. Abd V **a**, **m** and **p** series with 1, 4 and 5 mac, respectively. Ratio Abd III: IV = 1: 4.01–5.25 (n= 3), holotype 1: 5.25.

Legs. Subcoxa I with 6 chaetae, 2 anterior chaetae and 2 psp; subcoxa II with an anterior row of 10–11 chaetae, posterior row of 2 chaetae and 3 psp; subcoxa III with one row of 13 chaetae and 2 posterior psp (Fig. 97A–C). Trochanteral organ with about 46 spine-like chaetae (Fig. 97D). Tibiotarsus not subdivided, outer side with 5 larger ciliate chaetae and apically acuminate, inner side with 6 mac weakly ciliate. Ungues inner side with 4 teeth, 2 paired basal, 1 unpaired median subequal to basal teeth and 1 small

unpaired apical. Unguiculus with all lamellae acuminate, **pe** lamella serrated and with small proximal tooth, other lamellae smooth; ratio unguis: unguiculus = 1: 0.60. Tibiotarsal smooth chaeta 0.90 smaller than unguiculus and tenent hair 1.06 larger than unguis outer edge.

Collophore. Anterior side with 17 chaetae, 9 proximal spine-like chaetae, 2 normal ciliate chaetae, 4 ciliate chaetae apically acuminate and 2 mac distally; posterior side with 21–24 chaetae, 7–8 spines, 11–13 thin ciliate chaetae widely distributed and 1 smooth chaetae distally; lateral flap with about 39 chaetae, 5 smooth and 34 ciliate (Fig. 97E).

Furcula. Manubrium ventral formula with 0, 0, 2, 2/0 (subapical), 18 (apical) ciliate chaetae of different sizes plus about 12 elongated apical scales per side (Fig. 97F); manubrial plate with 3 blunt mac finely ciliate and apically nipple-like, 8 ciliate chaetae of different sizes and 3 psp. Dens dorsally with one proximal row of 10–13 blunt mac finely ciliate and apically nipple-like, holotype with 10–12 (Fig. 97G).

Etymology. “boy” (in apposition) is the nickname for Dr. Daniell R. R. Fernandes (INPA), who helped providing us specimens of the new species from Rio de Janeiro.

Remarks. *Lepidocyrtinus boy* **sp. nov.** resembles *L. harena* **comb. nov.** and *L. pseudopulcher* **sp. nov.** by reduced dorsal macrochaetotaxy (Figs 94B, 95–96) at least on head (e.g. mac **A3**, **S0**–**2**, **S4** and **S6** absent), Th III with 3 or less central mac and Abd II with 3 central mac (except *L. pseudopulcher* **sp. nov.** with 4 central mac). However, *L. boy* **sp. nov.** differs from theses species by pigments in dark strips on Ant II–IV, femur and tibiotarsus III, and dark pigments on head to Th II, plus one transverse band on Abd IV posteriorly (Fig. 93). In *L. pseudopulcher* **sp. nov.** the pigments are dark violet and appear on head to Th II, Abd IV laterally, Abd V and trochanter to femur III (Fig. 109); in *L. harena* **comb. nov.** the pigments are restricted bands on distal and proximal region on femur and tibiotarsus II–III (Fig. 65B). In head (Fig. 94D), they the new species differs by presence of four mic **A2**, **A5**, **M2** and **S5** (all mac in *L. harena* **comb. nov.**, Fig. 70C; only **A2** mac and **M1** mic in *L. pseudopulcher* **sp. nov.**, Fig. 110D), Ant I with 3 dorsal mac (4 in *L. harena* **comb. nov.**), and labial papilla E with lateral process reaching the base of apical appendage, while in *L. harena* **comb. nov.** it is distant of base and in *L. pseudopulcher* **sp. nov.** exceeds the base (Figs 70B, 110CD).

Lepidocyrtinus boy **sp. nov.** differs also in Th II with 16–23 anterior, 6 median (**m1ip** mac, **m4i**–**4p** mac absent) and 11 posterior mac (**p2ep** mac, **p3** mic), while in the same segment, *L. pseudopulcher* **sp. nov.** has 8–9 anterior, 7 median (**m1ip** and **m4** present, **m4i** and **m4p** mac absent) and 9 posterior mac (**p2ep** mac, **p3** mic), and in *L. harena* **comb. nov.** there are 9 anterior, 6 median (**m4i** present, **m1ip** and **m4**–**4p** mac absent) and 4–5 posterior mac (**p2ep** and **p3** mic). In addiction, *L. boy* **sp. nov.** has 3 central mac on Abd I, while *L. pseudopulcher* **sp. nov.** and *L. harena* **comb. nov.** have 6 and 2 central mac, respectively (Figs 71A, C, 95A, C, 111A, C).

Other differences among the new species, *L. harena* **comb. nov.** and *L. pseudopulcher* **sp. nov.** are: unguiculus I–II with **ai** lamella acuminate (truncate in *L. harena* **comb. nov.**, Fig. 73E), collophore anteriorly with 9 spine-like chaetae and posteriorly with 7–8 spines (5 and 4 respectively in *L. pseudopulcher* **sp. nov.**, 7 and 5 respectively in *L. harena* **comb. nov.**), manubrium ventrally with 2/0 subapical chaetae (2/4 in *L. pseudopulcher* **sp. nov.** and *L. harena* **comb. nov.**) and dens with 10–13 blunt mac (absent in *L. pseudopulcher* **sp. nov.**, 16–19 in *L. harena* **comb. nov.**).

FIGURE 93. *Lepidocyrtinus boy* **sp. nov.**, habitus of specimens fixed in alcohol (lateral view). Scale bar: 1 mm.

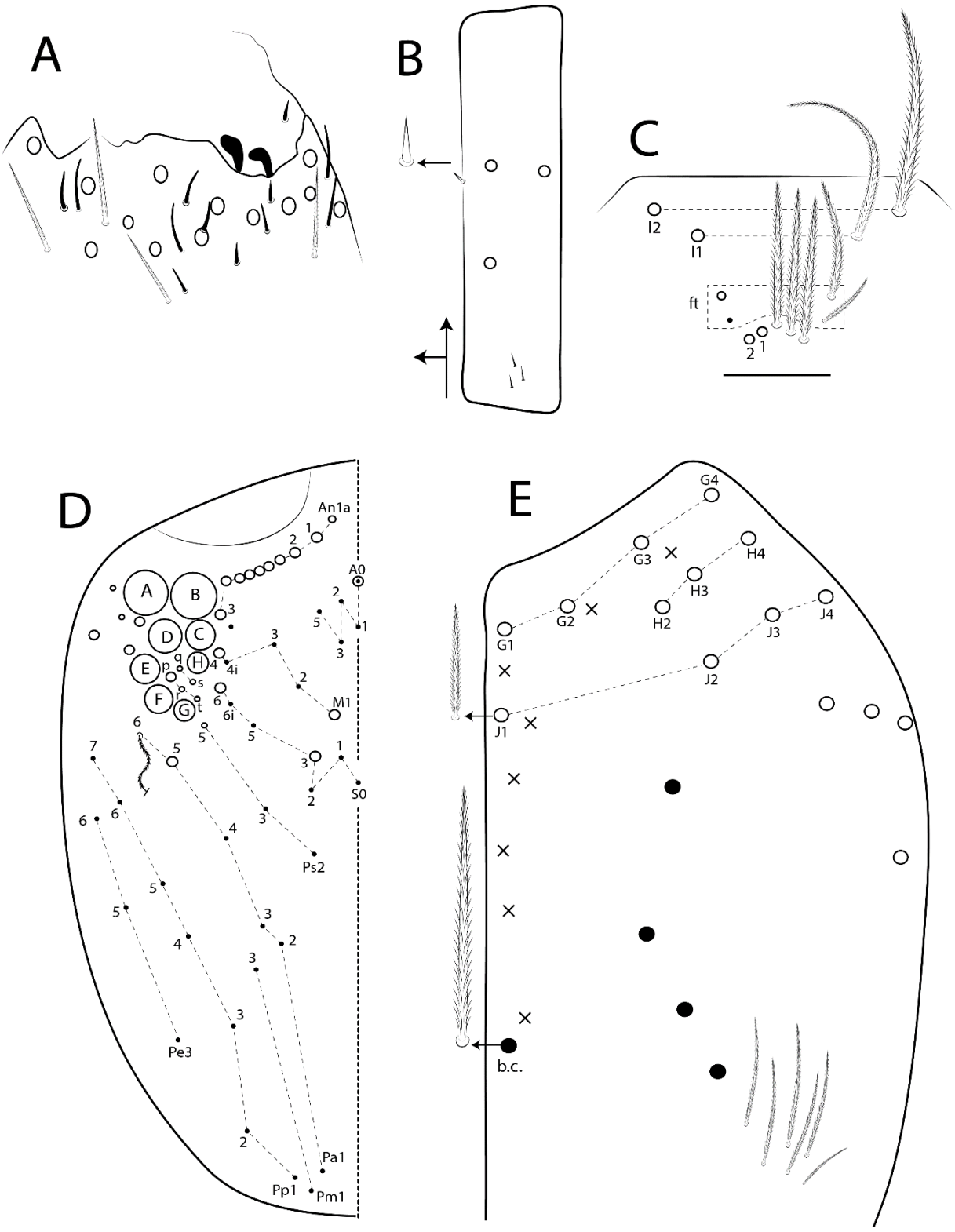

FIGURE 94A–E. *Lepidocyrtinus boy* **sp. nov.**: head; **A**, Ant I left chaetotaxy (dorsal side); **B**, Ant III apical organ (lateral side); **C**, chaetotaxy of the clypeus; **D**, dorsal chaetotaxy (left side); **E**, postlabial and cephalic groove chaetotaxy (right side).

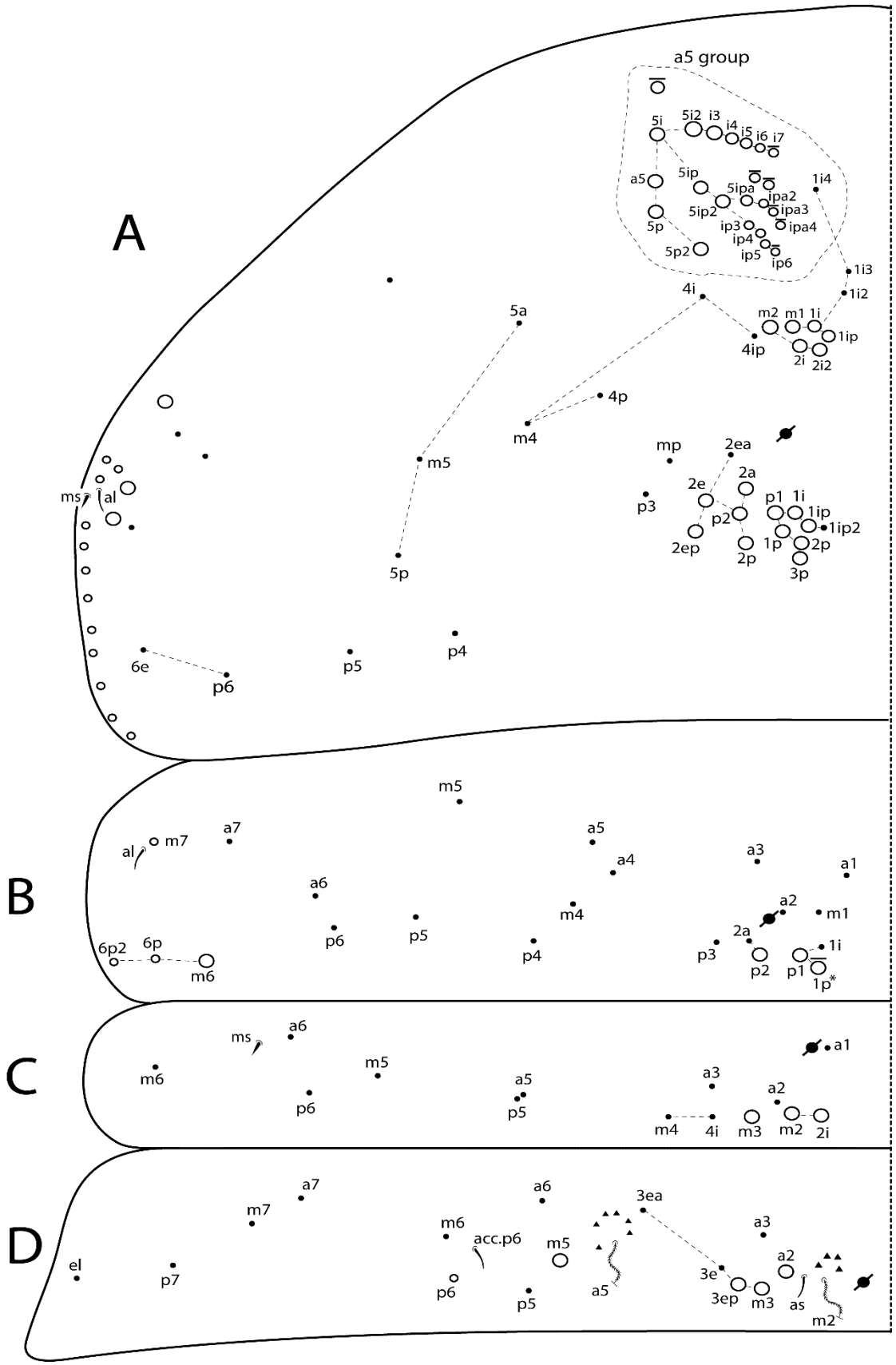

FIGURE 95A–D. *Lepidocyrtinus boy* **sp. nov.**: dorsal chaetotaxy; **A**, Th II; **B**, Th III; **C**, Abd I; **D**, Abd II.

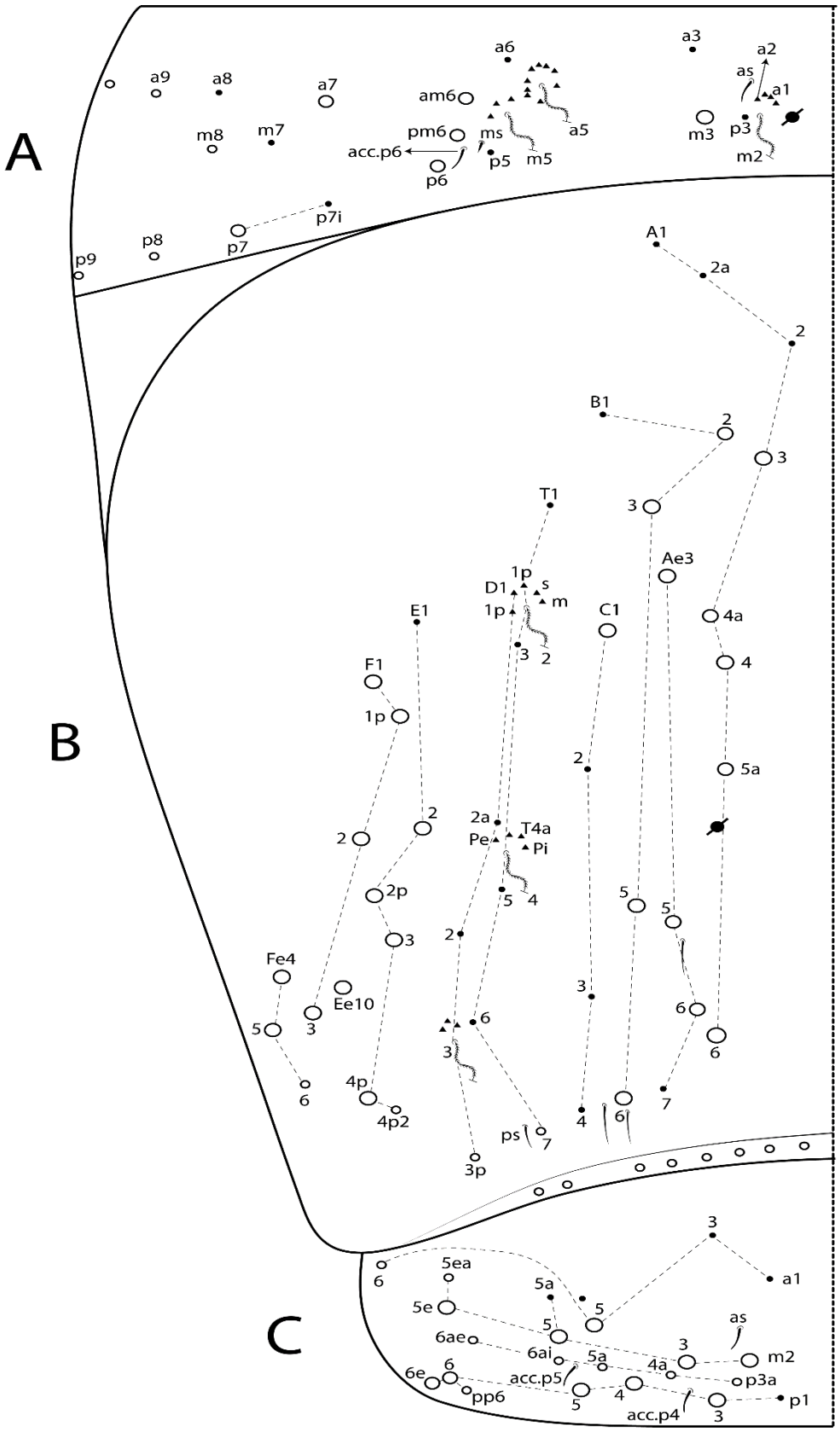

FIGURE 96A–C. *Lepidocyrtinus boy* **sp. nov.**: dorsal chaetotaxy; **A**, Abd III, **B**, Abd IV; **C**, Abd V.

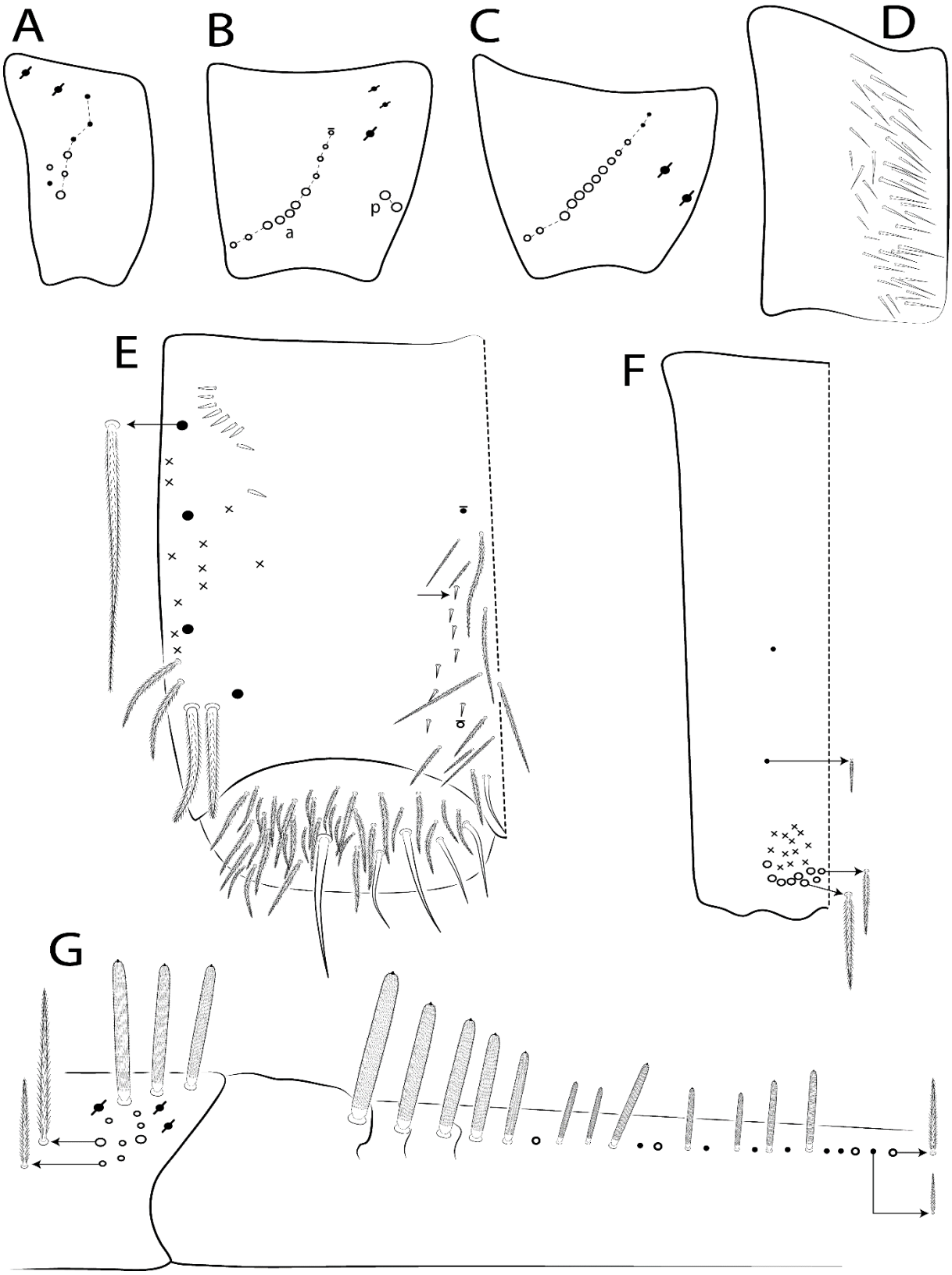

FIGURE 97A–G. *Lepidocyrtinus boy* **sp. nov.**: **A**, subcoxa I; **B**, subcoxa II; **C**, subcoxa III (outer side); **D**, trochanteral organ (inner side); **E**, collophore chaetotaxy (lateral view), arrow posteriorly indicates reduced spines present or absent; **F**, manubrium ventral chaetotaxy; **G**, chaetotaxy of the manubrial plate and proximal dens (lateral view).

***Lepidocyrtinus caeruleus* sp. nov. Cipola & Bellini**

Figs 98–102, 136

Type Material. Holotype female on slide (MZUSP): Brazil, Minas Gerais, Cabo Verde municipality, farm of "Cata", 21°27'11"S, 46°20'52"W (Fig. 136), Atlantic Forest, 906 m, 17.ii-13.v.2014, Malaise trap, DS Amorim coll. Paratypes on slides (MZUSP): 3 females, 1 juvenile and 2 specimens in alcohol, same data as holotype. Paratypes on slides (068/INPA): 1 female and 3 specimens in alcohol, same data as holotype, except 01.x.2012.

Diagnosis. Body with blue to violet dark pigments on Ant, at least trunk posteriorly and legs (Fig. 98A); head mac **A0**, **A2**–**3**, **A5**, **M1**–**2**, **S0**–**6** and **Pp5** present; prelabral chaetae ciliate; labial papilla E with lateral process (l.p.) apically pointed and reaching the base of apical appendage (Figs 99C–D); Th II with 39–62 anterior, 9 median (**m1ip**, **m4i**–**4p** present) and 13–14 posterior mac (**p2ep** and **p3** mac); Th III–Abd II with 11, 6, 4 central mac respectively; Abd IV with 17 central mac and 14 lateral mac (Figs 100, 101B); ungues apical tooth present; unguiculus with all lamella acuminate; collophore anteriorly with 6 spine-like chaetae and 6 ciliate chaetae apically acuminate, posteriorly with 6 spines, smooth chaeta present (Figs. 102E); manubrium ventrally with 2/4 subapical chaetae; manubrial plate with 5–6 blunt mac apically nipple-like; dens with 1 blunt mac apically nipple-like (Figs 103F–G).

Description. Total length (head + trunk) of specimens 3.08–3.75 mm (n=4), holotype 3.17 mm. Specimens pale white with blue to violet dark pigments on proximal one third of Ant IV, Ant I–II, lateral head with irregular speckles, Th II to Abd I laterally, Abd II to Abd V (except irregular unpigmented areas), collophore, legs (except tibiotarsus I–III distally), and proximal manubrium; eyespatches black (Fig. 98A). Juveniles pale white with dark blue pigments on Ant IV, Th II laterally, posterior half of Abd II to III, Abd IV posteriorly and all femur III (Fig. 98B). Scales present on Ant I to proximal one third of Ant IV, dorsal and ventral head, dorsal thorax and abdomen, legs (except empodia), anterior collophore, dorsal and ventral manubrium and dens ventrally.

Head. Antennae smaller than trunk length (Fig. 98A); ratio antennae: trunk = 1: 1.19–1.59 (n=3), holotype 1: 1.19; antennal segments ratio as I: II: III: IV = 1: 1.21–1.53:

1.27–1.30: 1.99–2.94, holotype 1: 1.21: 1.30: 2.73. Ant IV annulated on distal three fourth, with apical bulb apically bilobed. Ant III sense organ with 2 elongated, 3 spiny guard sens, s-blunt sens of different sizes and ciliated chaetae. Ant I dorsally with 2 median mac and 3 smooth mic at base, apparently without spines (Fig. 99A). Eyes B, C and E larger, G and H smaller, others subequal, and with 6 'IO' chaetae; head dorsal macrochaetotaxy with 11–12 **An**, 4 **A**, 3 **M**, 8 **S**, 1 **Pa** and 1 **Pp** mac (Fig. 99D). Clypeal formula with 4 (**l1**–**2**), 5 (**fr**), 3 (**pf0**–**1**) ciliate chaetae, **l1**–**2** larger and apically acuminate, 1 frontal smaller, others subequal. Prelabral chaetae ciliate, inner chaetae normal or equally bifurcate (Fig. 99B). Labral **p0** chaeta with median filament. Labral papillae with two small inner conical projections, outer papillae absent. Maxillary palp with smooth apical appendage (**a.a.**) and basal chaeta (**b.c.**) weakly ciliate, thicker and 1.17 larger in length than the apical. Labial papilla E with lateral process (l.p.) apically pointed and reaching the base of apical appendage (Fig. 99C). Basolateral and basomedian labial fields with chaetae **M1**–**2**, **E**, **L1**–**2** ciliate, **r** reduced (as Fig. 82F). Ventral head with about 16 ciliate chaetae, postlabial formula with 4 (**G1**–**4**), 3 (**H2**–**4**), 4 (**J1**–**4**) chaetae and 2 larger chaetae, 1 basal chaetae (b.c.) surrounding the cephalic groove (Fig. 99E).

Thorax chaetotaxy (Fig. 100A–B). Th II **a**, **m** and **p** series with 39–62 (54 in holotype), 9 and 13–14 mac, respectively. Th III **a**, **m** and **p** series with 5, 1 and 6 mac, respectively. Ratio Th II: III = 2.35–1.90: 1 (n=4), holotype 2.33: 1.

Abdomen chaetotaxy (Figs 100C–D, 101A–C). Abd I **a**, **m** and **p** series with 1, 5 and 0 mac, respectively. Abd II **a**, **m** and **p** series with 1, 4 and 0 mac, respectively. Abd III **a**, **m** and **p** series with 0, 3 and 1 mac, respectively. Abd IV with 17 central mac of **A**–**T** series and 14 lateral mac of **E**–**Fe** series; 7 posterior sens (**ps** type I, others type II) and 8 posterior mes. Abd V **a**, **m** and **p** series with 1, 4 and 6 mac, respectively. Ratio Abd III: IV = 1: 5.08–5.95 (n= 4), holotype 1: 5.95.

Legs. Subcoxa I with 7 chaetae, 4 posterior and 4 anterior chaetae and 2 psp; subcoxa II with an anterior row of 17 chaetae, posterior row of 9 chaetae and 4 psp; subcoxa III with one row of 16 chaetae, 2 anterior chaetae and 2 posterior psp (Fig. 102A–C). Trochanteral organ with about 56 spine-like chaetae (Fig. 102D). Tibiotarsus III normal or subdivided on two third or not, outer side with 3 proximal larger ciliate chaetae and apically acuminate, inner side with 7 mac weakly ciliate. Ungues inner side with 4 teeth, 2 paired basal, 1 unpaired median subequal to basal teeth and 1 minute unpaired apical. Unguiculus with all lamellae acuminate, **pe** lamella serrated and with small proximal tooth,

other lamellae smooth; ratio unguis: unguiculus = 1: 0.57. Tibiotarsal smooth chaeta 1.22 larger than unguiculus and tenent hair 0.80 smaller than unguis outer edge.

Collophore. Anterior side with 16 chaetae, 6 proximal spine-like chaetae, 1 thin and 1 normal ciliate chaeta, 6 ciliate chaetae apically acuminate and 2 mac distally; posterior side with 18 chaetae, 6 spines, 11 thin ciliate chaetae widely distributed and 1 smooth chaetae distally; lateral flap with about 67 chaetae, 11 smooth and 56 ciliate (Fig. 102E).

Furcula. Manubrium ventral formula with 0, 2, 2, 2/4 (subapical), 18 (apical) ciliate chaetae of different sizes plus about 25 elongated apical scales per side (Fig. 102F); manubrial plate with 5–6 blunt mac finely ciliate and apically nipple-like, 15 ciliate chaetae of different sizes and 3 psp. Dens dorsally with 1 proximal blunt mac finely ciliate and apically nipple-like (Fig. 102G).

Etymology. Refers to the blue color predominant over the body of the new species (from Latin: *caeruleo* – bluish).

Remarks. *Lepidocyrtinus caeruleus* **sp. nov.** resembles *L. monteiroi* **sp. nov.** by head with **A3**, **A5**, **M1**–**2**, **S4**–**6i** and **Pp5** mac, Th II with at least 39 anterior mac and mac **m4i**, **m4p** and **p3** present, Th III with 11 central mac, Abd II–Abd IV 4, 3, 17 central mac respectively, manubrial plate with at least 4 blunt mac and reduction of blunt mac on dens (Figs 99D, 100–102, 115D, 116–118). However, these species differ from each other by color pattern: *L. caeruleus* **sp. nov.** is pigmented on Abd II–V and legs, while *L. monteiroi* **sp. nov.** has one transverse band of pigment on Th II–Abd III and one median spot on Abd IV posteriorly (Figs. 98A, 114). In dorsal chaetotaxy they differ by Abd I with 6 mac (5 in *L. monteiroi* **sp. nov.**), Abd III with 3 lateral mac (6 in *L. monteiroi* **sp. nov.**), and Abd IV posteriorly with 8 sens and 8 mes (4 and 10 respectively in *L. monteiroi* **sp. nov.**). Other characteristics that differ are: the collophore anteriorly with 6 ciliate chaetae apically acuminate (4 in *L. monteiroi* **sp. nov.**), posteriorly with 6 spines (7 in *L. monteiroi* **sp. nov.**), and lateral flap with 11 smooth (7 smooth in *L. monteiroi* **sp. nov.**). Finally, in *L. caeruleus* **sp. nov.** there are 6–7 blunt mac on manubrial plate, while in *L. monteiroi* **sp. nov.** there are only 4 blunt mac.

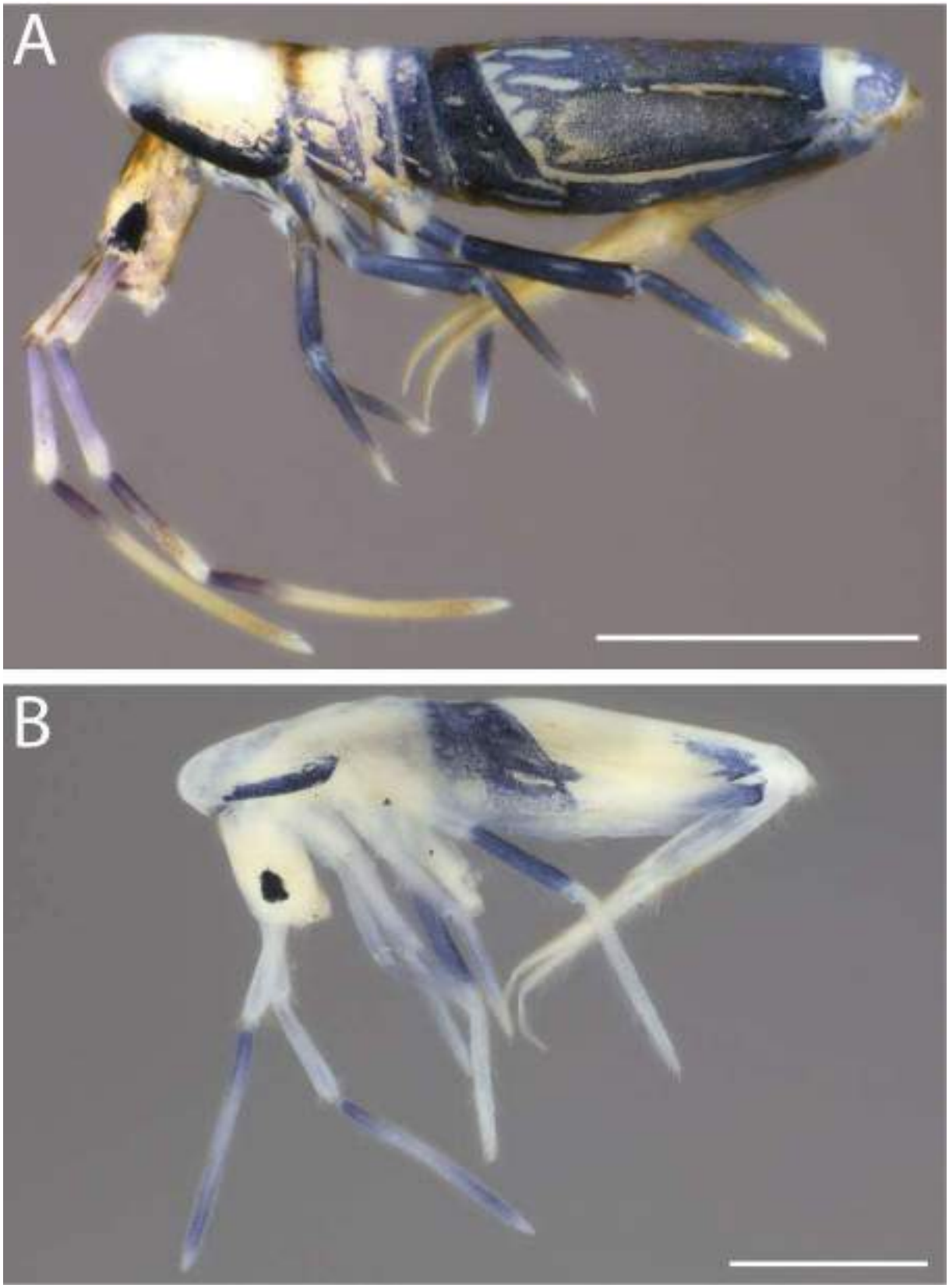

FIGURE 98A–B. *Lepidocyrtinus caeruleus* **sp. nov.**, habitus of specimens fixed in alcohol (lateral view); **A**, adult; **B**, immature. Scale bar: 0.5 mm.

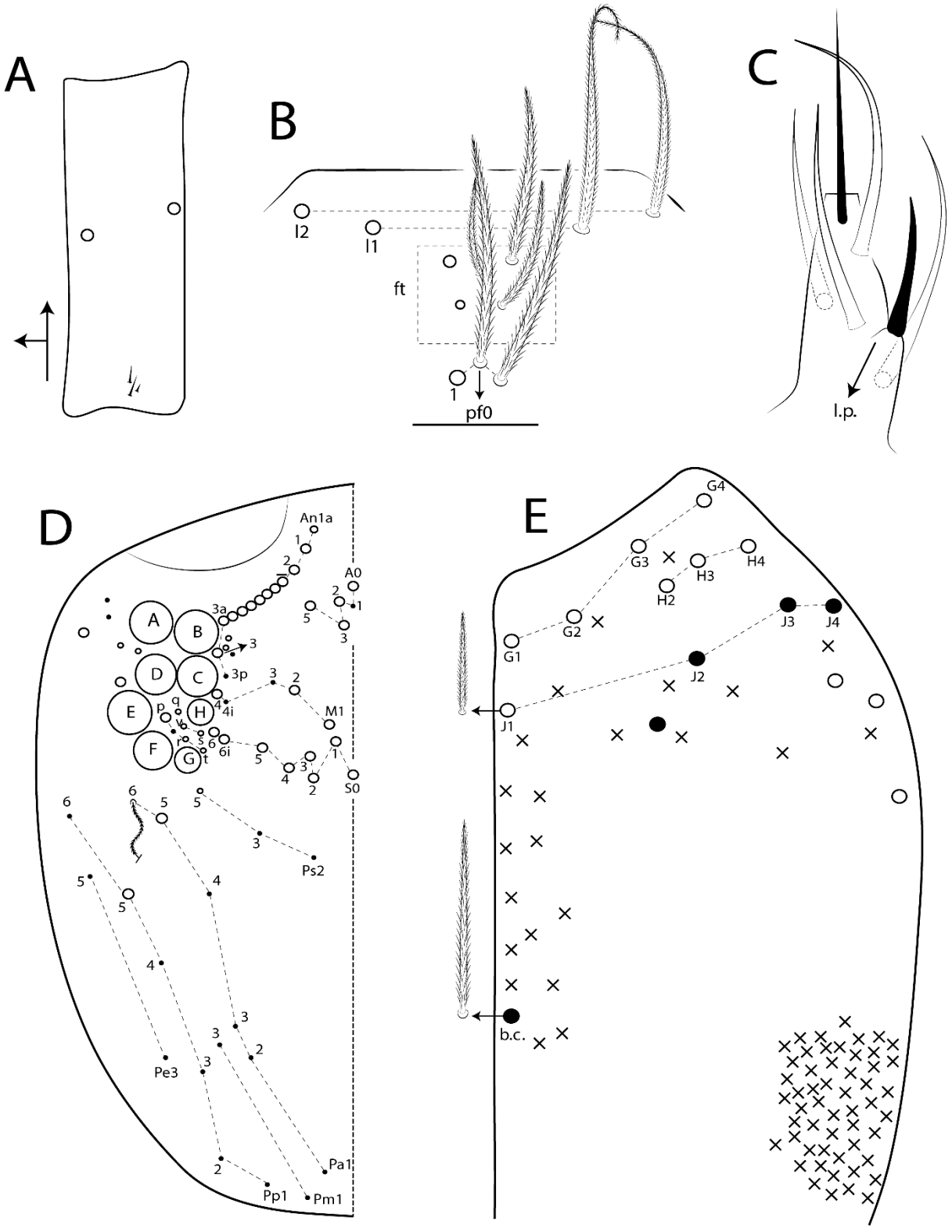

FIGURE 99A–E. *Lepidocyrtinus caeruleus* **sp. nov.**: head; **A**, Ant I left chaetotaxy (dorsal side); **B**, chaetotaxy of the clypeus; **C**, labial papillae E (right side), arrow indicates lateral process (**l.p.**); **D**, dorsal chaetotaxy (left side); **E**, postlabial and cephalic groove chaetotaxy (right side).

