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REVISÃO TAXONÔMICA DE *PHYLLOCNISTIS* ZELLER, 1848 (LEPIDOPTERA: GRACILLARIIDAE) NA REGIÃO NEOTROPICAL, COM DESCRIÇÃO DE DEZ NOVAS ESPÉCIES

Tese de Doutorado apresentada à Coordenação do Programa de Pós-graduação em Ciências Biológicas, Área de Concentração em Entomologia, da Universidade Federal do Paraná, para a obtenção do título de Doutor em Ciências Biológicas.

Orientador: Prof. Dr. Gilson R. P. Moreira.

Co-orientador: Prof. Dr. Olaf H. H. Mielke.

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Tese aprovada como requisito parcial para obtenção do grau de "Doutor em Ciências", no Programa de Pós-graduação em Ciências Biológicas, Área de Concentração em Entomologia, da Universidade Federal do Paraná, pela Comissão formada pelos professores:

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Curitiba, 21 de fevereiro de 2017.

DEDICATÓRIA

A todos os mestres que passaram pela minha vida, plantando
aos poucos sementes de curiosidade e conhecimento.

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Isaac Newton

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APRESENTAÇÃO

Conforme formato requerido pelo Programa de Pós-Graduação em Ciências Biológicas, área de concentração em Entomologia - Universidade Federal do Paraná, esta tese está dividida em uma Introdução geral, dois Capítulos e Considerações finais. Os capítulos estão sob a forma de artigos científicos já formatados para as revistas na língua inglesa. O capítulo I foi submetido à Austral Entomology em dezembro de 2016 e o capítulo II, à Zootaxa, em fevereiro de 2017. Este trabalho foi desenvolvido no Laboratório de Morfologia e Comportamento de Insetos da Universidade Federal do Rio Grande do Sul, com suporte do Laboratório de Estudos de Lepidoptera Neotropical da Universidade Federal do Paraná, além de contar com a colaboração do Institut de Recherche sur la Biologie de l'Insecte (IRBI) da Université François Rabelais de Tours. Para isso, a estudante recebeu bolsa de estudos concedida pelo Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq) - 140260/2013-7 e bolsa período sanduíche concedida pela Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (CAPES) - 99999.006656/2015-03.

SUMÁRIO

RESUMO

Phyllocnistis Zeller, 1848 (Lepidoptera: Gracillariidae), um gênero de mariposas conhecido pelo hábito minador, apresenta 98 espécies descritas para o mundo e apenas 17 na região Neotropical. Apresenta similaridades interespecíficas nas genitálias e carece de uma base taxonômica sólida para a acurada identificação das espécies que abriga. Diante disso, aqui é proposta uma revisão baseada no padrão das fáscias encontradas nas asas anteriores dos adultos para todas as espécies pertencentes ao neotrópico. Ao longo deste trabalho dez novas espécies foram descritas; primeiramente, três dessas espécies provenientes da Mata Atlântica, no estado do Rio Grande do Sul (RS), Brasil são apresentadas e dados referentes a morfologia dos imaturos, história natural, planta hospedeira e status específico, este último baseado em análises moleculares, são abordados. *Phyllocnistis* sp. 1 Brito & Moreira, sp. nov. foi encontrada minando folhas de *Baccharis anomala* DC. (Asteraceae), no município de Montenegro; *P.* sp. 2 Brito & Moreira, sp. nov. e *P.* sp. 3 Brito & Moreira, sp. nov. foram encontradas se alimentando de *Begonia fruticosa* (Klotzsch) A.DC. (Begoniaceae) e *Drimys angustifolia* Miers (Winteraceae), no município de São Francisco de Paula. Os estágios imaturos são típicos dos representantes de *Phyllocnistis*, apresentando três instares "sap-feeding" seguidos por um instar "spinning". Já, as demais espécies novas, descritas ao longo da revisão são provenientes de duas estações de pesquisas localizadas na Guiana Francesa (*P.* sp. 4 Brito & Lopez-Vaamonde, sp. nov.; *P.* sp. 5 Brito & Lopez-Vaamonde, sp. nov.; *P.* sp. 6 Brito & Lopez-Vaamonde, sp. nov.; e, *P.* sp. 10 Brito & Lopez-Vaamonde, sp. nov.), e na região de Planaltina, Distrito Federal (DF), Brasil (*P.* sp. 7 Brito & Moreira, sp. nov., sp. 8 Brito & Moreira, sp. nov. e *P.* sp. 9 Brito & Becker, sp. nov). Para essas espécies, somente caracteres morfológicos encontrados nos adultos foram avaliados. Ao longo da revisão foram designados holótipos, parátipos, lectótipos e paralectótipos. Uma árvore de distância genética foi construída utilizando DNA barcode. A partir desta tese, tornam-se conhecidas então 27 espécies de *Phyllocnistis* para a região Neotropical.

ABSTRACT

Phyllocnistis Zeller, 1848 (Lepidoptera: Gracillariidae), a moth genus known by its mining habit has 98 species worldwide, from which 17 occur in the Neotropical region. This genus, which presents interspecific similarities at the genitalia level, lacks a solid taxonomic basis, particularly regarding an accurate identification of its species. Thus, herein we propose a revision based on the fasciae pattern of forewing for all species belonging to the Neotropics. Along this work, ten new species were described; firstly, three species from the Atlantic Rain Forest, Rio Grande do Sul (RS), Brazil are presented, including data on immature morphology, natural history, host plant and specific status based on molecular analysis. *Phyllocnistis* sp. 1 Brito & Moreira, sp. nov. was found mining leaves of *Baccharis anomala* DC. (Asteraceae), on Montenegro municipality; *P.* sp. 2 Brito & Moreira, sp. nov. and *P.* sp. 3 Brito & Moreira, sp. nov. were found feeding respectively on *Begonia fruticosa* (Klotzsch) A.DC. (Begoniaceae) and *Drimys angustifolia* Miers (Winteraceae), on São Francisco de Paula municipality. Immature stages are typical for the genus, presenting three sap-feeding instars followed by a spinning instar. The other species were described from two field stations located in French Guiana (*P.* sp. 4 Brito & Lopez-Vaamonde, sp. nov.; *P.* sp. 5 Brito & Lopez-Vaamonde, sp. nov.; *P.* sp. 6 Brito & Lopez-Vaamonde, sp. nov.; and, *P.* sp. 10 Brito & Lopez-Vaamonde, sp. nov.), and in Planaltina, Distrito Federal (DF), Brazil (*P.* sp. 7 Brito & Moreira, sp. nov.; *P.* sp. 8 Brito & Moreira, sp. nov. ; and, *P.* sp. 9 Brito & Becker, sp. nov.). For these species, only morphological characters found adults were evaluated. Along the revision, holotypes, paratypes, lectotypes and paralectotypes were designated. A genetic distance tree was constructed using DNA barcoding. From this thesis on, 27 species of *Phyllocnistis* become known from the Neotropical region.

INTRODUÇÃO GERAL

Os insetos minadores foliares são herbívoros, cujas larvas são endófagas e conhecidas por construírem canais de alimentação nos tecidos internos da planta durante o seu desenvolvimento (Hering 1951). Esse hábito de vida, segundo alguns autores, pode trazer vantagens e desvantagens ao inseto. Em relação às vantagens podemos citar: um certo grau de proteção em relação aos inimigos naturais externos; regulação do ambiente, em que a mina pode servir como refúgio contra efeitos adversos provocados pela radiação UV; e proteção em relação as defesas da planta; ou seja, como o inseto se alimenta em determinados tipos de tecidos, é possível que ele possa evitar tanto as defesas físicas (cutícula, camada de cera ou tricomas) como as defesas químicas (metabólitos secundários). Em relação às desvantagens, as principais destas referem-se a dependência da fêmea, a qual escolhe o local de oviposição e consequentemente o local onde a larva irá se desenvolver; e a mobilidade limitada da larva dentro da mina foliar, por viverem na maioria das vezes em uma única folha, o inseto pode ficar vulnerável a determinados predadores e parasitoides (Connor & Tavener 1997; Sinclair & Hughes 2010).

Em Insecta, as ordens Coleoptera, Diptera, Hymenoptera e Lepidoptera são as que apresentam representantes com esse hábito de vida, sendo que entre os lepidópteros ao menos 34 famílias apresentam espécies minadoras de folhas (Hering 1951; Connor & Tavener 1997). Os microlepidópteros, mariposas com pequeno tamanho, representados por um grande número de minadores, podem ser considerados pobremente estudados quando comparados aos macrolepidópteros. Estima-se que apenas 35% da diversidade dos microlepidópteros seja atualmente conhecida (Kristensen *et al*. 2007). Segundo Sinclair & Hughes (2010), algumas dessas espécies são reconhecidas pela sua ampla importância econômica, associadas ao dano foliar causado em diversas culturas; por esse motivo, grande parte do conhecimento publicado refere-se ao combate e controle desses insetos considerados pragas, propiciando lacunas em relação aos aspectos taxonômicos, biológicos e evolutivos de diversas espécies, não qualificadas como tal.

GRACILLARIIDAE

Os gracilarídeos constituem a maior família de microlepidópteros minadores de plantas, apresentando aproximadamente 1.950 espécies, exceto na região da Antártica (De Prins & De Prins 2016). Os adultos desta família são difíceis de identificar,

especialmente por apresentarem uma ampla variabilidade de coloração e tamanho muito reduzido, com envergadura de asa variando de 2-10 mm (Davis 1987). Já o seu ciclo de vida é considerado uma das características mais marcantes da família. Suas larvas são conhecidas pela construção de minas com formato serpenteante ou em forma de manchas, e apresentam hipermetamorfose, que corresponde a mudanças nas formas larvais ao longo da ontogênese. A forma conhecida como "sap-feeding" é encontrada nos primeiros instares dos representantes da família, exceto em *Spinivalva gaucha* Moreira & Vargas, 2013 (Brito *et al*. 2013). Esta forma se caracteriza pelo achatamento da cabeça; presença de peças bucais prognatas, essas adaptadas a dilaceração do tecido e ingestão de líquidos; e, pela ausência do espinerete funcional, de pernas e de pseudopódios. A segunda forma, mais encontrada entre os últimos instares larvais dos gracilarídeos, é conhecida como "tissue-feeding" e se caracteriza pela cabeça e corpo cilíndrico; pelo aparelho bucal adaptado a mastigação; e pela presença de espinerete funcional, pernas e pseudopódios. Os representantes de Marmarinae, Oecophyllembiinae e Phyllocnistinae, subfamílias pertencentes à Gracillariidae, se destacam por apresentar uma terceira forma larval conhecida como "spinning" ou pré-pupa. Essa forma larval não se alimenta e se caracteriza por apresentar somente o espinerete funcional utilizado para tecer o casulo antes do empupamento (Kumata 1978; Davis 1987; Kawahara *et al*. 2016). A maioria das espécies de gracilarídeos são consideradas monófagos ou oligófagos, mas a família pode ser encontrada se alimentando em uma diversa gama de plantas hospedeiras (De Prins & De Prins 2016).