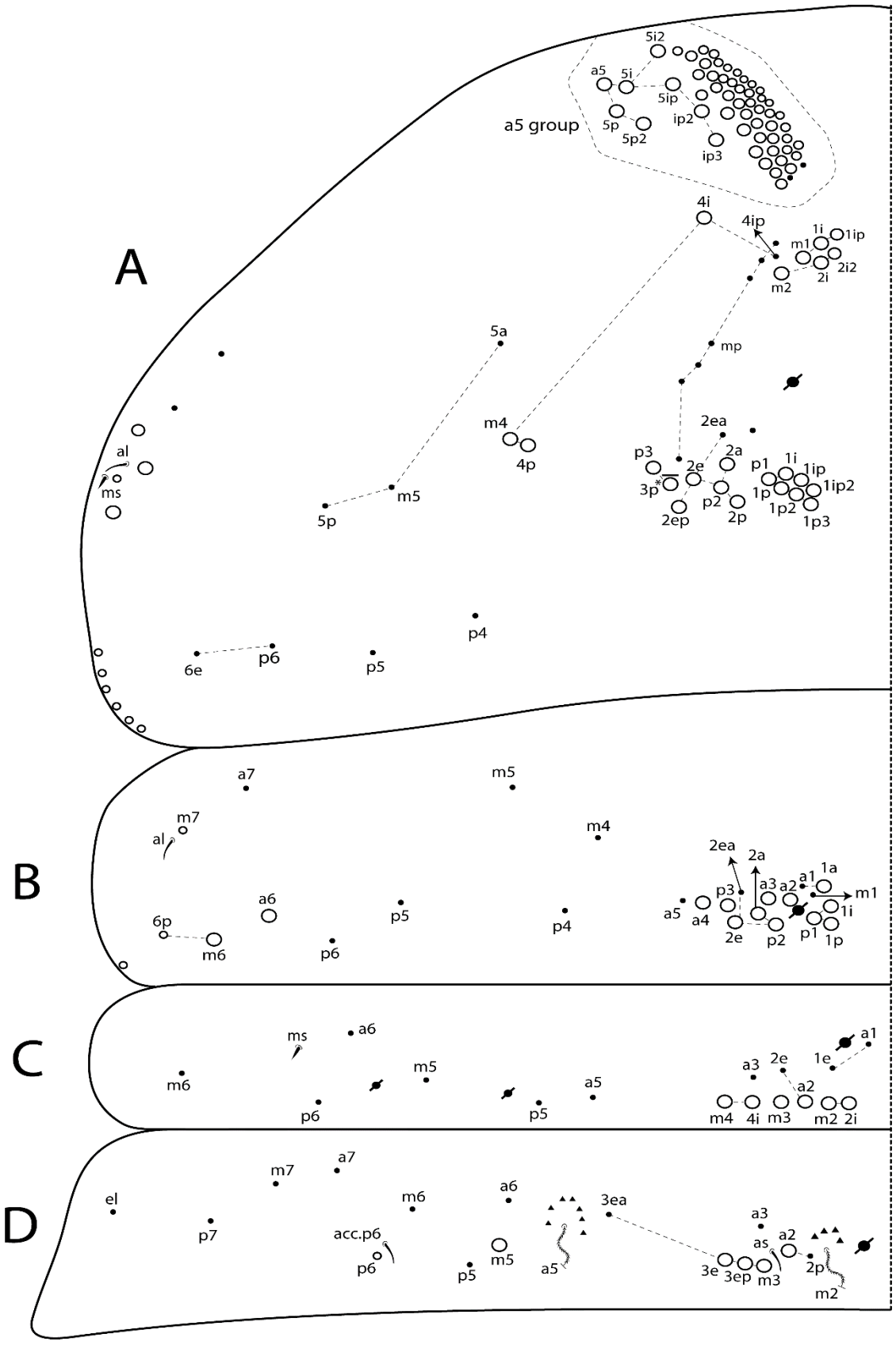

FIGURE 100A–D. *Lepidocyrtinus caeruleus* **sp. nov.**: dorsal chaetotaxy; **A**, Th II; **B**, Th III; **C**, Abd I; **D**, Abd II.

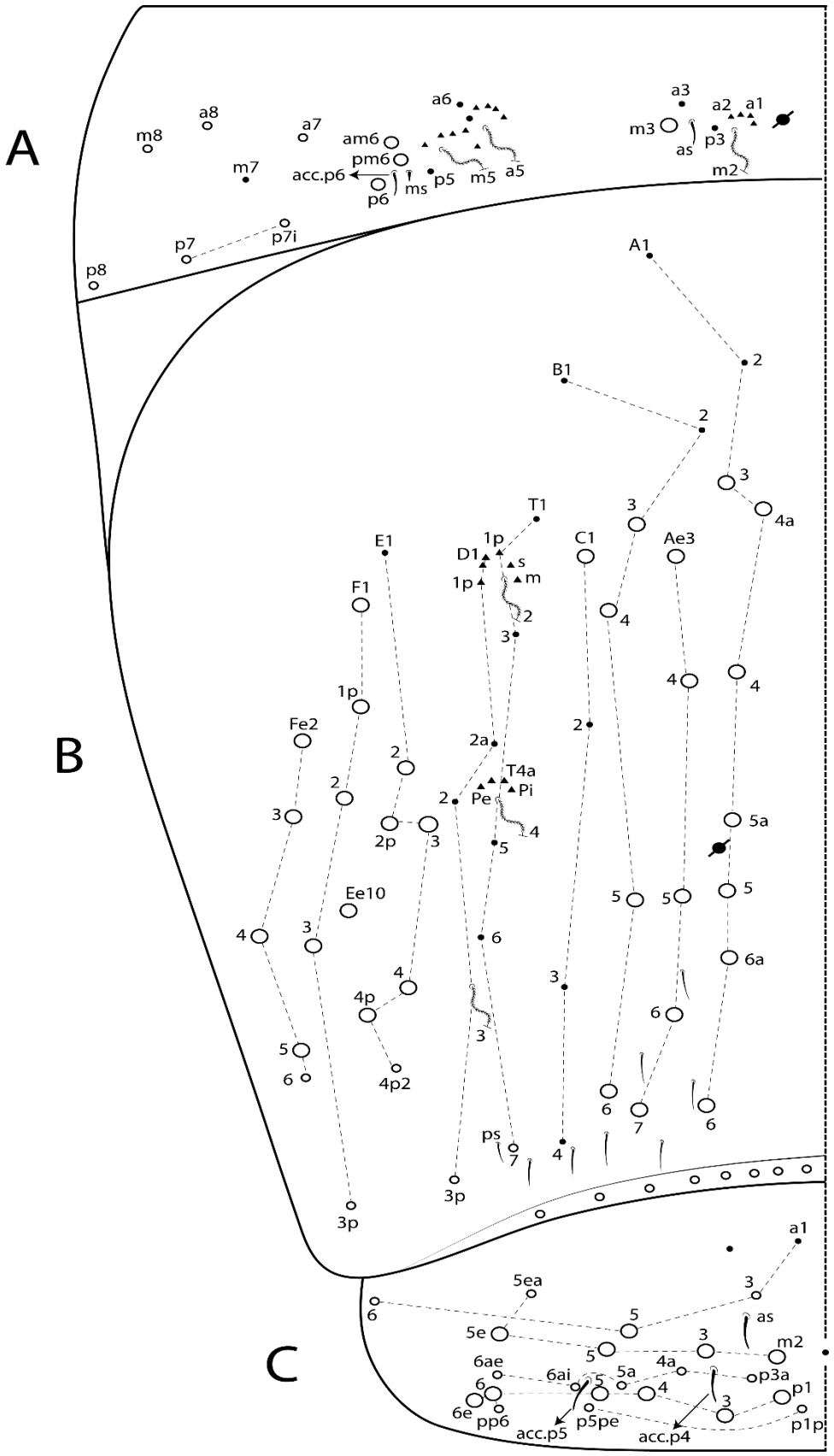

FIGURE 101A–C. *Lepidocyrtinus caeruleus* **sp. nov.**: dorsal chaetotaxy; **A**, Abd III, **B**, Abd IV; **C**, Abd V.

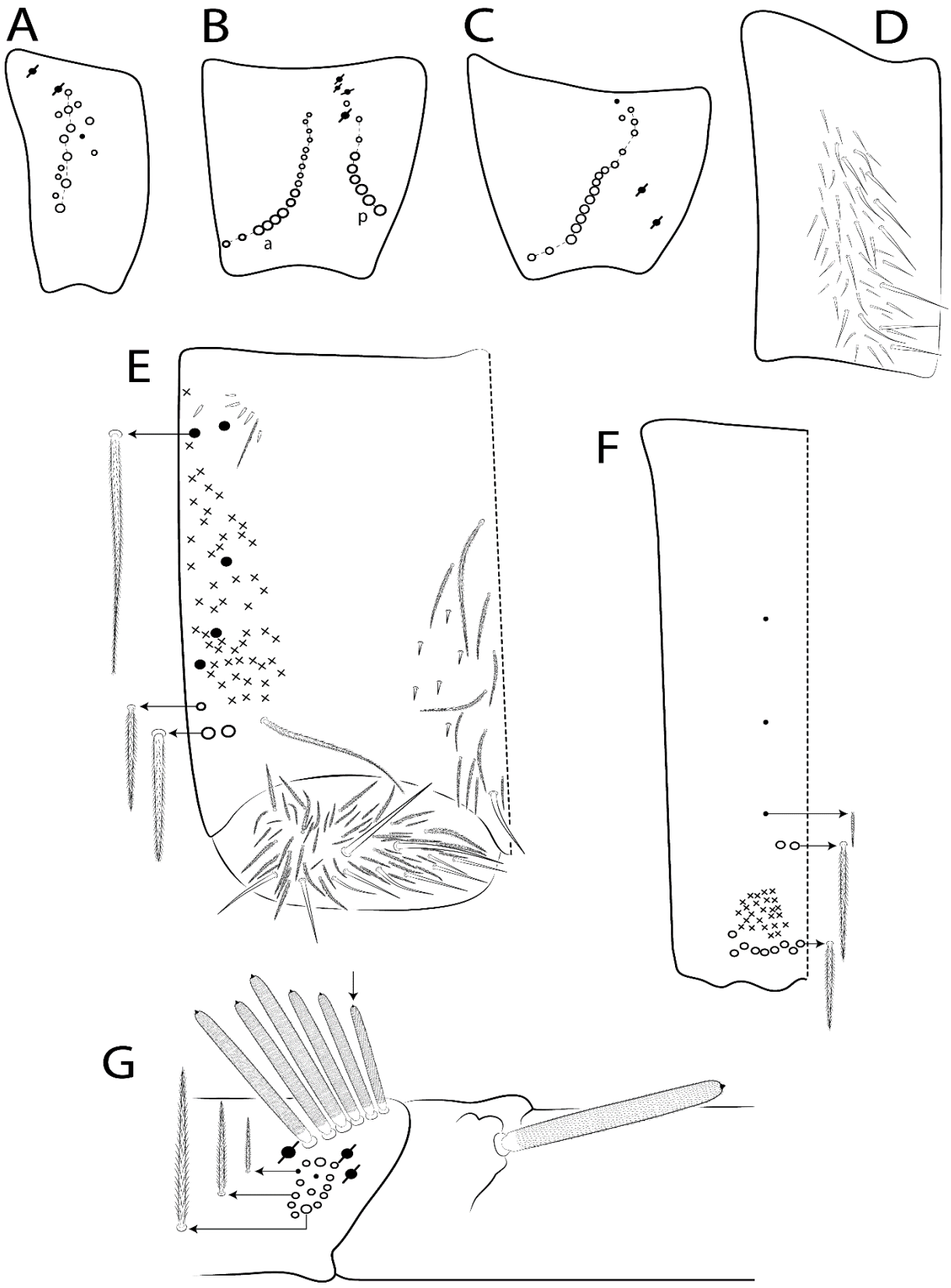

FIGURE 102A–G. *Lepidocyrtinus caeruleus* **sp. nov.**: **A**, subcoxa I; **B**, subcoxa II; **C**, subcoxa III (outer side); **D**, trochanteral organ (inner side); **E**, collophore chaetotaxy (lateral view); **F**, manubrium ventral chaetotaxy; **G**, chaetotaxy of the manubrial plate and proximal dens (lateral view), arrow indicates blunt chaetae present or absent.

***Lepidocyrtinus chavarii* sp. nov. Cipola & Bellini**

Figs 103–108, 138

Type Material. Holotype female on slide (069/INPA): Brazil, São Paulo, São Paulo municipality, woods of "Instituto Butantan", 23°33'59"S, 46°43'15"W (Fig. 138), urban Atlantic Forest, 779 m, x.2010-iv.2011, Pitfall trap in tree trunk, JL Chavari coll. Paratypes on slides (069A-I/INPA): 8 females and 1 juvenile and 25 specimens in alcohol, same data as holotype.

Additional material: 1 male and 1 female in slides (CC/UFRN): Brazil, Santa Catarina, Brusque municipality, woods, 27°05'22.4"S, 48°55'03.1"W (Fig. 138), urban Atlantic Forest, 49 m, 13-19.xi.2016, Pitfall trap, G Kohler coll.

Diagnosis. Body with dark blue band Th III to Abd I and one spots on femur III distally (Fig. 103); head mac **A0**, **A2**–**3**, **A5**, **M1**–**2**, **S0**–**6** present; prelabral chaetae ciliate; labial papilla E with lateral process (l.p.) apically pointed and not reaching the base of apical appendage (Figs 104C–D); Th II with 16–23 anterior, 7 median (**m1ip** and **m4** present, **m4i** and **m4p** mac absent) and 12–14 posterior mac (**p2ep** and **p3** mac); Th III–Abd II with 7–8, 3–5, 4 central mac respectively, Abd IV with 14–16 central mac and 13 lateral mac (Figs 105, 106B); ungues apical tooth absent; unguiculus with all lamella acuminate (107E); collophore anteriorly with 7 spine-like chaetae and 4 ciliate chaetae apically acuminate, posteriorly with 8 spines, smooth chaeta absent (Fig. 108A); manubrium ventrally with 2/2 subapical chaetae; manubrial plate with 3–4 blunt mac apically nipple-like; dens with 14–18 blunt mac apically nipple-like (Figs 108B–C).

Description. Total length (head + trunk) of specimens 2.58–3.89 mm (n=4), holotype 2.98 mm. Specimens pale white with dark blue pigments on distal half of Ant IV, Ant III–IV proximal, Th III to Abd I and sometimes on Abd II anteriorly and femur III distally; eyespatches black (Fig. 103). Scales present on Ant I to proximal one quarter of Ant IV, dorsal and ventral head, dorsal thorax and abdomen, legs (except empodia), anterior and posterior collophore, dorsal and ventral manubrium and dens ventrally.

Head. Antennae subequal than trunk length (Fig. 103); ratio antennae: trunk = 1: 0.89–1.05 (n=2), holotype 1: 0.89; antennal segments ratio as I: II: III: IV = 1: 1.13–1.16:

1.09: 1.90–1.97, holotype 1: 1.16: 1.09: 1.90. Ant IV annulated on distal two-third, with apical bulb apically bilobed. Ant III sense organ with 2 club-shaped, 3 spiny guard sens, s-blunt sens of different sizes and ciliated chaetae. Ant I dorsally with 4 median mac, 2 spines and 3 smooth mic at base. Eyes A and B larger, G and H smaller, others subequal, and with 5 'IO' chaetae; head dorsal macrochaetotaxy with 11 **An**, 4 **A**, 3 **M**, 8 **S** and 1 **Pa** mac (Fig. 104D). Clypeal formula with 4 (**l1**–**2**), 10 (**fr**), 7 (**pf0**–3) ciliate chaetae, **l1**–**2** larger, **l1** apically acuminate, 4 frontal smaller, others subequal (Fig. 104A). Prelabral chaetae ciliate, inner chaetae equally or unequal bifurcate, outer chaetae normal or equally or unequal bifurcate. Labral **p0** chaeta sometimes with median filament. Labral papillae weakly pointed, outer papillae smaller (Fig. 104B). Maxillary palp with smooth apical appendage (**a.a.**) and basal chaeta (**b.c.**) weakly ciliate, thicker and 1.26 larger in length than the apical. Labial papilla E with lateral process (l.p.) apically pointed and not reaching the base of apical appendage (Fig. 104C). Basolateral and basomedian labial fields with chaetae **M1**–**2**, **E**, **L1**–**2** ciliate, **r** reduced (as Fig. 82F). Ventral head with about 29 ciliate chaetae, postlabial formula with 4 (**G1**–**4**), 3 (**H2**–**4**), 4 (**J1**–**4**) chaetae, 14 thin posterior chaetae, and 1 larger basal chaetae (b.c.) surrounding the cephalic groove (Fig. 104E).

Thorax chaetotaxy (Fig. 105A–B). Th II **a**, **m** and **p** series with 16–23, 7 and 12–14 mac, respectively. Th III **a**, **m** and **p** series with 3, 1 and 5–6 mac, respectively. Ratio Th II: III = 2.05–1.58: 1 (n=4), holotype 1.60: 1.

Abdomen chaetotaxy (Figs 105C–D, 106A–C). Abd I **a**, **m** and **p** series with 0–1, 3–4 and 0 mac, respectively. Abd II **a**, **m** and **p** series with 1, 4 and 0 mac, respectively. Abd III **a**, **m** and **p** series with 1, 3 and 1 mac, respectively. Abd IV with 14–16 central mac of **A**–**T** series and 13 lateral mac of **E**–**Fe** series; 11 posterior sens (**ps** type I, others type II) and 11 posterior mes. Abd V **a**, **m** and **p** series with 1, 4 and 5 mac, respectively. Ratio Abd III: IV = 1: 3.25–5.08 (n= 4), holotype 1: 3.25.

Legs. Subcoxa I with 6–7 chaetae, 1 anterior chaetae and 2 psp; subcoxa II with an anterior row of 14 chaetae, posterior row of 4 chaetae, 1 anterior chaeta and 5 psp; subcoxa III with one row of 13 chaetae, 2 anterior chaetae and 2 posterior psp (Fig. 107A–C). Trochanteral organ with about 80 spine-like chaetae (Fig. 107D). Tibiotarsus III rarely subdivided on distal two third, outer side with 4 proximal larger ciliate chaetae and apically acuminate, inner side with 8 mac weakly ciliate. Ungues inner side with 3 teeth, 2 paired basal and 1 unpaired median larger than basal teeth, apical tooth absent. Unguiculus with all lamellae acuminate, **pe** lamella serrated and with small proximal tooth, other lamellae

smooth; ratio unguis: unguiculus = 1: 0.66. Tibiotarsal smooth chaeta 1.42 larger than unguiculus and tenent hair 0.92 smaller than unguis outer edge (Fig. 107E).

Collophore. Anterior side with 16–19 chaetae, 7 proximal spine-like chaetae, 1 thin and 3–5 normal ciliate chaeta, 4 ciliate chaetae apically acuminate and 2 mac distally; posterior side with 16–17 chaetae, 8 spines and 8–9 ciliate chaetae widely distributed (3–4 not thin), smooth chaeta absent; lateral flap with about 48 chaetae, 6 smooth and 42 ciliate (Fig. 108A).

Furcula. Manubrium ventral formula with 0, 2, 2, 2/2 (subapical), 20-24 (apical) ciliate chaetae of different sizes plus about 27 elongated apical scales per side (108B); manubrial plate with 3–4 blunt mac finely ciliate and apically nipple-like, 14 ciliate chaetae of different sizes and 3 psp. Dens dorsally with one proximal row of 14–18 blunt mac finely ciliate and apically nipple-like, holotype with 17–18 (Fig. 108C).

Etymology. It is named after Msc. João Lucas Chavari (Instituto Butantan) collector of the new species.

Remarks. *Lepidocyrtinus chavarii* **sp. nov.** has morphological characteristics (Figs 103–108), including dorsal chaetotaxy of head (mac **A0**, **A2**–**3**, **A5**, **M1**–**2**, **S0**–**6** present), Abd I (with at least 4 central mac) and Abd II (4 central mac), similar to other Brazilian species, such as *L. monteiroi* **sp. nov.** (Figs 114–118) and *L. nigrans* **comb. nov.** (Figs 74–77). However, *L. chavarii* **sp. nov.** differ from these species by head mac **Pp5** absent (present in *L. monteiroi* **sp. nov.**), Th II without numerous anterior mac (present in *L. monteiroi* **sp. nov.**) and **m4i** and **m4p** mic (mac in *L. monteiroi* **sp. nov.**). Other differ is body with one transverse blue spot on Th III–Abd I (up to Abd III in *L. monteiroi* **sp. nov.**, absent in *L. nigrans* **comb. nov.**), outer papillae smaller (absent in *L. monteiroi* **sp. nov.** and *L. nigrans* **comb. nov.**), ungues apical tooth absent (present in *L. monteiroi* **sp. nov.** and *L. nigrans* **comb. nov.**), and dens with 14–18 blunt mac apically nipple-like (less in *L. monteiroi* **sp. nov.**).

FIGURE 103. *Lepidocyrtinus chavarii* **sp. nov.**, habitus of specimens fixed in alcohol (lateral view). Scale bar: 1 mm.

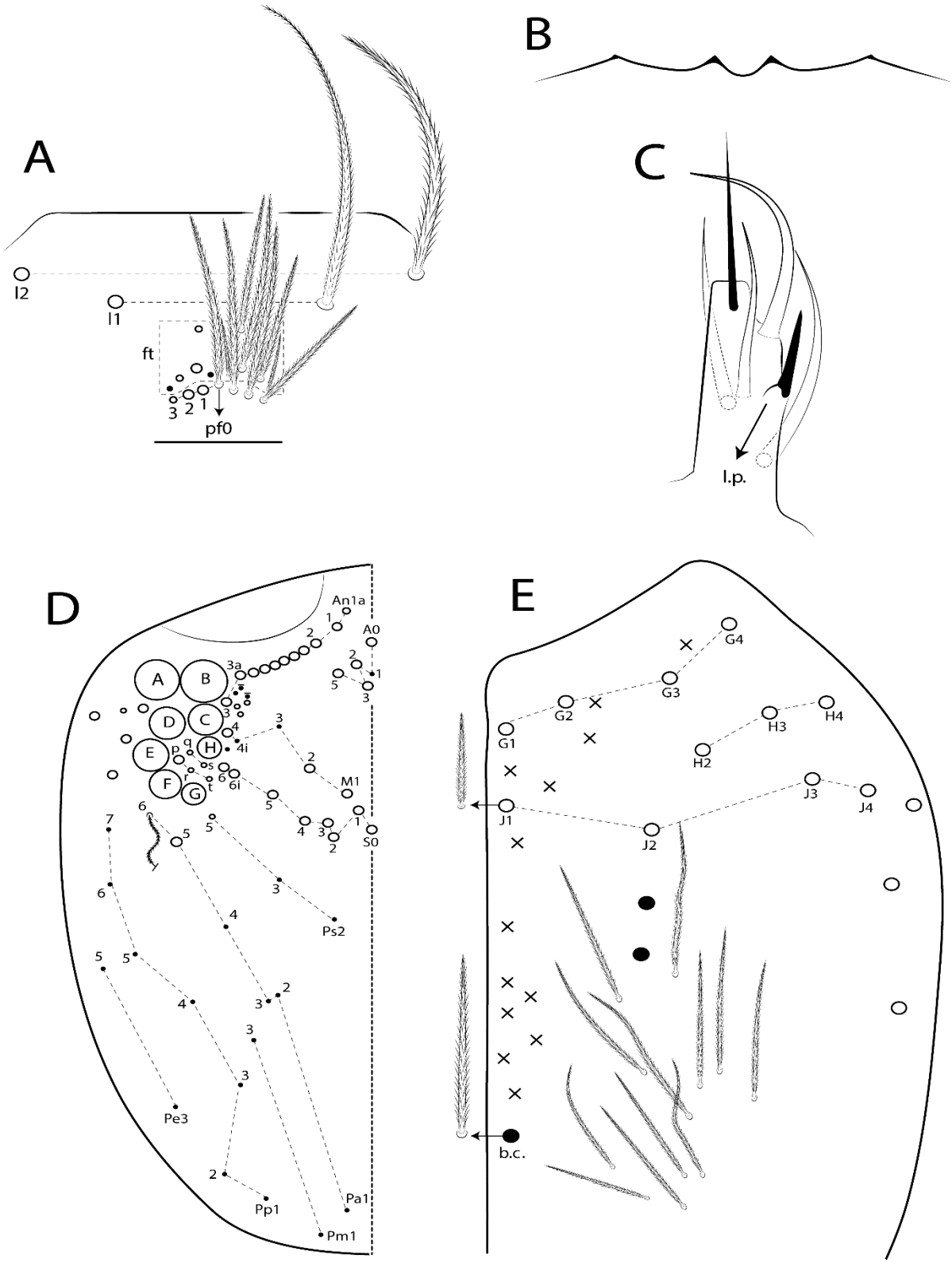

FIGURE 104A–E. *Lepidocyrtinus chavarii* **sp. nov.**: head; **A**, chaetotaxy of the clypeus; **B**, labral papillae (ventral view); **C**, labial papillae E (right side), arrow indicates lateral process (**l.p.**); **D**, dorsal chaetotaxy (left side); **E**, postlabial and cephalic groove chaetotaxy (right side).

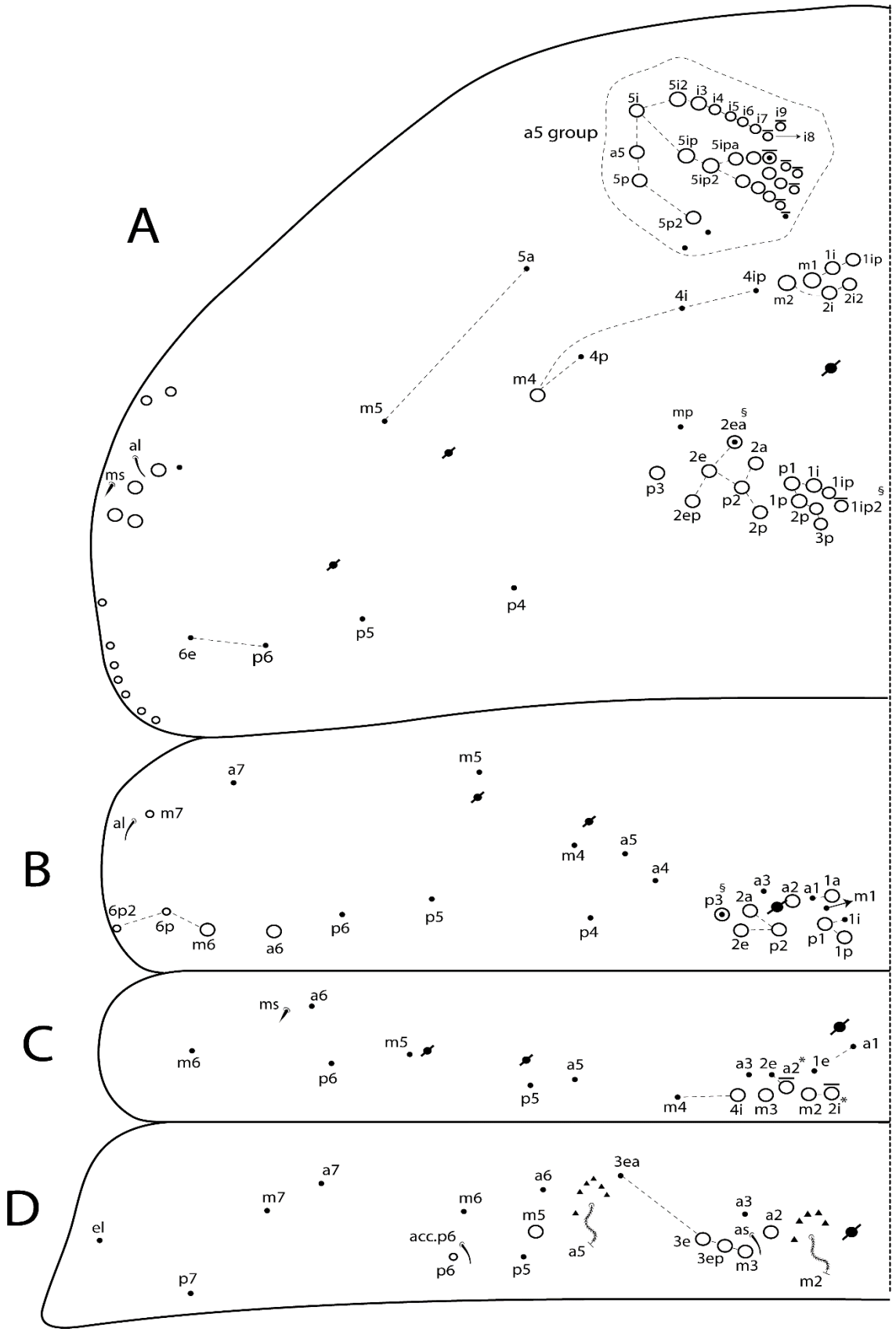

FIGURE 105A–**D.** *Lepidocyrtinus chavarii* **sp. nov.**: dorsal chaetotaxy; **A**, Th II; **B**, Th III; **C**, Abd I; **D**, Abd II.

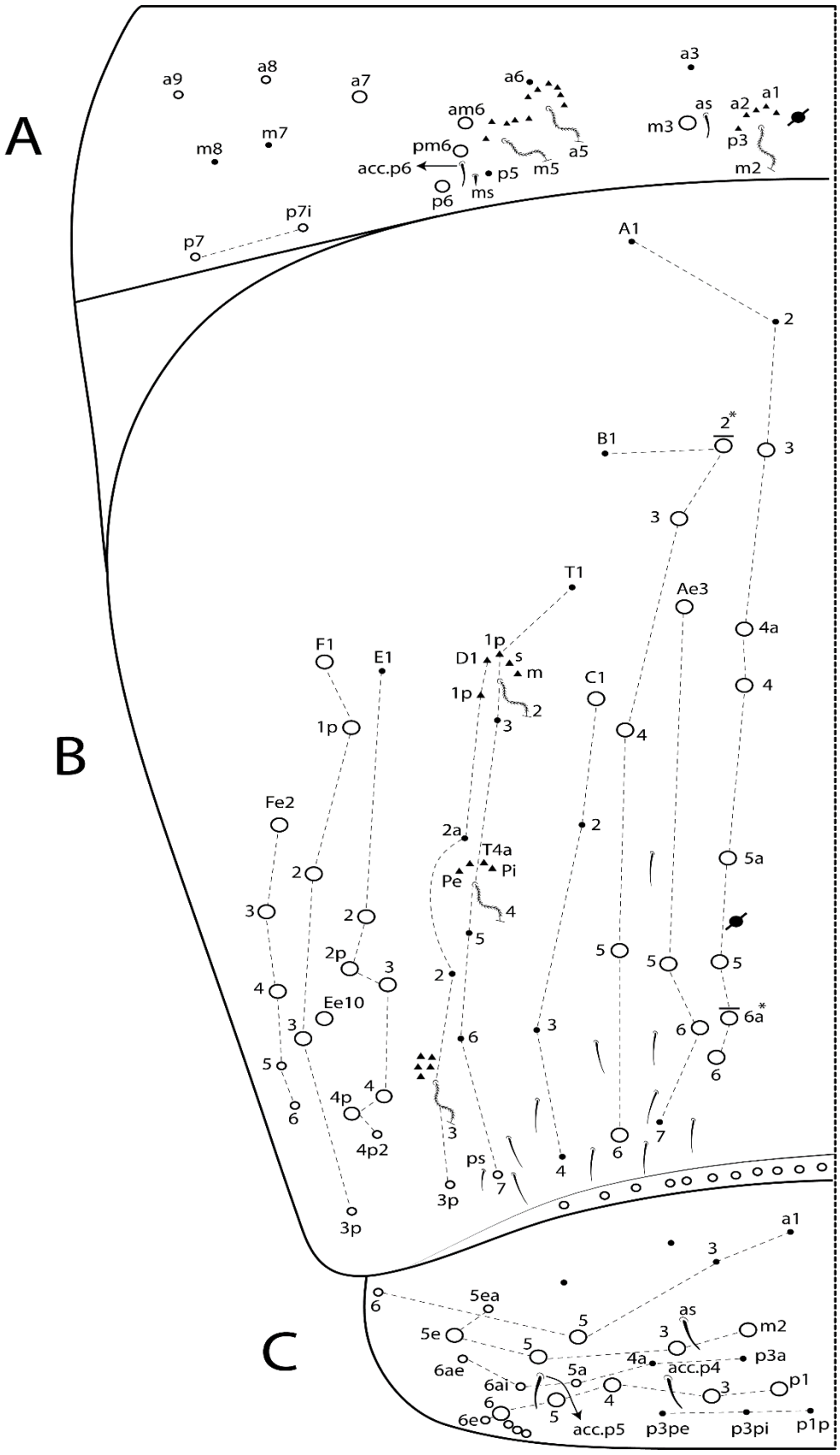

FIGURE 106A–C. *Lepidocyrtinus chavarii* **sp. nov.**: dorsal chaetotaxy; **A**, Abd III, **B**, Abd IV; **C**, Abd V.

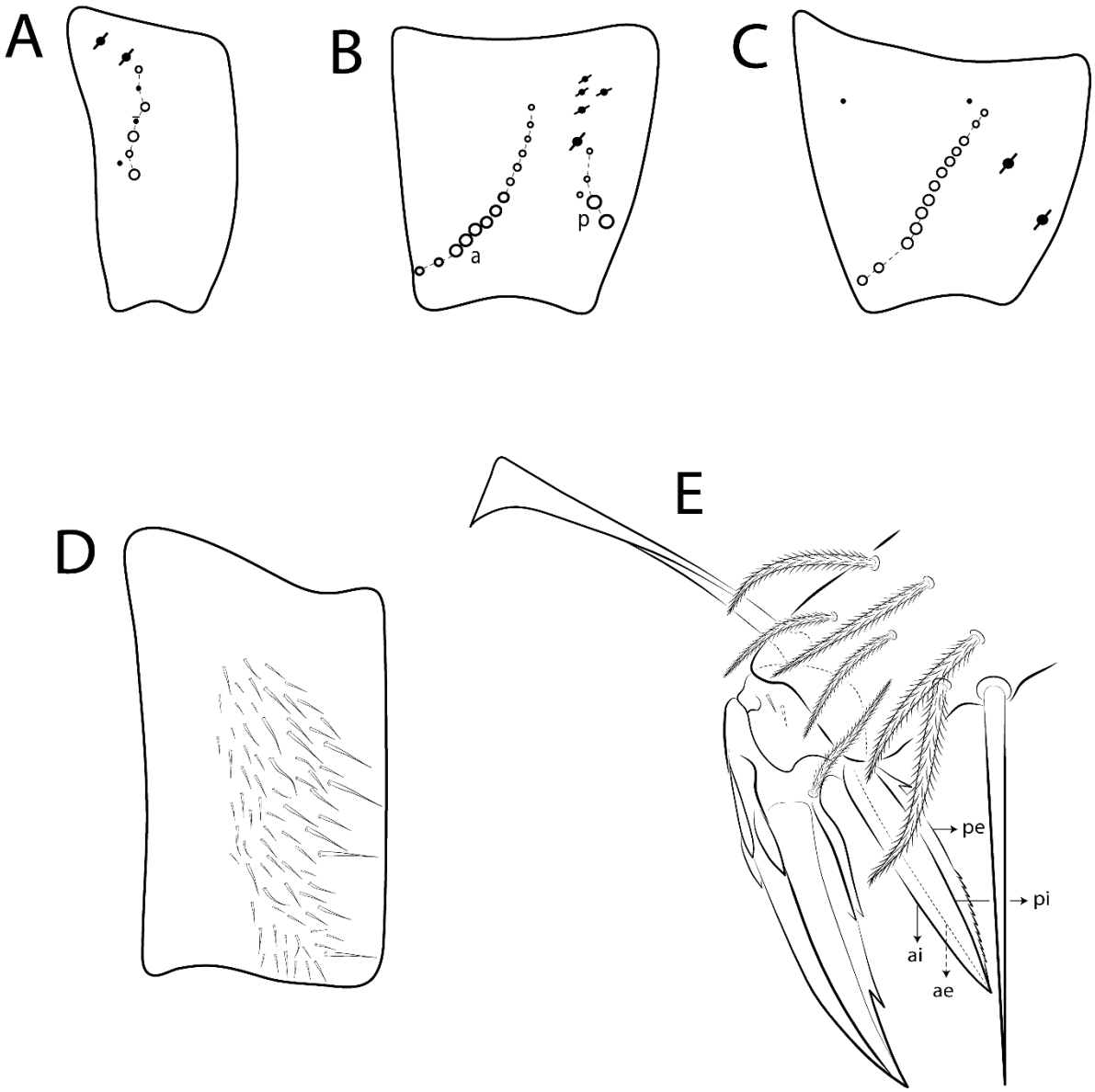

FIGURE 107A–E. *Lepidocyrtinus chavarii* **sp. nov.**: **A**, subcoxa I; **B**, subcoxa II; **C**, subcoxa III (outer side); **D**, trochanteral organ (inner side); **E**, distal tibiotarsus and empodial complex III (posterior side).

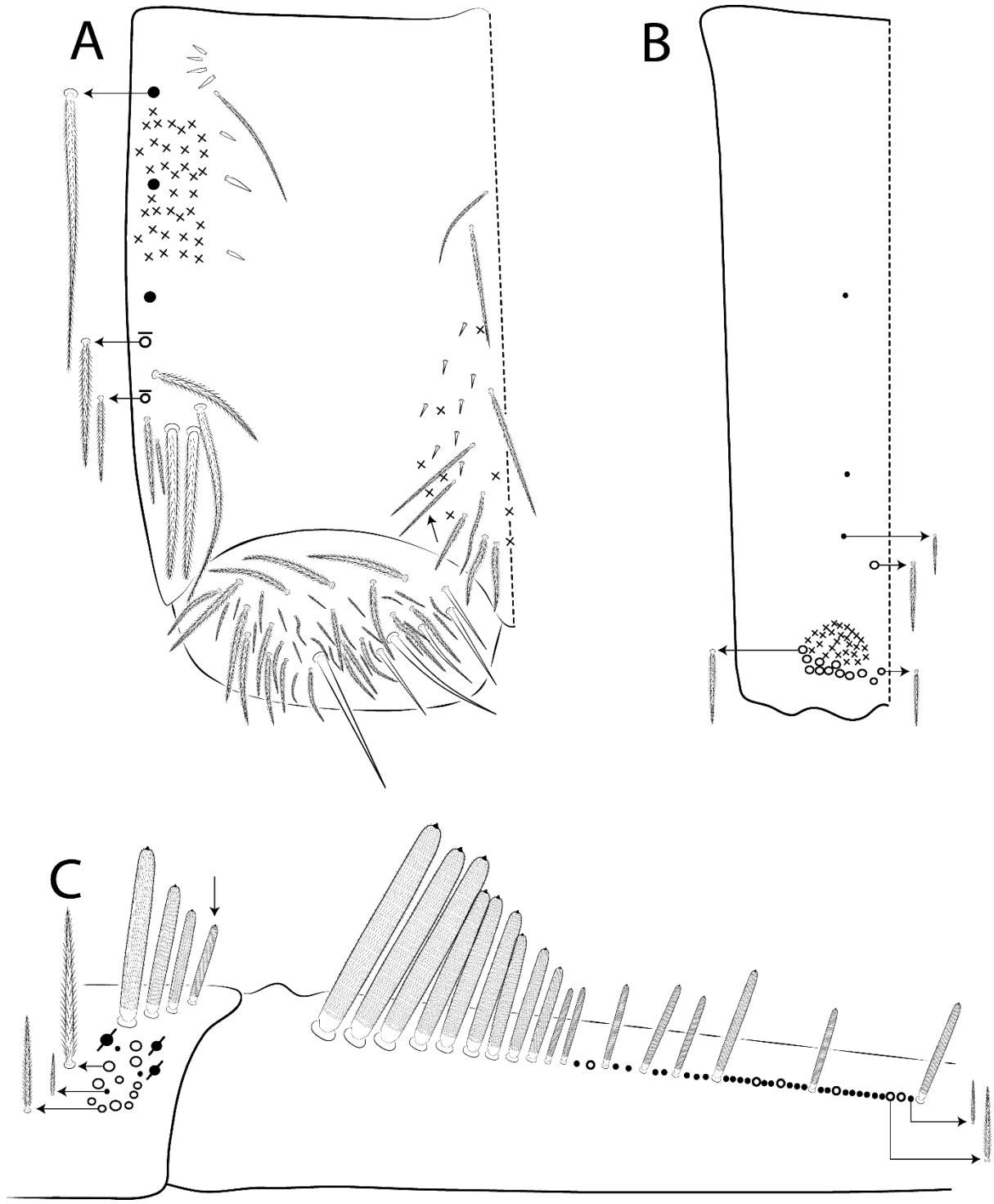

FIGURE 108A–C. *Lepidocyrtinus chavarii* **sp. nov.**; **A**, collophore chaetotaxy (lateral view), arrow posteriorly indicates chaeta present or absent; **B**, manubrium ventral chaetotaxy; **C**, chaetotaxy of the manubrial plate and proximal dens (lateral view), arrow indicates blunt chaetae present or absent.

***Lepidocyrtinus pseudopulcher* sp. nov. Cipola & Bellini**

Figs 109–113, 138

Type Material. Holotype male on slide (MZUSP): Brazil, Minas Gerais, Cabo Verde municipality, farm of "Cata", 21°27'11"S; 46°20'52"W (Fig. 138), Atlantic Forest, 906 m, 17.ii-13.v.2014, Malaise trap, DS Amorim coll. Paratypes on slides (MZUSP): 1 male, 4 females, 2 juveniles and 15 specimens in alcohol, same data as holotype. Paratypes on slides (070/INPA): 2 females and 4 specimens in alcohol, same data as holotype, except 01.x.2012.

Additional material: 2 males and 3 females in slides and 10 specimens in alcohol (CC/UFRN): Brazil, Minas Gerais, Arcos municipality, in cave, 20°29'22" S, 45º54'77''W (Fig. 138), in cave, 700 m, 06.ii-28.iii.2018, manual collect, E.L. Borges-Filho coll.

Diagnosis. Body with dark violet pigments on head to Th II, Abd IV laterally, Abd V and trochanter to femur III (Fig. 109); head mac **A0**, **A2**, **S3** and **S6** present; prelabral chaetae ciliate; labial papilla E with lateral process (l.p.) apically pointed and exceed the base of apical appendage (Figs 110C–D); Th II with 8–9 anterior, 7 median (**m1ip** and **m4** present, **m4i** and **m4p** mac absent) and 9 posterior mac (**p2ep** mac, **p3** mic); Th III–Abd II with 2, 6, 4 central mac respectively; Abd IV with 9–11 central mac and 11 lateral mac (Figs 111, 112B); ungues apical tooth present; unguiculus with all lamella acuminate; collophore anteriorly with 5 spine-like chaetae and without chaetae apically acuminate, posteriorly with 4 spines, smooth chaeta present (Fig. 113E); manubrium ventrally with 2/4 subapical chaetae; manubrial plate with 3–4 blunt mac apically nipple-like; dens without blunt mac (Figs 113F–G).

Description. Total length (head + trunk) of specimens 3.19–4.00 mm (n=4), holotype 3.35 mm. Specimens pale white with dark violet pigments on Ant IV, head (except posterior side with irregular unpigmented areas), Th II, Abd II to Abd IV laterally, and proximal two thirds of the manubrium; eyespatches black (Fig. 109). Scales present on Ant I to proximal one thirds of Ant IV, dorsal and ventral head, dorsal thorax and abdomen, legs (except empodia), anterior and posterior collophore, dorsal and ventral manubrium and dens ventrally.

Head. Antennae smaller than trunk length (Fig. 109); ratio antennae: trunk = 1: 1.57 (Ant IV present only holotype); antennal segments ratio as I: II: III: IV = 1: 1.18–1.25: 1.05–1.15: 1.78, holotype 1: 1.18: 1.09: 1.78. Ant IV annulated on distal two thirds, with apical bulb apically bilobed. Ant III sense organ with 2 rods, 3 spiny guard sens, s-blunt sens of different sizes, smooth chaetae and ciliated chaetae (Fig. 110A). Ant I dorsally with 3–4 median mac, 1 spine and 3 smooth mic at base. Eye B larger, G and H smaller, others subequal, and with 5 'IO' chaetae; head dorsal macrochaetotaxy with 11–12 **An**, 2 **A**, 1 **M**, 2 **S** and 1 **Pa** mac (Fig. 110D). Clypeal formula with 4 (**l1**–**2**), 10 (**fr**), 3 (**pf0**–**1**) ciliate chaetae, **l1**–**2** larger and apically acuminate, 8 frontal smaller, others subequal (Fig. 110B). Prelabral chaetae ciliate and not bifurcated. Labral **p0** chaeta sometimes with median filament. Labral papillae with two inner conical projections, outer papillae absent. Maxillary palp with smooth apical appendage (**a.a.**) and basal chaeta (**b.c.**) weakly ciliate, thicker and 1.29 larger in length than the apical. Labial papilla E with lateral process (l.p.) apically pointed and exceed the base of apical appendage (Fig. 110C). Basolateral and basomedian labial fields with chaetae **M1**–**2**, **E**, **L1**–**2** ciliate, **r** reduced (as Fig. 82F). Ventral head with about 15 ciliate chaetae, postlabial formula with 4 (**G1**–**4**), 3 (**H2**–**4**), 4 (**J1**–**4**) chaetae and 1 larger chaetae, basal chaetae (b.c.) absent (Fig. 110E).

Thorax chaetotaxy (Fig. 111A–B). Th II **a**, **m** and **p** series with 8–9, 7 and 9 mac, respectively. Th III **a**, **m** and **p** series with 0, 2 and 2 mac, respectively. Ratio Th II: III = 1.44–2.05: 1 (n=4), holotype 2.05: 1.

Abdomen chaetotaxy (Figs 111C–D, 112A–C). Abd I **a**, **m** and **p** series with 1, 5 and 0 mac, respectively. Abd II **a**, **m** and **p** series with 1, 4 and 0 mac, respectively. Abd III **a**, **m** and **p** series with 1, 3 and 2 mac, respectively. Abd IV with 9–11 central mac of **A**–**T** series and 11 lateral mac of **E**–**Fe** series; 11 posterior sens (**ps** type I, others type II) and 13 posterior mes. Abd V **a**, **m** and **p** series with 1, 4 and 6 mac, respectively. Ratio Abd III: IV = 1: 3.52–5.25 (n= 4), holotype 1: 5.25.

Legs. Subcoxa I with 7 chaetae, 6 anterior chaetae and 2 psp; subcoxa II with an anterior row of 14 chaetae, posterior row of 2 chaetae and 5 psp; subcoxa III with one row of 14 chaetae, 2 anterior chaetae and 2 posterior psp (Fig. 113A–C). Trochanteral organ with about 110 spine-like chaetae (Fig. 113D). Tibiotarsus III subdivided or not, outer side with 3 proximal and 2 distal larger ciliate chaetae and apically acuminate, inner side with 10 mac weakly ciliate. Ungues inner side with 4 teeth, 2 paired basal, 1 unpaired median subequal to basal teeth and 1 small unpaired apical. Unguiculus with all lamellae

acuminate, **pe** lamella serrated and with small proximal tooth, other lamellae smooth; ratio unguis: unguiculus = 1: 0.54. Tibiotarsal smooth chaeta 1.53 larger than unguiculus and tenent hair 0.69 smaller than unguis outer edge.

Collophore. Anterior side with 10–14 chaetae, 5 proximal spine-like chaetae, 1 thin and 2–6 normal ciliate chaeta and 2 mac distally, chaetae apically acuminate absent; posterior side with 14–15 chaetae, 4 spines and 9–10 thin ciliate chaetae widely distributed, smooth chaeta present; lateral flap with about 58 chaetae, 7 smooth and 51 ciliate (Fig. 113E).

Furcula. Manubrium ventral formula with 0, 2, 2, 2/4 (subapical), 20 (apical) ciliate chaetae of different sizes plus about 36 elongated apical scales per side (Fig. 113F); manubrial plate with 3–4 blunt mac finely ciliate and apically nipple-like, 21 ciliate chaetae of different sizes and 3 psp. Dens dorsally without blunt mac (Fig. 113G).

Etymology. Refers to the similar color pattern of *Lepidocyrtinus pulcher* (from Greek: *pseudo* – false) (Fig. 109).

Remarks. In general, *L. pseudopulcher* **sp. nov.** resembles *L. harena* **comb. nov.** and *L. boy* **sp. nov.** by reduced macrochaetotaxy (see differences among these species in remarks of *L. boy* **sp. nov.**). The color pattern of *L. pseudopulcher* **sp. nov.** also resembles *L. boy* **sp. nov.** and *L. pulcher* **comb. rev.** (Figs 65F, 93), but the new species differs from the late by reduced macrochaetotaxy, as head mac **A3**, **M1**–**2**, **S0**–**1**, **S4**–**6i** absent (all present in *L. pulcher* **comb. rev.**), Th II with 9 posterior mac (13–14 in *L. pulcher* **comb. rev.**), and Th III–Abd I with 2 and 6 central mac respectively (8 and 5 in *L. pulcher* **comb. rev.**). Both species also differ in collophore devoided of normal chaetae and dens without blunt mac (both present in *L. pulcher* **comb. rev.**).

FIGURE 109. *Lepidocyrtinus pseudopulcher* **sp. nov.**, habitus of specimens fixed in alcohol (lateral view). Scale bar: 1 mm.

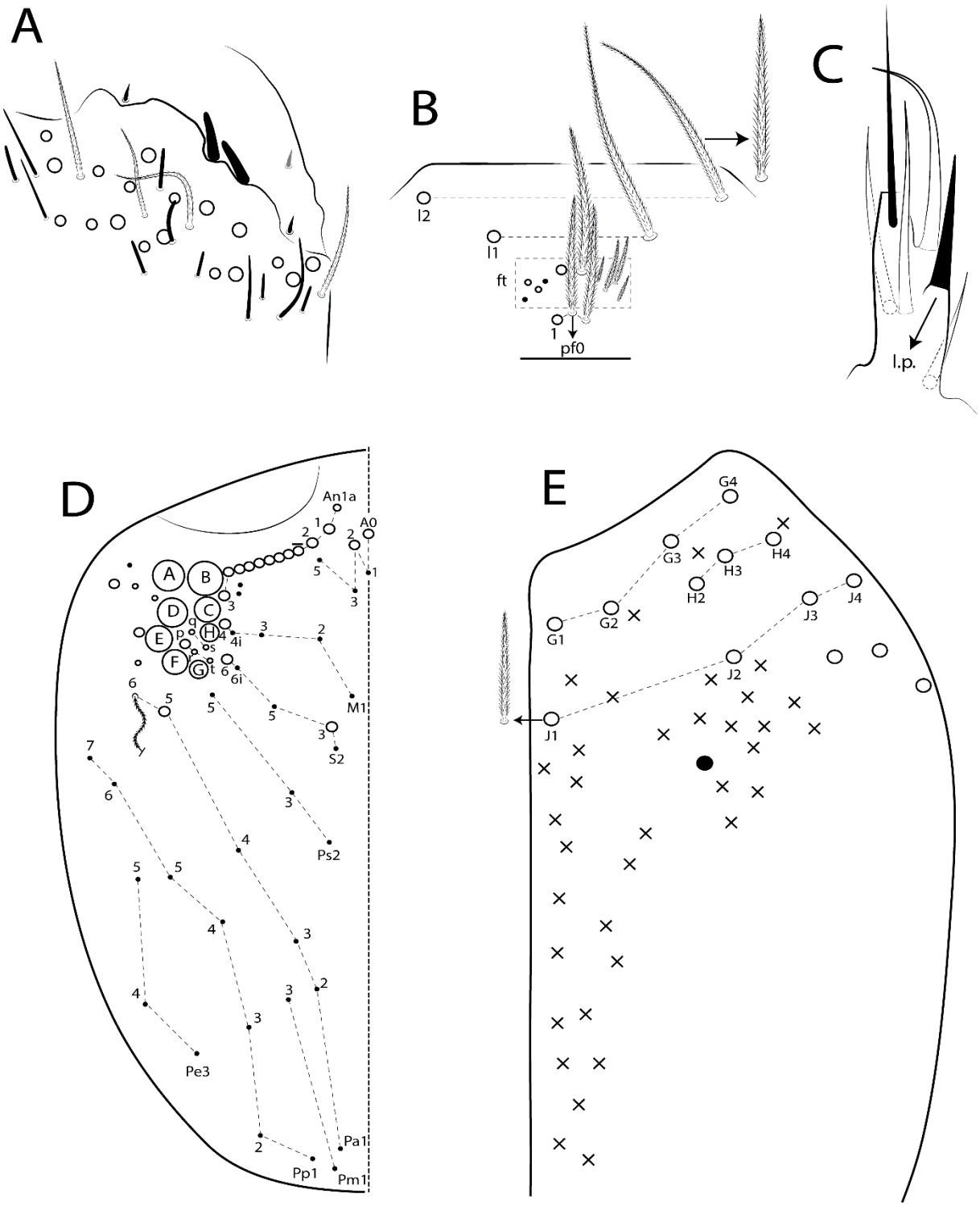

FIGURE 110A–E. *Lepidocyrtinus pseudopulcher* **sp. nov.**: head; **A**, Ant III apical organ (lateral side); **B**, chaetotaxy of the clypeus, arrow indicates **l2** chaeta nor acuminate eventually; **C**, labial papillae E (right side), arrow indicates lateral process (**l.p.**); **D**, dorsal chaetotaxy (left side); **E**, postlabial and cephalic groove chaetotaxy (right side).

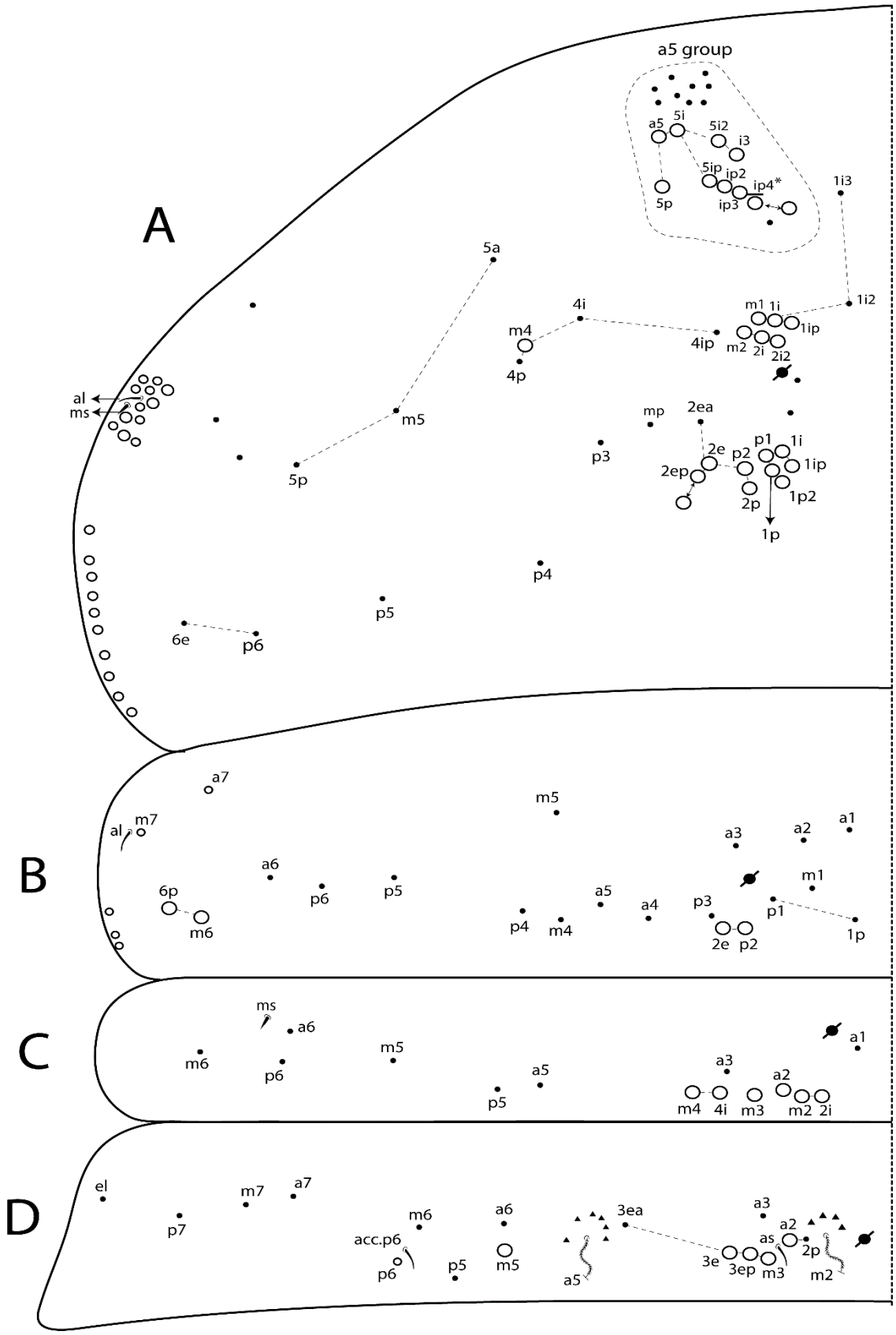

FIGURE 111A–D. *Lepidocyrtinus pseudopulcher* **sp. nov.**: dorsal chaetotaxy; **A**, Th II; **B**, Th III; **C**, Abd I; **D**, Abd II.

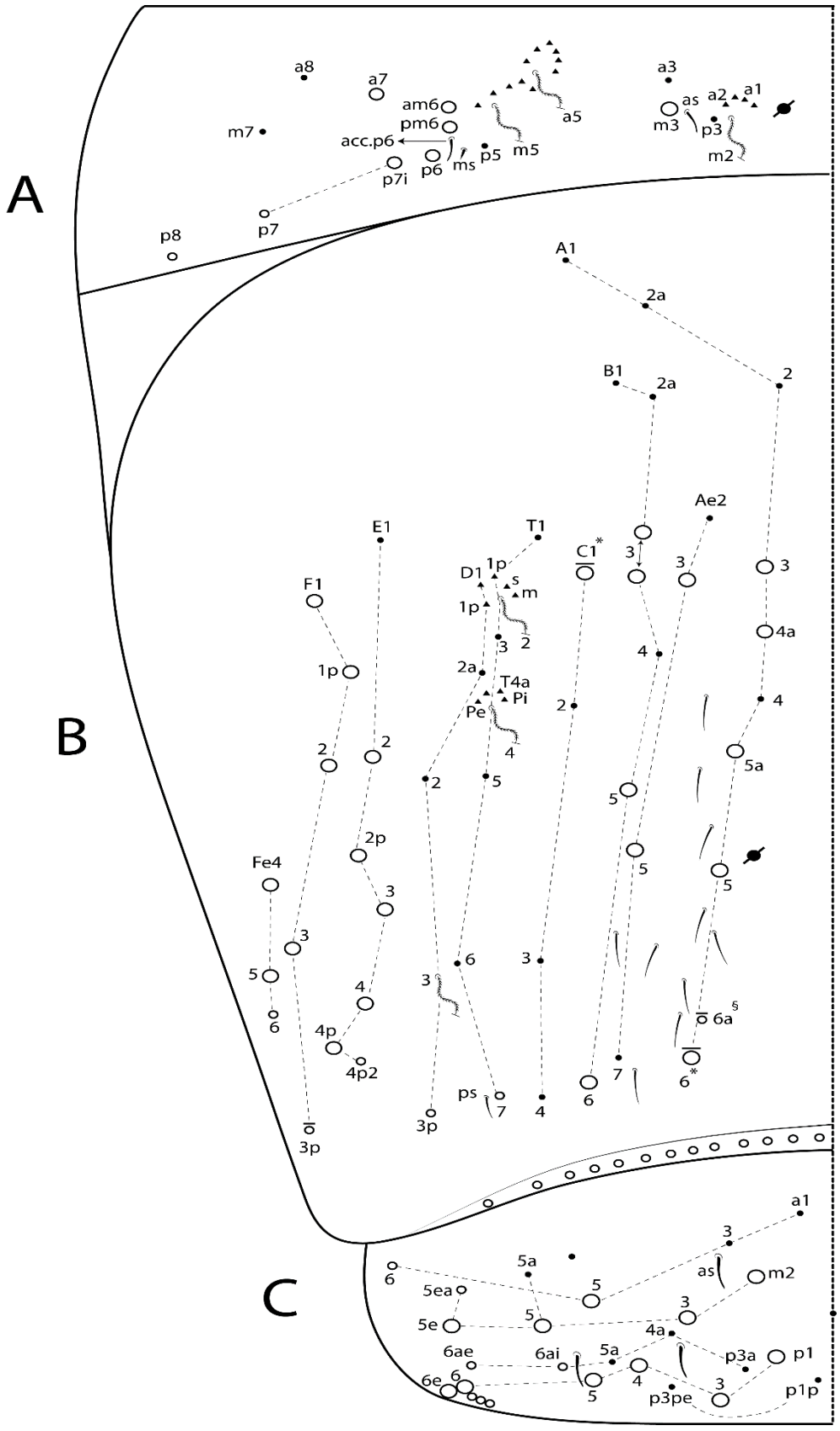

FIGURE 112A–C. *Lepidocyrtinus pseudopulcher* **sp. nov.**: dorsal chaetotaxy; **A**, Abd III, **B**, Abd IV; **C**, Abd V.

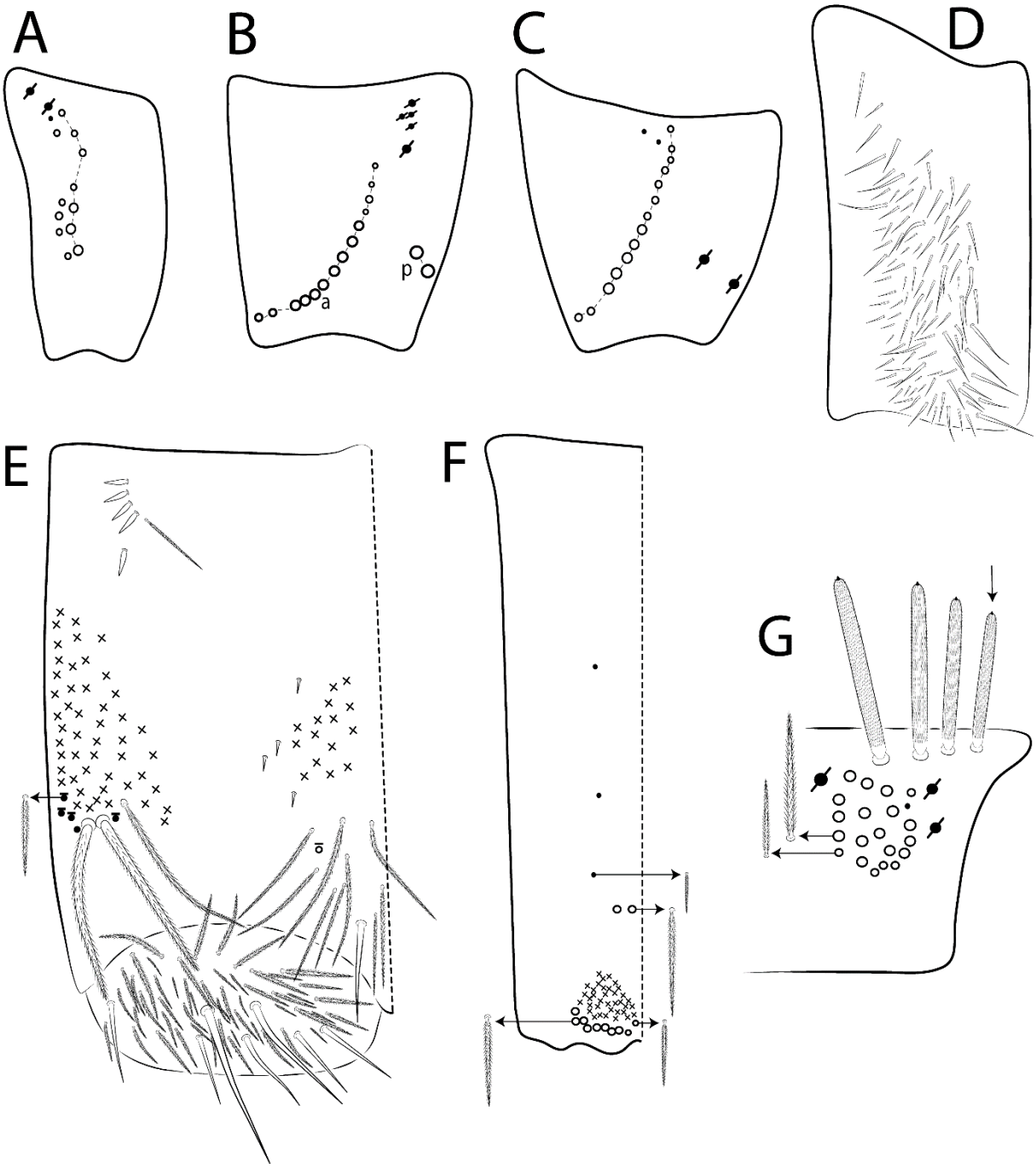

FIGURE 113A–G. *Lepidocyrtinus pseudopulcher* **sp. nov.**: **A**, subcoxa I; **B**, subcoxa II; **C**, subcoxa III (outer side); **D**, trochanteral organ (inner side); **E**, collophore chaetotaxy (lateral view); **F**, manubrium ventral chaetotaxy; **G**, chaetotaxy of the manubrial plate (lateral view), arrow indicates blunt chaetae present or absent.

***Lepidocyrtinus monteiroi* sp. nov. Cipola & Bellini**

Figs 114–118, 138

Type Material. Holotype male on slide (MNRJ): Brazil, Rio de Janeiro, Teresópolis municipality, National Park of "Serra dos Orgãos", 22°26'55.1"S, 43°00'16.4"W (Fig. 138), Atlantic Forest, 1246 m, i-2015, Malaise trap, RF Monteiro & eq. coll. Paratypes on slides (MNRJ): 2 males, 6 females and 1 juvenile and 15 specimens in alcohol, same data as holotype.

Diagnosis. Body with dark spots on Ant III–IV, one transverse band on Th II to Abd III, and one median spot on Abd IV posteriorly (Fig. 114); head mac **A0**, **A2**–**3**, **A5**, **M1**–**2**, **S0**–**6** and **Pp5** present; prelabral chaetae ciliate; labial papilla E with lateral process (l.p.) apically pointed and not reaching the base of apical appendage (Figs 115C–D); Th II with 39–54 anterior, 9 median (**m1ip**, **m4i**–**4p** present) and 11–12 posterior mac (**p2ep** and **p3** mac); Th III–Abd II with 11, 5, 4 central mac respectively; Abd IV with 17–18 central mac and 14 lateral mac (Figs 116, 117B); ungues apical tooth present; unguiculus with all lamella acuminate; collophore anteriorly with 5–6 spine-like chaetae and 4 ciliate chaetae apically acuminate, posteriorly with 7 spines, smooth chaeta present (Fig. 118E); manubrium ventrally with 2/4 subapical chaetae; manubrial plate with 4 blunt mac apically nipple-like; dens with 1 blunt mac apically nipple-like (Figs 118F–G).

Description. Total length (head + trunk) of specimens 3.42–3.84 mm (n=4), holotype 3.68 mm. Specimens pale white with dark navy blue pigments on distal and proximal Ant IV, proximal Ant III, Th II to Abd III with one transverse band, Abd IV posteriorly with one median spot, and pigments internally on trochanter to proximal half of femur III. Orange pigments medially on Ant IV; eyespatches black (Fig. 114). Scales present on Ant I to one quarter proximal of Ant IV, dorsal and ventral head, dorsal thorax and abdomen, legs (except empodia), anterior collophore, dorsal and ventral manubrium and dens ventrally.

Head. Antennae smaller than trunk length (Fig. 114); ratio antennae: trunk = 1: 1.19–1.41 (n=3), holotype 1: 1.19; antennal segments ratio as I: II: III: IV = 1: 1.13–1.66: 1.18–1.63: 2.03–2.54, holotype 1: 1.15: 1.18: 2.03. Ant IV annulated on distal three-fourths, with apical bulb apically bilobed or trilobed. Ant III sense organ with 2 rods, 3

spiny guard sens and s-blunt sens of different sizes. Ant I dorsally with 2 median mac, 1 spine and 3 smooth mic at base (Fig. 115A). Eyes A and B larger, G and H smaller, others subequal, and with 5 'IO' chaetae; head dorsal macrochaetotaxy with 11–12 **An**, 4 **A**, 3 **M**, 8 **S**, 1 **Pa** and 1 **Pp** mac. (Fig. 115D). Clypeal formula with 4 (**l1**–**2**), 2 (**fr**), 3 (**pf0**–**1**) ciliate chaetae, **l1**–**2** larger and apically acuminate, 2 frontal smaller, others subequal (Fig. 115B). Prelabral chaetae ciliate, inner chaetae rarely bifurcate. Labral **p0** chaeta rarely median filament. Labral papillae with two inner conical projections, outer papillae absent. Maxillary palp with smooth apical appendage (**a.a.**) and basal chaeta (**b.c.**) weakly ciliate, thicker and 1.33 larger in length than the apical. Labial papilla E with lateral process (l.p.) apically pointed and not reaching the base of apical appendage (Fig. 115C). Basolateral and basomedian labial fields with chaetae **M1**–**2**, **E**, **L1**–**2** ciliate, **r** reduced (as Fig. 82F). Ventral head with about 17 ciliate chaetae, postlabial formula with 4 (**G1**–**4**), 3 (**H2**–**4**), 4 (**J1**–**4**) chaetae and 1 larger basal chaetae (b.c.) surrounding the cephalic groove (Fig. 115E).

Thorax chaetotaxy (Fig. 116A–B). Th II **a**, **m** and **p** series with 39–54 (39–40 in holotype), 9 and 11–12 mac, respectively. Th III **a**, **m** and **p** series with 5, 1 and 7 mac, respectively. Ratio Th II: III = 2.51–1.94: 1 (n=4), holotype 2.51: 1.

Abdomen chaetotaxy (Figs 116C–D, 117A–C). Abd I **a**, **m** and **p** series with 1, 4 and 0 mac, respectively. Abd II **a**, **m** and **p** series with 1, 4 and 0 mac, respectively. Abd III **a**, **m** and **p** series with 1, 3 and 3 mac, respectively. Abd IV with 17–18 central mac of **A**–**T** series and 14 lateral mac of **E**–**Fe** series; 4 posterior sens (**ps** type I, others type II) and 10 posterior mes. Abd V **a**, **m** and **p** series with 1, 4 and 5 mac, respectively. Ratio Abd III: IV = 1: 4.16–8.68 (n= 4), holotype 1: 6.37.

Legs. Subcoxa I with 5 chaetae, 3 anterior chaetae and 2 psp; subcoxa II with an anterior row of 15 chaetae, posterior row of 9 chaetae, 1 posterior chaeta present or absent and 6 psp; subcoxa III with one row of 15 chaetae, 2 anterior chaetae and 2 posterior psp (Fig. 118A–C). Trochanteral organ with about 67 spine-like chaetae (Fig. 118D). Tibiotarsus subdivided or not, outer side with 5 proximal larger ciliate chaetae and apically acuminate, inner side with 8 mac weakly ciliate. Ungues inner side with 4 teeth, 2 paired basal, 1 unpaired median largaer to basal teeth and 1 small unpaired apical. Unguiculus with all lamellae acuminate, **pe** lamella serrated and with small proximal tooth, other lamellae smooth; ratio unguis: unguiculus = 1: 0.59. Tibiotarsal smooth chaeta 1.33 larger than unguiculus and tenent hair 0.66 smaller than unguis outer edge.