Em uma recente filogenia, baseada em caracteres moleculares, Kawahara *et al*. (2016) propuseram uma nova classificação para a família. Gracillariidae foi subdividida em oito subfamílias, quais sejam: Acrocercopinae, Gracillariinae, Lithocolletinae, Marmarinae, Oecophyllembiinae, Parornichinae, Ornixolinae e Phyllocnistinae. À essa última cabe ressaltar a presença de um único gênero, *Phyllocnistis*, um dos mais representativos em relação aos demais pertencentes à família (De Prins & Kawahara 2009).

PHYLLOCNISTIS ZELLER, 1848

Phyllocnistis Zeller, 1848 é um gênero pouco estudado quando comparado a outros grupos pertencentes à Lepidoptera. Inclui atualmente 98 espécies, 17 dessas assinaladas para a região Neotropical (De Prins & De Prins 2016). A distribuição de

muitas espécies do gênero é restrita a uma única região biogeográfica, no entanto, *Phyllocnistis citrella* Stainton, 1856 apresenta distribuição cosmopolita (Heppner 1995; Heppner & Dixon 1995; De Prins & Kawahara 2009). A diversidade de hospedeiros utilizadas pelas espécies de *Phyllocnistis* varia amplamente, De Prins & Kawahara (2009), sugerem que sejam hóspedes de ao menos 20 famílias de plantas no mundo.

As larvas encontradas entre os representantes de *Phyllocnistis* apresentam três instares "sap-feeding" e de um instar "spinning", sendo a primeira forma larval a responsável pela construção de minas superficiais (epidérmicas, ou subepidérmicas), com formato serpenteante. Os adultos desse gênero apresentam tamanho reduzido não excedendo 7 mm de envergadura de asa, sendo que as anteriores são lanceoladas e marcadas com fáscias e estrígulas (faixas e linhas transversais) de diferentes colorações. As genitálias são consideradas simples e apresentam similaridades interespecíficas o que dificulta a identificação das espécies (Davis & Wagner 2011). As pupas, no entanto, apresentam ampla diversidade morfológica, sendo consideradas completamente distintas entre os representantes do gênero até o momento estudados a esse respeito. Alguns autores utilizam o processo frontal da cabeça, "cocoon-cutter" e o arranjo dos espinhos tergais presentes nos segmentos abdominais como caracteres diagnósticos (Kawahara *et al*. 2009; Davis & Wagner 2011; Brito *et al*. 2012). Muitas dificuldades sobre as relações taxonômicas para os representantes do gênero ainda existem, elevando a importância da realização de estudos taxonômicos e sistemáticos com vistas a elucidar tais problemas (De Prins & Kawahara 2009).

Esta tese tem como principal objetivo revisar a posição taxonômica das espécies de *Phyllocnistis* pertencentes à região Neotropical, utilizando como base caracteres morfológicos encontrados nas asas anteriores. Adicionalmente, ao longo dos capítulos, descrições de novas espécies provenientes do Brasil e da Guiana Francesa são fornecidas e para algumas espécies informações relacionadas à morfologia dos imaturos e história de vida são descritas. Estudos moleculares utilizando DNA barcode foram realizados a fim de se estabelecer as distâncias genéticas correspondentes e o status específico de algumas espécies.

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CAPÍTULO I

DESCRIPTION OF THREE NEW SPECIES OF *PHYLLOCNISTIS* ZELLER, 1848 (LEPIDOPTERA: GRACILLARIIDAE) FROM THE ATLANTIC FOREST, SOUTH BRAZIL, WITH NOTES ON NATURAL HISTORY AND PHYLOGENY

RUNNING TITLE: Three new *Phyllocnistis* from South Brazil.

ABSTRACT: Three new species of *Phyllocnistis* Zeller (Lepidoptera, Gracillariidae, Phyllocnistinae), from the Atlantic Forest, Rio Grande do Sul (RS) state of Brazil, are described stereo and scanning electron microscopy. *Phyllocnitis* sp. 1 Brito & Moreira, sp. nov. is a leaf miner of *Baccharis anomala* DC. (Asteraceae) in the municipality of Montenegro. The other two species, *P.* sp. 2 Brito & Moreira, sp. nov. and *P.* sp. 3 Brito & Moreira, sp. nov. were found mining *Begonia fruticosa* (Klotzsch) A.DC. (Begoniaceae) and *Drimys angustifolia* Miers (Winteraceae) leaves, respectively, in the municipality of São Francisco de Paula. Information regarding the natural history of each species is provided, in addition to the specific status and phylogenetic relationships, including other members of *Phyllocnistis*, inferred based on DNA sequences. Immature stages of the three species present typical sap-feeding instars, followed by the final spinning instar. Differences found for pupal characters and for the coloration pattern of the fasciae of adult forewings were stable and thus used to delimit these new species. Thus five species of *Phyllocnistis* are now known from Brazil, four of them from the Atlantic Forest.

Key words: Asteraceae, Begoniaceae, leaf miners, Neotropical region, Winteraceae

INTRODUCTION

Among the Microlepidoptera known to be angiosperm leaf miners, Gracillariidae stands out as the most diverse family. They are distributed over all biogeographic regions except Antarctica, and may have variable life habits. The construction of mines either in fruits or stems, gall induction and leaf curling are also life styles found within the family (Davis 1987, De Prins & De Prins 2016). Taxonomic studies with the group in the

Neotropics are scarce, especially compared to the total number of species described for other biogeographic regions. This reflects the low sampling effort and reduced number of taxonomists working with gracillariids in the region (Brito *et al*. 2016). In an attempt to revert this scenario, intensive studies analyzing samples with molecular analysis are being conducted in some South American countries, in order to optimize the taxonomic process in relation to the family diversity (e.g. Lees *et al*. 2014).

Phyllocnistis Zeller, 1848 is one of the most speciose genera of Gracillariidae, with currently 98 species known worldwide, 17 assigned to the Neotropics (Brito *et al*. 2016, De Prins & De Prins 2016, De Prins *et al*. 2016). Only two species are recorded for Brazil, *P. citrella* Stainton, 1856 and *P. tethys* Moreira & Vargas, 2012 (Brito & Duarte 2016). *Phyllocnistis citrella* is a cosmopolitan species originally from India, with great economic importance due to the leaf damage caused by the larvae. It is popularly known as the citrus leaf miner; it feeds on cultivated plants of the Rutaceae (Heppner 1995, Heppner & Dixon 1995, Causton *et al*. 2006, Kobayashi *et al*. 2013). Its first record in Brazil was for São Paulo state in 1996, after which the species has spread rapidly to the rest of the country (Cônsoli 2001). Studies related to biological control of *P. citrella* and the damage caused on the leaves, such as the decrease of photosynthetic leaf area and premature sprouting, among others, have been conducted by Brazilian researchers (e.g. Sant'Ana *et al*. 2003, Jahnke *et al*. 2005, 2006, Jesus *et al*. 2008). *Phyllocnistis tethys* is an endemic species, a leaf miner of *Passiflora organensis* Gardner (Passifloraceae) in the Atlantic Forest, South Brazil; the characterization of immature and its natural history were addressed in the original description (Brito *et al*. 2012).

Due to the diminutive size of adults, with wing spam usually not exceeding seven millimeters in length, some morphological characteristics are difficult to evaluate in *Phyllocnistis*, especially regarding the genitalia. These structures are generally very similar among *Phyllocnistis* species, and often do not show valuable characteristics that may serve for species delimitation (Davis & Wagner 2011, Kawahara *et al*. 2016). Characteristics related to the pattern of fasciae and strigulae (wide stripes and transverse lines formed by different colored scales on the forewings) have been used for species identification in the genus. The larvae form serpentine leaf mines and present two distinct larval forms: three initial instars known as sap-feeding, in which the larvae exhibit mouth parts adapted to lacerate plant tissues, and a final instar known as spinning with reduced mouth parts, exhibiting only a functional spinneret that releases silk during the construction of the cocoon prior to pupation (Davis 1994, Davis & Robinson 1998). Other

important characteristics used by some authors to distinguish species are morphological characters of pupae such as the quantity and arrangement of tergal abdominal spines and the shape of the cephalic frontal process, known as the cocoon-cutter (Kawahara *et al*. 2009, Davis & Wagner 2011).

In this study, we increased the known Neotropical diversity of *Phyllocnistis* by describing three new species associated with Asteraceae, Begoniaceae and Winteraceae, in Rio Grande do Sul state, Brazil. The morphology of the immature stages and the natural history of each species are described and compared to other similar species known for the Neotropical region. A comparative assessment of interspecific divergence based on the cytochrome oxidase subunit I gene sequences in relation to other *Phyllocnistis* species was performed, as well as inferences on the specific status of each new taxon and their phylogenetic relationships.

MATERIAL AND METHODS

Specimens were reared from larvae kept in small plastic vials under controlled abiotic conditions in a laboratory chamber (25±5 ºC, 14h light/day) existing in the Laboratório de Morfologia e Comportamento de Insetos, Departamento de Zoologia, Universidade Federal do Rio Grande do Sul (UFRGS), Porto Alegre, Rio Grande do Sul state (RS), Brazil. They were collected in a *Citrus* orchard located in Montenegro municipality, RS (29º37'59" S; 51º28'12" W, 18 m altitude) during May 2015, and in the Centro de Pesquisas e Conservação da Natureza (CPCN Pró-Mata / PUCRS; 29°28'36" S; 50°10'01" W, 900 m), São Francisco de Paula municipality, RS, from 2012 to 2016.

Immature stages were fixed with Dietrich's fluid and preserved in 70% ethanol. Adults were pinned and dried by the process of double mounting. For analysis of genitalia morphology, some specimens were cleared in a 10% potassium hydroxide solution, stained with Chlorazol black and slide-mounted in Canada balsam. Observations were performed with the aid of a Leica® M125 stereomicroscope and photographed with an attached Sony® DSC-H10 digital camera. Images were digitalized and vectorized with the software CorelDraw® and CorelPhotoPaint® X7.

For ultrastructural morphology, samples were dehydrated in a Bal-tec® CPD030 critical-point drier, mounted on metal stubs with double-sided tape and coated with gold carbon in a Bal-tec® SCD050 sputter coater. The photographs were taken under a JEOL® JSM6060 scanning electron microscope at the Centro de Microscopia Eletrônica da

UFRGS (CME). Nomenclature used for description of the forewing region follows Kawahara *et al*. (2009). For general description of larvae and pupae, we adopted Davis & Wagner (2011). At least five specimens were compared in each case.