Collophore. Anterior side with 17–18 chaetae, 5–6 proximal spine-like chaetae, 2 thin and 4 normal ciliate chaetae, 4 ciliate chaetae apically acuminate and 2 mac distally; posterior side with 23 chaetae, 7 spines, 15 thin ciliate chaetae widely distributed and 1 smooth chaetae distally; lateral flap with about 64 chaetae, 7 smooth and 57 ciliate (Fig. 118E).

Furcula. Manubrium ventral formula with 0, 2, 2, 2/4 (subapical), 18–20 (apical) ciliate chaetae of different sizes plus about 20 elongated apical scales per side (Fig. 118F); manubrial plate with 4 blunt mac finely ciliate and apically nipple-like, 17 ciliate chaetae of different sizes and 3 psp. Dens dorsally with 1 proximal blunt mac finely ciliate and apically nipple-like (Fig. 118G).

Etymology. It is named after Dr. Ricardo F. Monteiro (UFRJ), who provided the specimens.

Remarks. *Lepidocyrtinus monteiroi* **sp. nov.** resembles *L. caeruleus* **sp. nov.** in dense macrochaetotaxy (see remarks of this species).

FIGURE 114. *Lepidocyrtinus monteiroi* **sp. nov.**, habitus of specimens fixed in alcohol (lateral view). Scale bar: 1 mm.

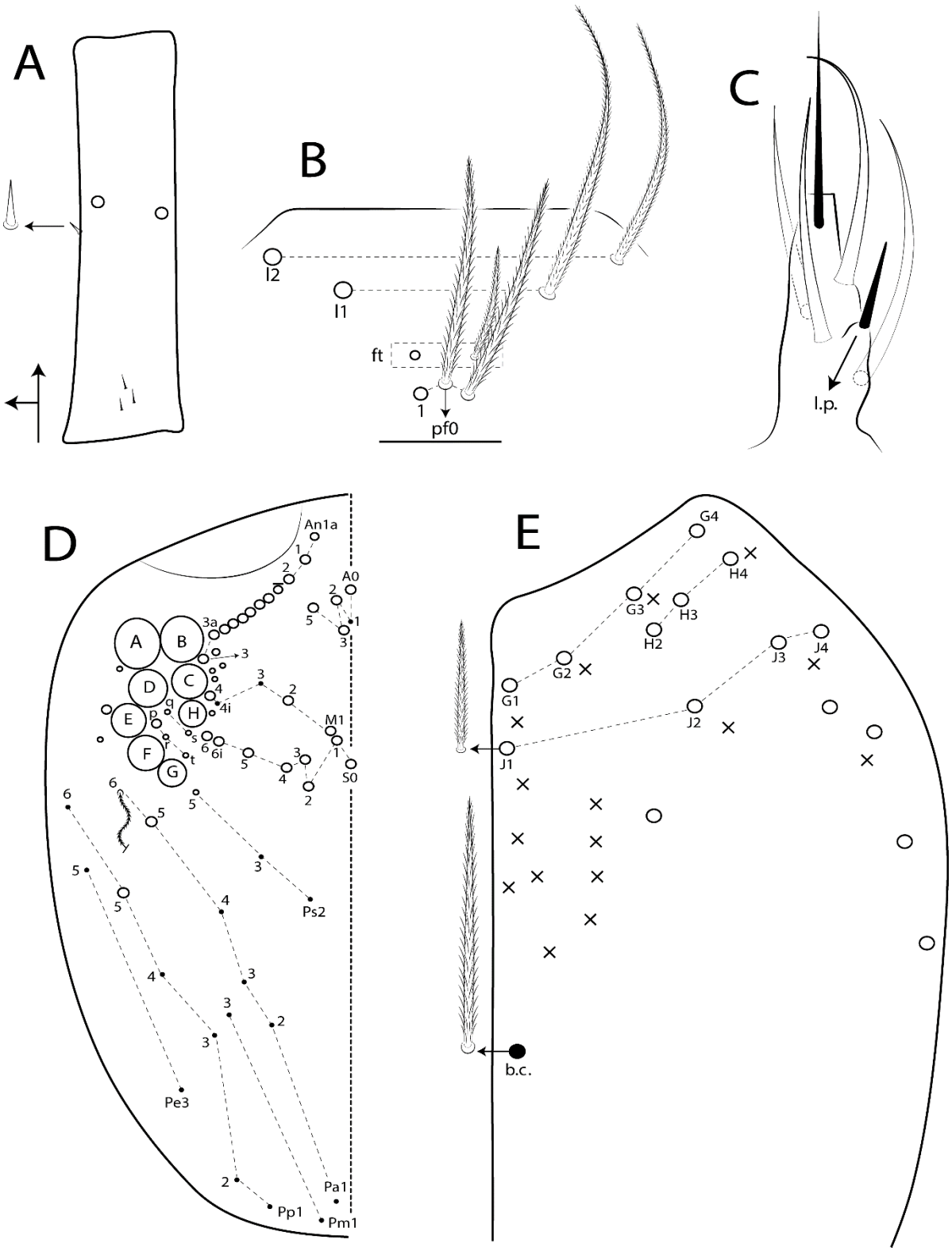

FIGURE 115A–E. *Lepidocyrtinus monteiroi* **sp. nov.**: head; **A**, Ant I left chaetotaxy (dorsal side); **B**, chaetotaxy of the clypeus; **C**, labial papillae E (right side), arrow indicates lateral process (**l.p.**); **D**, dorsal chaetotaxy (left side); **E**, postlabial and cephalic groove chaetotaxy (right side).

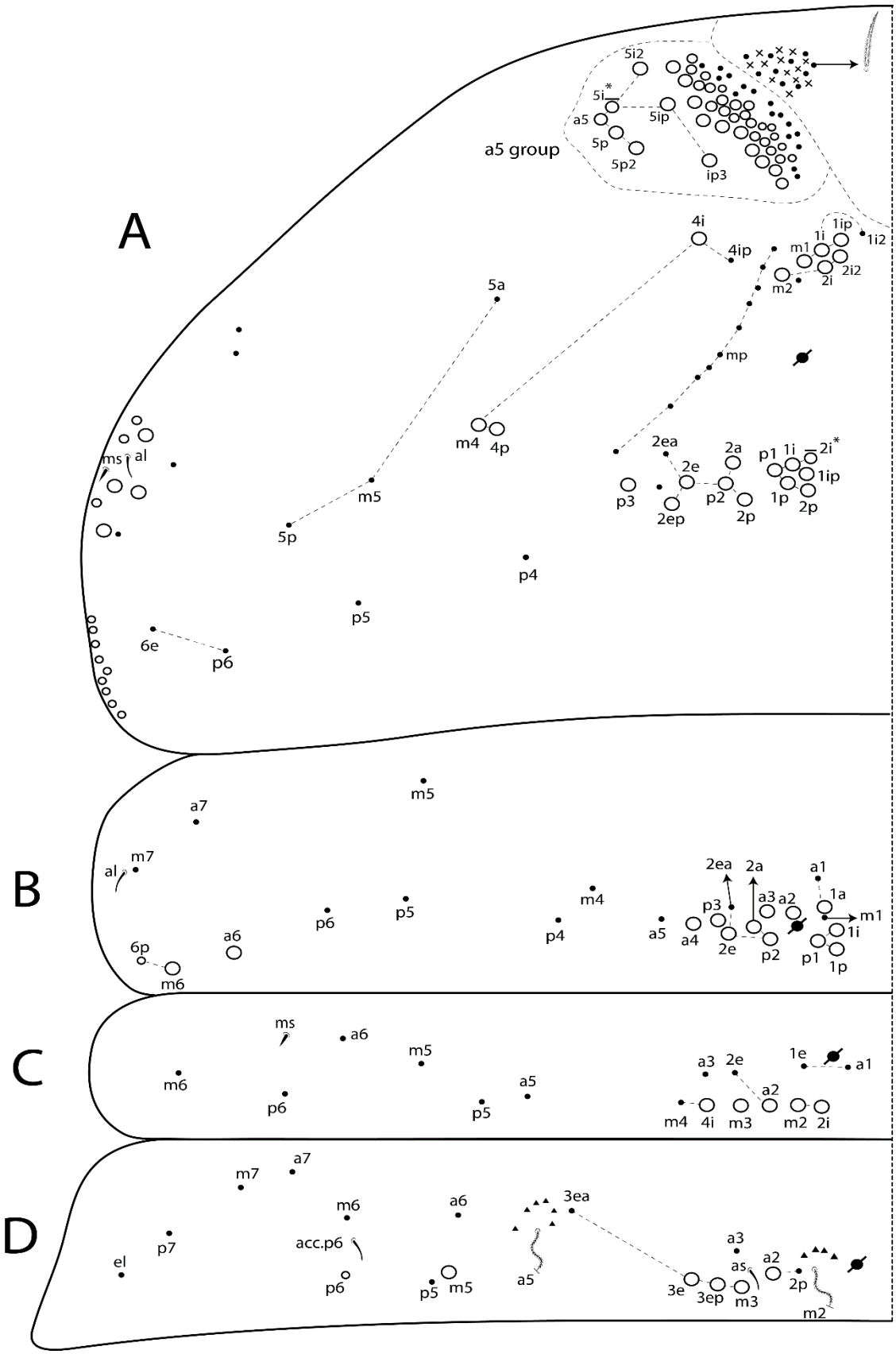

FIGURE 116A–**D.** *Lepidocyrtinus monteiroi* **sp. nov.**: dorsal chaetotaxy; **A**, Th II; **B**, Th III; **C**, Abd I; **D**, Abd II.

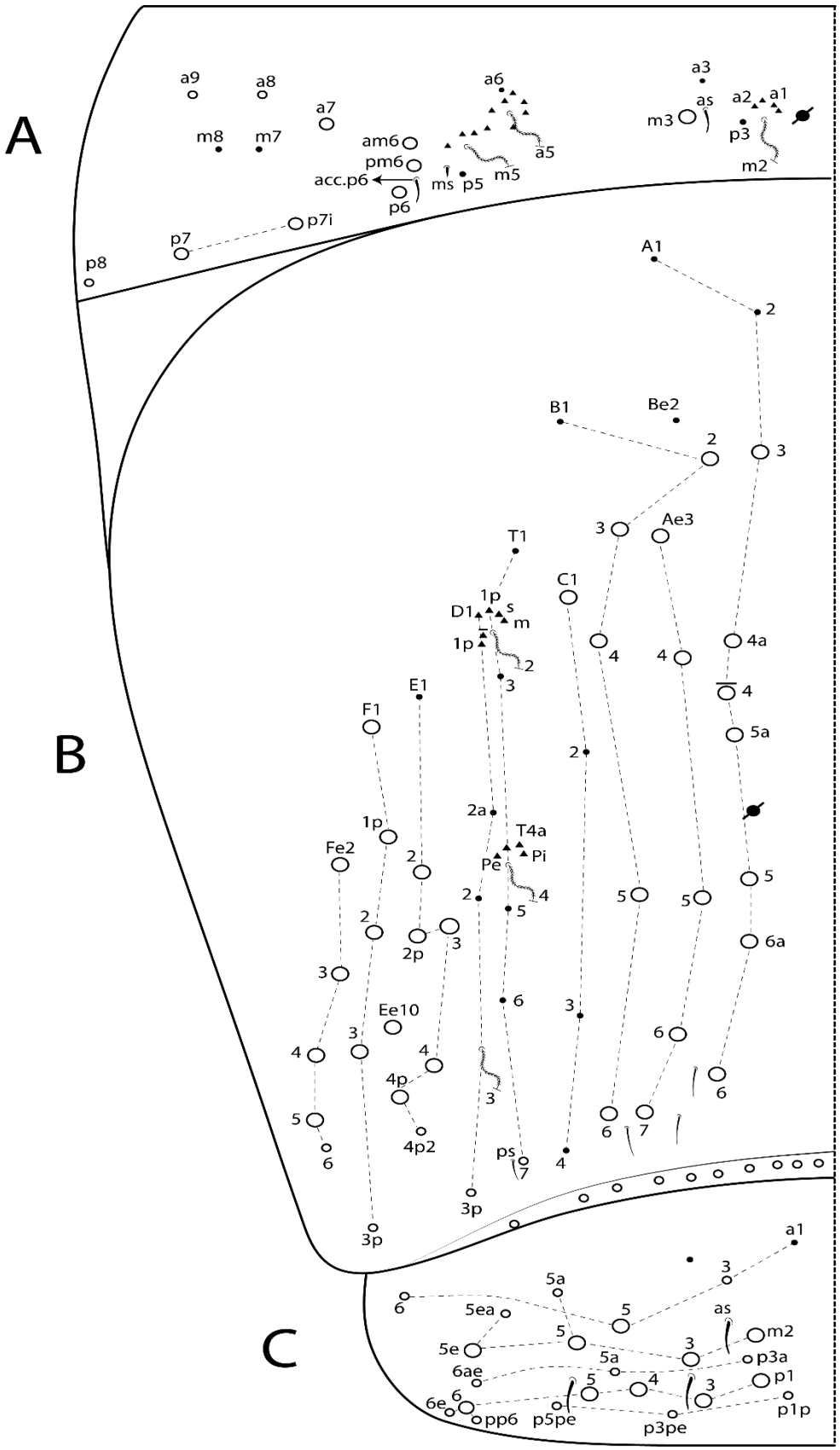

FIGURE 117A–**C.** *Lepidocyrtinus monteiroi* **sp. nov.**: dorsal chaetotaxy; **A**, Abd III, **B**, Abd IV; **C**, Abd V.

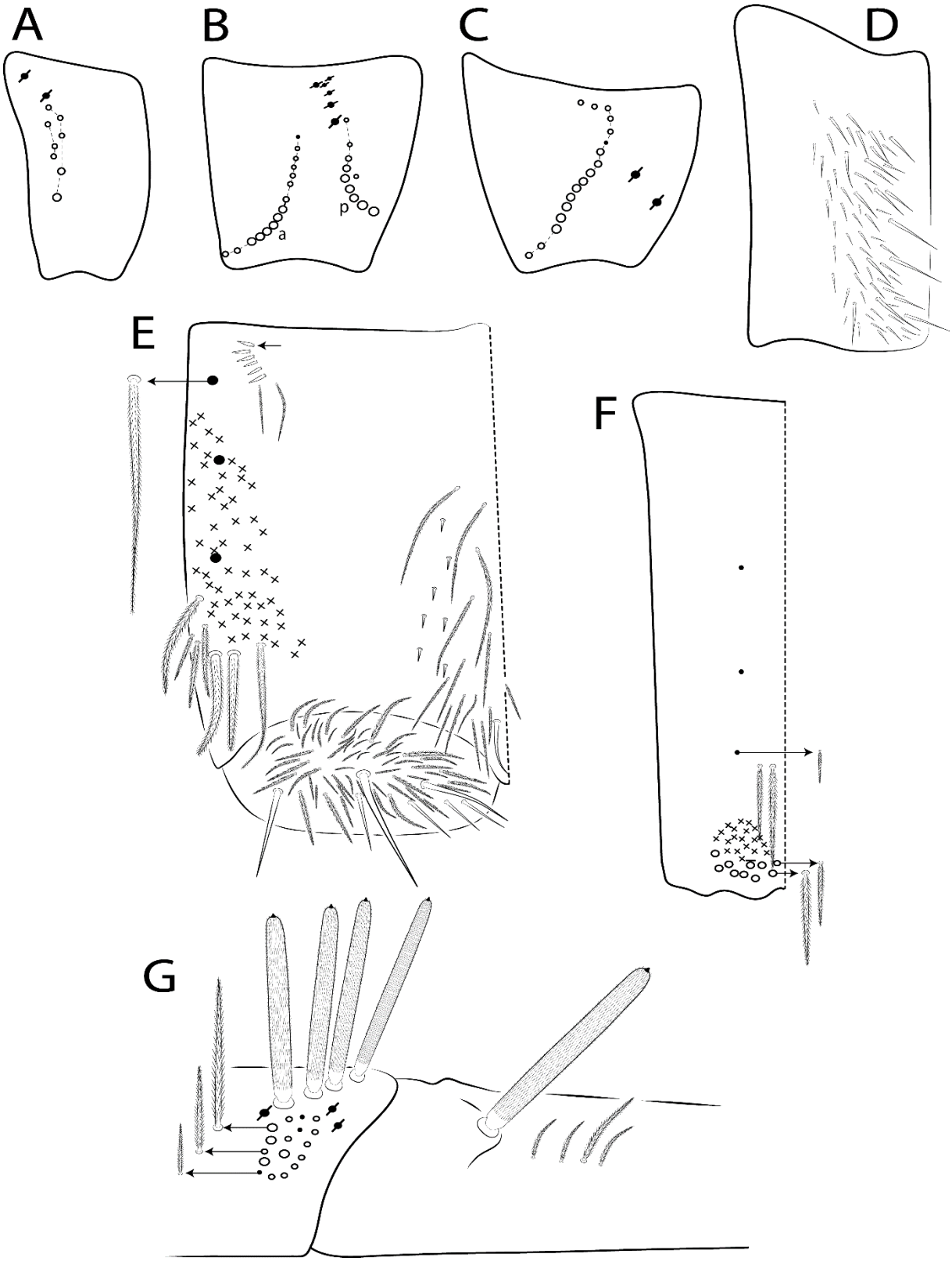

FIGURE 118A–G. *Lepidocyrtinus monteiroi* **sp. nov.**: **A**, subcoxa I; **B**, subcoxa II; **C**, subcoxa III (outer side); **D**, trochanteral organ (inner side); **E**, collophore chaetotaxy (lateral view), arrow anteriorly indicates spine-like chaetae present or absent; **F**, manubrium ventral chaetotaxy; **G**, chaetotaxy of the manubrial plate and proximal dens (lateral view).

***Lepidocyrtinus hylaeus* sp. nov. Cipola & Bellini**

Figs 119–123, 136

Type Material. Holotype female on slide (072/INPA): Brazil, Amazonas, Manaus municipality, National Institute of Amazonian Research, campus II, 03°05'49"S, 59°59'19"W (Fig. 136), urban area, 70 m, 01-03.vi.2013, Malaise trap, GC Tavares coll. Paratypes on slides (072A-I/INPA): 1 male and 8 females and 34 specimens in alcohol, same data as holotype.

Additional material: 3 females on slides and 46 specimens in alcohol (INPA): Brazil, Amazonas, Maués municipality, farm “Santa Helena”, road “dos Morais”, 03°27'13"S; 57°39'01"W (Fig. 136), Amazon forest, 23 m, 25-28.iv.2017, Malaise trap, A Somavilla coll. 3 females on slides and 8 specimens in alcohol (CC/UFRN): Itacoatiara municipality, campus II of "Universidade Federal do Amazonas", 03°05'37.68"S, 58°27'31.78"W (Fig. 136), Amazon forest, 30 m, Malaise trap, 11.xi.2017, AC Barata coll.

Diagnosis. Body with dark spots on Ant III–IV and leg II–III (Fig. 119); head mac **A0**, **A2**, **A5**, **M1**–**2**, **S0**–**3** and **S5**–**6** present, **A3** rarely mac; prelabral chaetae ciliate; labial papilla E with lateral process (l.p.) apically pointed and not reaching the base of apical appendage (Figs 120B–C); Th II with 18–22 anterior, 6–7 median (**m4** present, **m1ip** present or not, **m4i** and **m4p** mac absent) and 12 posterior mac (**p2ep** and **p3** mac); Th III–Abd II with 6–8, 4, 4 central mac respectively; Abd IV with 15 central mac and 11 lateral mac (Figs 121, 122B); ungues apical tooth present; unguiculus with all lamella acuminate; collophore anteriorly with 6 spine-like chaetae and 3 ciliate chaetae apically acuminate, posteriorly with 6 spines, smooth chaeta absent (Fig. 123E); manubrium ventrally with 2/2 subapical chaetae; manubrial plate with 3–4 blunt mac apically nipple-like; dens with 16–20 blunt mac apically nipple-like (Figs 123F–G).

Description. Total length (head + trunk) of specimens 3.36–4.32 mm (n=4), holotype 4.0 mm. Specimens pale white with dark blue pigments on proximal Ant II, III and IV, lateral Th II, coxae and trochanters I–III, proximal and distal femur II–III, and proximal two-thirds of tibiotarsus III with one stripe. Orange pigments to dark blue on Ant IV distally; eyespatches black (Fig. 119). Scales present on Ant I to half proximal of Ant

IV, dorsal and ventral head, dorsal thorax and abdomen, legs (except empodia), anterior and posterior collophore, dorsal and ventral manubrium and dens ventrally.

Head. Antennae larger than trunk length (Fig. 119); ratio antennae: trunk = 1: 0.81–0.72 (n=4), holotype 1: 0.72; antennal segments ratio as I: II: III: IV = 1: 1.01–1.14: 0.94–1.06: 2.05–2.63, holotype 1: 1.01: 0.94: 2.39. Ant IV annulated on distal three-fourths, with apical bulb apically unilobed or bilobed (common). Ant III sense organ with 2 rods, 3 spiny guard sens, s-blunt sens of different sizes and ciliated chaetae (Fig. 6B). Ant I dorsally with 4 median mac, 2 spines and 3 smooth mic at base. Eyes A and B larger, G and H smaller, others subequal, and with 5 'IO' chaetae; head dorsal macrochaetotaxy with 14–17 **An**, 3–4 **A**, 3 **M**, 7 **S**, 1 **Ps**, and 1 **Pa** mac, **A3** as mac in two specimens (Fig. 120C). Clypeal formula with 4 (**l1**–**2**), 8 (**fr**), 5 (**pf0**–**2**) ciliate chaetae, **l1**–**2** larger, **l1** apically acuminate, 2 frontal smaller, others subequal (Fig. 120A). Prelabral chaetae ciliate, inner chaetae bifurcate equal or unequal, outer chaetae normal or discretely bifurcated (Fig. 120A). Labral **p0** chaeta rarely with median filament. Labral papillae with two inner conical projections, outer papillae absent. Maxillary palp with smooth apical appendage (**a.a.**) and basal chaeta (**b.c.**) weakly ciliate, thicker and 1.33 larger in length than the apical. Labial papilla E with lateral process (l.p.) apically pointed and not reaching the base of apical appendage (Fig. 120B). Basolateral and basomedian labial fields with chaetae **M1**–**2**, **E**, **L1**–**2** ciliate, **r** and **r2** (present in one specimen) reduced (as Fig. 82F). Ventral head with about 32 ciliate chaetae, postlabial formula with 4 (**G1**–**4**), 3 (**H2**–**4**), 4 (**J1**–**4**) chaetae, 12 thin posterior chaetae, and 4 larger chaetae, 1 basal chaetae (b.c.) surrounding the cephalic groove (Fig. 120D).

Thorax chaetotaxy (Fig. 121A–B). Th II **a**, **m** and **p** series with 18–22, 6–7 and 12 mac, respectively. Th III **a**, **m** and **p** series with 3, 1 and 4–6 mac, respectively. Ratio Th II: III = 2.30–1.90: 1 (n=4), holotype 1.94: 1.

Abdomen chaetotaxy (Figs 121C–D, 122A–C). Abd I **a**, **m** and **p** series with 1, 3 and 0 mac, respectively. Abd II **a**, **m** and **p** series with 1, 4 and 0 mac, respectively. Abd III **a**, **m** and **p** series with 1, 3 and 4 mac, respectively. Abd IV with 15 central mac of **A**–**T** series and 11 lateral mac of **E**–**Fe** series; 7 posterior sens (**ps** type I, others type II) and 9 posterior mes. Abd V **a**, **m** and **p** series with 1, 4 and 5 mac, respectively. Ratio Abd III: IV = 1: 5.95–6.42 (n= 4), holotype 1: 6.27.

Legs. Subcoxa I with 6 chaetae, 3 anterior chaetae and 2 psp; subcoxa II with an anterior row of 15 chaetae, posterior row of 5 chaetae, 2 anterior chaetae and 4 psp;

subcoxa III with one row of 13 chaetae and 2 posterior psp (Fig. 123A–C). Trochanteral organ with about 43 spine-like chaetae (Fig. 123D). Tibiotarsus not subdivided, outer side with 2 proximal larger ciliate chaetae and apically acuminate, inner side with 8 mac weakly ciliate. Ungues inner side with 4 teeth, 2 paired basal, 1 unpaired median subequal to basal teeth and 1 small unpaired apical. Unguiculus with all lamellae acuminate, **pe** lamella serrated and with small proximal tooth, other lamellae smooth; ratio unguis: unguiculus = 1: 0.63. Tibiotarsal smooth chaetae 1.59 larger than unguiculus and tenent hair 0.99 smaller than unguis outer edge.

Collophore. Anterior side with 18–19 chaetae, 6 proximal spine-like chaetae, 1 thin and 6–7 normal ciliate chaetae, 3 ciliate chaetae apically acuminate and 2 mac distally; posterior side with 16 chaetae, 6 spines and 10 thin ciliate chaetae widely distributed, smooth chaetae absent; lateral flap with about 38 chaetae, 7 smooth and 31 ciliate (Fig. 123E).

Furcula. Manubrium ventral formula with 0, 0, 2, 2/2 (subapical), 18–20 (apical) ciliate chaetae of different sizes plus about 21 elongated apical scales per side (Fig. 123F); manubrial plate with 3–4 blunt mac finely ciliate and apically nipple-like, 13 ciliate chaetae of different sizes and 2 psp. Dens dorsally with one proximal row of 16–20 blunt mac finely ciliate and apically nipple-like, holotype with 16–17 (Fig. 123G).

Etymology. “Hylaeus” refers to the inhabitant of the forest (from: “hyla”, ‘timber.’. (from Greek: *hyla* – timber), equatorial region of the Brazilian Amazon where found the species.

Remarks. *Lepidocyrtinus hylaeus* **sp. nov.** resembles *L. dapeste* **stat. nov.** (see Bellini *et al*. 2018) in body with few pigment spots on antennae and legs, head mac **S4** absent, and dorsal chaetotaxy in general (Figs 119, 120C, 121–122). However, *L. hylaeus* **sp. nov.** differs from *L. dapeste* **stat. nov.** in chaetotaxy by head mac **A5** (mic in *L. dapeste* **stat. nov.**), and Th II with up to 22 anterior (19 in *L. dapeste* **stat. nov.**). Other characteristics that differ from these species are: collophore anteriorly with 6 spine-like chaetae, and posteriorly with 6 spines, smooth chaeta absent, while *L. dapeste* **stat. nov.** has anteriorly 7 spine-like chaetae, plus 2 spines and smooth chaeta present posteriorly. In manubrium ventrally the new species differs by 2/2 subapical chaetae (0/2 in *L. dapeste*

stat. nov.) and dens dorsally with 16–20 blunt mac apically nipple-like (4–8 *L. dapeste* **stat. nov.**).

FIGURE 119. *Lepidocyrtinus hylaeus* **sp. nov.**, habitus of specimens fixed in alcohol (lateral view). Scale bar: 1 mm.

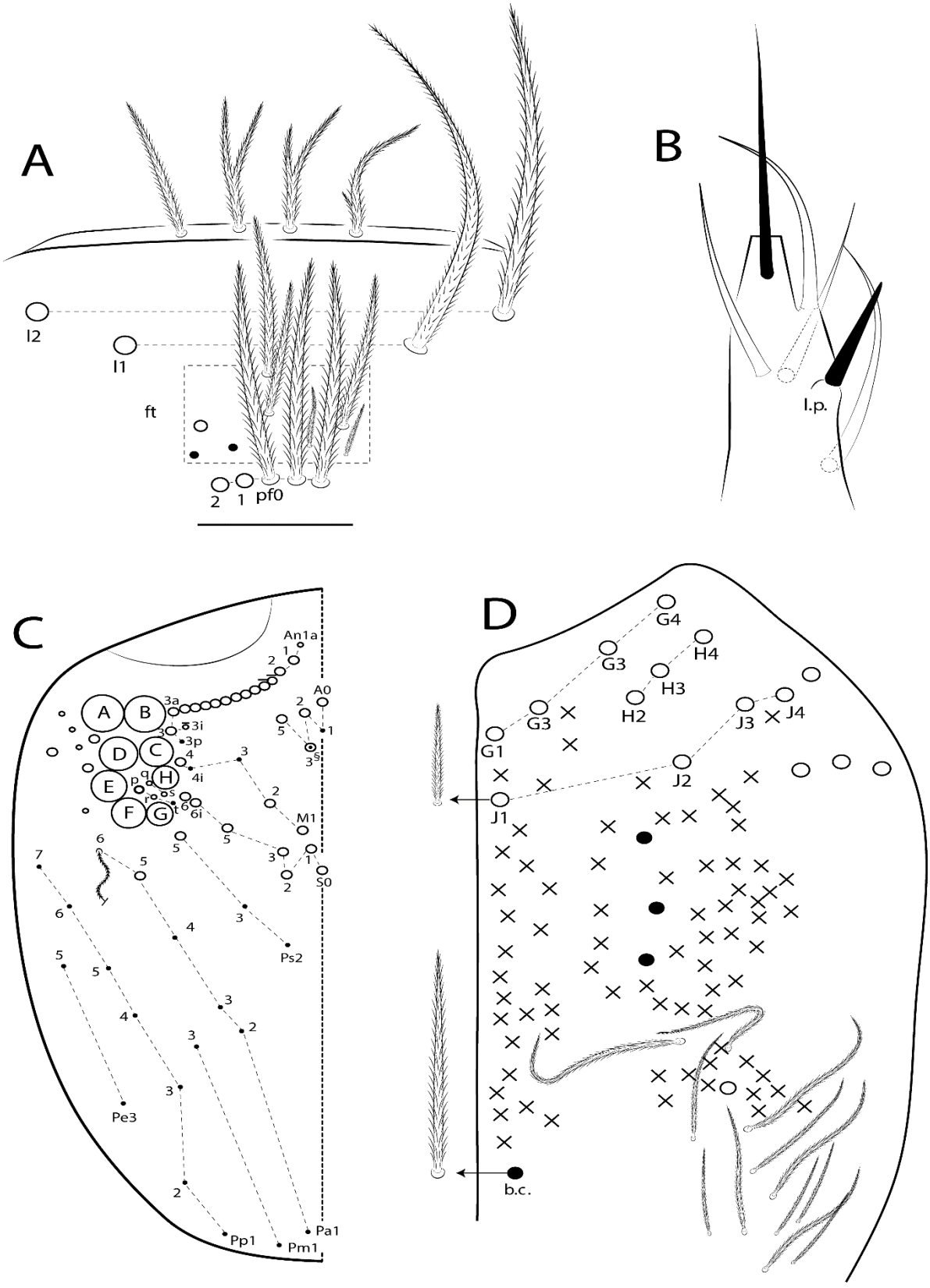

FIGURE 120A–D. *Lepidocyrtinus hylaeus* **sp. nov.**: head; **A**, chaetotaxy of the clypeus; **B**, labial papillae E (right side), arrow indicates lateral process (**l.p.**); **C**, dorsal chaetotaxy (left side); **D**, postlabial and cephalic groove chaetotaxy (right side).

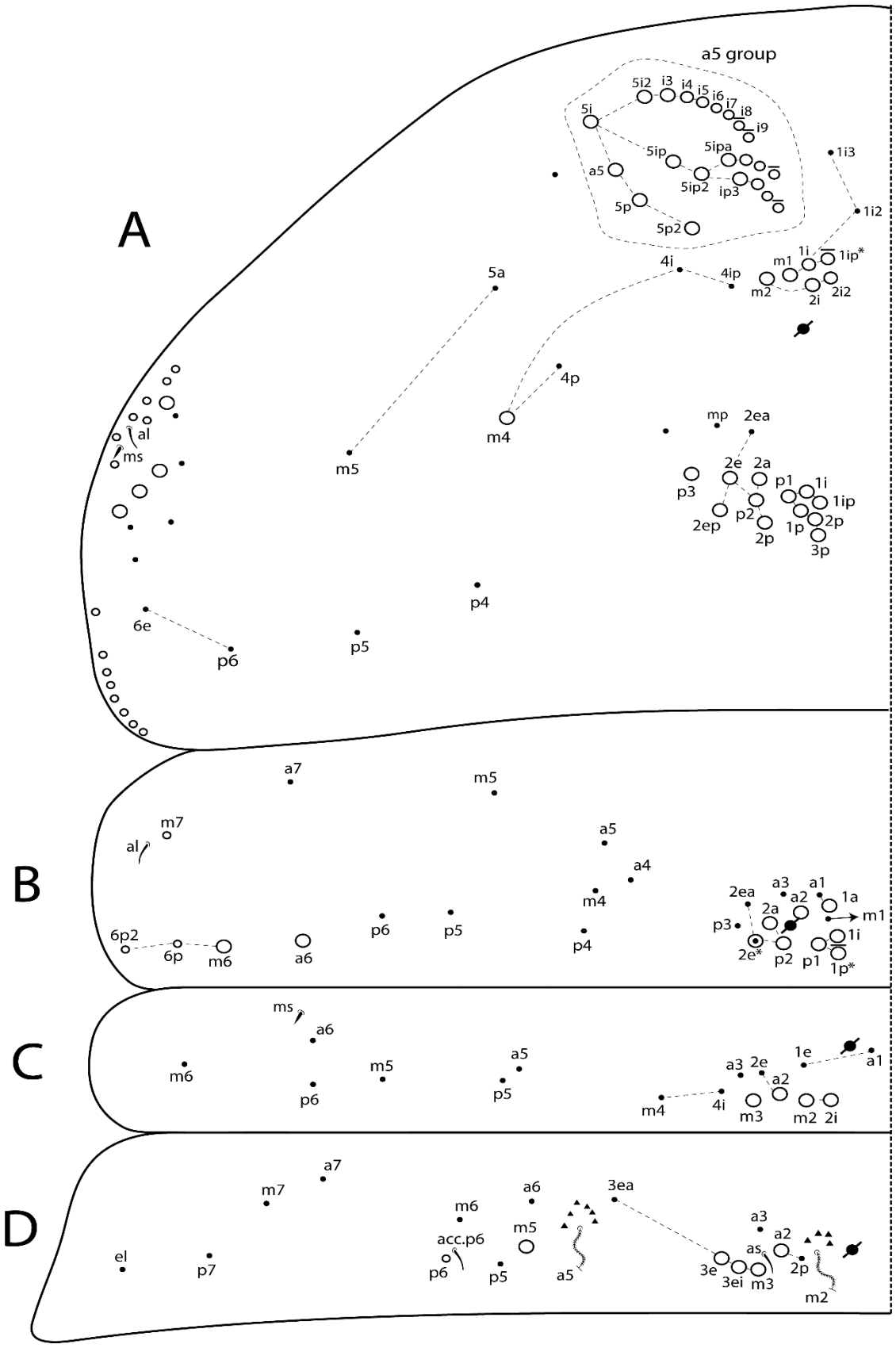

FIGURE 121A–**D.** *Lepidocyrtinus hylaeus* **sp. nov.**: dorsal chaetotaxy; **A**, Th II; **B**, Th III; **C**, Abd I; **D**, Abd II.

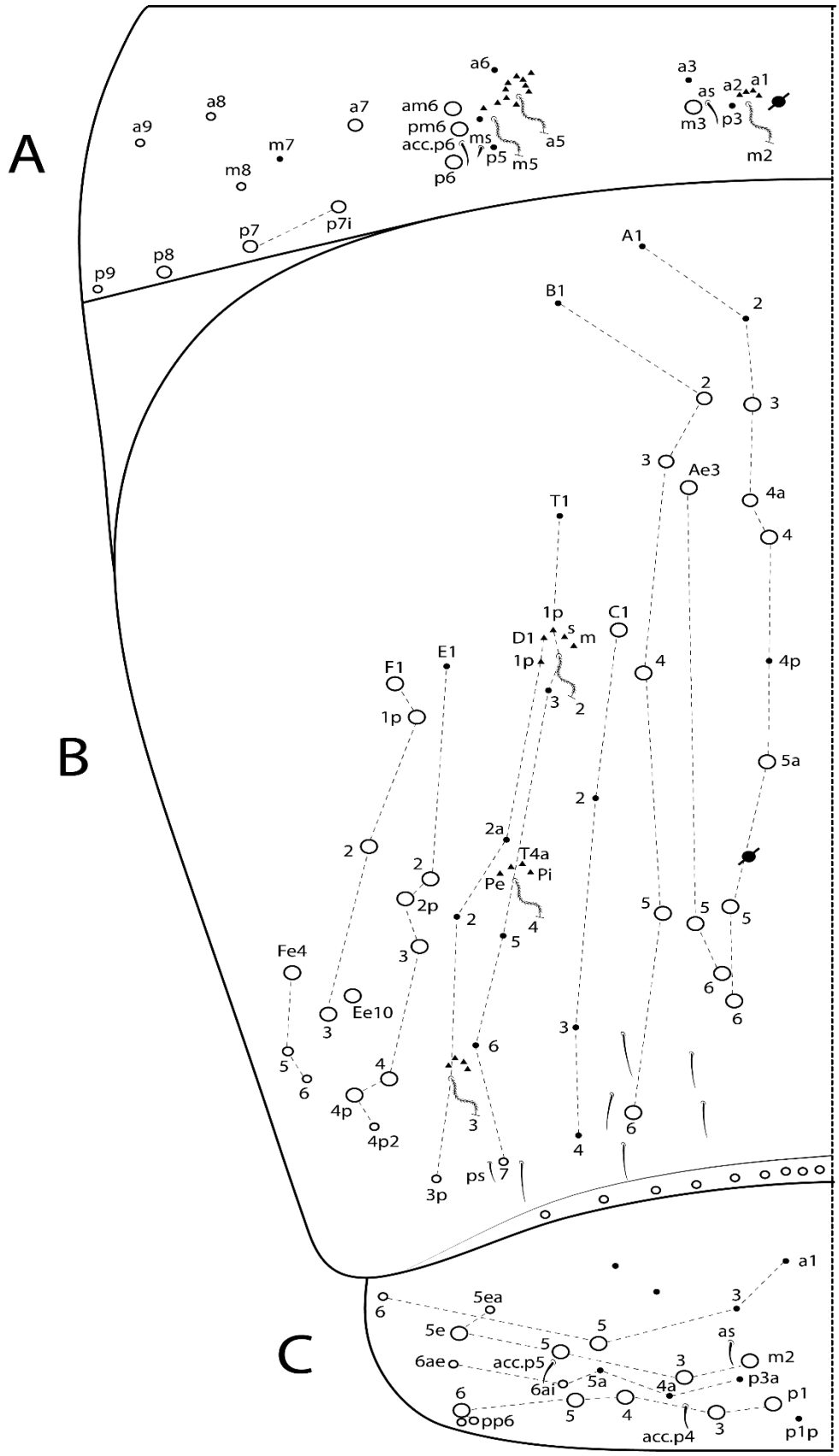

FIGURE 122A–**C.** *Lepidocyrtinus hylaeus* **sp. nov.**: dorsal chaetotaxy; **A**, Abd III, **B**, Abd IV; **C**, Abd V.

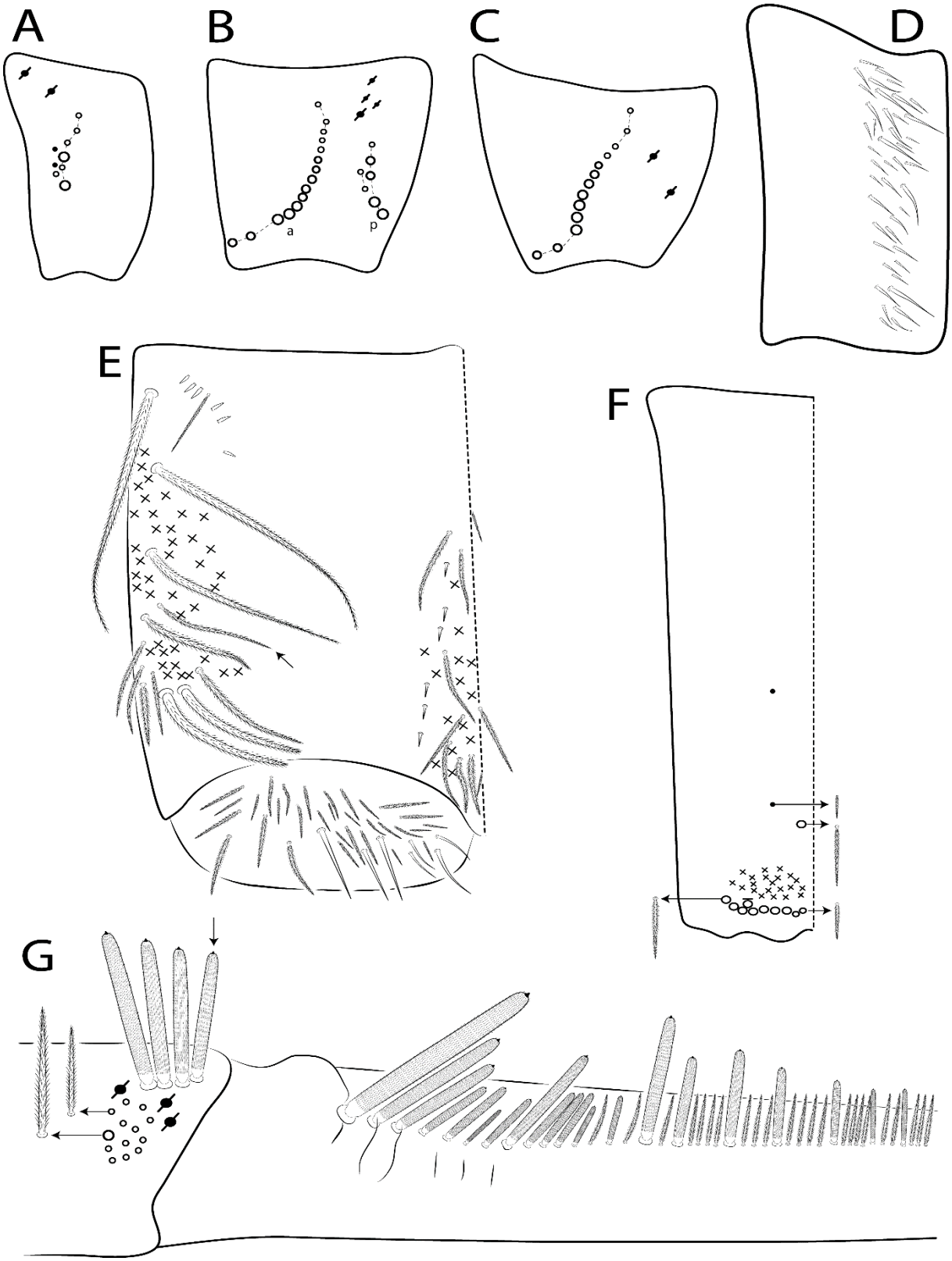

FIGURE 123A–G. *Lepidocyrtinus hylaeus* **sp. nov.**: **A**, subcoxa I; **B**, subcoxa II; **C**, subcoxa III (outer side); **D**, trochanteral organ (inner side); **E**, collophore chaetotaxy (lateral view), arrow anteriorly indicates chaetae present or absent; **F**, manubrium ventral chaetotaxy; **G**, chaetotaxy of the manubrial plate and proximal dens (lateral view), arrow indicates blunt chaetae present or absent.

***Lepidocyrtinus paduai* sp. nov. Cipola & Bellini**

Figs 124–135, 138

Type material. Holotype female on slide (071/INPA): Brazil, Minas Gerais, Cássia municipality, “Genoveva” farm, region of "Lajeado", road MG-856, 20°30'S, 46°56'W (Fig. 138), next to stream, 740 m, 04.xii.2016-04.i.2017, Malaise trap, DG Pádua & AG Pádua coll. Paratypes on slides (071A-M/INPA): 1 male, 8 females, 1 juvenile of 1st instar, 5 juveniles of intermediate stages and 112 specimens in alcohol, same data as holotype. Paratypes in alcohol (CC/UFRN): 16 specimens, same data as holotype.

Diagnosis. Body with dark spots on Ant III–IV, head laterally and leg III (Fig. 124C); head mac **A0**, **A2**–**3**, **A5**, **M1**–**2** and **S0**–**6** present (Fig. 126C); prelabral chaetae ciliate; labial papilla E with lateral process (l.p.) apically pointed not reaching the base of apical appendage; Th II with 21–25 anterior, 7 median (**m1ip** and **m4** present, **m4i** and **m4p** mac absent) and 12–13 posterior mac (**p2ep** and **p3** mac); Th III–Abd II with 8–9, 3–5 , 4 central mac respectively; Abd IV with 14–15 central mac and 13 lateral mac (Figs 130, 131B); ungues apical tooth present; unguiculus with all lamella acuminate; collophore anteriorly with 7–9 spine-like chaetae and 5 ciliate chaetae apically acuminate, posteriorly with 8 spines, smooth chaeta present (Fig. 133); manubrium ventrally with 2/2 subapical chaetae; manubrial plate with 3 blunt mac apically nipple-like; dens with 10–14 blunt mac apically nipple-like (Figs 134C, 135C).

Description. Total length (head + trunk) of specimens 3.39–3.87 mm (n=4), holotype 3.66 mm. Specimens pale white with dark blue pigments on proximal Ant I, III and IV, lateral head, trochanter III, distal femur II, and proximal and distal femur III. Orange pigments on Ant III distally and Ant IV completely; eyespatches black (Fig. 124C). Scales present on Ant I to one-third proximal of Ant IV, dorsal and ventral head, dorsal thorax and abdomen, legs (except empodia), anterior and posterior collophore, ventral and dorsal manubrium and dens ventrally.

Head. Antennae subequal to trunk length (Fig. 124C), ratio antennae: trunk = 1: 0.99–1.22 (n=4), holotype 1: 1.09; antennal segments ratio as I: II: III: IV = 1: 1.06–1.20: 0.99–1.01: 1.70–2.16, holotype 1: 1.18: missing: 2.10. Ant IV annulated on distal three-fourths, with apical bulb unilobed or bilobed apically. Ant III sense organ with 2 rods, at

leats 2 spiny guard sens, s-blunt sens of different sizes and ciliated chaetae (Fig. 125B). Ant I dorsally with 2 median mac, 2 spines and 3 smooth mic at base. Eyes A and B larger, G and H smaller, others subequal, and with 5 'IO' chaetae; head dorsal macrochaetotaxy with 11–12 **An**, 4 **A**, 3 **M**, 8 **S** and 1 **Pa** mac (Fig. 126C). Clypeal formula with 4 (**l1**–**2**), 6 (**fr**), 5 (**pf0**–**2**) ciliate chaetae, **l1**–**2** larger, **l1** apically acuminate, others subequal (Fig. 127C). Prelabral chaetae ciliate, inner chaetae normal or bifurcate equal or unequal, outer chaetae normal or bifurcated unequal. Labral **p0** chaeta sometimes with minute median filament (Fig. 125D). Labral papillae with two inner conical projections, outer papillae absent (Fig. 125C). Maxillary palp with smooth apical appendage (**a.a.**) and basal chaeta (**b.c.**) weakly ciliate, thicker and 1.24 larger in length than the apical. Labial papilla E with lateral process (l.p.) apically pointed and not reaching the base of apical appendage. Basolateral and basomedian labial fields with chaetae **M1**–**2**, **E**, **L1**–**2** ciliate, **r** reduced (as Fig. 82F). Ventral head with about 27 ciliate chaetae, postlabial formula with 4 (**G1**–**4**), 3 (**H2**–**4**), 4 (**J1**–**4**) chaetae, 6 thin posterior chaetae, and 1 larger basal chaetae (b.c.) surrounding the cephalic groove (Fig. 128C).

Thorax chaetotaxy (Fig. 130A–B). Th II **a**, **m** and **p** series with 21–25, 7 and 12–13 mac, respectively, and about 13 secondary psp. Th III **a**, **m** and **p** series with 3–4, 1 and 6 mac, respectively, and about 15 secondary psp. Ratio Th II: III = 2.13–1.66: 1 (n=4), holotype 2.13: 1.

Abdomen chaetotaxy (Figs 130C–D, 131A–C). Abd I **a**, **m** and **p** series with 1, 2–4 and 0 mac, respectively, and 1 secondary psp. Abd II **a**, **m** and **p** series with 1, 4 and 0 mac, respectively, and about 9 secondary psp. Abd III **a**, **m** and **p** series with 1, 3 and 4 mac, respectively, and about 13 secondary psp. Abd IV with 14–15 central mac of **A**–**T** series and 13 lateral mac of **E**–**Fe** series; 9 posterior sens (**ps** type I, others type II) and 9 posterior mes. Abd V **a**, **m** and **p** series with 1, 4 and 6 mac, respectively. Ratio Abd III: IV = 1: 4.52–6.30 (n= 4), holotype 1: 4.81.

Legs. Subcoxa I with 8 chaetae and 2 psp; subcoxa II with an anterior row of 13 chaetae, posterior row of 7 chaetae and 6 psp; subcoxa III with one row of 15 chaetae and 2 posterior psp (Fig. 132A–C). Trochanteral organ with about 65 spine-like chaetae (Fig. 132F). Tibiotarsus subdivided or not, outer side with 3 proximal larger ciliate chaetae and apically acuminate, inner side with 8 mac weakly ciliate. Ungues inner side with 4 teeth, 2 paired basal, 1 unpaired median subequal to basal teeth and 1 small unpaired apical. Unguiculus with all lamellae acuminate, **pe** lamella serrated and with small proximal tooth,

other lamellae smooth; ratio unguis: unguiculus = 1: 0.61. Tibiotarsal smooth chaeta 1.17 larger than unguiculus and tenent hair 0.88 smaller than unguis outer edge.

Collophore. Anterior side with 17–22 chaetae, 7–9 proximal spine-like chaetae, 1 thin and 3–5 normal ciliate chaetae, 4–5 ciliate chaetae apically acuminate and 2 mac distally; posterior side with 19 chaetae, 8 spines, 10 thin ciliate chaetae widely distributed and 1 smooth chaetae distally; lateral flap with about 44 chaetae, 8 smooth and 36 ciliate (Fig. 133).

Furcula. Manubrium ventral formula with 0, 2, 2, 2/2 (subapical), 20–24 (apical) ciliate chaetae of different sizes plus about 25 elongated apical scales per side (Fig. 134C); manubrial plate with 3 blunt mac finely ciliate and apically nipple-like, 12 ciliate chaetae of different sizes and 3 psp. Dens dorsally with one proximal row of 10–14 blunt mac finely ciliate and apically nipple-like, holotype with 11 (Fig. 135C).

Description of 1st instar. Body pale white with orange speckles on Ant I–III, lateral head, Th II to Abd VI posteriorly, tibiotarsus and femur, and dorsal manubrium; pigments dark blue on Ant IV, Ant I–III weakly, lateral Th II, and femur III distally; eyespatches black (Fig. 124A). Body scales absent.

Antennae shorter than trunk length; Ant IV larger in length, II–III subequal, I smaller (Figs 124A, 125A). Ant IV with four median annulations, apical bulb unilobed, about 27 s-blunt sens of different sizes, 2 small pin sens, and numerous ciliate chaetae. Ant III apical organ with 2 club-like sense, without guard and s-blunt sens, and with 11, 10 and 12 ciliate chaetae on whorls I–III, respectively. Ant II with 8, 7 and 10 ciliate chaetae on whorls I–III, respectively, no sens. Ant I with 11 ciliate chaetae on whorl and 1 proximal smooth chaeta, no sens (Fig. 125A). Eyes A and B larger, G and H smaller, others subequal, and with 3 interocular ciliate chaetae (**p** mac, **s** and **t** mes). Head dorsal chaetotaxy with 9 series of primary chaetae; 3 antennal (**An1**–**3**), 5 anterior (**A4** absent), 1 unnamed (**Am0**), 5 median (**M0**–**4** present), 6 sutural (**S4** absent), 3 post-sutural, 5 postoccipital anterior (**Pa4** absent), 2 postoccipital median (**Pm2** absent), 6 postoccipital posterior (**Pp2** absent), and 3 postoccipital external (**Pe3**–**5**) (Fig. 16B). Clypeal formula with 4 (**l1**–**2**), 2 (**fr**) and 1 (**pf0**) ciliate chaetae, **l1**–**2** larger, **l1** apically acuminate (Fig. 127A). Basolateral and basomedian labial fields has chaetae **a1**–**5** smooth (**a2** and **a5** larger), **M1**, **E**, **L1**–**2** ciliate, **M2** and **r** absent (Fig. 128A). Ventral head with about 17 ciliate chaetae, postlabial formula with 4 (**G1**–**4**), 3 (**X3**–**4**), 2 (**H3**–**4**), 4 (**J1**–**4**) chaetae,

plus 4 chaetae of uncertain homology, **H2** and basal chaetae on cephalic groove absent (Fig. 128A).

Thorax chaetotaxy with 3 series of primary chaetae (Fig. 129A). Th II, **a** series with 7 chaetae, **a1**–**6** mac and **a7** mes; **m** series with 6 chaetae (**m3** absent), **m1**–**2**, **m4** and **m6** mac, **m5** and **m7** mes; **p** series with 6 chaetae, **p1**–**3** and **p5** mac, **p4** and **p6** mes; 1 psp, 1 sens (**al**) type I and 1 S-microchaeta (**ms**). Th III, **a** series with 7 chaetae, **a1**–**6** mac and **a7** mes; **m** series with 5 chaetae (**m2**–**3** absent), **m6** mac, **m5** and **m7** mes, **m1** and **m4** mic; **p** series with 6 chaetae, **p1**–**3** mac, **p4**–**6** mes; 1 psp and 1 sens (**al**) type I.

Abdomen chaetotaxy with 3 series of primary chaetae, except Abd IV with 8 series (Fig. 129A). Abd I, **a** series with 5 chaetae, **a2** mac, **a1**, **a3** and **a6** mes, **a5** mic; **m** series with 5 chaetae, **m2**–**4** mac, **m5**–**6** mes; **p** series with 1–2 mes (**p5**–**6**), p6 present or absent; 1 psp and 1 S-microchaeta (**ms**). Abd II, **a** series with 6 chaetae, **a2** mac, **a3** and **a6** mes, **a1** and **a6** mic, **a5** bothriotrichum; **m** series with 6 chaetae, **m3** and **m5** mac, **m7** mes, **m4** and **m6** mic, **m2** bothriotrichum; **p** series with 4 chaetae, p6 mac, **p4**–**5** and **p7** mes; 1 psp, **el** chaeta and 2 sens (**as**, **acc.p6**) type I. Abd III, **a** series with 7 chaetae, **a1**–**3** and **a6**–**8** mes, **a5** bothriotrichum; **m** series with 8 chaetae (added double of **m6**), **m3** and **pm6** mac, **m4**, **am6** and **m7**–**8** mes, **m2** and **m5** bothriotricha; **p** series with 4 chaetae, **p6** mac, **p3**, **p5** and **p7** mes; 1 psp, 2 sens (**as**, **acc.p6**) type I and 1 S-microchaeta (**ms**). Abd IV, **A** series with 5 mes (**A1**–**3**, **A5**–**6**), **A4** absent; **B** series with 6 chaetae, **B4**–**5** mac, **B1**–**3** and **B6** mes; **C** series with 3 mes (**C2**–**4**), **C1** absent; **T** series with 7 chaetae, **T1**, **T3**, **T5**–**7** mes, **T2** and **T4** bothriotricha, no accessory chaetae; **D** series with 3 mes (**D1**–**3**); **E** series with 3 chaetae, **E3** mac, **E1**–**2** and **E4** mes; **F** series with 3 mes (**F1**–**3**), **Fe** series with 1 mes (**Fe2**); **Ae** and **Ee** series and posterior mes absent, 1 psp and about 10 posterior sens (**as** and **ps** type I, others type II) present. Abd V, **a** series with 4 mes (**a1**, **a3**, **a5**–**6**), **A2** and **A4** absent; **m** series with 3 mac (**m2**–**3**, **m5**), **m1** and **m4** absent; **p** series with 5 mes (**p1**, **p3**–**6**), **p2** absent; and 3 sens (**as**, **acc.p4**, **acc.p5**) type I present, psp absent.

Legs. Trochanteral organ with one subapical spine-like chaetae (Fig. 134A). Tibiotarsus I whorls formula (I–V) with 10, 8, 8, 8 and 4 ciliate chaetae, respectively, plus 4 posterior and 1 anterior chaetae (Figs 132G). Ungues outer side with a pair of large laterobasal teeth; inner side with 4 teeth, 2 paired basal, 1 unpaired median subequal to basal teeth, and 1 minute unpaired apical. Unguiculus with **ai** lamella truncate, others lamellae acuminate and smooth.

Collophore. Anterior side without chaetae; posterior side with 1 smooth chaeta distally; lateral flap with 2 smooth chaetae.

Furcula. Manubrium ventral formula with 0, 2, 2, 3 (subapical), 2 (apical) large ciliate chaetae (Fig. 134A); manubrial plate (dorsally) without chaetae and psp. Dens dorsally with 1 proximal blunt mac finely ciliate and apically nipple-like (Fig. 135A)

Etymology. The new species is named after Msc. Diego Galvão de Pádua (INPA) and Antônio Galvão de Pádua, collectors of the new species.

Remarks. *Lepidocyrtinus paduai* **sp. nov.** resembles *L. hylaeus* **sp. nov.** and *L. dapeste* **stat. nov.** by white body with few pigment spots (typicall of these species), but it is easily distinguishing by head with mac **A5** and **S4** present (both absent in *L. dapeste* **stat. nov.**, **S4** absent in *L. hylaeus* **sp. nov.**), Th II mac **p3** present (absent in *L. hylaeus* **sp. nov.**) and collophore posteriorly with 8 spines (less in *L. hylaeus* **sp. nov.** and *L. dapeste* **stat. nov.**).

The macrochaetotaxy pattern of *L. paduai* **sp. nov.** is more similar to *L. nigrans* **comb. nov.** in head mac **A2**–**3**, **A5**, **S0–6** present, Th II with 7 and 13 posterior median mac, and Abd I–II with 5 and 4 central mac, respectively (Figs 126C, 130). *Lepidocyrtinus paduai* **sp. nov.** differs also from this species by a lateral band of pigment on head and depigmented trunk, while *L. nigrans* **comb. nov.** has head entirely pigmented plus trunk with lateral dark spots (Figs 65C, 124C). In chaetotaxy they differ by Th III mac **p1i** absent (present in *L. nigrans* **comb. nov.**), Abd III with 7 lateral mac (5 in *L. nigrans* **comb. nov.**), and Abd IV with 7 posterior mac and **Ee10** mac present (5–6 posterior and **Ee10** absent in *L. nigrans* **comb. nov.**). In addition, *L. paduai* **sp. nov.** has some lateral psp on Th II to Abd III which are absent in *L. nigrans* **comb. nov.** (Figs 75–76).

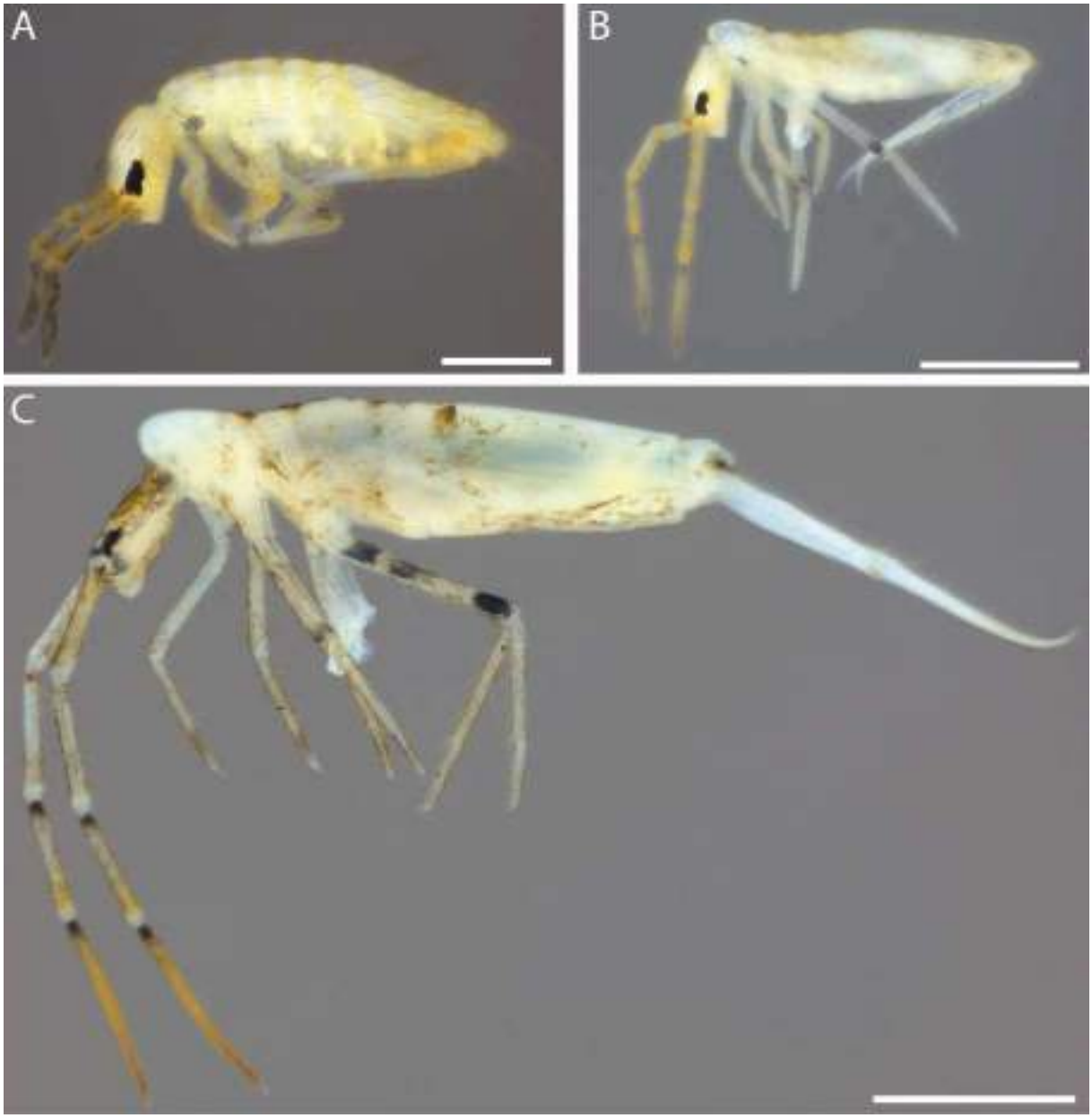

FIGURE 124A–C. *Lepidocyrtinus paduai* **sp. nov.:** habitus of specimens fixed in alcohol (lateral view); **A**, 1st instar; **B**, 3rd instar; **C**, adult. Scale bars: **A** (0.2 mm), **B** (0.5 mm), **C** (1 mm).

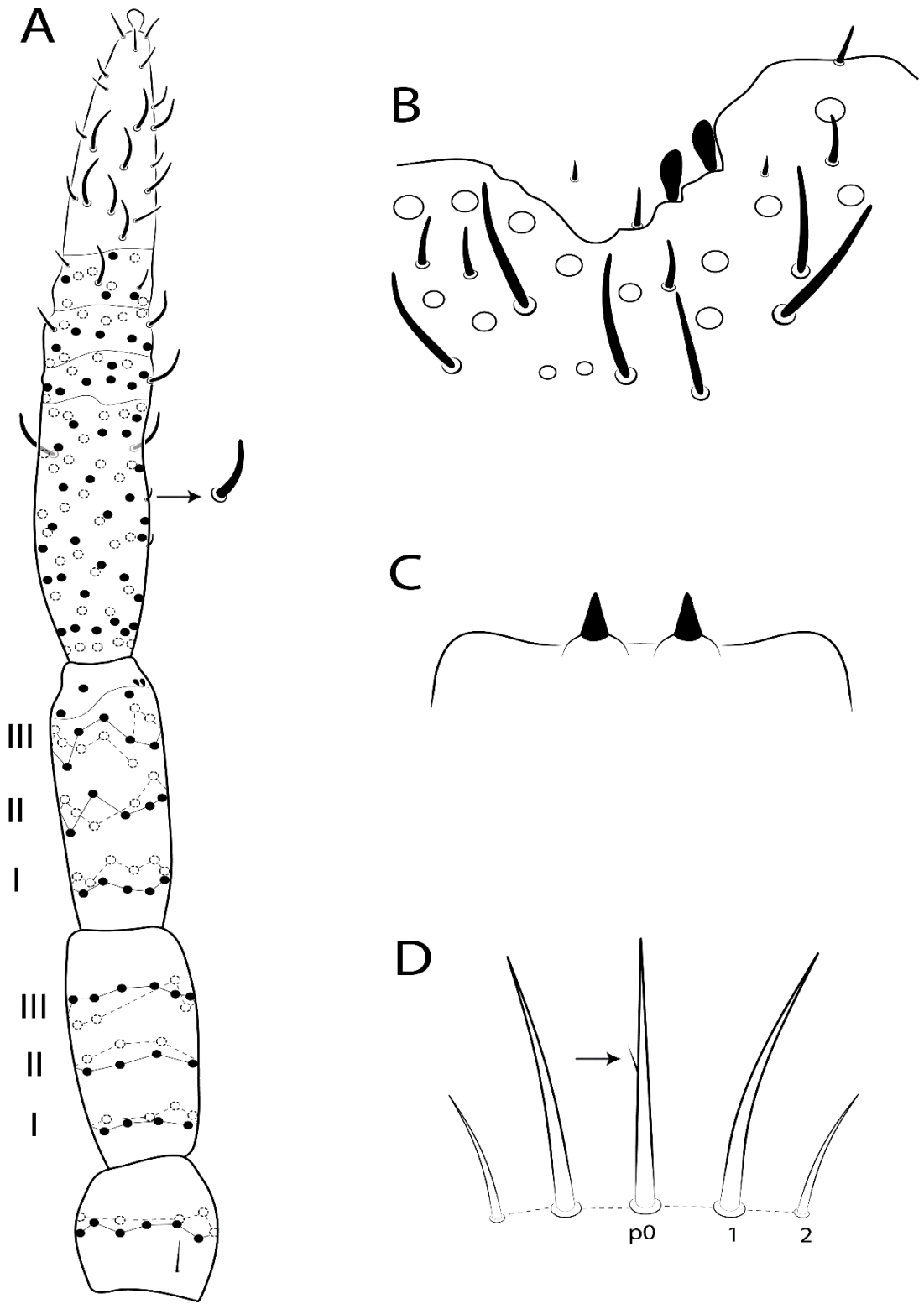

FIGURE 125A–D. *Lepidocyrtinus paduai* **sp. nov.**: head parts; **A**, chaetotaxy of Ant I–IV (right side, dorsal view), ciliate chaetae omitted in Ant IV distally; **B**, Ant III sense organ (left view); **C**, labral papillae (ventral view); **D**, labral posterior row (dorsal view), arrow indicates median filament on **P0** chaeta

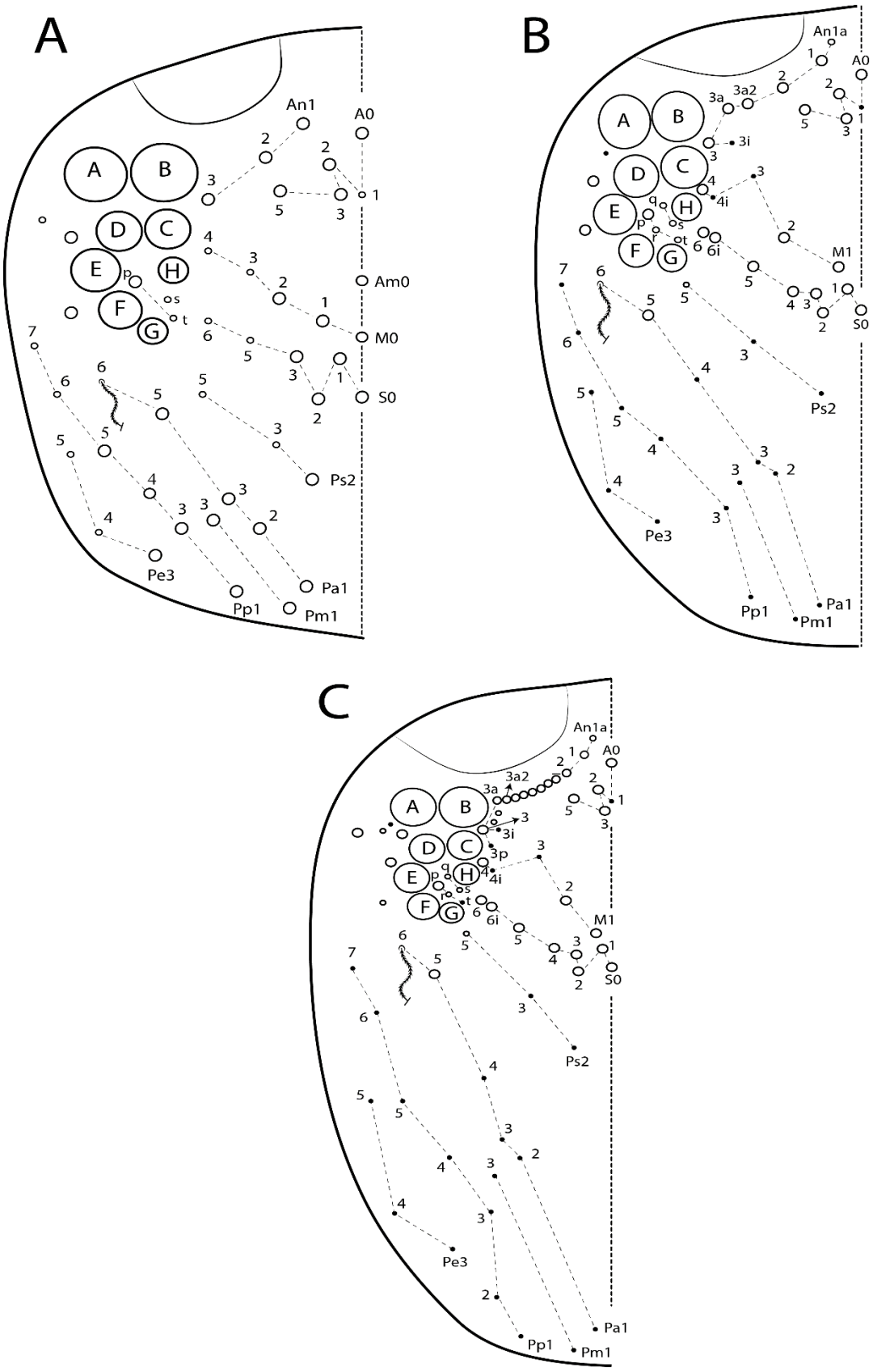

FIGURE 126A–C. *Lepidocyrtinus paduai* **sp. nov.**: head dorsal chaetotaxy (left side); **A**, 1st instar; **B**, 3rd instar; **C**, adult

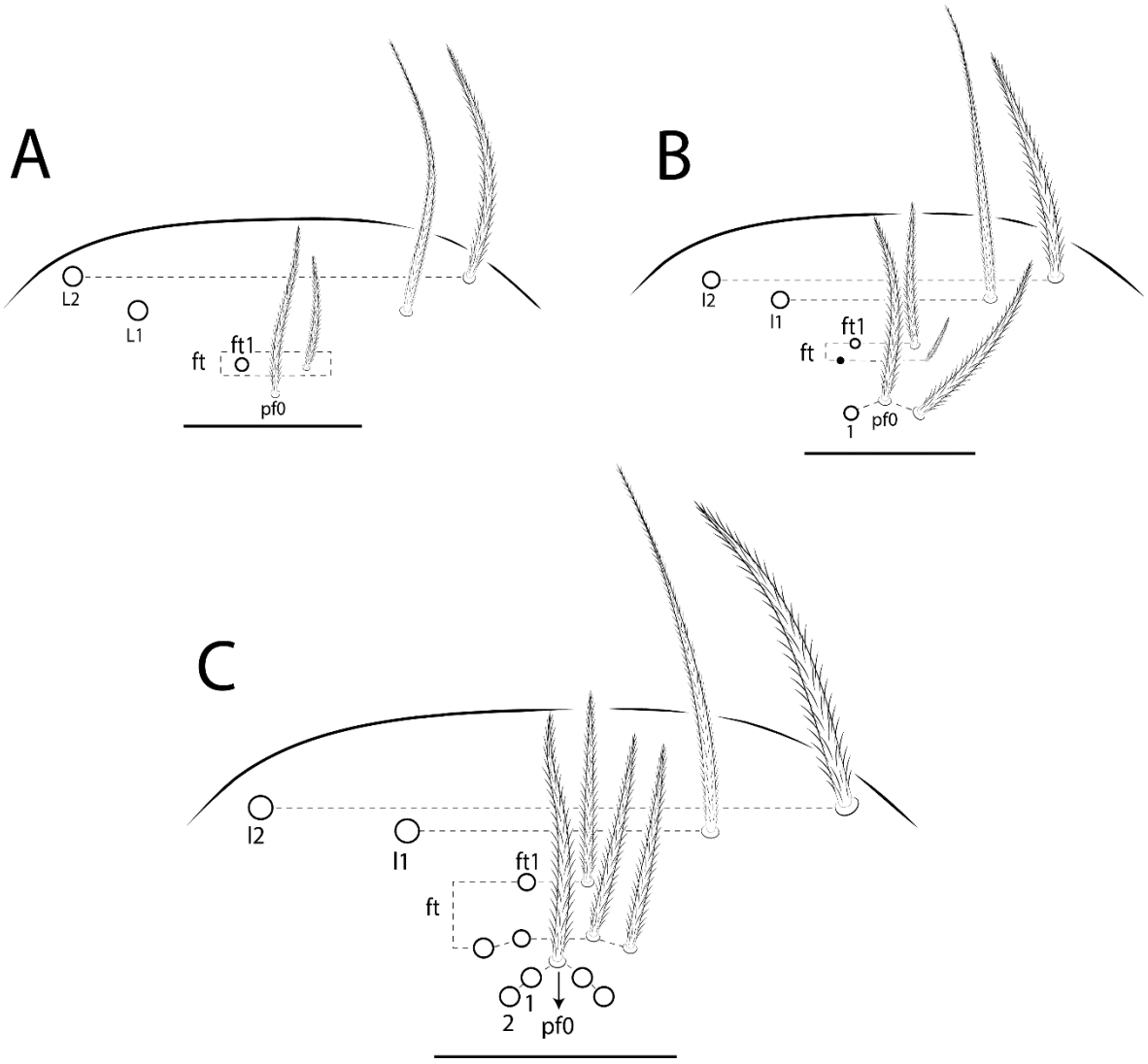

FIGURE 127A–C. *Lepidocyrtinus paduai* **sp. nov.**: chaetotaxy of the clypeus; **A**, 1st instar; **B**, 3rd instar; **C**, adult

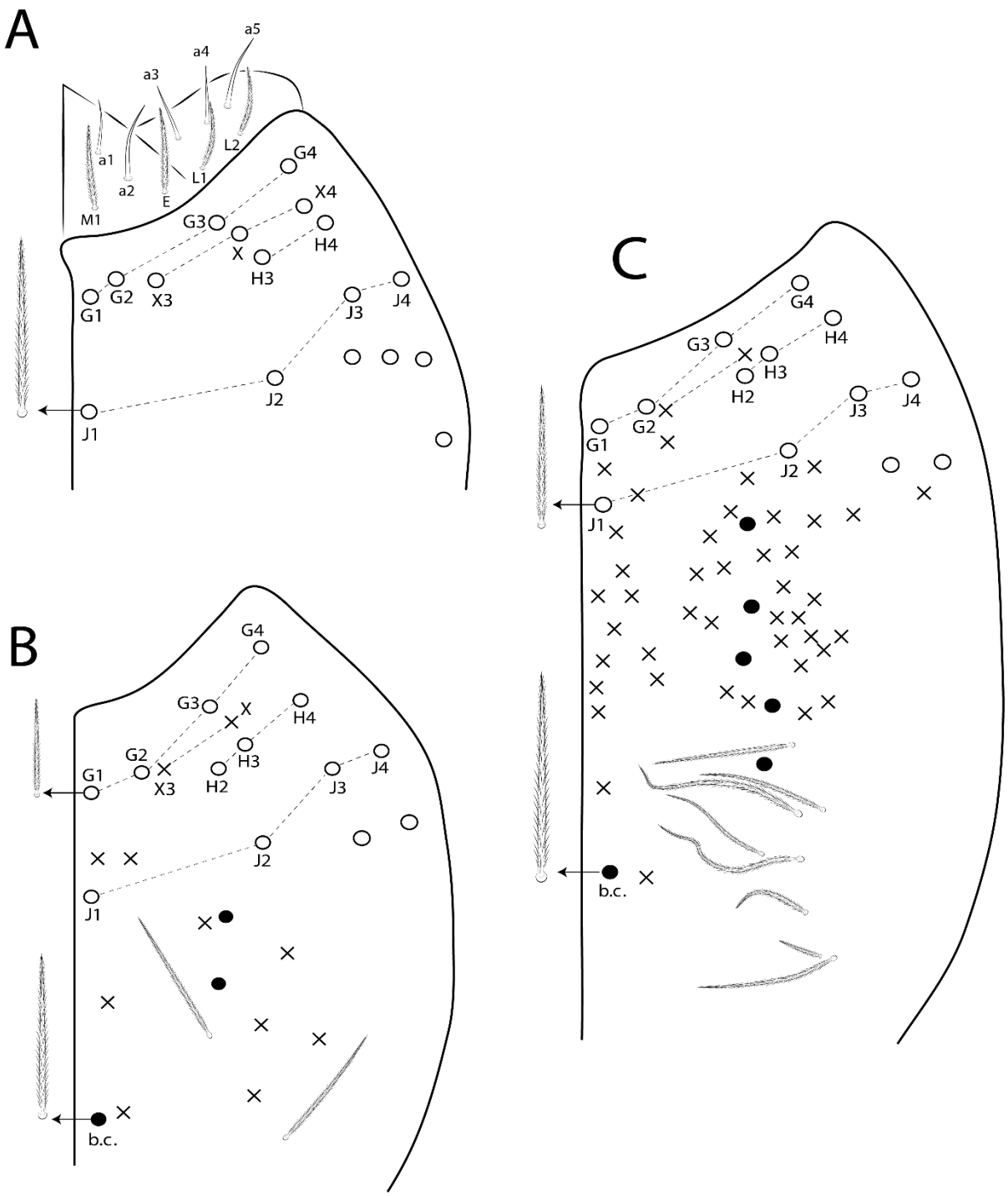

FIGURE 128A–C. *Lepidocyrtinus paduai* **sp. nov.**: basomedian and basolateral labiel filds, postlabial and cephalic groove chaetotaxy (right side); **A**, 1st instar; **B**, 3rd instar; **C**, adult.