MUSEUM COLLECTIONS

The material examined is deposited in the following collections:

DZUP Coleção entomológica Padre Jesus S. Moure, Departamento de Zoologia, Universidade Federal do Paraná, Curitiba, Brazil

LMCI Laboratório de Morfologia e Comportamento de Insetos, Universidade Federal do Rio Grande do Sul, Porto Alegre, Brazil

MCTP Museu de Ciências e Tecnologia da Pontifícia Universidade Católica do Rio Grande do Sul, Porto Alegre, Brazil

MOLECULAR ANALYSIS

Genomic DNA was purified from larval tissue of six specimens (two per species) of the new taxa *P.* sp. 1, *P.* sp. 2, and *P.* sp. 3 using the Purelink genomic DNA extraction kit (Invitrogen). Amplification was performed by PCR for a 658-base pair (bp) segment of the mitochondrial gene cytochrome c oxidase subunit I (COI, the 'DNA barcode' region) with the universal primers LCO1490 and HCO2198, following the program and conditions proposed by Folmer *et al*. (1994). We obtained variants that match exactly the region previously sequenced in related *Phyllocnistis* deposited in the GenBank and BOLD Systems databases. Aliquots of PCR products were treated with exonuclease I and FastAP thermosensitive alkaline phosphatase (Thermo Scientific), sequenced using BigDye chemistry and analyzed on an ABI3730XL (Applied Biosystems) at Macrogen (Seoul, Republic of Korea). Sequences were aligned and inspected visually using the algorithm Clustal X in MEGA 5 (Tamura *et al*. 2011) running in full mode with no manual adjustment. Data generated in this study were deposited in GenBank under accession numbers KY006927 to KY006929.

A phylogenetic tree was reconstructed in order to test the specific status of the three new species and also to infer their evolutionary relationships within the genus. We thus incorporated representative taxa belonging to *Phyllocnistis* and rooted with genera from the known related subfamilies *Angelabella* (Oecophyllembiinae) and *Marmara* (Marmarinae) according to Kawahara *et al*. (2016) (Table 1).

Phylogenetic reconstructions were based on two methods: Bayesian inference (BI), implemented in BEAST 2.0 (Drummond *et al*. 2012) and maximum likelihood (ML), run in PHYML 3.0 (Guindon *et al*. 2010). A relaxed uncorrelated lognormal clock was used for BI, together with no fixed mean substitution rate and a Yule prior on branching rates, using the GTR (general time-reversible; Rodríguez *et al*. 1990) model of sequence evolution. Four independent runs of 10 million generations and a burn-in period of 10,000 (the first 1000 trees were discarded) were used; the remaining trees were summarized in TreeAnnotator 1.6.2 (Drummond & Rambaut 2007) and used to infer a maximum *a posteriori* consensus tree. Bayesian posterior probabilities (BPP) were used as an estimate of branch support. The program jModeltest (Darriba *et al*. 2012) was used for ML to estimate the substitution model GTR + G with gamma distribution (G), according to the Akaike information criterion. Monophyly confidence limits were assessed with the bootstrap method (Felsenstein 1985) at 60% cut-off after 1000 bootstrap iterations. Trees were visualized and edited in FigTree 1.4.2 (http://tree.bio.ed.ac.uk/software/201/). Finally, we analyzed the genetic distance between the same pairs of taxa used in the phylogenetic analysis (including outgroups) using the Kimura 2-parameter (K2P) model (Kimura 1980), with 1000 bootstrap replications.

RESULTS

***Phyllocnistis* sp. 1** Brito & Moreira, **sp**. **nov**.

(Figs.: 1A,1D, 2A-C, 3A-E, 4A-I, 5A-I, 6A-H,7A-H)

Phyllocnistis sp., Santos *et al*., 2009: 383-384, 386, tab. 01, fig. 03; Brito *et al*., 2016: 2, figs. 07, 08.

TYPE MATERIAL. BRAZIL: *Citrus* orchard, Luiz Laux´s organic farm, 29º37’59” S, 51º28’12” W, 18 m altitude, Montenegro, Rio Grande do Sul (RS). All specimens preserved dried and pinned, reared by the senior author from larvae and pupae collected on *Baccharis anomala* DC. (Asteraceae). LMCI 297, G.R.P. Moreira, R. Brito, C.M. Pereira & G.T. Silva legs, 27.V.2015. HOLOTYPE: ♂ (LMCI 297-65), with genitalia on slide (GRPM 50-115), donated to DZUP (DZ 33.343). PARATYPES: 1♂ (LMCI 297-66), with genitalia on slide (GRPM 50-116), 1♀ (LMCI 297-26), donated to DZUP (DZ 33.353 and DZ 33.363, respectively); 1♂ (LMCI 297-67), with genitalia on slide (GRPM

50-117), 1♀ (LMCI 297-28), donated to MCTP (MCTP 57.616 and MCTP 57.617, respectively).

OTHER SPECIMENS EXAMINED (with the same collection data, deposited in LMCI). Adults in 70% ethanol: 1♂ (LMCI 297-25), 2♀ (LMCI 297-20 and 27). Immature stages, fixed in Dietrich's fluid and preserved in 70% ethanol: 5 sap-feeding larvae (LMCI 297-13), 8 spinning larvae (LMCI 297-8), 7 pupae (LCMI 297-14). Last instar larvae (n = 3), preserved in 100% ethanol, at -20 ºC, used for DNA extraction (LMCI 297-15).

DIAGNOSIS. Characteristics of adults of *P.* sp. 1 allow easy distinction of this species from other Neotropical *Phyllocnistis*. Between the costal and transversal fasciae there are dark gray scales on the forewing, interrupting the transverse fascia, a characteristic shared only with *P. baccharidis* Hering, 1958. However, at the wing apex *P. baccharidis* presents two additional fasciae that are completely separated from each other, while in *P.* sp. 1 they are united, forming a large blotch. The valvae and saccus of male genitalia are wider in *P.* sp. 1, the saccus more than two-thirds the length of the valvae; these characteristics are not found in other Neotropical *Phyllocnistis* for which the genitalia have been described. For pupae, there are differences in the arrangement of tergal spines on abdominal segments A2 and A3-A7. *Phyllocnistis tethys* and *P.* sp. 2, sp. nov. have a set of small spines on abdominal terga, but they have no robust spines as reported here for *P.* sp. 1.

ADULT (Figs. 1A, D, 2A-C). Male and female similar in size and color, with forewing length varying from 2.55 to 2.81 mm (n = 4). *Head*: antennae silver, length reaching 2/3 of forewing. Labial palpus slender, ~0.3 mm in length, covered with light gray scales. Proboscis without scales, shorter than labial palpus. *Thorax*: forewing ground color light gray; fascia light orange, bordered by dark gray scales. Longitudinal fascia beginning at the proximal region of the wing and ending at the costal fascia. The latter begins at the costal margin and reaches the distal region of the longitudinal fascia. Transverse fascia located parallel to the costal fascia, reaching the inner margin of the wing; in the central region grayish scales interrupt this fascia. A large blotch, also light orange, in the distal region of the wing. Apex of forewing with a well-marked black apical spot. Three dark costal strigulae; one beginning at the transverse fascia and two at the orange blotch; in addition, three apical strigulae and one tornal strigula, all beginning at the apical spot (Figs. 1A, 1D). A long fringe on the inner margin of forewing, varying from orange to dark brown. Hindwings and legs with dark gray scales. *Abdomen*: covered with dark gray

scales. *Male genitalia*: A pair of lateral coremata between the intersegmentary membrane of abdominal segments VIII-IX, each pair consisting of a set of flat and long scales. Uncus absent. Tegumen with membranous base and slightly sclerotized apex forming a little pronounced arch surpassing the length of the valvae; with small spines arranged laterally from the base to the median region. Saccus U-shaped, well developed, ~0.7 x length of valvae. These are digitiform and slightly converge from the base to the apex, which presents a pair of small, stout spines; medium size setae are randomly arranged along the valvae (Fig. 2A). Aedeagus surpassing the size of valvae in length, weakly sclerotized, cylindrical, partially wrinkled, narrowing near the apex, which has a slightly folded border. Cornutus absent (Fig. 2B). *Female genitalia*: segment VII subrectangular and segment VIII reduced. Anterior and posterior apophyses similar in size, ~0.3 x the length of papillae anales, which are covered with setae of varied length. Ductus bursae membranous and slender. Corpus bursae ellipsoid, membranous, with a half-moon shaped signum in the central region, ~0.6 x the width of the corpus bursae; one pair of acute, stout spines near the lateral margin of the signum (Fig. 2C).

IMMATURE STAGES

Sap-feeding larva (Figs. 3A, 4A-I, 7C). Body flattened dorso-ventrally, yellowish (Figs. 4C, 7C), ~5.7 mm maximum length. Head prognathous, setae reduced or absent. Two small stemmata located in the lateral region (Fig. 4D). Antenna 3-segmented, with three sensilla, two on the second segment and one small, apical on the distal segment (Fig. 4E). Labrum and labium bi-lobed, surrounded by minute setae and small pharyngeal spines, which are of greater size in the lateral region (Fig. 4A). Spinneret not functional, represented by a small ventral opening (Fig. 4B). Maxillary and labial palpi absent. Thoracic and abdominal segments without setae (Fig. 3A). Legs and prolegs absent. One pair of lateral lobes on abdominal segments A1-A7; on the eighth segment these lobes are in two pairs (Fig. 4F-G). Last abdominal segments partially divided, with two pairs of microsetae distally in the ventral region (Figs. 4H-I).

Spinning larva (Figs. 3B, 5A-I, 7E). Body yellowish, robust, cylindrical and covered with microtrichia (Fig. 7E), ~5.83 mm maximum length. Stemmata absent. Antenna 1-segmented with four apical sensilla, three with a blunt tip and one, narrower, spineform (Fig. 5D). Frontal protuberance with reduced mouthparts (Fig. 5B), with two pairs of setae on the clypeal region. Maxillary palpi modified into three pairs of apical setae.

Spinneret long, opening terminal (Figs. 5A, 5C). Thorax with slightly pronounced prothoracic shield (Fig. 5E). Legs absent. A single ambulatory callus ventrally on center of meso- and metathorax (Fig. 5F). One pair of smaller ambulatory calli on abdominal sterna A3-A6 (Figs. 3B, 5G). Last abdominal segments slightly bilobed distally (Figs. 5H-I).

Pupa (Figs. 3C-E, 6A-H, 7G). Yellowish brown (Figs. 3E, 7G), covered with microtrichia, maximum length ~4.42 mm. Cocoon-cutter subtriangular, with serrated lateral edges (Fig. 6A). Labrum rounded with two pairs of small setae at anterior margin. Antennae long and extending to the posterior limit of abdominal segment A6; forewing extending up to 2/3 of A5; proboscis extending to A2; prothoracic, mesothoracic and metathoracic legs reaching segments A2, A4 and A7 respectively (Fig. 3D). Meso- and metathorax with one pair of medium-sized setae laterally on tergum. First abdominal tergum with one pair of microsetae and one pair of strong, laterally directed spines on center. Second abdominal tergum with an additional pair of lateral setae longer than others; one pair of conspicuous spiracles up to A6; dorsally one cluster of small spines arranged in a V-shaped pattern, up to A7 (Figs. 6B-C). One pair of strong, laterally directed spines on the central region from tergum A2 to A7 (Fig. 6D). Lateral setae on abdominal segments, varying in form; between A2-A5 with rectangular apex, and clavate on A6 and A7, (Figs. 3C, 6E). Eighth abdominal segment with a pair of setae directed the posteriorly, followed by a microseta and a partially closed spiracle (Fig. 6H). One pair of short lobes is on the final portion of segment A10 (Figs. 6F-G).

DISTRIBUTION. *Phyllocnistis* sp. 1 specimens were found only at the type locality, in Montenegro, RS. The host plants from which the larvae used in this study were collected were located next to a *Citrus* orchard in an organic farm. This is located within the transition boundary between the Atlantic Forest and Pampa biomes.

HOST PLANT (Fig. 7A). *Baccharis anomala* DC (Asteraceae). *Baccharis* is one of the most diverse genera of the composites with medicinal importance. About 400 species have been described, distributed from the United States to Argentina; about 90% of the species concentrated in South America (Judd *et al*. 1999). *B. anomala*, the host plant of *P.* sp. 1 immature stages, is found in southern Brazil, Paraguay and Argentina. In Brazil, *B. anomala* is currently distributed in the states of São Paulo, Paraná, Santa Catarina and Rio Grande do Sul, where it is vulgarly known as “cambará-de-cipó”, “uva-do-mato” and

"parreirinha". *B anomala* is a scandent bush with hirsute green leaves having crenate margins, generally found on forest edges (Alice *et al*. 1985, Budel *et al*. 2005, Budel & Duarte 2008).

NATURAL HISTORY (Figs. 7B-H). *Phyllocnistis* sp. 1 mines are found on the adaxial surface of *B. anomala* leaves. As with most species of *Phyllocnistis*, the mines are serpentine, initially narrow, increasing in width during ontogeny. The larva leaves a black path of feces while feeding that can be traced along the mine (Fig. 7B). The oviposition location on the leaf was not observed. During the first three instars, the sap-feeding larva lacerates the plant tissue, feeding by sucking the sap (Fig. 7C). During the last, spinning instar, it does not feed, spinning the cocoon within which pupation occurs (Fig. 7E). The cocoon is endophyllous, constructed at the final portion of the mine and covered by a whitish silk that causes a slight leaf wrinkling (Figs. 7D, 7F). The pupal cocoon is ruptured by the cocoon-cutter during emergence, and the pupal exuvium is left half protruded outside of the chamber (Fig. 7G, 7H). Sampling of this species was performed in May. However, Santos *et al*. (2009) reported that this species (reported as *Phyllocnistis* sp.) occurs year around in the area, with higher densities found during the winter and spring.

***Phyllocnistis* sp. 2** Brito & Moreira, **sp**. **nov**.
(Figs.: 1B,1E, 2D-F, 8A-E, 9A-F, 10A-F, 11A-H,12A-H)

TYPE MATERIAL. BRAZIL: Centro de Pesquisas e Conservação da Natureza Pró-Mata (CPCN Pró-Mata), 29º28'36" S, 50º10'01" W, 900 m, São Francisco de Paula, Rio Grande do Sul state (RS). All preserved dried and pinned, reared by the senior author from larvae and pupae collected on *Begonia fruticosa* (Klotzsch) A.DC. (Begoniaceae): LMCI 200, G.R.P. Moreira, R. Brito & F.A Luz legs, 20-22.XII.2012; LMCI 236, G.R.P. Moreira & R. Brito legs, 07.III.2014; LMCI 263, G.R.P. Moreira & R. Brito legs, 04-06.IV.2014; LMCI 306, G.R.P. Moreira, R. Brito & J. Fochezato legs, 21-24.VI.2016. HOLOTYPE: ♂ (LMCI 306-54), with genitalia on slide (GRPM 50-118), donated to DZUP (DZ 33.373). PARATYPES: 1♂ (LMCI 306-55), with genitalia on slide (GRPM 50-119), 1♀ (LMCI 200-14), donated to DZUP (DZ 33.383 and DZ 33.393, respectively); 1♂ (LMCI 263-24), 1♀ (LMCI 306-56), with genitalia on slide (GRPM 50-120), donated to MCTP (MCTP 57.618 and MCTP 57.619, respectively).

OTHER SPECIMENS EXAMINED (with the same collection data, deposited in LMCI). Adults in 70% ethanol: 1♂ (LMCI 263-25), 1♀ (LMCI 263-27). Immature stages, fixed in Dietrich's fluid and preserved in 70% ethanol: 7 sap-feeding larvae (LMCI 306-13), 2 spinning larvae (LMCI 306-3), 4 pupae (LCMI 236-5, 263-1 to 3). Pupae (n = 4), preserved in 100% ethanol, at -20 ºC, used for DNA extraction (LMCI 263-9 and 10).

DIAGNOSIS. *Phyllocnistis* sp. 2 adults are differentiated from other Neotropical *Phyllocnistis* by the shape and the bright ochre color of forewing fasciae; in particular by the transverse fascia that is distinguished only near the costal margin, which is fused in the central region and inner margin with scales of the same color, forming a blotch that covers most of the forewing distal region. Male genitalia similar to the other species studied, except for *P.* sp. 1, as already mentioned. Female genitalia are unique in presenting one pair of small signa located at the corpus bursae extremities, both bearing a small spine. The pupa is distinguished by the acute cocoon-cutter apex, absence of hooks on the abdominal terga, with only a cluster of spines on abdominal terga A2-A7. This characteristic is shared with *P. tethys*, differentiating from this species by the presence of a pair of setae found laterally in these spines.

ADULT (Figs. 1B, E, 2D-F). Male and female similar in size and color, with forewing length varying from 2.29 to 2.86 mm (n = 4). *Head*: Antenna grayish, gradually varying to light gray towards the apex; length 2/3 of forewing. Labial palpus slender, ~0.24 mm in length, covered with dark gray scales. Proboscis without scales, ~2.0 x the length of palpus. *Thorax*: forewing ground color dark gray; fasciae bright ochre, bordered by dark brown scales. Longitudinal fascia beginning at the costal margin near the wing base and merging with the costal fascia distally. Transverse fascia with the right border not defined but continuing with scales of same color, forming a blotch on the distal region of the forewing. Additional ochre scales on the inner margin of median portion, forming a strip that extends a little to the forewing base. Black apical spot well defined, located at the wing apex. Three costal dark brown strigulae; the first beginning at the transverse fascia and the other two from the bright ochre blotch. Three apical and one tornal strigulae, with the same color as the costal, originating from the apical spot of the wing; inner margin with dark gray fringe. Hindwing and legs dark gray. *Abdomen*: covered with scales ranging from dark gray to silver (Figs. 1B, E). *Male genitalia*: one pair of coremata present laterally on eight abdominal segment formed by long (~2/3 length of valvae) and flattened scales. Uncus absent. Tegumen with membranous base, with a set of long and

thin setae; apex slightly sclerotized, surpassing the length of valvae. Valvae digitiform, long and narrow with setae randomly arranged along its length, ~1.9 x the size of saccus. Saccus U-shaped, narrow (Fig. 2D). Aedeagus weakly sclerotized, tubular shaped, narrow, with rounded, thinner apex and partially wrinkled along its length (Fig. 2E). *Female genitalia*: Abdominal segment VII rectangular and segment VIII reduced. Anterior and posterior apophyses similar in size and shape, ~0.3 x the length of papilla analis; posterior apophyses slightly reaching segment A8. Papillae anales covered with setae of varied size, randomly arranged. Corpus bursae membranous, saculiform, elongated, with a pair of small, stout, spineform signa arranged at the proximal and distal portions (Fig. 2F).

IMMATURE STAGES

Sap-feeding larva (Figs. 8A, 9A-F, 12C). Head and body flattened dorsoventrally, light yellow (Figs. 9C, 12C), with maximum length 5.30 mm. Head prognathous, setae either absent or reduced. Stemmata absent. Antenna 3-segmented with four sensilla; three stout and blunt located on distal margin of the second segment, and one spineform located on the apical segment (Fig. 9D). Labrum bilobed, with rounded margins, covered by long, filiform setae that form a posteriorly bent fringe (Fig. 9A). Labium margin ventrally covered by small pharyngeal spines and setae (Fig. 9B). One pair of modified lateral maxillae, with apex bearing a set of long setae (Fig. 9E). Thorax and abdomen without setae, legs or prolegs. Last abdominal segment with one pair of projections distally divided, with three pairs of latero-dorsal microsetae (Figs. 8A, 9F).

Spinning larva (Figs. 8B, 10A-F, 12F). Body cylindrical, yellowish, wider along the thorax and narrowing towards the posterior region (Figs. 8B, 12F), covered with microtrichia, with maximum length ~4.62 mm. Stemmata absent. Antenna 1-segmented, with three sensilla, two with blunt apex and one spineform (Fig. 10D). Mouthparts reduced, forming a prominent and rounded lobe (Fig. 10B). Maxilla vestigial, represented by a pair of two small setae. Spinneret functional, short and with apical opening (Fig. 10C). Head chaetotaxy either reduced or absent, except for the clypeal setae (Fig. 10A). Prothoracic shield slightly pronounced (Fig. 10E). Legs and prolegs absent. Abdominal segments A9-A10 fused, short and slightly divided into two caudal projections (Fig. 10F).

Pupa (Figs. 8C-E, 11A-H, 12G). Yellowish, varying from light to dark brown later in ontogeny, covered with microtrichia, maximum length ~3.48 mm (Figs. 8E, 12G).

Cocoon-cutter subrectangular, with serrated lateral edges and acute apex (Fig. 11A). Labrum rounded with two small pairs of setae (Fig. 8D). Antenna long, reaching abdominal segment A7; forewing extending to A5; proboscis reaching segment A1; prothoracic, mesothoracic and metathoracic legs extending to A2, A4 and A7, respectively (Fig. 8D). One pair of medium-sized setae on the anterior region of the metathoracic terga and A1. One pair of long, supraspiracular setae on the mesothoracic terga and A2-A7; one pair of spiracles with adjacent microseta on A2-A8 (Figs. 8C, 11E-F). On the median region of terga A2-A7, a set of posteriorly directed V-shaped spines. A pair of small, laterally pointed setae among these spines (Figs. 11B-D). Abdominal segments A8-10 fused, with one pair of short, laterally directed caudal lobes (Figs. 11G-H).

DISTRIBUTION. *Phyllocnistis* sp. 2 is known only for the type locality, fragments of Ombrophilous Dense Forest (= Brazilian Atlantic Forest *sensu strictu*) located in CPCN Pró-Mata, São Francisco de Paula, RS.

HOST PLANT (Fig. 12A). *Begonia fruticosa* (Klotzsch) A.DC (Begoniaceae). The genus *Begonia* has about 1400 species, 215 of these found in Brazil (Doorenbos *et al*. 1998, Forrest *et al*. 2005). *B. fruticosa* is endemic to Brazil and is distributed in the Atlantic Forest from the state of Bahia in the North to Rio Grande do Sul in the South (Jacques 2016). In the latter state, *B. fruticosa* plants can be found in areas ranging from 900 to 1100 m altitude, where it stands out due its scandent habit and the reddish abaxial leaf surface (Jacques 2016).

NATURAL HISTORY (Figs. 12B-H). Mines constructed by larvae of *P.* sp. 2 have a serpentine shape and are found on the adaxial leaf surface. The gallery is initially narrow, but increases in width during ontogeny. Frass granules are found scattered in the mine path left by the sap-feeding larva (Figs. 12B, C). Only one larva was found in each *B. fruticosa* leaf mined examined. We could not find a clear pattern regarding oviposition site, since the mine can be initiated in any part of the leaf. The cocoon is a chamber covered with silk located at the interior end of the mine, constructed by the spinning larva (Figs. 12D, F). It is oval in shape and yellowish, being partially ruptured by the pupal cocoon-cutter during adult emergence: the pupal exuvium is left partially protruded from the cocoon (Figs. 12E, G, H). Specimens used in this study were collected in March, April, June and December, thus suggesting a multivoltine life cycle for this species.