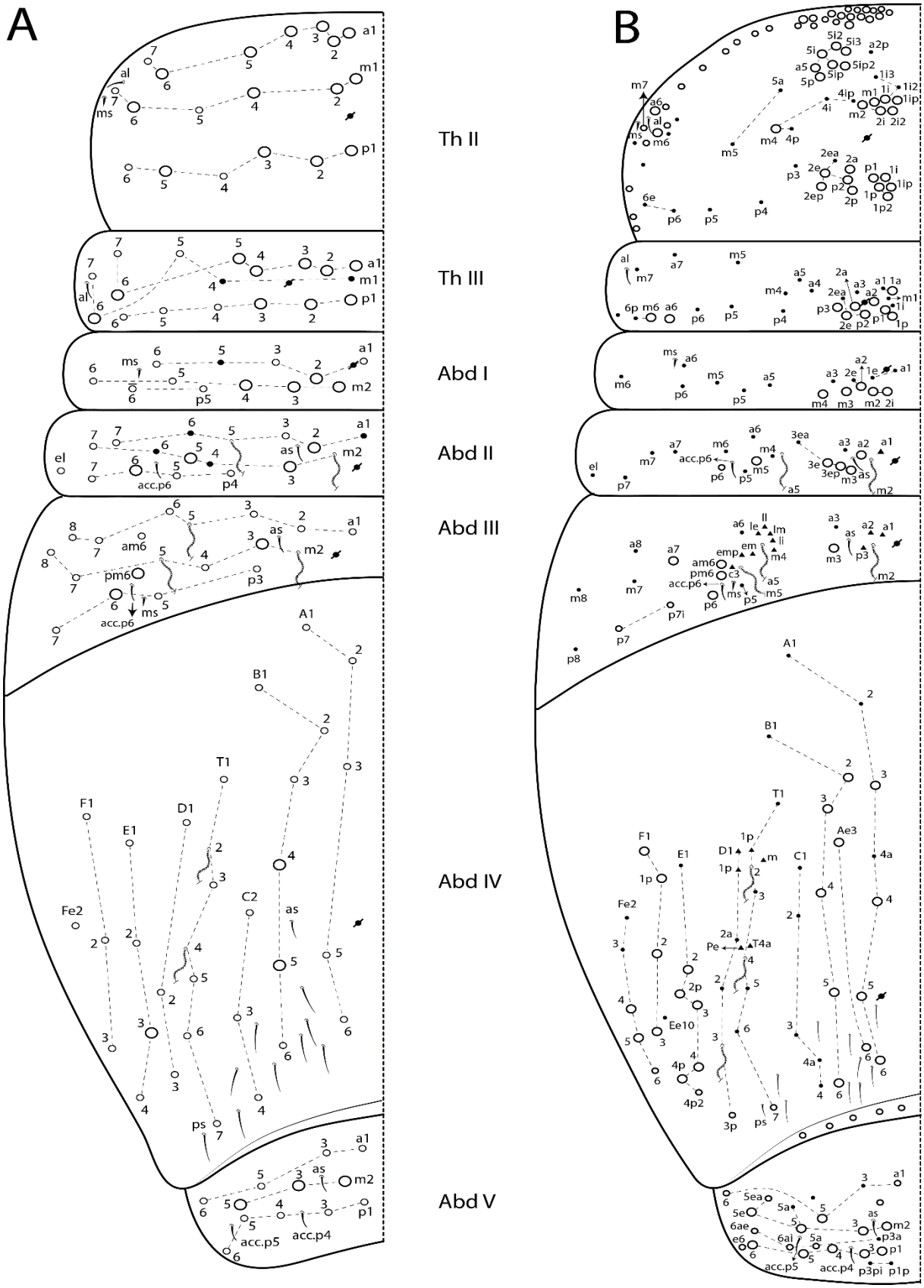

FIGURE 129A–B. *Lepidocyrtinus paduai* **sp. nov.**: dorsal chaetotaxy of Th II to Abd V (left side); **A**, 1st instar; **B**, 3rd instar.

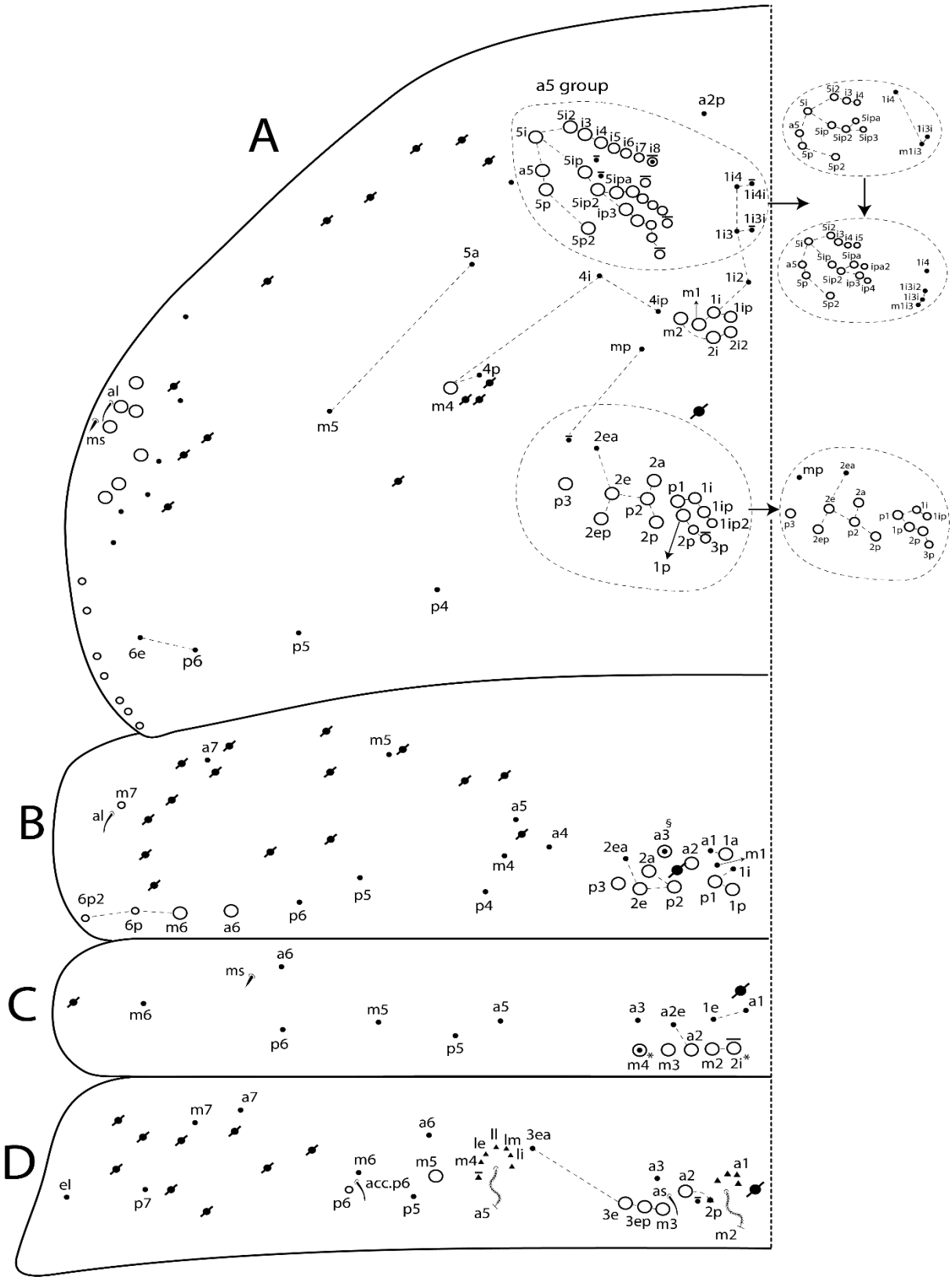

FIGURE 130A–D. *Lepidocyrtinus paduai* **sp. nov.**: dorsal chaetotaxy (adult); **A**, Th II, anterior arrows indicate respectively 4th and 5th instar, posterior arrow indicate 4th instar; **B**, Th III; **C**, Abd I; **D**, Abd II.

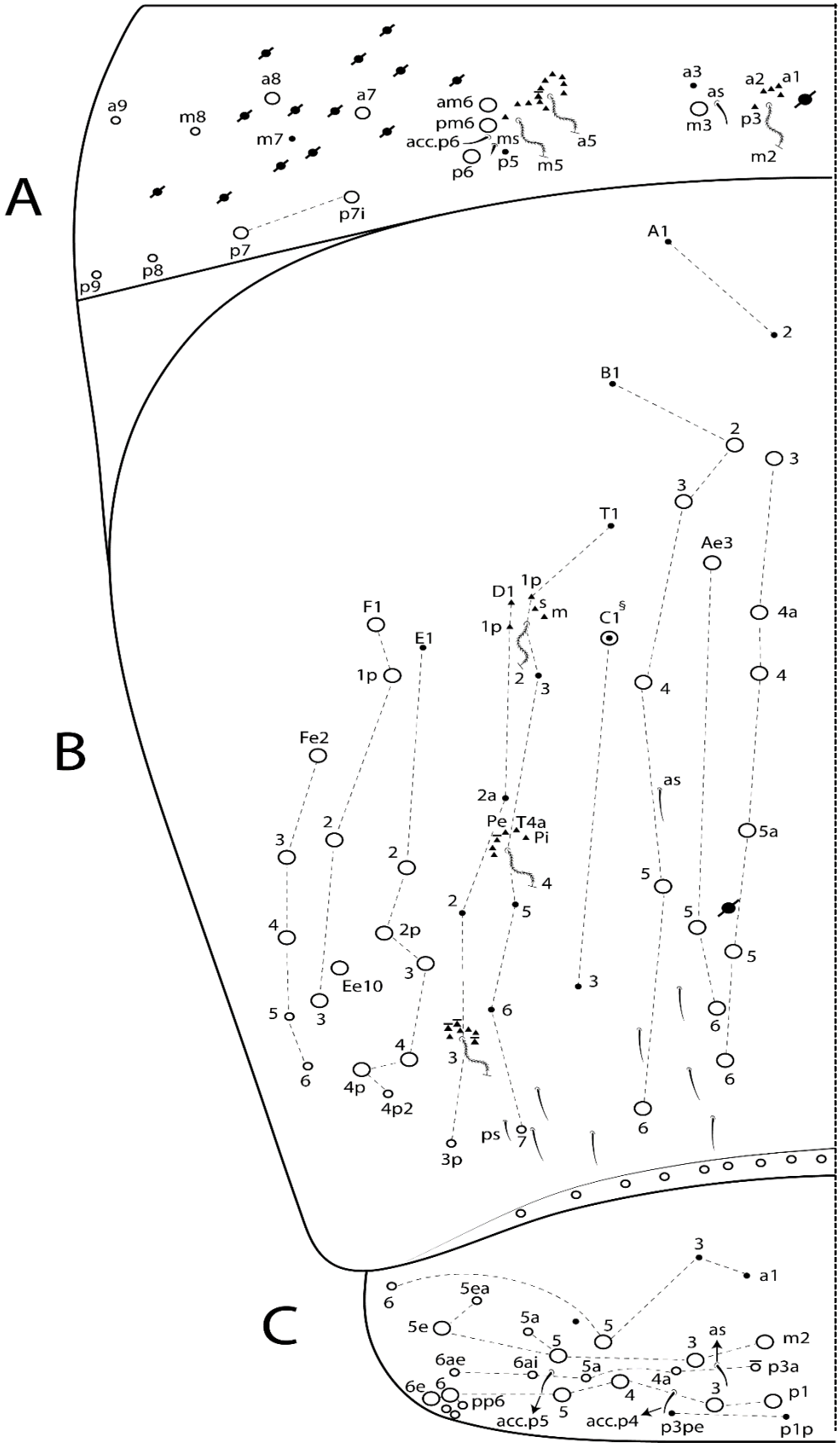

FIGURE 131A–C. *Lepidocyrtinus paduai* **sp. nov.**: dorsal chaetotaxy (adult); **A**, Abd III, **B**, Abd IV; **C**, Abd V.

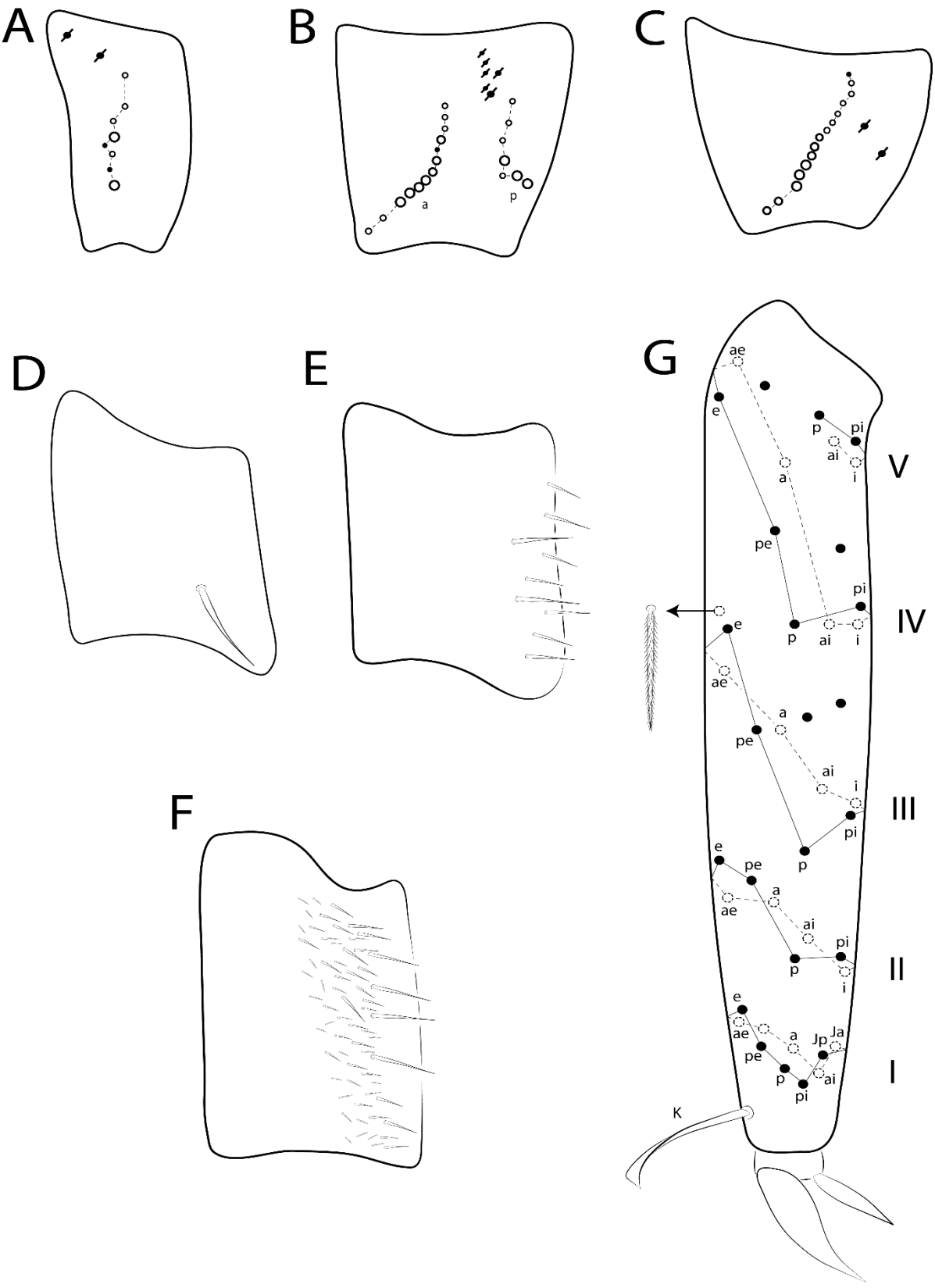

FIGURE 132A–G. *Lepidocyrtinus paduai* **sp. nov.**: legs; **A**, subcoxa I; **B**, subcoxa II; **C**, subcoxa III (outer side); **D–E.** trochanteral organ (inner side): **D**, 1st instar; **E**, 3rd instar; **F**, adult; **G**, chaetotaxy of tibiotarsus I in 1st instar (posterior view).

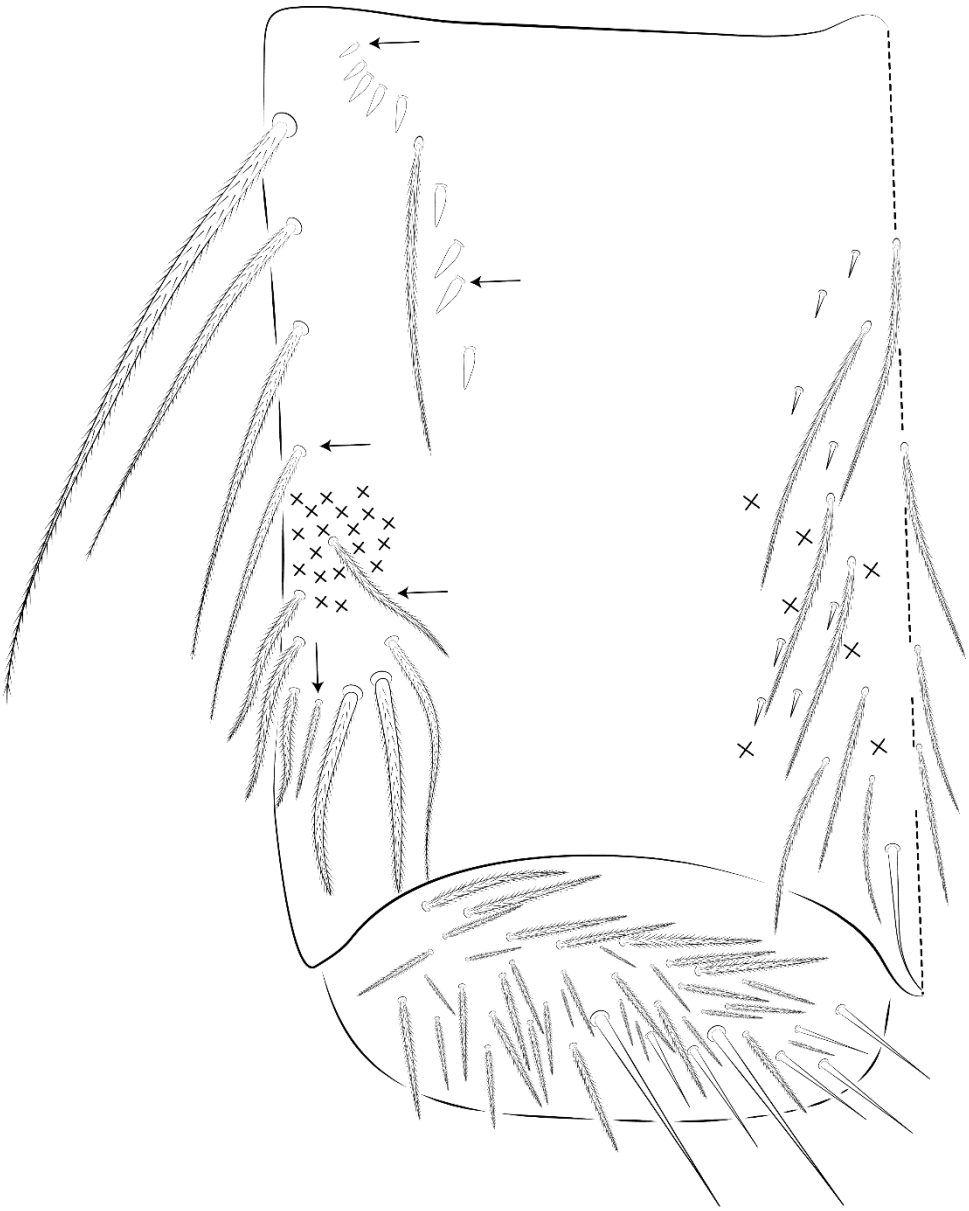

FIGURE 133. *Lepidocyrtinus paduai* **sp. nov.**: collophore chaetotaxy (lateral view), arrows indicate chaetae present or absent.

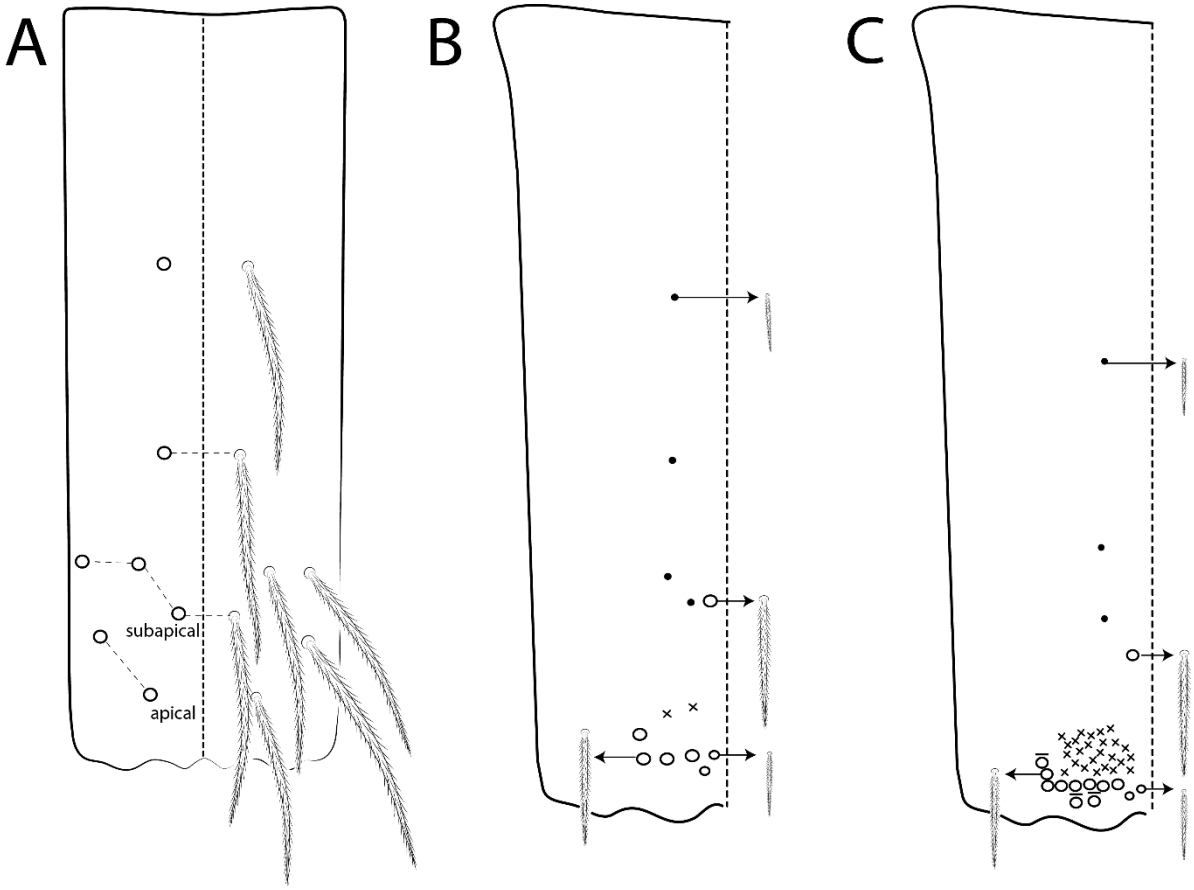

FIGURE 134A–C. *Lepidocyrtinus paduai* **sp. nov.**: manubrium ventral chaetotaxy; **A**, 1st instar; **B**, 3rd instar; **C**, adult.

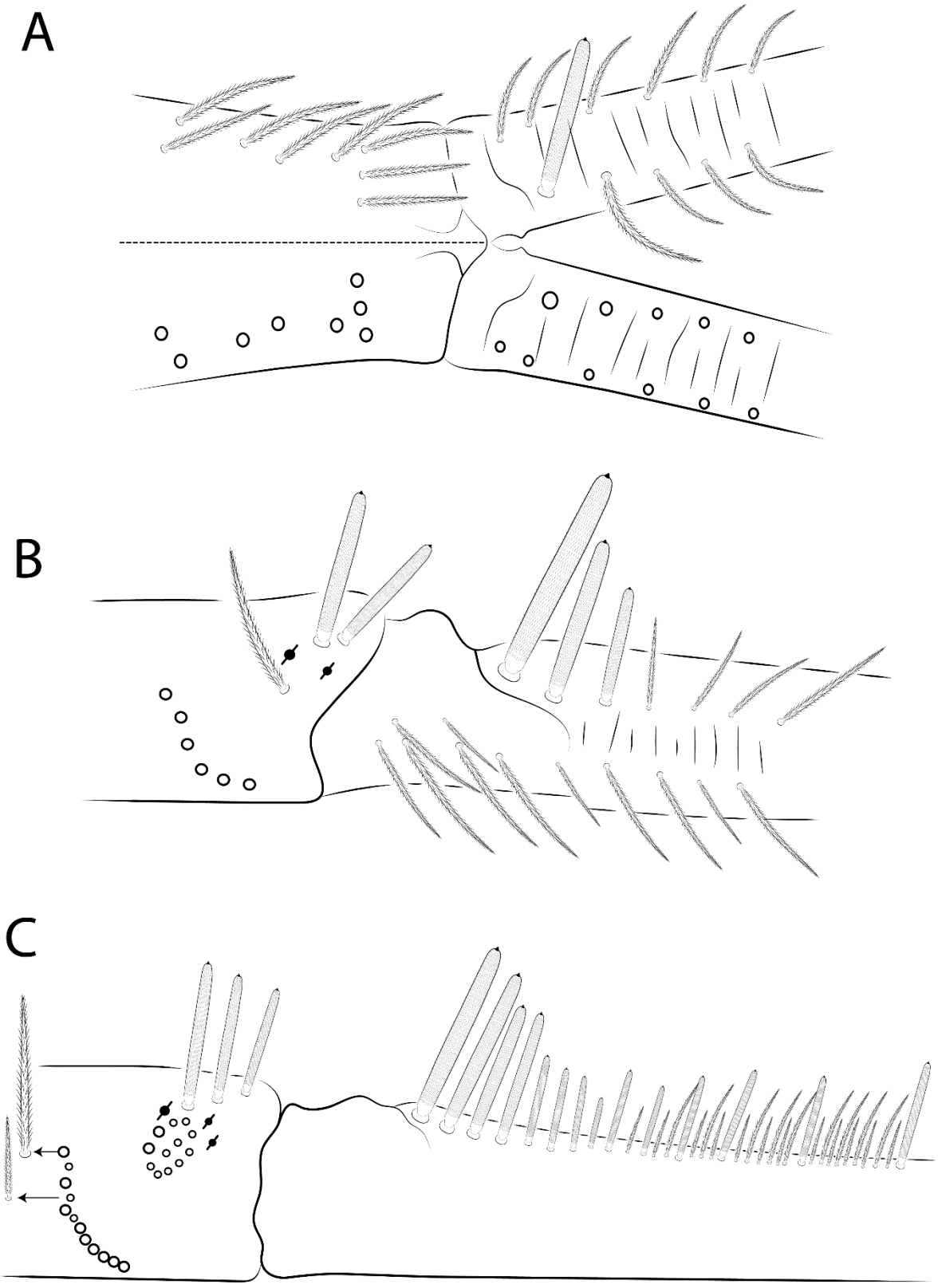

FIGURE 135A–C. *Lepidocyrtinus paduai* **sp. nov.**: chaetotaxy of the manubrial plate and proximal dens; **A**, 1st instar (dorsal view); **B**, 3rd instar (lateral view); **C**, adult (lateral view).

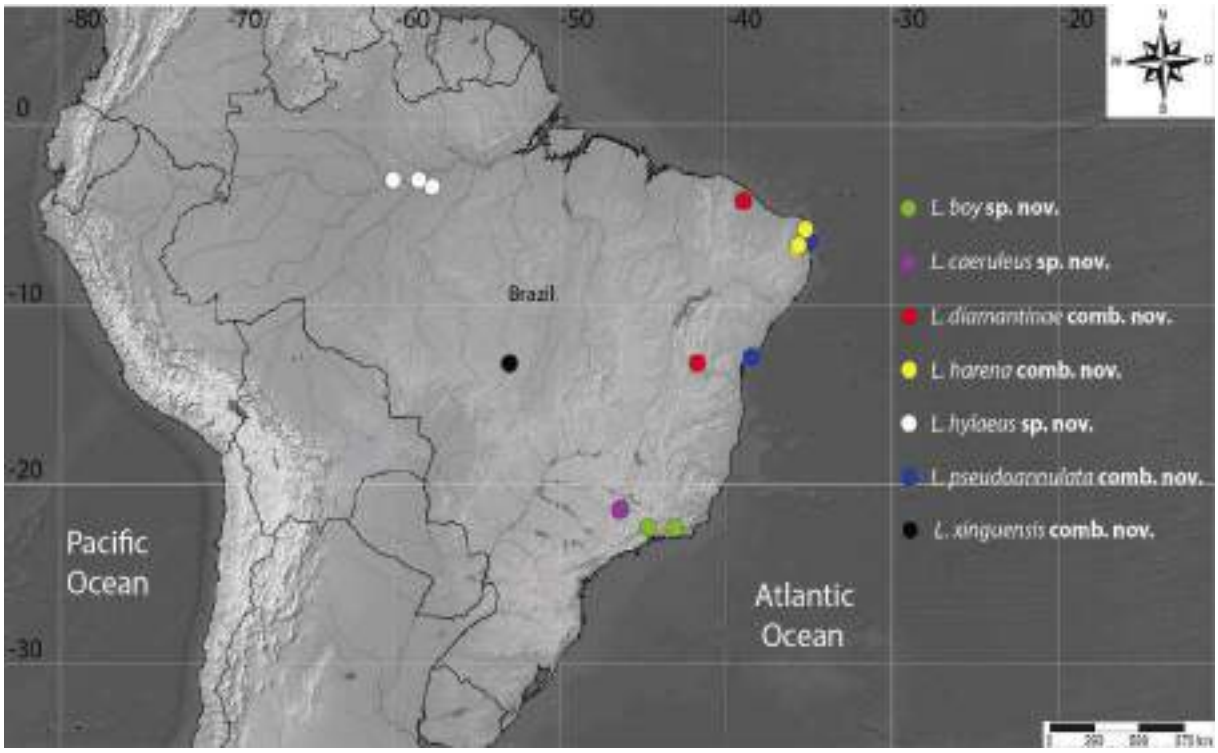

FIGURE 136. Records map of seven *Lepidocyrtinus* species from Brazil**.**

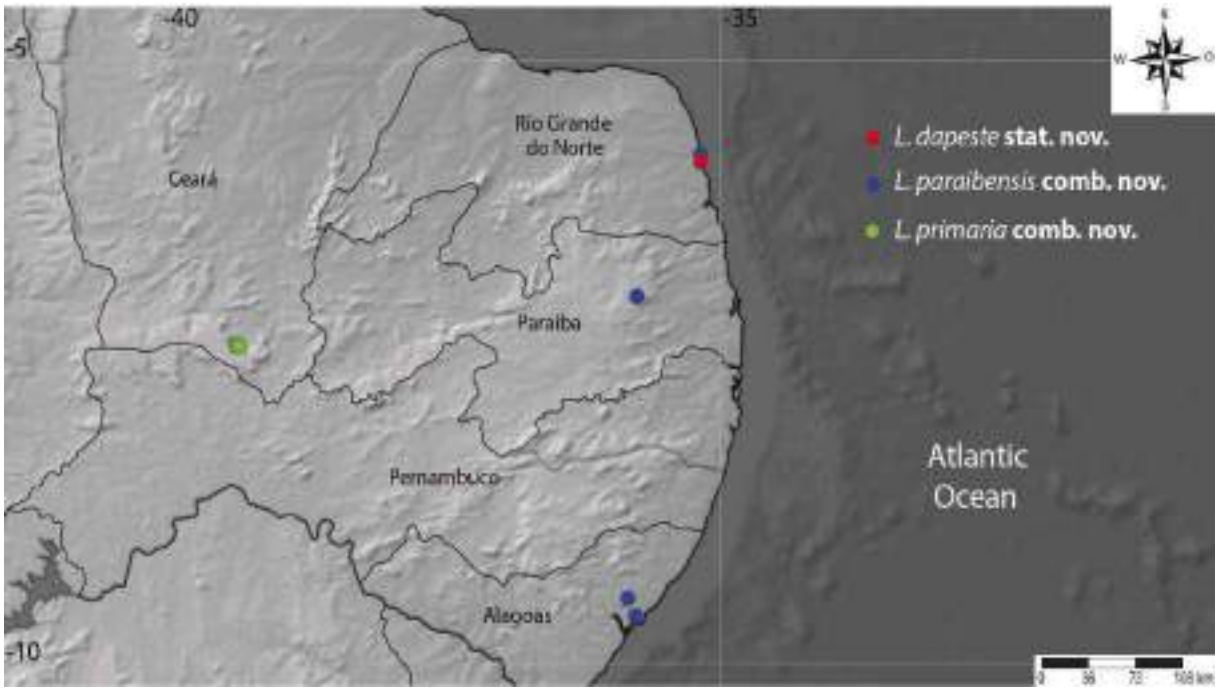

FIGURE 137. Records map of three *Lepidocyrtinus* species in Brazilian Northeast.