***Phyllocnistis* sp. 3** Brito & Moreira, **sp**. **nov**.
(Figs.: 1C,1F, 2G-I, 13A-E, 14A-F, 15A-F, 16A-H,17A-H)

TYPE MATERIAL. BRAZIL: Centro de Pesquisas e Conservação da Natureza Pró-Mata (CPCN Pró-Mata), 29º28'36" S, 50º10'01" W, 900 m, São Francisco de Paula, Rio Grande do Sul state (RS). All preserved dried and pinned, reared by the senior author from larvae and pupae collected on *Drimys angustifolia* Miers (Winteraceae): LMCI 210, G.R.P. Moreira, F.A. Luz & L.T. Pereira legs, 7-9.III.2013; LMCI 236, G.R.P. Moreira & R. Brito legs, 7.III.2014; LMCI-263, G.R.P. Moreira & R. Brito legs, 4-6.IV.2014. HOLOTYPE: ♂ (LMCI 236-22), with genitalia on slide (GRPM 50-121), donated to DZUP (DZ 33.403). PARATYPES: 1♂ (LMCI 263-18), with genitalia on slide (GRPM 50-122), 1♀ (LMCI 210-34), donated to DZUP (DZ 33.413 and DZ 33. 423, respectively); 1♂ (LMCI 263-26), with genitalia on slide (GRPM 50-123), 1♀ (LMCI 263-28), donated to MCTP (MCTP 57.620 and MCTP 57.621, respectively).

OTHER SPECIMENS EXAMINED (with the same collection data, deposited in LMCI). Adults in 70% ethanol: 3♂ (LMCI 210-25, 28 and 37), 2♀ (LMCI 210-26 and 31). Immature stages, fixed in Dietrich's fluid and preserved in 70% ethanol: 4 sap-feeding larvae (LMCI 210-9), 2 spinning larvae (LMCI 236-2), 2 pupae (LCMI 210-4 and 5). Pupae (n = 4), preserved in 99,5% ethanol, at -20 ºC, used for DNA extraction (LMCI 263-22 and 23).

DIAGNOSIS. *Phyllocnistis* sp. 3 can be easily distinguished from other species described here and of neotropic by having the costal fascia interrupted on the junction of the longitudinal fascia with the transversal fascia; that is, contrary to *P.* sp. 3, neither of the two other species described here has the costal fascia connected to the transversal fascia. Regarding the male genitalia, the tegumen has no setae or spines, and length is similar to valvae, which have many small setae next to the apex that cannot be found on the other species described here. Furthermore, in the female genitalia the signum is absent from the corpus bursae, a structure present in the majority of Neotropical *Phyllocnistis* including the other two species described here. The pupal stage shows two exclusive characters in *P.* sp. 3 compared to *P.* sp. 1 and *P.* sp. 2: a serrated cocoon-cutter bearing a distal hook and two pairs of strong, laterally directed spines on abdominal terga A3-A5.

ADULT (Figs. 1C, F, 2G-I). Male and female similar in size and color, with forewing varying from 1.98 to 2.29 mm (n = 4). *Head*: Antenna light grayish, gradually becoming dark gray towards the apex, reaching slightly over 2/3 the size of forewing. Labial palpus slender, covered with silver scales, ~0.23 mm in length. *Thorax*: forewing ground color light gray; longitudinal fascia of the same color, with light brown border, beginning at the base of the wing and partially interrupted in the median region, at the joining of costal and transverse fasciae. Costal fascia light yellow, with light brown border. Transversal fascia of the same color, extending transversally from the costal to inner margin. A small dark brown blotch at the center region of the wing, and another formed by light yellow scales on the wing apex. A well-defined black apical spot on the distal region of the wing. Three brown costal strigulae, the first beginning from transversal fascia and the others from the light yellow blotch. Three apical strigulae and one tornal strigula, all beginning at the apical spot. On the inner margin, light yellow setae with the apex slightly silvery. Hindwing and legs silver, with tarsomeres dark gray. *Abdomen*: covered with dark gray scales (Figs. 1C, F). *Male genitalia*: one pair of coremata present latero-posteriorly on eighth abdominal segment, formed by long scales (~2/3 length of valve). Uncus absent. Tegumen with membranous base, becoming more sclerotized towards the apex, with similar length to valvae. Saccus U-shaped and well developed, ~0.5 x the length of valvae. Valvae digitiform, narrower in the proximal portion and wider towards the apex; setae of medium size scattered along valvae, and a set of small setae at the inner margin of apex (Fig. 2G). Aedeagus tubiform, slightly sclerotized and wrinkled, narrowing at the apex, slightly surpassing the valvae in length. Cornutus absent (Fig. 2H). *Female genitalia*: Abdominal segment VII subrectangular, segment VIII subtriangular and reduced. Anterior and posterior apophyses similar in size, with ~0.3 x the length of papillae anales. These are covered with setae of varied sizes, distributed in greater number along the outer edge. Corpus bursae membranous, forming an elongated and narrow sac. Signum absent (Fig. 2I).

IMMATURE STAGES

Sap-feeding larva (Figs.13A, 14A-F, 17C). Head and body flattened dorso-ventrally, yellowish (Figs. 14C, 17C), maximum length ~5.25 mm. Head prognathous, setae either reduced or absent. Two stemmata located on the lateral region of the head (Fig.14D). Antenna 3-segmented with four sensilla, three stout and blunt located on the distal margin of the second segment, and one smaller, spiniform located on the apical segment. Labrum

bilobed, showing rounded antero-lateral margins and small pharyngeal spines surrounding the lateral region and that extend in greater number towards the labium. Spinneret not functional, represented by a single opening ventrally (Figs. 14A-B). Labial and maxillary palpus absent. Thorax and abdomen with setae reduced or absent. One pair of small lobes on the lateral region of abdominal segments A1-A7. Two pairs of lobes on abdominal segment A8; the latero-ventral ones larger, with flattened and rounded apex (Figs. 13A, 14E-F).

Spinning larva (Figs. 13B, 15A-F, 17E). Body cylindrical, light yellow, covered with microtrichia (Fig. 17E), maximum length ~4.42 mm. Stemmata absent. Antenna short, one-segmented, with four sensilla; three stout and blunt and one spiniform (Fig. 15D). Mouthparts forming a trophic lobe on the anterior region of the head (Fig. 15B). Maxilla reduced to three pairs of setae. Spinneret functional, long and with terminal opening (Fig. 15C). One group of reduced setae on frontoclypeus: group F unisetose, represented by F1; group C bisetose, represented by C1 and C2 located anteriorly to F1; group L unisetose, represented by L1; group S bisetose, represented by S1 and S2 found next to the antenna; group P unisetose, represented by P1 next to the epicranial notch (Fig. 15A). Thorax with slightly pronounced prothoracic shield (Fig. 15E). Legs and prolegs absent. One microseta on the abdominal terga A1-A8 (Fig. 13B). Last abdominal segment slightly divided, forming two distal, weakly defined lobes (Fig. 15F).

Pupa (Figs. 13C-E, 16A-H, 17F). Body color varying from light to dark brown during ontogeny (Figs. 13E, 17F), covered with microtrichia, maximum length ~3.17 mm. Cocoon-cutter subtriangular with serrated lateral edges, bearing a hook-shaped apex (Fig. 16A). Labrum U-shaped, with two pairs of small setae. Antenna long, reaching abdominal segment A6; forewing extending to the limit of A5-A6; proboscis reaching middle of A2; prothoracic, mesothoracic and metathoracic legs reaching A2, A4 and A6, respectively (Fig. 13D). One pair of long setae lateral on the mesothorax and one pair of short setae on the metathorax. In addition to the similar short setae, also one pair of stout, laterally directed spines on abdominal segment A1 (Fig. 13C). Tergum A2 with one pair of long setae larger than the ones on the mesothorax, with a narrow apex; in addition, one pair of small setae on the central region and one pair of strong spines, slightly larger than in A1; also, several posteriorly directed small spines scattered on the center of the tergum (Figs. 13C, 16C). Setae located laterally on abdominal segments A3-A7 with clavate apex (Fig. 16F). Two pair of stout, laterally directed spines on A3-A5, with a pair of small setae

located between them. Also, two lines hook-shaped parallel spines on the central tergum, directed posteriorly on A3-A7 (Figs. 13C, 16B, D). One pair of microsetae (Fig. 16E) on A3-A7, located near the lateral setae. Spiracles on anterior portion of abdominal terga A1-A8 (Fig. 16F). Eighth abdominal segment with a single hook-shaped, mesal spine and two small pairs of setae, both directed posteriorly. One pair of short projections on the last abdominal segment (Figs. 16G-H).

DISTRIBUTION. *Phyllocnistis* sp. 3 is known only from the type locality, fragments of Ombrophilous Dense Forest (= Brazilian Atlantic Forest *sensu strictu*) in CPCN Pró-Mata, São Francisco de Paula municipality, Rio Grande do Sul, Brazil.

HOST PLANT (Fig. 17A): *Drimys angustifolia* Miers (Winteraceae). Only one genus (*Drimys*) is recorded for the family in the Neotropical region. In Brazil, where the occurrence of one to three species has been accepted, the taxonomy is still controversial. *D. angustifolia* is popularly known as "cataia" and "casca-d'anta", and is distributed in the states of Minas Gerais, Paraná, Santa Catarina and Rio Grande do Sul. In the last, *D. angustifolia* plants are found in regions with altitude varying from 700 to 1400 m. Striking features for identification are the shrubby habit, grayish abaxial surface and erect leaves. Furthermore, the absence of vessel elements led them to be considered a group with primitive characteristics among angiosperms (Hertzog *et al*. 2016).

NATURAL HISTORY (Figs. 17B-H). Mines built by larvae of *P.* sp. 3 have a transparent color and are initially of a serpentine shape, found on both adaxial and abaxial leaf surfaces. The mine is thin at the beginning of development, widening during ontogeny. The path of the sap-feeding larva is followed by a brown frass trail, turning into a blotch that partially covers the leaf lamina later in ontogeny (Fig. 17B, C). Only one mine per leaf was found. The egg is laid near the petiole. The cocoon constructed by the spinning larva is endophyllous, oval and yellowish, consisting of a chamber covered with silk, usually at the edges of the leaf lamina, causing a lateral folding of the leaf margin (Fig. 17D, E). It is partially ruptured by the pupal cocoon-cutter during adult emergence, when the pupal exuvium is left partially protruded from the cocoon (Figs. 17 F-H). The damage caused by immature on *D. angustifolia* does not promote leaf fall, so that mined leaves remain on the plant, regenerating afterwards. Field collection of *P.* sp. 3 mines was accomplished during March and April, suggesting that adults fly from late summer to early autumn.