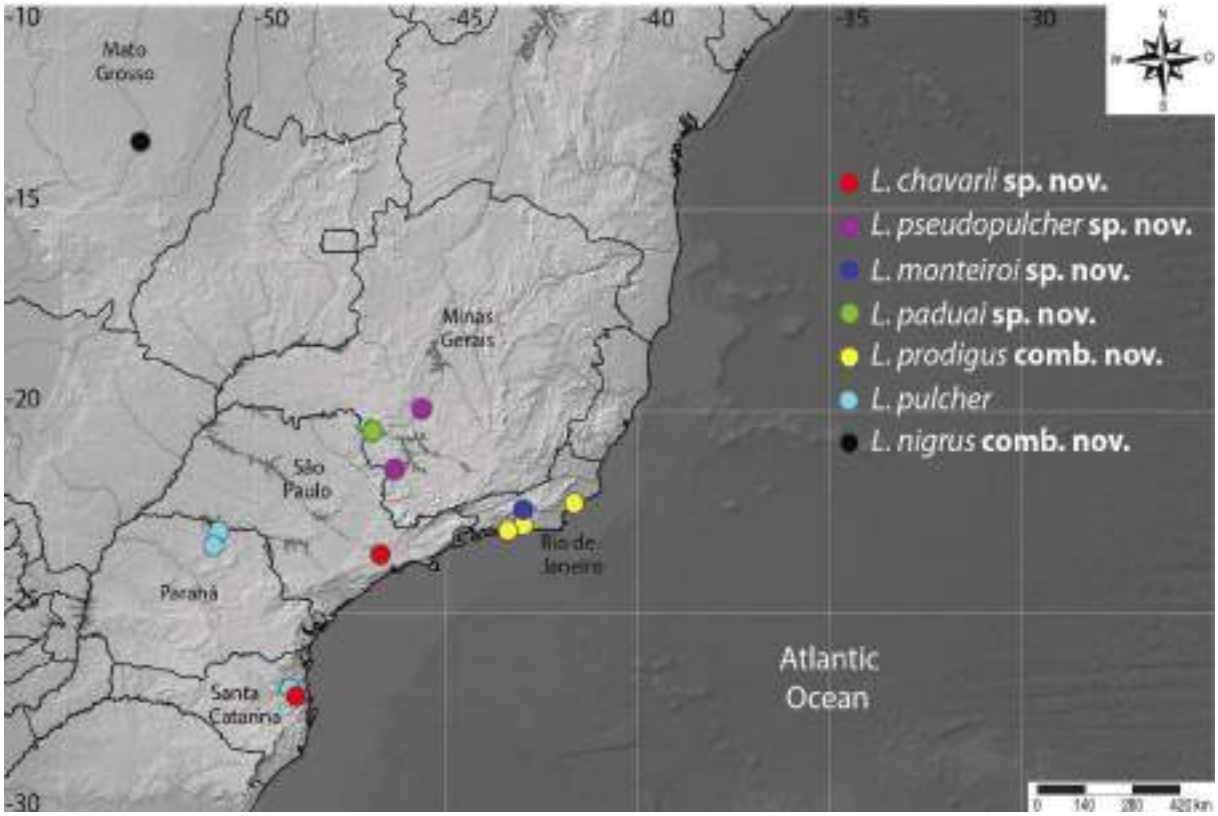

FIGURE 138. Records map of seven *Lepidocyrtinus* species in Central West, Southeast and South of Brazil.

Key to *Lepidocyrtinus* species from South America

1 Abd I with 3 or less central mac; Abd II with 3 central mac (**m3e** absent) (Figs 95C–D) … 2

- Abd I with at least 4 central mac; Abd II with 4 central mac (**m3e** present) (Figs 100C–D, 121C–D) … 6

2 Head mac **A3**, **S0**–**2**, **S4** and **S6i** present (Fig. 78E); Th II with mac **m4**, **m4i** and **m4p**; Th III with 6–7 central mac (Figs 79A–B) … 3

- Head without these mac (Fig. 70C); Th II only with mac **m4i**; Th III with 3 central mac (Figs 71A–B) … 5

3 Th III with **p2ep** mic (Fig. 79A); Abd IV with 12 or more central mac (Fig. 80B); manubrial plate with blunt mac apically nipple-like (Fig. 81G) … 4

- Th III with **p2ep** mac; Abd IV with 11 or more central mac; manubrial plate only with ciliate chaetae, no blunt; Bahia and Paraíba (Fig. 136) … *L. pseudoannulata* (Bellini & Zeppelini, 2008) **comb. nov.**

4 Th II with 9 anterior (Fig. 79A); Alagoas, Paraíba and Rio Grande do Norte (Fig. 137) … *L. paraibensis* (Bellini & Zeppelini, 2009) **comb. nov.**
- Th II with 7 anterior; Ceará (Fig. 137) … *L. primaria* (Godeiro & Bellini, 2014) **comb. nov.**

5 Body with dark spots on femur II–III (Fig. 65B); head mac **A2**, **A5**, **M2** and **S5** present (Fig. 70C); Th II with 4–5 posterior mac; Abd I with 2 central mac (Figs 71A, C); unguiculus with **ai** lamella truncate (Fig. 73E); Paraíba and Rio Grande do Norte (Fig. 136) … *L. harena* **comb. nov.**
- Body with dark strips on Ant, femur and tibiotarsus III, and pigments on head, Th II and Abd IV posteriorly (Fig. 93); head without these mac (Figs 94D); Th II with 11 posterior mac; Abd I with 3 central mac (Figs 95A, C); unguiculus with all lamella acuminate (as Fig. 107E); Rio de Janeiro (Fig. 136) … *L. boy* **sp. nov.**

6 Abd I with 6 central mac (Fig. 100C) … 7
- Abd I with 4 or 5 central mac (Figs 67C, 75C) … 8

7 Body pigment of Abd II–V (Fig. 98); dorsal head with mac **A3**, **A5**, **M1**–**2**, **S0**–**2**, **S4**–**6i** (Fig. 99D); Th II anteriorly with 35–50 mac; Th III with 11 central mac (Figs 100A–B); dens with 1 proximal blunt mac (Fig. 102G); Minas Gerais (Fig. 136) … *L. caeruleus* **sp. nov.**
- Body pigment of head to Th II (Fig. 109); dorsal head without these mac (Fig. 110D); Th II anteriorly with 8–9 mac; Th III with 2 central mac (Figs 111A–B); dens without blunt mac; Minas Gerais (Fig. 138) … *L. pseudopulcher* **sp. nov.**

8 Head mac **S4** present (Fig. 74C) … 9
- Head mac **S4** absent (Fig. 66C) … 13

9 Head to Th II completely black (Fig. 65F); head mac **A2** and **A5** absent (Fig. 89D); Santa Catarina (Fig. 138) … *L. pulcher* **comb. rev.**
- Body with pigmentation different; head mac **A2** and **A5** present (Fig. 115D) … 10

10 Th II with 38–50 anterio mac (**a5** group), **m4**, **m4i** and **m4p** mac present; Th III with 11 central mac (Figs 116A–B); Rio de Janeiro (Fig. 138) … *L. monteiroi* **sp. nov.**
- Th II with 26 or less anterior mac (**a5** group), only **m4** mac present; Th III with 9 or less central mac (Figs 75A–B, 105A–B) … 11

11 Body with one transverse spots blue on Th III–Abd I (Fig. 103); ungues apical tooth absent (Fig. 107E); São Paulo and Santa Catarina (Fig. 138) … *L. chavarii* **sp. nov.**
- Body with pigmentation different (Figs 65C, 124C); ungues apical tooth present (Fig. 86F) … 12

12 Body with numerous spots (Fig. 65C); Th III with **p1i** mac (Fig. 75B); Abd IV without mac **Ee10** (Fig. 76B); Mato Grosso do Sul (Fig. 138) … *L. nigrans* (Arlé, 1959) **comb. nov.**
- Body with pigmentation only on head and leg III (Fig. 124C); Th III with **p1i** mic (Fig. 130B); Abd IV without mac **Ee10** (Fig. 131B); Minas Gerais (Fig. 138) … *L. paduai* **sp. nov.**

13 Dorsal head without mac **A5** (as Fig. 89D); Rio Grande do Norte (Fig. 137) … *L. dapeste* Santos & Bellini, 2018 **stat. nov.**
- Dorsal head with mac **A5** (Fig. 83B) … 14

14 Th II with **p2a**, **p2ep** and **p3** mic; Th III with **p2a** mic (Figs 84A–B); Rio de Janeiro (Fig. 138) … *L. prodigus* (Arlé, 1959) **comb. nov.**
- Th II with **p2a**, **p2ep** and **p3** mac; Th III with **p2a** mac (Figs 67A–B) … 15

15 Body withour spots on head and trunk (Fig. 119); Th II with 18–22 anterior mac in **a5** group; Th III with **a1a** and **a2** mac (Figs 121A–B); Amazonas (Fig. 136) … *L. hylaeus* **sp. nov.**

- Body with blue spots laterally on head, Th II–Abd I and Abd IV (Fig. 65A); Th II with 17 or less anterior mac in **a5** group; Th III without these mac (Figs 67A–B); Bahia and Ceará (Fig. 136) … *L. diamantinae* (Godeiro & Bellini, 2015) **comb. nov.**

Morphological and chaetotaxic development of *Lepidocyrtinus*

The complete study of chaetotaxy was based in at least three instars (1st, 3rd and adult) of *L. paduai* **sp. nov.** for development of color pattern, clypeus, dorsal and ventral head, including basomedian and basolateral labial fields, Th II to Abd V, trochanteral organ, manubrium ventrally, manubrial plate and dens dorsally, with additions of 4th and 5th instars for Th II chaetotaxy. Some secondary chaetae reported in 3rd instar of *L. paduai* **sp. nov.** probably have arisen in 2nd instar (Fig. 129). Notes on color pattern of juveniles to adults of *L. boy* **sp. nov.** and *L. caeruleus* **sp. nov.**, as well as on tergal and appendages chaetotaxy of *L. fabioi* **sp. nov.**, *L. prodigus* **comb. nov.**, *L. pseudopulcher* **sp. nov.** and *L. scheepersae* **sp. nov.** were also included. The tergal development of *L. paduai* **sp. nov.** was compared with *Seira dowlingi* (Wray, 1953) in 1st, 3rd instar and adult, and to *L. barnardi* **stat. nov.** 1st instar and adult (Soto-Adames 2008; Zhang & Deharveng 2015b).

Color pattern

In 3rd instar of *L. paduai* **sp. nov.** there is a slight reduction of pigmentation on Ant I–IV and Th II laterally, but in adults pigments appear intensely on proximal Ant III–IV, head laterally, trochanter III, femur II distally, and proximal and distal femur III (Fig. 124). This addition of pigments in 3rd instar to adult apparently occurs in other species as *L. caeruleus* **sp. nov.** (Fig. 98) and *L. boy* **sp. nov.** (Fig. 93), this last species because juveniles have reduced pigments on head and Th II. In *Lepidocyrtinus* this gain of pigments in postembryonic development should be common, as in other Entomobryidae (Pan *et al*. 2015; Cipola et al. 2018a).

Head

Antennae (Fig. 125A). After 1st instar of *L. paduai* **sp. nov.**, numerous ciliate chaetae and s-blunt sens are added to Ant I–IV, as well as 2 proximal smooth chaetae on

Ant I (e.g. Fig. 115A), but the homology of chaetae whorls on segments are not clear. Soto-Adames (2008) reports the presence of bothriotricha on Ant I–II in inicial stages to adult of *S. dowlingi*, but this has not been observed to any species of *Lepidocyrtinus*, so this has to be investigated thoroughly since it could be a generic difference.

Clypeus (Figs 127). Primary chaetae present in *L. paduai* **sp. nov.** does not have changes of 1st instar to adults. In 3rd instar two small **fr** and **pf1** chaetae appear, and posteriorly 2 **fr** and **pf2** are also added to adults. The pair of primary chaetae (**fr1**) move anteriorly after 1st instar, which are apparently present in most species of *Lepidocyrtinus* (Figs 18B, 33C, 43B, 48C, 70A). Consequently, other secondary additions are of uncertain homology, except **pf1**–**2**. The presence of at least 3 frontal (**pf0**–**1**) and 4 lateral (**l1**–**2)** chaetae in *Lepidocyrtinus*, apparently is homologous to other Entomobryoidea (Zhang *et al.* 2016).

Basomedian and basolateral labial fields (Fig. 128). In 1st instar to adults of *L. paduai* **sp. nov.** the primary chaetae (**a1**–**5**, **M1**, **E**, **L1**–**2**) don't change. The secondary emergence of **M2** ciliate chaeta and **r** spine occurs in 3rd instar and remains in adults (e.g. Fig. 82F). The absence of **M2** and **r** in 1st instar (Fig. 128A), as well as development pattern to adult, was also observed in *S. dowlingi* and *Pseudosinella* Schäffer (Barra 1975). African species of the genus have chaeta **R** ciliate (except for *L. fabioi* **sp. nov.**), and may still have chaeta **e** and sometimes **l1**–**2** smooth (e.g. *L. barnardi* **stat. nov.** and *L. dayi* **stat. nov.**). These modifications are probably secondarily in different species of *Lepidocyrtinus*, or are intraspecific variation, since different Entomobryidae have these polymorphic characteristics (Cipola & Bellini 2016; Cipola *et. al.* 2018a, 2018b), therefore the labial basal chaetotaxy in this case does not present generic significance.

Postlabial field (Fig. 128). In 1st instar of *L. paduai* **sp. nov.** there are 13 anterior primary chaetae. In 3rd instar **X3** and **X** chaetae become necessarily scales, while **X4** may disappear in some species (e.g. Figs 43E, 70D, 94E, 99E, 128B), or is retained in others as *L. briani* **sp. nov.**, *L. paraibensis* **comb. nov.** and *L. pseudopulcher* **sp. nov.** (Figs 53D, 78E, 110E). In addition, **H2** chaeta appear secondarily (Fig. 128B), as well as thin posterior chaetae and larger chaetae, including basal chaetae (b.c.). Consequently, the chaetae number encreases (or less, e.g. 110E) after the 3rd instar to adult and is specific for each species. The position of **X** series in *Lepidocyrtinus* species corresponds to preserved chaetae of unscaled genera of Entomobryidae (Chen & Christiansen 1993; Cipola & Bellini 2016). So, such chaetae are homologous in can be directly compared among part of

Entomobryidae, but it undergoes in a transformation of chaetae to scales after in 2nd or 3rd instar in *Lepidocyrtinus* (and possibly other Seirinae).

Dorsal chaetotaxy

Head. The dorsal chaetotaxy in 1st instar of *L. paduai* **sp. nov.** has 27 primary mac (**An1**–**3**, **A0**, **A2**–**3**, **A5**, **Am0**, **M0**–**2**, **S0**–**3**, **Ps2**, **Pa1**–**3**, **Pa5**, **Pm1**, **Pm3**, **Pp1**, **Pp3**–**5**, **Pe3**). In 3rd instar are added 4 **An** (**An1a**, **An3a**–**3a2**, **An3i**), 1 **M** (**M4i**), 2 **S** (**S4**, **S6i**), 2 IO (**q**, **r**) and 1 **Pa** (**Pa4**) chaetae, and at the same time 2 chaetae are lost: **Am0** and **M0** (Fig. 126B). This instar still presents 3 mic which change states to mac (**M4**, **S5**, **S6**), and all postoccipical mac (except **Pa5**) change to mic (**Ps2**, **Pa1**–**3**, **Pm1**, **Pm3**, **Pp1**, **Pp3**–**5**). In adults, few modifications occur from the 3rd instar, but there are at least 5 **An** mac and 3 mes/mic (**An3p**) and **Pp2** mic (Fig. 126C). This chaetotaxy pattern, as well as the transformation of 3rd instar to adult of *L. paduai* **sp. nov.** was also observed in *L. prodigus* **comb. nov.** (Fig. 83), plus the modification of **A3** and **S6i** firstly as mic, and later as mac in adults of *L. prodigus* **comb. nov.** In this same sense, in *L. scheepersae* **sp. nov.** it was also observed secondary reductions, as **Pp5** mac in 3rd instar and **Pp5** mic in adults. Notably, in transformation of 3rd instar to adult some chaetae are constant (**M1**–**2**, **M4**, **S0**–**3**, **S5**, **S6**, **Pa5**), as well as secondary losses of postoccipal mac (Figs 83, 126), but some chaetae (e.g. **A3**, **S4**, **S6i**, **Pp5**) do not follow the same pattern of development in different species. Some exceptions are *L. fabioi* **sp. nov.**, *L. harena* **comb. nov.**, *L. boy* **sp. nov.** and *L. pseudopulcher* **sp. nov.** by reduction of primary macrochaetotaxy (e.g **S0**–**2**), which quite possibly happens in 2nd instar (or at least 3rd instar) instar and it is seen in the adults.

In general, the head chaetotaxy of 1st instar of *S. dowlingi* is smilar to *L. paduai* **sp. nov.**, but differs by **Am0** and **M1** chaetae absent, **Pp2** present, and **An1**–**3**, **M0**, **M2**, **Ps2**, **Pp1** and **Pp4** mic (opposite in *L. paduai* **sp. nov.**). In 2nd instar of *S. dowlingi* **M0** chaeta disappear, and this probably happens in the same instar of *L. paduai* **sp. nov.** This may not be a rule, since two IO secundary chaetae (**q** and **v**) and at least **An3a2** appear in 3rd instar of *L. paduai* **sp. nov.**, and in *S. dowlingi* 4th instar. Still in 2nd instar of *S. dowlingi* **An2a** and **A4** chaetae emerge, both absent in Neotropical *Lepidocyrtinus* (except for **A4** present in *pseudoannulata* complex), but frequent in African species (e.g. Figs 14F, 22D, 48F). In *Seira* adults secondary additions in **An** series are similar and the postoccipical mac remains, while in *Lepidocyrtinus* they are modified into mic (possibly apomorphy). However, *Seira* species devoid of postoccipital mac (e.g. *Seira caerucinerea* Cipola &

Bellini, 2014) need to be investigated to find out whether this reduction has embryonic origin or secondary developmental loss.

Th II. The AMP series chaetotaxy in *L. paduai* **sp. nov.** is exactly the same of *S. dowlingi*, in homology and state of primary chaetae, and both differ of *L. barnardi* **stat. nov.** by **m2** as mac. In 3rd instar of *L. paduai* **sp. nov.** 18 mac (**a5i**–**5i3**, **a5ip**–**5ip2**, **a5p**, **m1i**–**1ip**, **m2i**–**2i2**, **p1i**–**1ip**, **p1p**–**1p2**, **p2a**, **p2p**, **p2e**–**2ep**) and 9 mic (**a2p**, **m1i2**–**i3**, **m4i**–**4ip**, **m5a**, **p2ea**, **p6e**) emerge, besides chaetae of uncertain homology on anterior collar to lateral margin. In addition, three chaetae are reduced from mes to mic (**m5**, **p4**, **p6**) and **P3** mac changes to mic. After, in 4th instar (Fig. 130A) 5 mac (**a5i4**, **a5ipa**, **a5ip3**, **15p2**, **p1p3**) and 4 mic (**m1i3i**, **m1i4** and two **mp**) arise, besides **p3** changes back to mac. In 5th instar 4 more mac (**A5i5**, **a5ipa2**, **a5ip4**, **p1ip2**) and 1 mic (**m1i3i2**) emerge. Consequently, until the adult the other chaetae of **a5** group gradually appear as well as extra psp. This gradual change also occurs in *L. pseudopulcher* **sp. nov.**, since chaetae as **a5ip3**, **m1ip** and **p1ip** are all absent in juvenile (probably rise in 4th or 5th instars), as well as in *L. fabioi* **sp. nov.** since most of the juvenile's chaetotaxy is formed by mic that change to mac in adults (Figs 30A). However, this is not rule, and in 3rd instar of *L. prodigus* **comb. nov.** chaetae as **p2a** and **p2ep** are mac, **a5ip2** and **p2e** are mic, and **m1ip** and **p1p2** are absent. In adults of this last species **p2a** and **p2ep** are reduced to mic, **a5ip2** and **p2e** become mac, and **m1ip** and **p1p2** emerge, as well as others secondary mac (Fig. 84A).

The AMP series of 3rd instar to adult *L. paduai* **sp. nov.** (and *Lepidocyrtinus* in general) differs from *S. dowlingi* by presence of typical secondary mac (**a5i2**–**3**, **a5ip2**, **m1ip**, **m2i2**, **p1p2**) and secondary lost of some primary mac (e.g. **m4**, **p3**, **p5**), present in *Seira* species (e.g. Cipola *et al.* 2018d). Concerning the primary chaetae, in *Lepidocyrtinus* **p5** is always mic, **p3** is variable (mac or mic), and **m4** is mic at least in *L. boy* **sp. nov.** (Fig. 95A), while in *Seira* they are all mac, except for **p5** in *S. caerucinerea* (Christiansen & Bellinger 2000; Cipola *et al.* 2014b, 2018d; Godeiro & Bellini 2014, 2015). Secondary chaetae as **m4p** and **m4i** mac arise respectively in 2nd and 4th instars of *Seira*, both absent in any stages of *L. paduai* **sp. nov.** and *L. prodigus* **comb. nov.**, but present at least in adults of *pseudoannulata* complex, *L. caeruleus* **sp. nov.** and *L. monteiroi* **sp. nov.** (Figs 79A, 100A, 116A). Thus such chaetae does not present generic significance. Other differences in *Seira* is **m1i** mac emergence only in adult, while in *Lepidocyrtinus* this happens earlier, at least at the 3rd instar.

Th III. The chaetotaxic pattern in 1st instar of *L. paduai* **sp. nov.** is similar to *S. dowling* and *L. barnardi* **stat. nov.**, but differ from these species by presence of **a3** and **a6** mac. At least in adults of *L. barnardi* **stat. nov.** (Fig. 15B), **a6** and **p5** change to mac, 4 mac appear (**p1i**, **p1p**, **p2a**, **p2e**) and 2 mac are reduced to mic (**a4**–**5**), but probably some of these changes happens in intermediary instars. Soto-Adames (2008, fig. 41) report one supplementary chaeta in 1st instar of *S. dowlingi* (absent in *L. paduai* **sp. nov.**), that potentially can be **p2a** secondary mic which becomes mac in 2nd instar. Other change in *S. dowling* is **p1a** mic that appears in 3rd instar. In 3rd instar of *L. paduai* **sp. nov.** 4 mac (**a1a**, **p1p**, **p2a**, **p2e**) and 4 mic (**p1i**, **p2ea**, **m6p**, **m6p2**) secondarily arise, plus all mes of 1st instar are reduced to mic (**a7**, **m5**, **m7**, **p4**–**6**) and 4 mac change to mic (**a1**, **a3**–**5**). After the 4th instar the only changes are 3 mic (**m6p**, **m6p2**, **m7**) which become mes, and in adults there are extra psp and eventually **a3** occurs as mac (Fig. 130B). *Lepidocyrtinus prodigus* **comb. nov.** also has this pattern in 3rd instar, except by **p2a** and **p3** as mic and chaetae **p1i** and **p2ea** are absent, but in adults only **p1i** mic emerge (Fig. 84B). Therefore, the change of primary and secondary chaetae among species can be different, as *L. fabioi* **sp. nov.** which has some of the primary chaetae as mic (e.g. **a1**–**3**, **a6**) with same pattern of juvenile and adult, except for one change of mic to mac (**p1p**).

Abd I. In *L. paduai* **sp. nov.** chaeta **a2** is mac in 1st instar to adults, while in *L. barnardi* **stat. nov.** this emergence (mes to mac) is secondary in instars, and in *S. dowlingi* this chaeta remains as mic in all stages. In 3rd instar of *L. paduai* **sp. nov.** only 1 mac (**m2i**) and 2 mic (**a1e**, **a2e**) secondarily emerges, and all mes are reduce to mic (Fig. 129). This does not change until the adult, except for the transversal alignment of 5 central mac (**a2**, **m2i**–**2**, **m3**, **m4**) (Fig. 130C). This pattern is also seen in *L. prodigus* **comb. nov.** during the 3rd instar to adult, except by **m4** mic which does not modify into mac (Fig. 84C). In juveniles of *L. pseudopulcher* **sp. nov.** (Fig. 111C) **a2** and **m4** are mic, but become mac in adults, and in *L. fabioi* **sp. nov.** there is the reduction of primary mac (**a2**, **m3**, **m4**) and **m2i** is absent in juveniles to adults (Figs 29B, 30C). Secondary emergencies of **m2i** mac happens in *L. paduai* **sp. nov.** and *L. barnardi* **stat. nov.**, and of **m4i** mac in *L. barnardi* **stat. nov.** and *S. dowlingi*. Thus, these secondary chaetae occur in both genera, but in some cases **m2i** were labeled as **a1** mistakenly in *Seira* (e.g. Soto-Adames 2008; Cipola *et al.* 2014a, 2014b; Godeiro & Bellini 2014). Although these emergencies do not have generic support, **a2** generaly is mac and **a3** is mic in species of *Lepidocyrtinus* (except **a2** in *L.*

harena **comb. nov.**, *L. boy* **sp. nov.** and some African species), while in *Seira* species it happens the opposite condition, at least in most Paleartic species (Cipola *et. al.* 2018d).

Abd II. The chaetotaxy in 1st instar of *L. paduai* **sp. nov.** presents 4 primary mac (**a2**, **m3**, **m5**, **p6**), while in *L. barnardi* **stat. nov.** and *S. dowlingi* there are 3 mac (**p6** is mes). In the other hand all these species have **p4** chaeta which is lost after the 1st instar. In 3rd instar of *L. paduai* **sp. nov.** 2 mac (**m3e**, **m3ep**), 1 mic (**m3ea**) appear, and **m4** chaeta moves next to **a5** bothriotrichum (Fig. 129). In addition, all mes change to mic, **p6** mac pass to mes, **a1** mic to accessory chaeta of bothriotrichum, and chaeta **p4** disappear. In 4th instar arise 5–6 (**m4**, **le**, **ll**, **lm**, **li**) and 3–4 (**a1** complex) accessory chaetae of uncertain homology on **a5** and **m3** bothriotricha, respectively, and this pattern does not change to adult, except for the appearance of extra psp (Fig. 130D). This chaetotaxic pattern, as well as the gradual changes in juveniles to adults of *L. paduai* **sp. nov.**, is similar to *L. prodigus* **comb. nov.**, except by **m4** as accessory chaetae in 3rd instar. In juveniles, **m3ep** chaeta is mic in *L. pseudopulcher* **sp. nov.** and absent in *L. fabioi* **sp. nov.**, while in adults **m3ep** change to mac in the first species (Fig. 111D) and arise as mic secondarily in the late species (Figs 29B, 30D). Consequently, the modifications of **m3ep** are not of generic importance, since it is also variable in *Seira* species (as "**m3ei**" in Soto-Adames 2008; Cipola et al. 2014a, 2014b). The emergence of **m3e** mac and **m3ea** mic, as well as the reduction of **p6** chaeta in 2nd instar of *S. dowlingi*, indicate that this also likely occurs in the same instar of *L. paduai* **sp. nov.** and *L. barnardi* **stat. nov.** Comparing the 3rd instar of *L. paduai* **sp. nov.** and *S. dowlingi* they share the rise of **a1** as accessory chaeta, but **a2p, m4**, **lm** and **ll** as accessory chaetae appear first in *S. dowlingi*. Development of posterior instars are similar in these species, without any obvious modifications.

Abd III. The chaetotaxy in 1st instar of *L. paduai* **sp. nov.** and *L. barnardi* **stat. nov.** are similar, but both differ from *S. dowlingi* by **a1** reduced to mes. In 3rd instar of *L. paduai* **sp. nov.** arise **p7i** mes, **p8** mic and 7 accessory chaetae between **a5** and **m5** bothriotricha, 6 mes are reduced to mic (**a3**, **a6**, **a8**, **m7**, **m8**, **p5**), **a7** and **am6** mes change to mac, **a1**, **a2** and **p3** mic to accessory chaetae of **m2** bothriotrichum and **m4** mes to accessory chaetae of **a5** bothriotrichum (Fig. 129). In 4th instar arise 2 mes (**a9**, **p9**), 2 accessory chaetae on **m2** bothriotrichum and 4 accessory chaetae of **a5** bothriotrichum, while 4 chaetae change to mac (**a8**, **p7**, **p7i**). This pattern stays up to the adult, except for the emergence of the extra psp (Fig. 131A). In *S. dowlingi*, the same patten that appear in 2nd instar is maintained in 3rd instar, except by change of **p7i** mic to mac. In *L. paduai* **sp. nov.** this pattern is also

similar, but 4 accessory chaetae (**c3**, **em**, **le** and **ll**) appear first, in 3rd instar. Already in 3rd instar of *L. prodigus* **sp. nov.**, **p3** is mic and remains in this state until the adult, but **a7**, **a9**, **m9** and **p7** are reduced (mes/mic) in juvenile and change to mac in adults (Fig. 85A). The juvenile of *Lepidocyrtinus fabioi* **sp. nov.** has reduction of some chaetae as **a6** and **p5** absent, accessory chaetae on **a5** and **m5** bothriotricha, besides **m4**, **em**, **emp** and **c3** as mic, but presents two extra chaetae of uncertain homology (Fig. 29B). In adults, **p5** arise, **em** and **emp** change into accessory chaetae, two mac (**a8**, **p7**) are reduce to mes, plus one mes of uncertain homology disappear (Fig. 31A).

Abd IV. *Lepidocyrtinus paduai* **sp. nov.** has a chaetotaxic pattern in 1st instar similar to *L. barnardi* **stat. nov.** and *S. dowlingi*, all with only 3 primary mac (**B4**, **B5**, **E3**). However, *L. paduai* **sp. nov.** differ from *L. barnardi* **stat. nov.** by **C1** mes absent and **Fe2** present (Fig. 129A). Soto-Adames (2008, fig. 74) reports to *S. dowlingi* **C1** chaeta present and **T1** absent, but it is actually the opposite, and "**C1**" is **T1**, plus "**B1**" is **B2**, and "**B2**" is **B1**, in a similar way as in *Lepidocyrtinus*. In 3rd instar of *L. paduai* **sp. nov.** secondary chaetae 26 appear: 7 mac (**A4**, **Ae3**, **Ae6**, **E4p**, **F1p**, **Fe4**–**5**), 3 mes (**D3p**, **E4p2**, **Fe6**), 6 mic (**A4a**, **C1**, **C4a**, **D2a**, **Ee10**, **Fe3**), 5 accessory chaetae (**T1p**, **m**, **D1p**, **T4a**, **Pe**), plus 5 posterior mes (Fig. 129). Of the primary chaetae, 11 mes change to mac (**A3**, **A5**–**6**, **B2**–**3**, **B6**, **E2**, **E4**, **F1**–**3**) and 11 mac change to mic (**A1**–**2**, **C2**–**4**, **T1**, **T3**, **T5**–**6**, **D2**, **E1**), while **D1** changes to accessory chaeta and **D3** to bothriotrichum. The S-chaetae pattern remains stable (with 10 sens), except by **ps** sens reduction in size and **as** sens apparently disappears. In sequential instars (4th to adult), 2 mac (**A5a**, **Ae5**), 4 posterior mes, 8–12 accessory chaetae (**s**, **Pi** and other unnamed) arise and **as** sens reappears, while **C4** and **C4a** mic are lost (Fig. 131B). The modified mic to mac in late stages were **A4a**, **C1**, **Ee10** and **Fe2**–**3**, though **C1** is variable, and it usually appearsas mic in adults.

In 2nd instar of *S. dowlingi* gain 5 mac (**B6**, **E4p**, **F1p**, **Fe4**–**5**), which probably also appear in the same instar of *L. paduai* **sp. nov.** Secondarily, in both species chaetae **A4**, **C1**, **D3p**, **E4p2** and **Ee10** mic emerge in 3rd instar, but **A3a** present in *S. dowlingi* is typically absent in *Lepidocyrtinus*, at least in Neotropical species. In addition, *S. dowlingi* has 5 mac (**A4**, **A5**, **B3**, **E4**, **E2**, **F1**) and 3 accessory chaetae (**D1p**, **m**, **Pe**) which later arise in *L. paduai* **sp. nov.** These differences are probably species specific rather than generic, but *L. prodigus* c**omb. nov.** in 3rd instar has a pattern very similar to *L. paduai* **sp. nov.**, differing by **A5**, **E2** and **E4** as mic, chaetae **Ae7** and **D3p** present, **D2a** as accessory chaetae, and in total 13 sens. In adults, the same primary and secondary chaetae transform

into mac (e.g. **A4a**, **A5**, **E2**, **E4**, **Ee10**), but **F2p** mac arise exclusively in *L. prodigus* c**omb. nov.** and in this species the number of sens is reduced to 11 (Fig. 85B). Already in juvenile of *L. fabioi* **sp. nov.** there is **Be3** as mac, but the chaetotaxy is reduced and **A6** and **B6** are mic, chaeta **D1p** and from **Ae** series are absent (Fig. 29C). In adults, this pattern remains, except for **Fe3** arises and **E4** mes change into mac (Fig. 31B)

Abd V. The 1st instar of *L. paduai* **sp. nov.** has the same pattern as *L. barnardi* **stat. nov.** (except by one extra mes, probably **pp6),** both with only 3 mac (**m2**, **m3**, **m5**) typically. In 3rd instar of *L. paduai* **sp. nov.** secondarily emerge 11 chaetae, 1 mac (**m5e**) 6 mes (**m5ea**, **p5a**, **p6ai**, **p6ae**, **a6e**, and one uncertain) and 5 mic (**a5a**, **m5a**, **p3a**, **p1p**, **p3pi**). All **p** series change to mac (**p1**, **p3**–**6**) and **a3** mic change to mes (Fig. 129). In 4th instar to adult 4 mes (**p4a**, **pp6** complex) arise, mes of uncertain homology are lost, 2 mic change to mes (**m5a**, **p3a**), and on **Pp** series apparently **p3pi** disappears and **p3pe** appears, or still **p3pi** moves laterally (Fig. 131C). *Lepidocyrtinus prodigus* c**omb. nov.** in 3rd instar also have 10 mac as *L. paduai* **sp. nov.**, but differ by chaetae **m5ea** and **p3a** absent, and **p4a** and **p3pe** present. In adults **m5ea** and **p3a** arise, **p3pe** is lost, and **p6e** change to mac (Fig. 85C).

Legs

Trochanteral organ (Figs 132D–F). In *L. paduai* **sp. nov.** the trochanteral organ has 1, 9 and 65 spine-like chaetae respectively in 1st, 3rd instar and adult. This addition gradually also occurs also in *Tyrannoseira* (personal observation), and certainly in Entomobryoidea in general, but this needs to be confirmed.

Tibiotarsus I (Fig. 132G). The primary chaetotaxy in 1st instar of *L. paduai* **sp. nov.** is similar to *L. barnardi* **stat. nov.** (Zhang & Deharveng 2015a), by whorls I–IV, but *L. paduai* **sp. nov.** has in total 43 chaetae, while *L. barnardi* **stat. nov.** has 39 chaetae. These differences are due presence or absence of extra chaetae of uncertain homology, so they are not considered here. In 1st instar on whorls I there are 10 chaetae (**e**, **pe**, **p**, **pi**, **jp**, **ja**, **ai**, **a**, **ae**), including one extra chaeta, while on whorls II–IV there are 8 (**e**, **pe**, **p**, **pi**, **i**, **ai**, **a**, **ae**). In 3rd instar of *L. paduai* **sp. nov.** and *L. prodigus* **comb. nov.** (Fig. 87A) the chaetotaxy patterns of tibiotarsus I are similar by the rise of larger ciliate apically acuminate chaetae on outer side, mac weakly ciliate on inner side, and numerous extra chaetae. These modified chaetae in both species are in the same place, **e** and **pe** (proximal) on outer side, and **i** and **pi** (distal) on inner side. In adults the number of these modified chaetae may

increase, as well as numerous secondary chaetae of uncertain homology, and this pattern is also present in *L. botswanensis* **sp. nov.** (Fig. 26E). In adults of *L. barnardi* **stat. nov.,** the modified chaetae are in the same place in African and Brazilian species (see Coates 1968), so it is certainly a characteristic of *Lepidocyrtinus*. Consequently, if they are located in the same place among the species and follow similar development pattern of immatures to adults, then they are homologous chaetae of primary origin.

Unguiculus. *Lepidocyrtinus paduai* **sp. nov.** has **ai** lamella truncate, but in 3rd instar it becomes acuminate, and on **pe** lamella arise one small proximal tooth, that in adults appear at the base of the serrated lamella (as in Fig. 86F). The truncated lamella is present in adults of *L. harena* **comb. nov.** and *pseudoannulata* complex (Fig. 81D), so this initial shape most likely is held until adults. However, this needs to be further investigated to check all stages of these species.

Furcula

Manubrium ventral formula (Fig. 134). *Lepidocyrtinus paduai* **sp. nov.** has 0, 2, 2, 6 (subapical), 4 (apical) elongated ciliate chaetae. In 3rd instar occurs the reduction of chaetae length (except the inner subapical chaetae) and the ventral formula changes to 0, 2, 2, 2/4 (subapical), 12 (apical) ciliate chaetae of different sizes, 4 inner apical smaller, plus 2 scales that emerge. The manubrium ventral formula in adult loses 2 subapical chaetae and gains at least 12 more ciliate chaetae (6 per side) and 23 elongated apical scales (Fig. 134C). The postembryonic development of the manubrium ventral formula in *L. paduai* **sp. nov.** apparently follows homologous pattern to other species (Figs 69F, 73G), but remarkably the formula can be altered in the stages. For this reason, this has to be observed in juveniles to adults of other species, since the different patterns are used as diagnostic of species. The presence of chaetae on ventral manubrium in 1st instar can be a typical characteristic of Seirinae, and therefore needs to be investigated, since in Lepidocyrtinae (at least in *Pseudosinella*) they are absent (Barra 1975).

Manubrial plate (Fig. 135). *Lepidocyrtinus paduai* **sp. nov.** in 1st instar is devoid of chaetae, but in 3rd instar (or 2nd instar presumably) 2 blunt mac finely ciliate and apically nipple-like arise, plus 1 elongated ciliate chaetae and 1 psp (Fig. 135B). Later in adults 1 more blunt mac appears, plus up to 12 ciliate chaetae of different sizes, and 1 extra psp laterally (Fig. 135C). Barra (1975) reports 2–3 ciliate chaetae on manubrial plate in 1st

instar of two *Pseudosinella* species, therefore this needs to be investigated in different genres to verify if it has suprageneric importance.

Dens (Fig. 135). In *L. paduai* **sp. nov.** from 1st to 3rd instar 1 blunt mac finely ciliate and apically nipple-like appear (1st instar) followed by the acquisition of 2 smaller blunt mac in a row (3rd instar) followed by ciliate chaetae. In adults, there are 14 blunt mac, 9 proximal followed 1–3 ciliated chaetae interleaved by blunt mac which increases gradually. Some species as *L. barnardi* **stat. nov.**, *L. dayi* **stat. nov.**, *L. fabioi* **sp. nov.**, *L. caeruleus* **sp. nov.**, *L. monteiroi* **sp. nov.**, *L. pseudopulcher* **sp. nov.** and species of *pseudoannulata* complex are devoided of such chaetae, or even present reduction of blunt mac on manubrial plate as well (Figs 21G, 32G, 81G, 102G, 113G). This should be better studied since it is quite possible such chaetae are absent on early stages of these species.

From the presented data, it is possible to verify that the postembrionic development of *Lepidocyrtinus* species is complex, as well as in *Seira*. Consequently, it is possible to affirm that the final state of primary and secondary chaetae in adults (many of them used for specific diagnosis), can or cannot be available in intermediary instars, and for this reason identifications based in juveniles may be mistaken, especially where similar species coexist. In the other hand, species with similar chaetotaxic patterns of adults almost certainly have similar intermediate stages, and most likely are equal in initial stages.

Discussion

Lepidocyrtinus now has stat. rev. to genus with 44 nominal species (about 20% of Seirinae species), with 27 of them from Africa and 17 from South America. Although the relationships of *Lepidocyrtinus* with other Seirinae are still not clear, some characteristics are unique to this group, at least among the Seirinae, such as extra mac on **a5** group of Th II, tibiotarsus outer side with larger ciliate apically acuminate chaetae, and ungues outer side with a pair of large laterobasal teeth. Thus, the traditional proposal of dens with blunt mac (Yosii 1959; Yoshii & Suhardjono 1992) alone is an inconsistent feature to support *Lepidocyrtinus*, although it is present in most species, including on the manubrial plate. These characteristics (except blunt mac on dens) resemble *Lepidocyrtoides* Schött, 1917, but this Entomobryinae genus (sensu Zhang & Deharveng 2015b) is distinguished by S-chaetae pattern of Th II–Abd V with formula 1, 0| 1, 0, 1, 0, 0 (ms) and 2, 2 | 1, 2, 2, +, 3

(sens), respectively, Abd IV with two bothriotricha (**T2** and **T4**), and mucro bidentate with basal spine (Cipola *et al*. 2017). In addition, in *Lepidocyrtoides* the group of extra mac on Th II has a different pattern, since the cluster possibly involves extra mac of **m1**–**2** complex.

Hypothetically, such exclusive morphology of *Lepidocyrtinus* suggests that *Tyrannoseira* and *Seira* may be more related, at least morphologically, as Th II is never projeted and anterior series of this segment lacks extra mac groups, ungues outer teeth are normal (as most of Entomobryidae), and tibiotarsus outer side and dens dorsally lack any remarkable modification. Another characteristic that suggests this relationship are modifications in the previous legs of the males, present in *Tyrannoseira* and some species of *Seira* from Old World (Bellini & Zeppelini 2011; Cipola *et al.* 2018c; 2018d). In this sense a detailed phylogenetic study needs to be conducted to verify the relationships within Seirinae as well as between the *Lepidocyrtinus* species from both continents. Also, a phylogeographic analysis should be performed to reinforced or refute the species status of closely similar lineages, such as the ones from *paraibensis* group.

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SÍNTESE

Os resultados apresentados na tese fornecem informações relevantes para o status do conhecimento da sistemática de Seirinae, assim como sobre fauna proveniente de diferentes regiões biogeográficas do mundo. As informações a cerca dos caracteres morfológicos fornecidos são inovadoras para taxonomia atual de Seirinae, assim como para Entomobryoidea no geral (ex. anexos 1 e 2), portanto com base neles, futuramente novas propostas filogenéticas/taxonômicas podem ser feitas para diferentes grupos de Collembola.

O capítulo I propõe uma hipótese filogenética para Seirinae, incluindo uma revisão para as relações internas (tribos e gêneros), o que consequentemente gerou nova classificação que provavelmente reflete melhor a evolução desta subfamília. Além disso, a hipótese proposta aqui pela primeira vez é baseada em dados morfológicos quantitativos e qualitativos, e é o maior banco de dados codificados para Collembola até o momento, que por sua vez poderá ser utilizado em análises filogenéticas futuras mesmo fora de Seirinae. Para a maior parte dos táxons de Seirinae (subfamília, tribos e gêneros) abordados na análise filogenética, foi também fornecido novas diagnoses, afim de estabelecer características morfológicas que sustentem os diferentes níveis hierárquicos.

O capítulo II compreende um levantamento de *Seira* s. str. da Península Ibérica, incluindo a descrição de três novas espécies dessa região e a redescrição de mais cinco, inclusive da espécie tipo do gênero: *Seira domestica* Nicolet. Nesse capítulo ainda nós fornecemos uma chave de identificação e compilado de dados morfológicos comparáveis, que juntos podem proporcionar identificações mais seguras para as espécies do oeste Paleártico.

O capítulo III descreve três novas espécies de *Seira* de Madagascar, região que nunca teve uma espécie de *Seira* descrita antes. Além disso, essas espécies possuem características atípicas do gênero, portanto as informações foram relevantes para taxonomia do grupo em si, assim como para o entendimento da biodiversidade desconhecida da região.

O capítulo IV compreende a revisão de *Tyrannoseira*, e uma nova diagnose é proposta para diferenciá-lo de *Seira*. Foi revelado que as cinco espécies que compõem *Tyrannoseira* tem a morfologia em grande parte homogênea, portanto novos caracteres específicos foram propostos. No entanto este táxon não é considerado gênero válido

conforme o capítulo I, e por essa razão a alteração taxonômica será feita posteriormente afim de respeitar a adequação filogenética.

O capítulo V é a revisão de *Lepidocyrtinus*, táxon agora considerado um gênero válido de Seirinae, abrigando 44 espécies provenientes da África e Brasil, das quais nove foram redescritas, e 15 são novas para a ciência. Uma nova diagnose é proposta para *Lepidocyrtinus*, incluindo elementos quetotáxicos úteis na separação dos gêneros de Seirinae, além de um estudo comparativo do desenvolvimento pós-embrionário que indica padrão distinto para este gênero frente a *Seira*. Após a revisão e descoberta das novas espécies, ficou evidente que em ambos continentes potencialmente há uma grande diversidade de *Lepidocyrtinus* ainda a ser explorada.

ANEXO 1

Artigos publicados referentes ao grupo interno

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Two new species of *Seira* Lubbock (Collembola, Entomobryidae, Seirini) from South Brazil

NIKOLAS GIOIA CIPOLA[1,3], JOSÉ WELLINGTON DE MORAIS[1] & BRUNO CAVALCANTE BELLINI[2]

[1]*Laboratório de Sistemática e Ecologia de Invertebrados do Solo, Instituto Nacional de Pesquisas da Amazônia – INPA, CPEN, Avenida André Araújo, 2936, Aleixo, CEP 69011–970, Cx. Postal 478, Manaus, AM, Brazil. E-mail: nikolasgc@gmail.com*
[2]*Programa de Pós-graduação em Sistemática e Evolução, Departamento de Botânica, Ecologia e Zoologia, Centro de Biociências, Universidade Federal do Rio Grande do Norte, Rodovia BR 101, Lagoa Nova, Campus Universitário, 59072-970 Natal, RN, Brazil*
[3]*Corresponding author*

Abstract

Two new species of *Seira*, *Seira tinguira* **sp. nov.** and *Seira paulae* **sp. nov.** from Atlantic Rainforest Phytogeographic Domain in Paraná State, southern Brazil, are described and illustrated, with dorsal chaetotaxy labeled in detail. The general morphology of *S. tinguira* **sp. nov.** resembles *S. frater* (Bonet) and *S. occamica* Yosii, however differs by chaeta **Pa4** present in head, three extra macrochaetae (**m1i2**, **p1i2** and **one extranumerary**) in mesothorax; four (**a3**, **p2e**, **p2ea** and **a4**) in metathorax; one (**m3ep**) in the second abdominal segment , among other morphological features. *Seira paulae* **sp. nov.** is similar to *S. atrolutea* (Arlé) in body colour, however dorsal chaetoxy resembles *S. mendoncea* Bellini & Zeppelini and *S. ritae* Bellini & Zeppelini. On the other hand, the new species clearly differs from other similar taxa by the presence of cephalic macrochaeta **M2**; three macrochaetae (**M2**, **M1** and **M2i**) in mesothorax and **p2p** as microchaeta; one extra macrochaeta (**p1i**) in metathorax and two (**a1** and **p2ea**) as macro or microchaetae; macrochaeta **m3ep** missing in the second abdominal segment; macrochaeta **am6** present in the third abdominal segment among other features. *Seira tinguira* **sp. nov.** was found in different habitats of Paraná State while *S. paulae* **sp. nov.** was recorded only in its type locality. A distribution map is provided for both species. With the presented description there are now four recorded species of *Seira* from south Brazil.

Key words: Chaetotaxy, Entomobryinae, Neotropical Region, soil fauna, taxonomy

Introduction

Entomobryidae is the most diverse family of Collembola (Hopkin 1997) and currently holds more than 1678 species in 56 genera (Janssens & Christiansen 2011). Entomobryids are recognized by the presence of crenulate dens, small mucro with one or two curved apical teeth, trochanteral organ present and usually bearing several spine-like setae arranged in lines, body with or without scales, postantennal organ generally absent and at least some feathered setae (Christiansen & Bellinger 2000, Soto-Adames *et al.* 2008).

Seirini is one of the ten tribes of Entomobryidae (Soto-Adames *et al.* 2008). Among the Seirini, the largest genus is *Seira* Lubbock, with almost 200 described species, mostly in the tropics (Barra 2004, Bellini & Zeppelini 2008ab, Soto-Adames *et al.* 2008, Bellinger *et al.* 1996–2013). *Seira* species can be distinguished from other entomobryids by the presence of apically rounded scales with coarse ribs or denticles covering most of dorsal body, falcate mucro, 8+8 eye lenses (rarelly 7+7, as seen in *S. americana* Jacquemart) and a large fourth abdominal segment, when compared to the third (Christiansen & Bellinger 2000, Barra 2004, Soto-Adames *et al.* 2008). *Seira* is predominantly tropical (Barra 2004, Bellini & Zeppelini 2008a) with approximately 73 of species register in the Africa, 49 in Asia, 35 in Europa and 57 for the Americas (Christiansen & Bellinger 2000; Bellinger *et al.* 1996–2013). Twenty eight species of *Seira* were recorded in Brazil (Abrantes *et al.* 2012, Godeiro & Bellini 2013, 2014), but only *S. reichenspergeri* (Handschin, 1924) and *S. paranensis* Stach (1935) have been reported from southern Brazil.

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A new species of *Seira* (Collembola: Entomobryidae: Seirini) from Northern Brazil, with the addition of new chaetotaxic characters

Nikolas Gioia Cipola[1,3], José Wellington de Morais[1] & Bruno Cavalcante Bellini[2]

[1] *Laboratório de Sistemática e Ecologia de Invertebrados do Solo, CPEN, Instituto Nacional de Pesquisas da Amazônia. Avenida André Araújo 2936, Aleixo, Caixa Postal 478, 69011-970 Manaus, AM, Brazil.*
[2] *Programa de Pós-graduação em Sistemática e Evolução, Departamento de Botânica, Ecologia e Zoologia, Centro de Biociências, Universidade Federal do Rio Grande do Norte. Rodovia BR 101, Lagoa Nova, Campus Universitário, 59072-970 Natal, RN, Brazil.*
[3] *Corresponding author: Email: nikolasgc@gmail.com*

ABSTRACT. *Seira caerucinerea* **sp. nov.**, a new species of springtail from the Cerrado domain, state of Tocantins, Brazil, is described and illustrated. The new species is mainly characterized by bluish-gray coloration and dorsal chaetotaxy presenting macrochaeta S7 on head, three macrochaetae (a6, m6 and p6) on margin of metathorax and 4+4 macrochaetae (a1, m2, m3 and m4) on abdomen I. Characteristics of maxillary and labial papillae, chaetotaxy of subcoxae, collophore, ventral region of head, ventral and lateral region of abdomen IV and V, which are usually omitted in species descriptions within the genus, are also provided. This is the first species of *Seira* described from the Cerrado domain, as well as the first record of the genus from the state of Tocantins.

KEY WORDS. Biodiversity; Cerrado; Seirinae; taxonomy; Tocantins.

Seira Lubbock, 1870 includes epiedaphic springtails found mostly in litter, from low vegetation to canopy and over uncovered top soils, primarily in tropical landscapes (Christiansen & Bellinger 2000). It is the fourth most diverse genus of Entomobryidae and the most diverse taxon among the Seirini, comprising around 200 described species worldwide (Bellinger *et al.* 2014). In the Americas 60 species of the genus have been recorded (Christiansen & Bellinger 2000), half of them from Brazil, mostly from the Northeastern Region of the country (Godeiro & Bellini 2014). From the Northern Region of Brazil, only *S. signata* (Arlé, 1959) and *S. xinguensis* (Arlé, 1959) were recorded until now (Godeiro & Bellini 2014, Cipola *et al.* 2014).

The closest genus to *Seira* is possibly *Tyrannoseira* Bellini & Zeppelini, 2011, and both taxa share similar mucronal morphology, overall dorsal chaetotaxy, and habitus. On the other hand, *Seira* presents a more variable dorsal chaetotaxy, with macrochaetae M1 and M2 present or absent on head; first abdominal segment with or without macrochaetae (absent in *Tyrannoseira*); and the first pair of legs of males devoid of any clear dimorphic structures (Bellini & Zeppelini 2011).

Herein we present a new species of Neotropical *Seira* from the Cerrado Phytogeographic Domain, state of Tocantins, Northern Region of Brazil. The description also presents some data usually omitted in descriptions for the genus.

MATERIAL AND METHODS

The specimens were collected from leaf litter, preserved in 80% ethanol, clarified with potassium dichromate ($K_2Cr_2O_7$) and hydrochloric acid (HCl), and mounted on glass slides with Hoyer medium following the procedures described by Arlé & Mendonça (1982) and Christiansen & Bellinger (1998). One specimen was photographed in ethanol gel using a stereomicroscope (M165C) attached to a DFC420 digital camera. Photographs were digitally corrected using Leica Application Suite V3.4.1. The general chaetotaxy system used in the descriptions follows Jacquemart (1974) modified by Christiansen & Bellinger (2000); labial chaetotaxy follows Fjellberg (1999); maxillary palp follows Mari Mutt (1986); and detailed dorsal chaetotaxy follows Szeptycki (1979) and Soto-Adames (2008). Symbols used to depict the chaetotaxy are: large empty circles refer to macrochaetae; small empty circles to mesochaetae; small black circles to microchaetae; large empty circles with a small black dot inside to micro or macrochaetae; line over circles to chaeta present or absent; large black circles with two cross lines to pseudopores; two cross lines to scales; small curved seta to microsensillum; long multiciliated setae to bothriotricum; and triangle near bothriotricum to fan-shaped microchaetae. The material examined is deposited in the Invertebrate Collection of the Instituto Nacional de Pesquisas da Amazônia (INPA), Manaus.

ANEXO 2

Artigos publicados referentes ao grupos externos

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A new genus of Entomobryinae (Collembola, Entomobryidae) from Brazilian Amazon with body scales and dental spines

NIKOLAS GIOIA CIPOLA[1,3], JOSÉ WELLINGTON DE MORAIS[1] & BRUNO CAVALCANTE BELLINI[2]

[1]*Laboratório de Sistemática e Ecologia de Invertebrados do Solo, Instituto Nacional de Pesquisas da Amazônia – INPA, CPEN, Avenida André Araújo, 2936, Aleixo, CEP 69011–970, Cx. Postal 478, Manaus, AM, Brazil*
[2]*Programa de Pós-graduação em Sistemática e Evolução, Centro de Biociências, Universidade Federal do Rio Grande do Norte, Rodovia BR 101, Lagoa Nova, Campus Universitário, 59072-970 Natal, RN, Brazil*
[3]*Corresponding author. E-mail: nikolasgc@gmail.com*

Abstract

A new monotypic genus of Entomobryinae from Brazilian Amazon is described and illustrated. *Amazhomidia* **gen. nov.** is similar to other genera of the subfamily, especially to *Sinhomidia* Zhang, in presence of apically pointed scales on body dorsally and spines on dens. It differs from all other genera of Entomobryinae by the combination of: bifurcate prelabral chaetae, cephalic groove with scale-like chaetae and two transverse rows macrochaetae present on anterior central region of the abdominal IV segment. *Amazhomidia ducke* **sp. nov.**, the type species of the new genus is described. An identification key to the genera of Entomobryidae with scales and dental spines is also provided.

Key words: chaetotaxy, neotropics springtails, Willowsiini, keys

Introduction

Entomobryidae is the largest family of Collembola, with seven subfamilies (Zhang & Deharveng 2015), 58 genera and more than 1700 recognized species distributed worldwide (Bellinger *et al.* 1996–2016). So far, five subfamilies (*sensu* Zhang & Deharveng 2015), 10 genera and 67 species have been recorded from Brazil, and about half of these species belong to *Seira* Lubbock, 1870 (Abrantes *et al.* 2012, Bellini *et al.* 2013, 2015, Cipola *et al.* 2014a, b, Godeiro & Bellini 2014, 2015).

Sinhomidia Zhang, 2009 is a monotypic genus of entomobryids recorded from China, which resembles some genera such as *Acanthocyrtus* Handschin, 1925 (Seirini) and *Acanthurella* Börner, 1906 (Lepidocyrtini), in having scales on the dorsal body and dental spines, but differs from those by the absence of dental scales (Zhang *et al.* 2009). *Acanthocyrtus*, *Acanthurella*, and *Sinhomidia* belonged to the tribes Seirini, Lepidocyrtini, and Willowsiini, respectively (*sensu* Yoshii & Suhardjono 1989; Soto-Adames *et al.* 2008). Recent studies based on molecular and morphological data (Zhang *et al.* 2014b, Zhang & Deharveng 2015) indicate Willowsiini and Seirini *sensu* Soto-Adames *et al.* (2008) are not monophyletic, and some taxa with scales and bidentate mucro such as *Sinhomidia* and *Acanthocyrtus*, belong to Entomobryini (Entomobryinae *sensu* Zhang & Deharveng 2015).

Here a new genus and species of Entomobryinae from Brazilian Amazon is described and illustrated, and an identification key to Entomobryidae genera with dorsal body scales and dental spines is provided.

Material and methods

The specimens were collected in "Reserva Ducke", a remnant of amazonian Rainforest, Amazonas State, Northern Brazil. Specimens were preserved in 92% ethanol, clarified with potassium dichromate ($K_2Cr_2O_7$) and hydrochloric acid (HCl), and mounted on glass slides in Hoyer's medium following the procedures described by Bonet (1931). Specimens were photographed in ethanol gel using a stereomicroscope (M165C) attached with a DFC420 digital

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A new cave species of *Coecobrya* Yosii (Collembola, Entomobryidae, Entomobryinae) from South Africa, with an identification key to the genus

NIKOLAS GIOIA CIPOLA[1] & BRUNO CAVALCANTE BELLINI[2,3]

[1]*Laboratório de Sistemática e Ecologia de Invertebrados do Solo, Instituto Nacional de Pesquisas da Amazônia – INPA, CPEN, Avenida André Araújo, 2936, Aleixo, CEP 69011–970, Cx. Postal 478, Manaus, AM, Brazil*
[2]*Programa de Pós-graduação em Sistemática e Evolução, Centro de Biociências, Universidade Federal do Rio Grande do Norte, Rodovia BR 101, Lagoa Nova, Campus Universitário, 59072-970 Natal, RN, Brazil*
[3]*Corresponding author. E-mail: entobellini@gmail.com*

Abstract

Coecobrya anagailae **sp. nov.**, a new species of springtail from Cango Caves, South Africa is described and illustrated. The new species is similar to other species of *tenebricosa*-group such as *C. communis* (Chen & Christiansen), *C. edenticulata* (Handschin), and *C. tropicalis* Qu, Chen & Greenslade in some elements of dorsal chaetotaxy, absence of eyes, unguis with one unpaired median tooth, and manubrium without smooth chaetae, but differs from them in dorsal head, mesothoracic and collophore chaetotaxy. This is the first species of *Coecobrya* described from Africa as well as the first indisputable record of the genus for the whole continent. In this study an updated key to the species of the genus is provided, adding 14 species to the most recently published identification key. We also discuss some aspects of distribution and evolution of *Coecobrya*.

Key words: Entomobryini, Ethiopian Region, systematics, *tenebricosa*-group, troglobite

Introduction

Entomobryinae Schäffer (*sensu* Zhang & Deharveng 2015) is a subfamily of entomobryids currently with 20 genera and 624 nominal species (Bellinger *et al.* 1996–2016). The subfamily is nowadays characterized by: tergal sensilla formula on mesothorax to abdomen III as 22/122; body scales absent or present; scales, when present, with coarse ribs or denticles, with at least some of them apically pointed; postantenal organ absent; abdominal bothriothrica formula (II–IV) 2, 3, 2; abdomen IV more than 2.0 times the length of abdomen III on its midline; and mucro falcate or bidentate, with or without a mucronal spine (Soto-Adames *et al.* 2008, Zhang & Deharveng 2015).

Coecobrya Yosii, 1956 (in: 1956b) is a scaleless genus of Entomobryinae with 49 described species currently described (Bellinger *et al.* 1996–2016; Zhang *et al.* 2016). This genus is closely related to *Sinella* Brook, 1882, and both taxa are characterized by body without scales, polymacrochaetotic chaetotaxy, body pigment reduced or absent, antennae without apical bulb and reduction of eyes (Zhang *et al.* 2014a). However, *Coecobrya* comprises species with 0+0 to 3+3 eyes (up to 6 + 6 in *Sinella*) and furca with falcate mucro bearing a basal spine (bidentate in *Sinella*) (Chen & Christiansen 1997; Zhang *et al.* 2011a, 2014a; Jordana 2012).

Zhang *et al.* (2011a) divided *Coecobrya* in two groups based on number of eyes and empodial morphology: *tenebricosa*-group, lacking eyes and with a large outer tooth on unguiculus; and *boneti*-group with eyes and with a toothless unguiculus with outer edge smooth or serrate. Due to the particular morphology of *Coecobrya qin* Zhang & Dong, 2014 which bears a large outer tooth on unguiculus and 3+3 eyes, currently the genus subdivision is supported only by presence (*boneti*-group) and absence of eyes (*tenebricosa*-group), and *C. qin* fits the former group (Zhang *et al.* 2016). The *tenebricosa*-group is the most diverse and wider distributed taxon (recorded from all continents except Africa and Antarctica) with 41 species, while the *boneti* -group has eight species only recorded to Asia (Zhang *et al.* 2014a, 2016; Bellinger *et al.* 1996–2016).

Here a new cave species of *Coecobrya* of the *tenebricosa*-group from South Africa, Ethiopian Region is

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The discovery of *Lepidocyrtoides* Schött, 1917 (Collembola, Entomobryidae, Entomobryinae) from the New World, including three new species from Brazil and one from Australia

NIKOLAS GIOIA CIPOLA[1,3], JOSÉ WELLINGTON DE MORAIS[1] & BRUNO CAVALCANTE BELLINI[2]

[1]*Laboratório de Sistemática e Ecologia de Invertebrados do Solo, Instituto Nacional de Pesquisas da Amazônia—INPA, CPEN, Avenida André Araújo, 2936, Aleixo, CEP 69011–970, Cx. Postal 478, Manaus, AM, Brazil.*

[2]*Laboratório de Collembola, Departamento de Botânica e Zoologia, Centro de Biociências, Universidade Federal do Rio Grande do Norte (UFRN), Rodovia BR 101, Lagoa Nova, Campus Universitário, 59072-970, Natal, RN, Brazil.*

[3]*Corresponding Author: E-mail: nikolasgc@gmail.com*

Abstract

Herein four new species of *Lepidocyrtoides* are described and illustrated: three from Brazilian Amazon, *L. caeruleomaculatus* **sp. nov.**, *L. colormutatus* **sp. nov.** and *L. bicolorangelus* **sp. nov.**, all similar to each other by macrochaetotaxy reduced; and *L. hopkini* **sp. nov.** from New South Wales, Australia. *Lepidocyrtoides tapuia* **comb. nov.** (Arlé & Guimarães) and *L. villasboasi* **comb. nov.** (Arlé & Guimarães) are redescribed and transferred from *Lepidosira* Schött due to projection of mesothorax over head and manubrial plate with blunt macrochaetae. Neotypes are designated to both species. The holotype of *L. oliveri* Liu, Chen & Greenslade is analyzed and details of the dorsal chaetotaxy are added. Keys to the five species of the genus from Brazil and six from Australia are provided. *Lepidocyrtoides* now is recorded from the New World, South and Southeast Asia and Oceania, and the records of *Lepidosira* in the American continent are excluded.

Key words: Brazilian Amazon, diagnosis of the genus, identification key, new combinations, taxonomy, systematics

Introduction

Lepidocyrtoides Schött, 1917 is a small genus of Entomobryinae (*sensu* Zhang & Deharveng 2015) currently with 15 species, of which most were described from Southeast Asia and Australia (Liu *et al.* 2008, Bellinger *et al.* 1996–2017). *Lepidocyrtoides* resembles other scaled Entomobryinae, such as *Lepidosira* Schött, 1925 and *Epimetrura* Schött, 1925 by presence of scales heavily ciliate on body including ventral dens (part of *Epimetrura*), S-chaetae formula of mesothorax to fifth abdominal segment as 1, 0| 1, 0, 1, 0, 0 to microsensilla and 2, 2 | 1, 2, 2, –, 3 to sensilla, 2+2 bothriotricha on fourth abdominal segment and mucro bidentate with a basal spine (Yoshii & Greenslade 1994, Greenslade & Sutrisno 1994, Zhang & Deharveng 2015). Currently, only the presence of mesothorax heavily projected over head and manubrial plate with blunt macrochaetae differ *Lepidocyrtoides* from these genera (Yoshii & Suhardjono 1992, Yoshii & Greenslade 1994, Liu *et al.* 2008), and for this reason some species are sometimes mistakenly described or identified in other genera. Examples are *Lepidosira tapuia* Arlé & Guimarães, 1980 and *Lepidosira villasboasi* Arlé & Guimarães, 1981 from Brazil, both mistakenly described in *Lepidosira*, since the mesothorax projection is shown clearly in the original descriptions, but the morphology of manubrial chaetae to both species were omitted.

Herein three new species of *Lepidocyrtoides* from Brazil and one from Australia are described and illustrated, including two new combinations to Brazilian species, chaetotaxy notes on *L. oliveri* Liu, Chen & Greenslade, 2008 and identification keys for Brazilian and Australian taxa.

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New species, redescriptions and a new combination of *Acanthocyrtus* Handschin, 1925 and *Amazhomidia* Cipola & Bellini, 2016 (Collembola, Entomobryidae, Entomobryinae)

NIKOLAS GIOIA CIPOLA[1,3], JOSÉ WELLINGTON DE MORAIS[1] & BRUNO CAVALCANTE BELLINI[2]

[1]*Laboratório de Sistemática e Ecologia de Invertebrados do Solo, Instituto Nacional de Pesquisas da Amazônia—INPA, CPEN, Avenida André Araújo, 2936, Aleixo, CEP 69011–970, Cx. Postal 478, Manaus, AM, Brazil.*
[2]*Laboratório de Collembola, Departamento de Botânica e Zoologia, Centro de Biociências, Universidade Federal do Rio Grande do Norte (UFRN), BR 101, Lagoa Nova, Campus Universitário, 59072-970, Natal, RN, Brazil.*
[3]*Corresponding Author: nikolasgc@gmail.com*

Abstract

Herein one new species of *Amazhomidia* Cipola & Bellini from Brazilian Amazon is described and illustrated: *A. thaisae* **sp. nov.**, plus one specimen no nominal due to lack of material for formal descriptionend point. *Acanthocyrtus guianiensis* Womersley is redescribed and transferred to *Amazhomidia* by presence of prelabral chaetae bifurcated, macrochaetotaxy pattern, manubrium laterally with long distal mac finely ciliate and dens ventrally unscaled. *Acanthocyrtus croceus* Womersley is confirmed as a junior synonymy of *A. guianiensis*. The juvenile description of *Amazhomidia ducke* is provided, and changes in chaetotaxy nomenclature are made based on them. *Acanthocyrtus lineatus* Womersley is redescribed based on type material and new diagnostic characters are revealed. Identification keys for both genera and a comparison for Entomobryinae genera with dental spines are provided. *Amazhomidia* has now three and *Acanthocyrtus* Handschin six valid species.

Key words: Chaetotaxy, dental spines, taxonomy, *Sinhomidia*, synonym

Introduction

Entomobryinae Schäffer, 1896 (*sensu* Zhang & Deharveng 2015) is the largest subfamily of entomobryids with about 700 species in 30 genera (Bellinger *et al.* 1996–2017). Of these, three genera are scaled and with dental spines: *Acanthocyrtus* Handschin, 1925 with eight Pantropical species, *Sinhomidia* Zhang, 2009 with two species from China, and the monotypic *Amazhomidia* Cipola & Bellini, 2016 from Brazil (Zhang *et al.* 2009, Cipola *et al.* 2016, Bellinger *et al.* 1996–2017, Jin *et al.* 2017).

Acanthocyrtus was recently reviewed by Zhang *et al.* (2009) and the generic diagnosis was determined as: body with scales heavily ciliated and apically pointed or rounded, bothriotrichal formula with 2, 3, 2 respectively on second to fourth abdominal segments, male genital plate papillate, dens with ventral scales and dorsal spines and mucro bidentate with a dorsal spine (Zhang *et al.* 2009; Zhang & Deharveng 2015). However, species as *A. guianiensis* Womersley, 1930 and *A. croceus* Womersley, 1930, both from Guyana do not entirely fit the diagnosis of the genus, since they do not present dental scales according to original descriptions. In addition, Salmon (1964) suggests that *A. croceus* is a junior synonym of *A. guianiensis* because the difference between species is based only on femur color pattern and for this reason these species need to be reviewed in the light of modern taxonomy. In this sense, the absence of dental scales in Neotropical species of scaled Entomobryinae with spines on dens (*Acanthocyrtus* and *Amazhomidia*) must be investigated to support the diagnoses and phylogenetic relationships of species from Asia with (*Acanthocyrtus*) or without dental scales (*Sinhomidia*).

Herein one new species of *Amazhomidia* is described, the description of *Amazhomidia* sp.1 is given and the juvenile chaetotaxy of *Amazhomidia ducke* Cipola & Bellini, 2016 is provided alongside with notes on chaetotaxy of this species. *Acanthocyrtus guianiensis* is redescribed and a new combination is proposed to it, *Acanthocyrtus croceus* is synonymized with *A. guianensis*. Finally, identification keys for both genera are provided.

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New subgenus and four species of *Lepidocyrtus* Bourlet (Collembola, Entomobryidae, Lepidocyrtinae) from Amazon

Nikolas G. Cipola[a,*], José W. de Morais[a] and Bruno C. Bellini[b]

[a]Laboratório de Sistemática e Ecologia de Invertebrados do Solo, Instituto Nacional de Pesquisas da Amazônia – INPA, CPEN, Avenida André Araújo, 2936, Aleixo, ZIP Code 69067-375, Manaus, AM, Brazil
[b]Departamento de Botânica e Zoologia, Centro de Biociências, Universidade Federal do Rio Grande do Norte, BR 101, Lagoa Nova, Campus Universitário, ZIP Code 59084-100 Natal, RN, Brazil
*Corresponding author, e-mail: nikolasgc@gmail.com

Abstract
Here a new subgenus of *Lepidocyrtus* Bourlet from South America is proposed. *Fractocyrtus* **subgen.n.** differs from other subgenera by tergal polychaetosis, dental tubercle truncate and dentes with numerous spine-like chaetae. Four new species of *Lepidocyrtus* are described, two of *Setogaster* Salmon and two of *Fractocyrtus* **subgen.n.** *Lepidocyrtus* (*S.*) *amazonicus* **sp.n.** and *L.* (*S.*) *multisensillatus* **sp.n.** are similar to *L. nigrosetosus* Folsom by basomedian field with chaetae smooth and dental tubercle rounded, but differ in dorsal chaetotaxy. *Lepidocyrtus* (*F.*) *americanus* **sp.n.** and *L.* (*F.*) *mateusi* **sp.n.** are similar by presence of numerous dental spines, but differ in chaetotaxy. Due to inconsistencies concerning scales on appendages of *Lepidocyrtus* subgenera, four synonyms are proposed, and the characteristics diagnostic to subgenera are shape and presence of dental tubercle, dental spines, mucronal spinelet and apical bulb of fourth antennal segment. An identification key to subgenera is also provided.

Keywords
Allocyrtus; Chaetotaxy; *Fractocyrtus* **subgen.n.**; Neotropical Region; new synonym; *Setogaster*; taxonomy

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Introduction

Entomobryidae Tömösvary, 1882 (*sensu* Zhang & Deharveng 2015) is currently the most diverse family of Collembola with more than 1800 species in 62 genera and 7 subfamilies (Bellinger et al. 2017). Brazil currently holds only 79 species of Entomobryidae within 12 genera (Cipola et al. 2016a, b, 2017; Zeppelini et al. 2018), of which five are endemic to the country: *Amazhomidia* Cipola & Bellini 2016, *Mastigocerus*

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