PHYLOGENETIC INFERENCE

A total of 658 nucleotide sites were analyzed, of which 266 (40%) were variable. In accordance with our phylogenetic hypothesis, the three new species were strongly supported in both methods of inference (BI and ML), with high support values (Fig. 18). Because the topologies were identical, we decided to present only one (BI). *Phyllocnistis* sp. 1 is closely related to *P.* sp. 3; they form a clade sister to *P.* sp. 2, although with low support (0.78 and 40; BPP and bootstrap support values, respectively) (Fig. 18). The genetic divergence observed between comparisons of pairs of species, including the outgroup, ranged from 3 to 27% (Table 2). The distance between pairs of new species described here was 14%. Similarly, the divergence between these lineages and the outgroup (*Angelabella* Vargas & Parra and *Marmara* Clemens) ranged from 22 to 27% (± 3%).

DISCUSSION

As mentioned above, adults of *Phyllocnistis* are considered difficult to identify due their minute size and because they share many morphological characteristics of genitalia, considered simple and uniform. Among the species here described, we in fact found such similarities in the morphology of the genitalia compared to other Neotropical *Phyllocnistis*. Male genitalia, for example, may look alike in their valvae, tegumen and saccus; and female genitalia may show resemblance in general morphology and in particular in the signum of the corpus bursae (e.g. Hering 1958, Kawahara *et al*. 2009, Davis & Wagner 2011). Thus in the diagnoses provided in this study we used primarily the pattern of fasciae of forewings and pupal morphology, characters that were stable in the corresponding populations. Our data provide further evidence that tergal spines of pupae provide stable characters that can be used to identify species within *Phyllocnistis*, as argued by Davis & Wagner (2011) and Brito *et al*. (2012). Kobayashi *et al*. (2013) provided diagnostic characters found in the pupal stage to differentiate Oecophyllembiinae from Phyllocnistinae, including the absence of paired, robust spines that look like hooks on abdominal terga of the former. This is not the case for *P.* sp. 2, which although being a phyllocnistine does not present abdominal hooks. Brito *et al*. (2012) also showed the absence of this type of spine in *P. tethys*. Thus, the use of variation

in this character to separate these gracillariid subfamilies in the pupal stage should be reconsidered.

Comparing *P.* sp. 1 genitalia with others described for the genus, we find greater similarity with *P. baccharidis*, a species described for Argentina, leaf miner of an unidentified species belonging to the same genus of Asteraceae (*Baccharis* sp.). In this case, the male genitalia differ only by the proportion of valvae and saccus sizes. However, the forewing fasciae of this species reveal striking differences, such as the presence of additional fasciae at the wing apex, found in *P. baccharidis* but not observed in *P.* sp. 1, as mentioned above (Hering 1958). For *P.* sp. 2, a unique characteristic is found in female genitalia, the presence of a pair of signa completely separated signa located at the extremities of the bursa. This characteristic contrasts with other Neotropical species for which the genitalia is known; this is also the case in *P.* sp. 3, which lacks a signum. However, it is noteworthy that many of the species already described do not have data in the literature regarding the morphology of male and female genitalia for comparisons, as for example, *P. aurilinea* Zeller, 1877*, P. dorcas* Meyrick, 1915*, P. rotans* Meyrick, 1915 and *P. sciophanta* Meyrick, 1915 (Zeller 1877, Meyrick 1915). They are distinguished from the ones described here by the color pattern of forewings, as compared recently by us in a detailed taxonomic revision of Neotropical *Phyllocnistis*, to be published elsewhere.

Molecular analyses confirmed the specific status of the new species described here, and as suggested by comparative morphology, recovered the close phylogenetic relatedness between *P.* sp. 1 and *P.* sp. 3, which together formed a sister clade of *P.* sp. 2. They also showed that genetic divergence among the new species is greater than 14%, thus suggesting there may exist hidden, unsampled lineages not included in these analyses, which should be further explored. As already mentioned, *Phyllocnistis* is certainly among the most diverse gracillariid lineages in the Neotropics, but largely underrepresented in collections, particularly in South America (Davis & Wagner 2011, Brito *et al*. 2012). In addition, molecular data indicated the existence of a South American *Phyllocnistis* clade, given that additional species included in the analyses are either from Central America or belong to other biogeographic regions. This monophyly should be taken as provisional, pending further sampling of the genus in the area.

The species described here have unique pupal characters: *P.* sp. 1 bears a cocoon-cutter similar to *P. tethys*, but pupae of these species differ regarding the shape and arrangement of abdominal spines. Contrary to *P.* sp. 1*, P.* sp. 2 has a set of small spines

directed posteriorly, sharing this character with *P. tethys*. However, as mentioned above, these species differ from each other by the presence of one pair of setae next to the dorsal spines present in *P.* sp. 2 and by the cocoon-cutter morphology, which is more acute than in *P. tethys* (Brito *et al*. 2012). Another characteristic that may have not yet reported for *Phyllocnistis* is the presence of two pairs of stout spines on abdominal terga, found here in *P.* sp. 3. Comparing this species with *P. drimiphaga* Kawahara, Nishida & Davis, 2009, another Neotropical species that also feeds on a *Drimys* (*D. granadensis*) plant, we noticed striking differences related to the dorsal abdominal spines of the pupa, and also in relation to the cocoon-cutter (Kawahara *et al*. 2009).

Until now, *P. subpersea* Davis & Wagner, 2011 was the only species of Neotropical *Phyllocnistis* whose larvae have two pairs of stemmata in the last sap-feeding instar. We found the same number of stemmata for *P.* sp. 1 and *P.* sp. 3. A reduced number of stemmata is common in Gracillariidae: for example, Gracillariinae and Ornichinae generally have six pairs; Ornixolinae and Marmarinae may have either five or six pairs, and Acrocercopinae have only five pairs of stemmata (Kawahara *et al*. 2016). Usually individuals of Gracillariidae that have stemmata develop these structures during the last, tissue-feeding instar, a stage in which the larva develops chewing mouthparts; however, this larval morphotype is not found within the hypermetamorphic Phyllocnistinae (Davis 1987, Kawahara *et al*. 2016). Other striking characteristics of the spinning instars of *P.* sp. 1, are the presence of an ambulatory callus on the meso- and metathorax, and one pair of modified calli from the third to sixth abdominal segments. Those in the thorax are supposedly not homologous to thoracic legs, since they occur in an odd number and in distinct places compared to legs. Abdominal prolegs and calli are commonly found in the Oecophyllembiinae, another Gracillariidae subfamily closely related to the Phyllocnistinae. For example, *Metriochroa* Busck and *Prophyllocnistis* Davis show vestigial thoracic legs and prolegs from the third to sixth abdominal segments, and *Corythoxestis* Meyrick (= *Cryphiomystis* Meyrick) presents prolegs from the second to sixth abdominal segments (Davis 1994, Kawahara *et al*. 2016). Although not represented in this study, the thoracic spiracles are located on the prothorax of larvae in the three species described here, thus confirming they do not belong to Oecophyllembiinae, whose thoracic spiracle is located on the mesothorax, but to Phyllocnistinae (Kumata 1998, Kawahara *et al*. 2016).

Here we provided the first record of a leaf miner gracillariid associated with Begoniaceae and expanded the knowledge in relation to Asteraceae and Winteraceae.

Until now *P. drimiphaga* was the only gracillariid species associated with Winteraceae, in addition to the oecophyllembiine *Prophyllocnistis epidrymys* Davis, 1994 (Davis 1994, Kawahara *et al*. 2009). For Asteraceae, however, there are at least 37 additional records of leaf miner gracillariids in the literature, four within *Phyllocnistis* (De Prins & De Prins 2016). It is noteworthy that none of these *Phyllocnistis* species are associated with *D. angustifolia* and *B. anomala*, which are thus new host plant records for gracillariids at the specific level. Thus the present study increases the number of *Phyllocnistis* species from one, *P. tethys* (Brito *et al*. 2012) to four in the Atlantic Forest, each associated with a different plant family.

The continuing description of microlepidoptera diversity in Atlantic Forest is crucial, since this biome is considered one of the greatest homes of endemic biodiversity, and yet has been losing part of its area cover for decades (Myers *et al*. 2000, Carnaval *et al*. 2009). *B. fruticosa* and *D. angustifolia* are native species considered vulnerable regarding the risk of extinction, according to FZB (2014), and thus *P.* sp. 2 and *P.* sp. 3 should be considered as such. Taking this scenario into account and given that a high number of gracillariids supposedly await description in the Neotropical region (Brito *et al*. 2016), we hope to stimulate additional studies associated with taxonomy and systematics of *Phyllocnistis* in the region. This certainly applies to the Atlantic Forest, since despite the present study, the great majority of plants from this biome have not yet been examined in relation to the presence of gracillariid mines.

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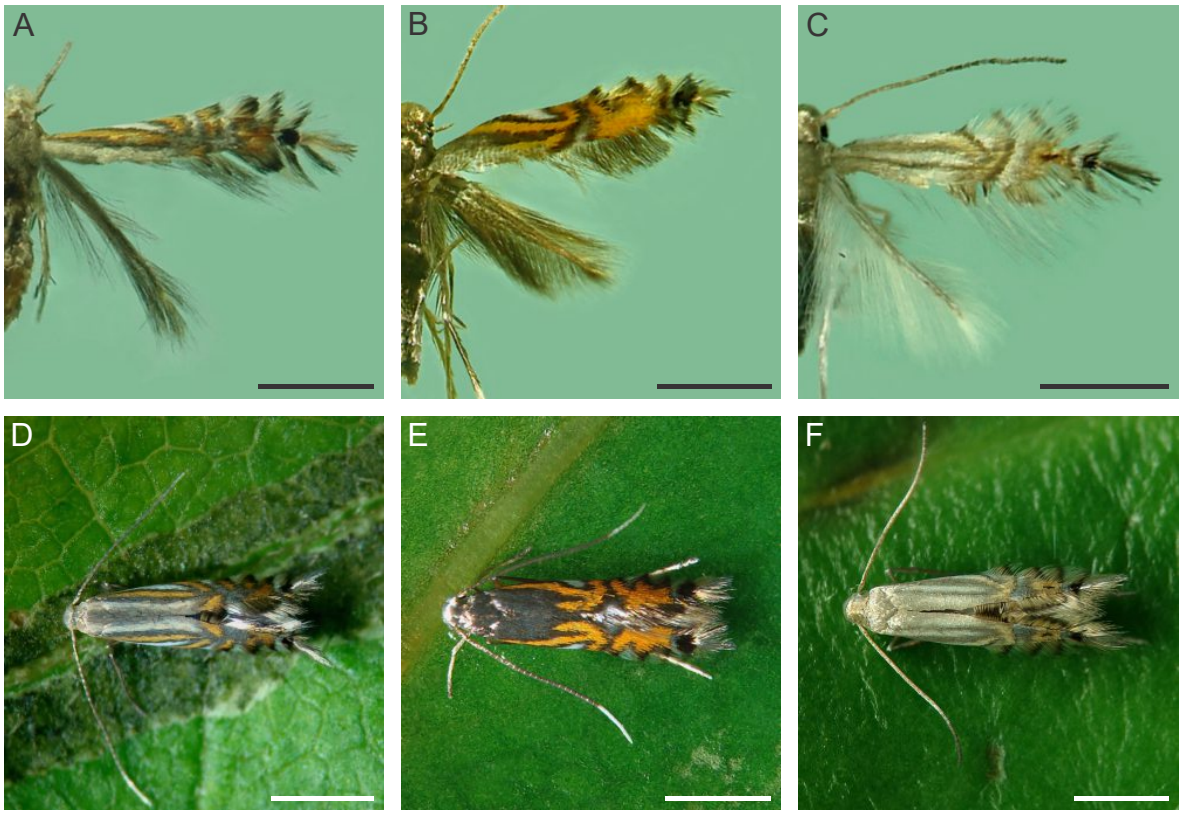

Fig 1. Pinned-dried specimens with wings spread (top) and landed on host plant surface with wings folded (down) of *Phyllocnistis* sp. 1, **sp. nov**. (A, D), *P.* sp. 2, **sp. nov**. (B, E), and *P.* sp. 3, **sp. nov**. (C, F). Scale bars: 1.0 mm.

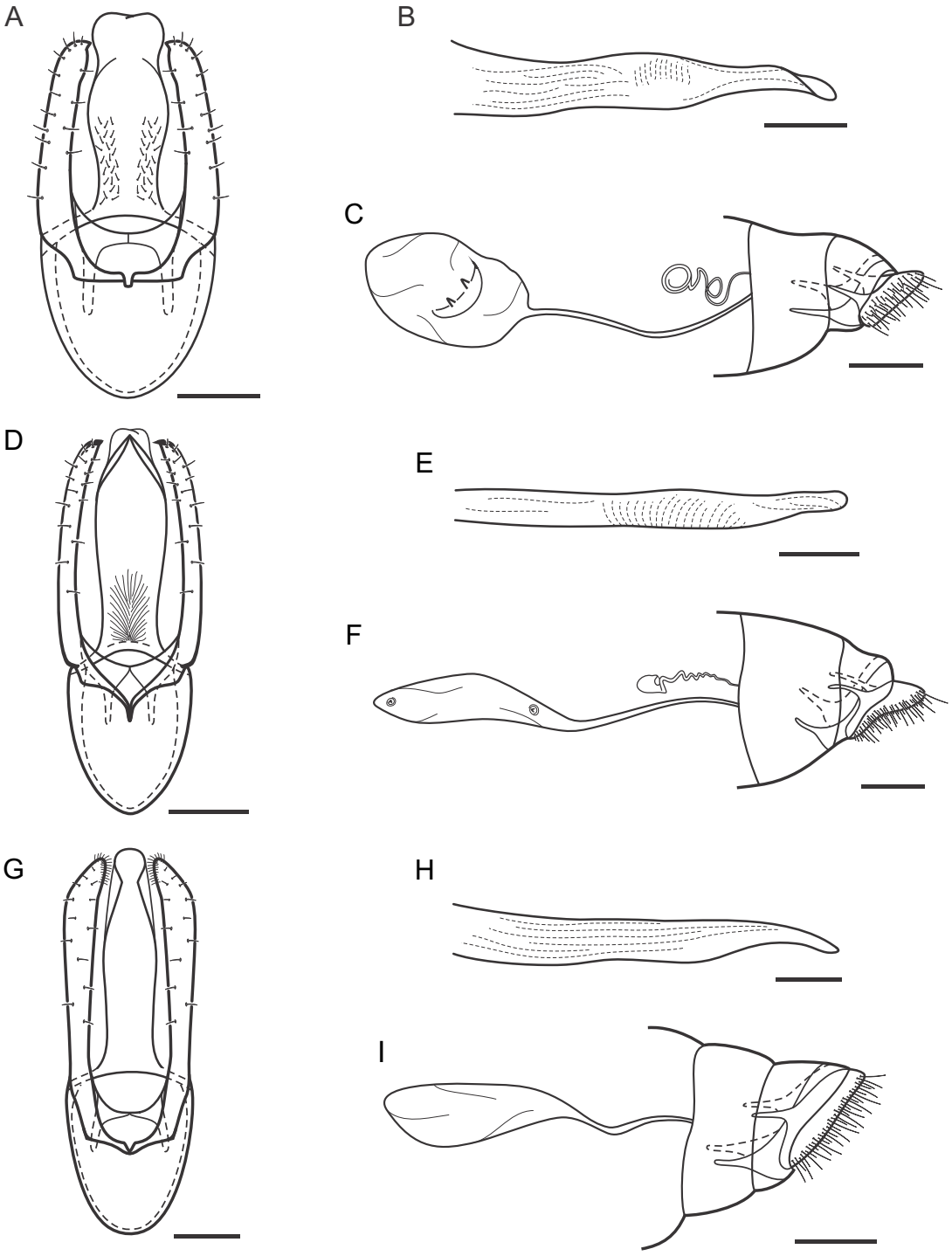

Fig 2. Genital morphology of *P.* sp. 1, **sp. nov**. (A-C), *P.* sp. 2, **sp. nov**. (D-F), and *P.* sp. 3, **sp. nov**. (G-I) under light microscopy. **A**, **D**, **G** male genitalia, ventral view; **B**, **E**, **H** aedeagus, lateral; **C**, **F**, **I** female genitalia, lateral. Scale bars: 50, 50, 200, 100, 100, 100, 50, 50, 100 μm, respectively.

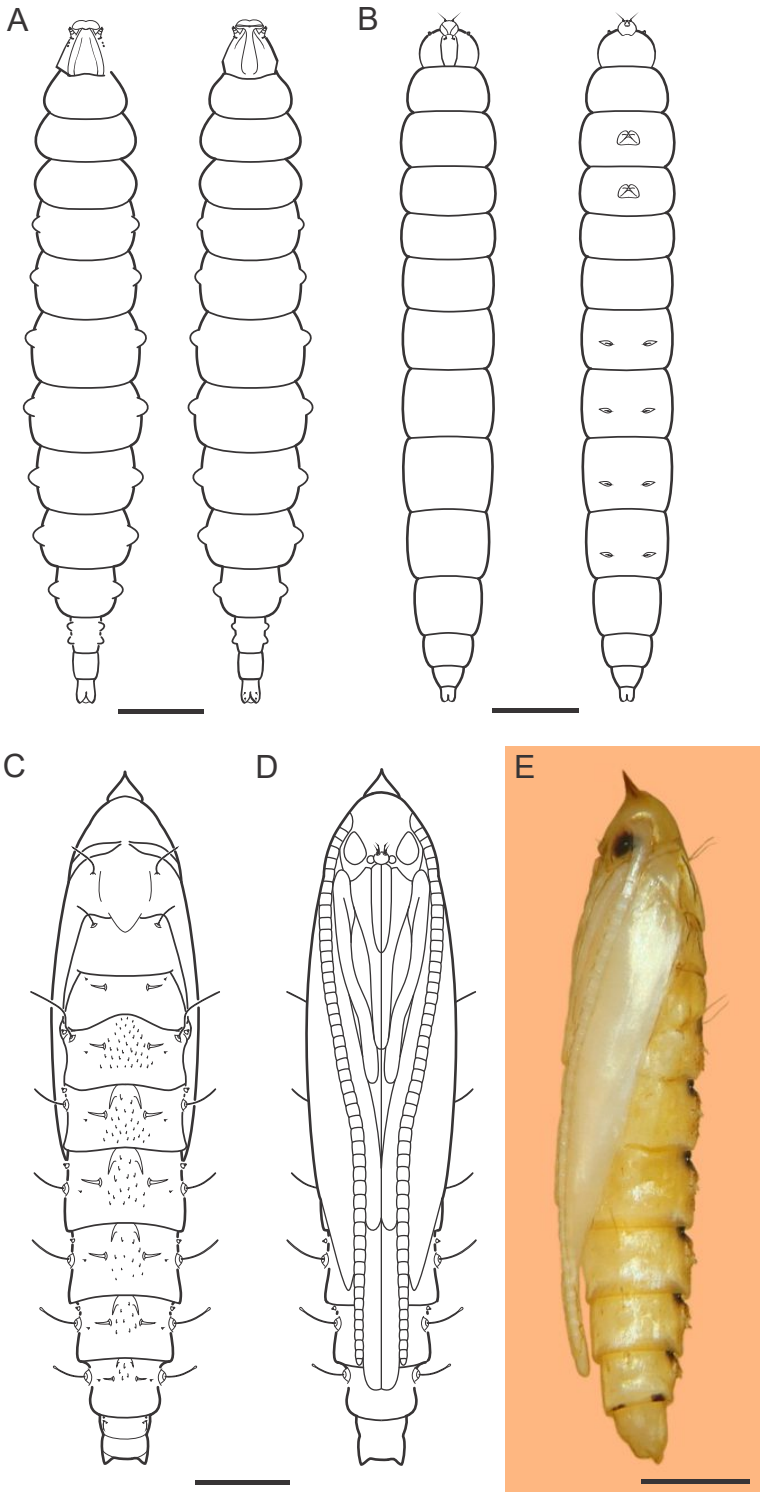

Fig 3. Larval and pupal morphology of *P.* sp. 1, **sp. nov**. under light microscopy: **A** sap-feeding larva, dorsal and ventral views; **B** spinning larva, dorsal and ventral; **C-E** pupa, dorsal, ventral and lateral, respectively. Scale bars: 0.5 mm.

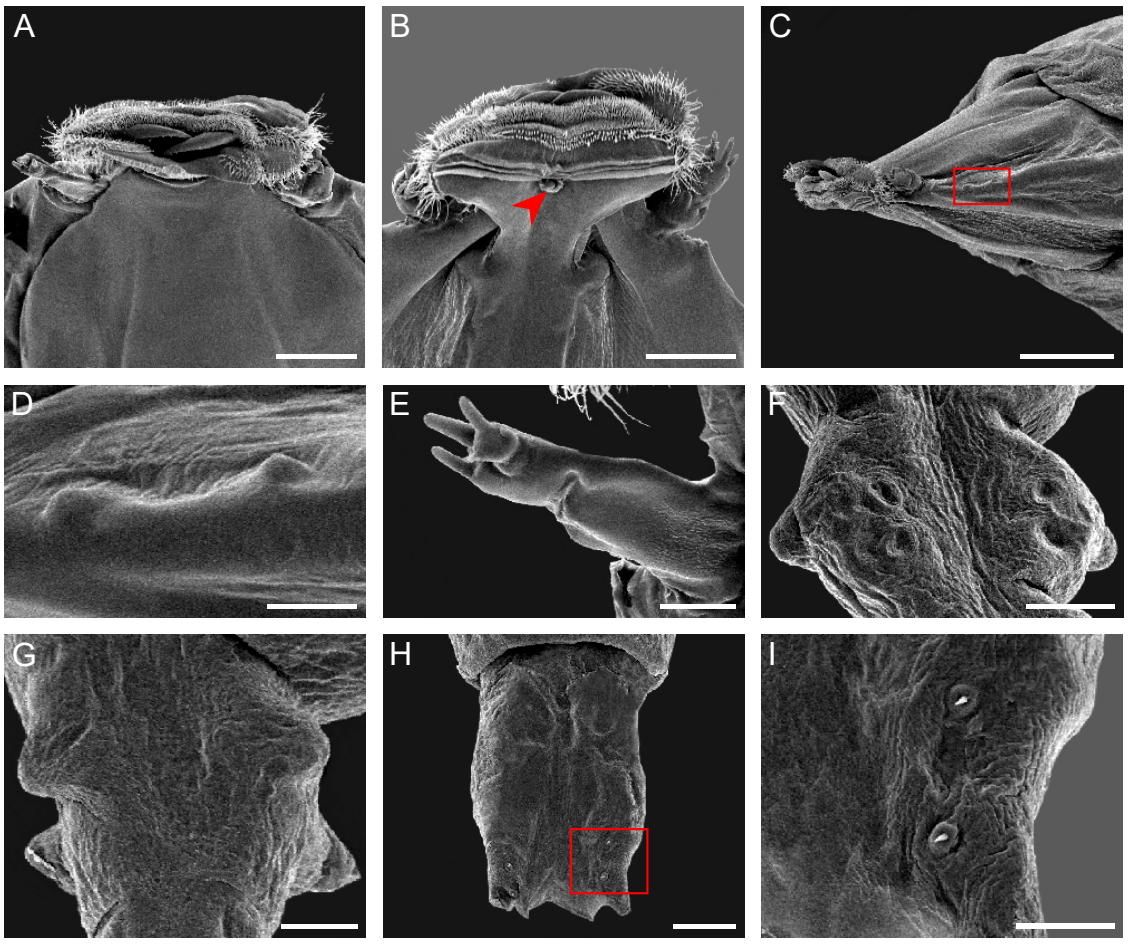

Fig 4. Sap-feeding larva of *P.* sp. 1, **sp. nov**. under scanning electron microscopy: **A**, **B**, **C** head, under antero-dorsal, ventral and lateral views, respectively (arrow indicates the spinneret opening); **D** stemmata in detail, lateral (enlarged area covered by rectangle in C); **E** antenna, dorsal; **F** abdominal segment A7, ventral; **G** abdominal segment A8, ventral; **H** last abdominal segment, ventral views; **I** microsetae of last abdominal segment in detail, ventral (enlarged area covered by rectangle in H). Scale bars: 50, 50, 100, 20, 20, 200, 100, 50, 20 µm, respectively.

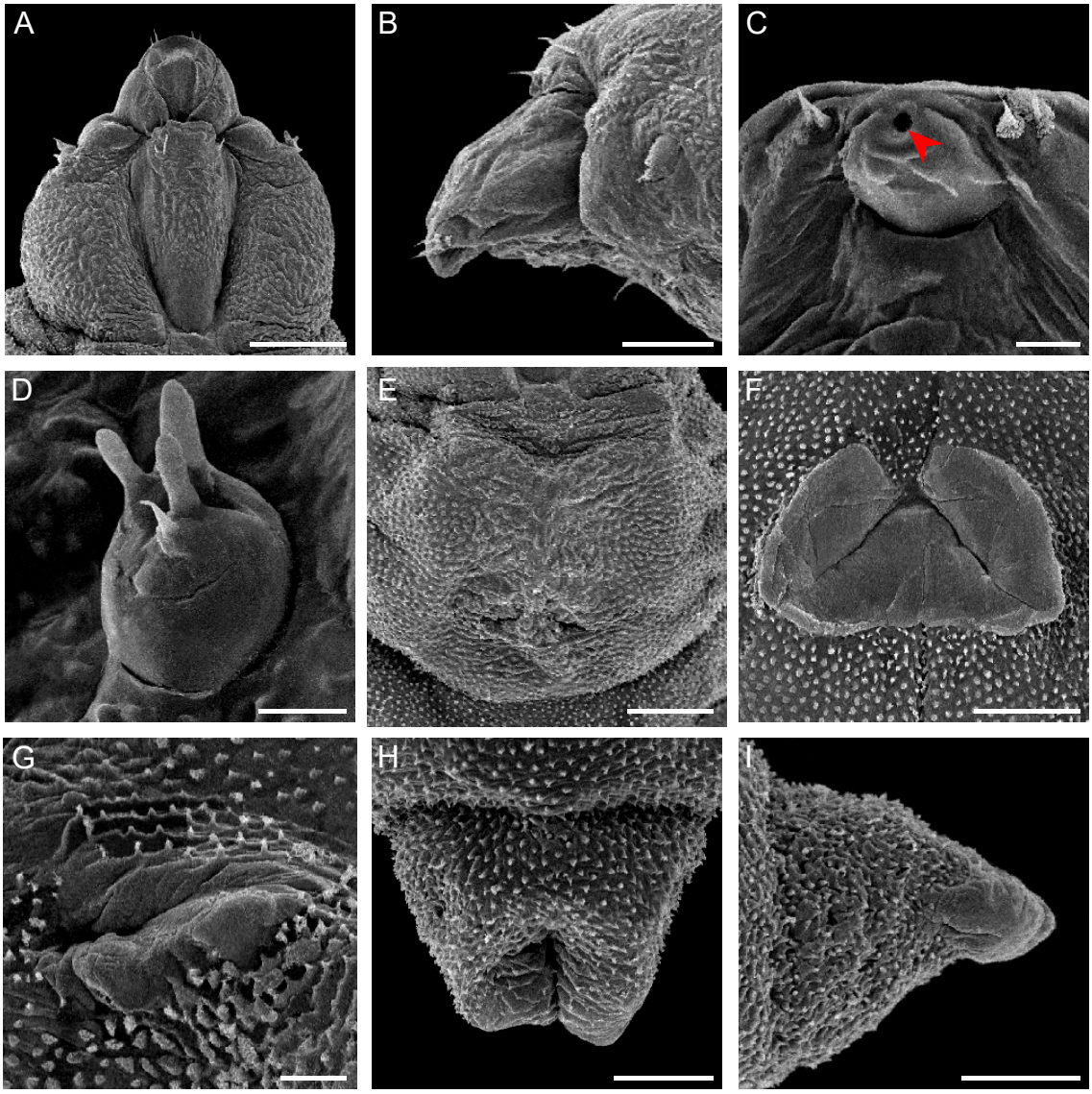

Fig 5. Spinning larva of *P.* sp. 1, **sp. nov**. under scanning electron microscopy. **A** head, general, dorsal view; **B** head, detail of modified mouthparts, lateral; **C** spinneret (opening indicated by arrow); **D** antenna, dorsal; **E** prothoracic shield; **F** metathoracic ambulatory callus, ventral; **G** ambulatory callus of abdominal segment A5, ventral; **H-I** last abdominal segments, ventral and lateral views, respectively. Scale bars: 100, 50, 20, 10, 100, 100, 25, 50, 50 μm, respectively.

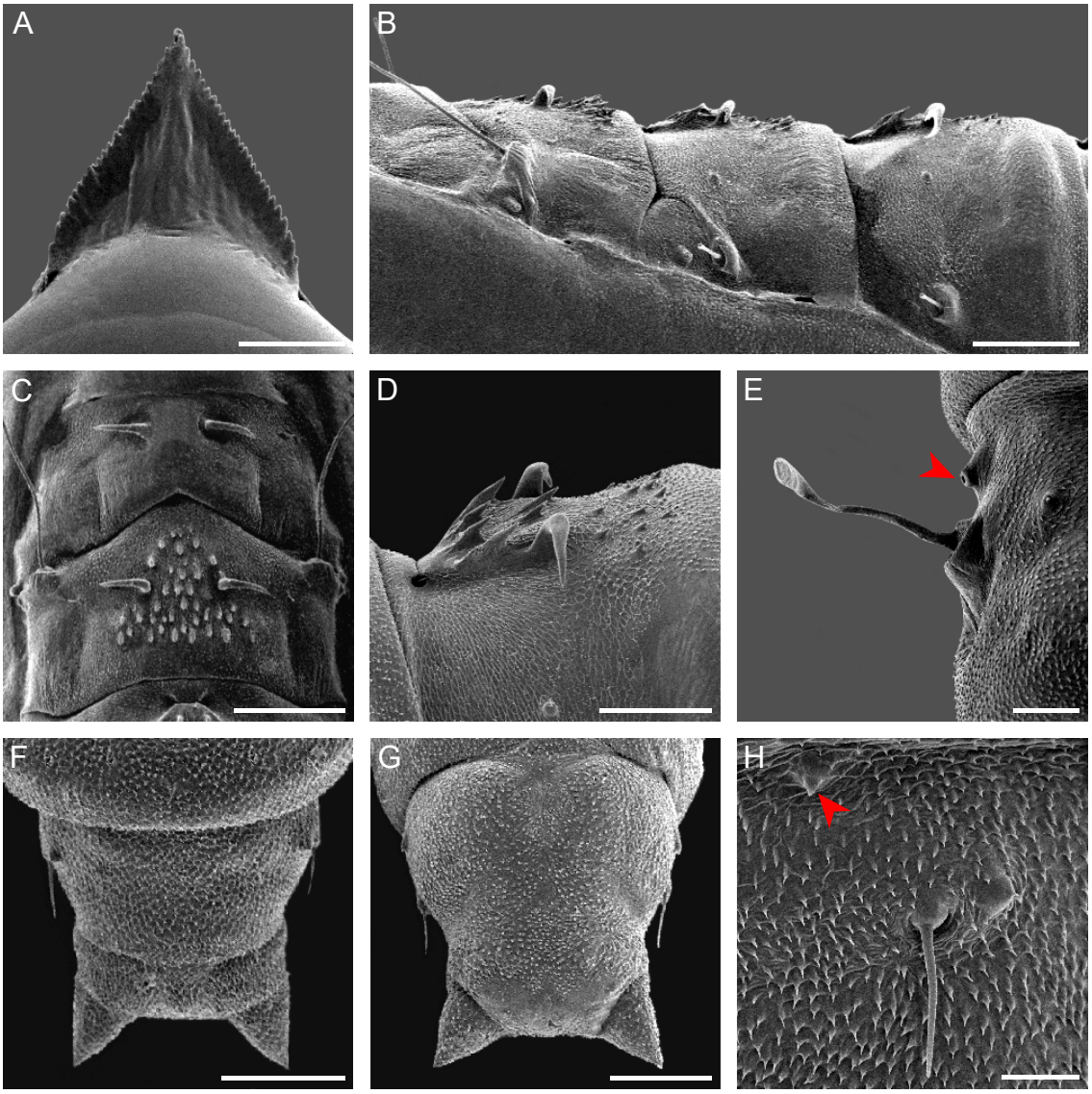

Fig 6. Pupa of *P.* sp. 1, **sp. nov.** under scanning electron microscopy: **A** cocoon-cutter, dorsal view; **B** abdominal segments A1-A4, lateral; **C** abdominal segments A1-A2, dorsal; **D** dorsal spines of abdominal segment A5 in detail, lateral; **E** spiracle (arrow) and lateral setae of abdominal segment A7, dorsal; **F-G** last abdominal segments, dorsal and ventral views, respectively; **H** detail of eight abdominal segment, showing spiracle partially closed (arrow), supraspiracular seta and microseta lateral. Scale bars: 50, 200, 200, 100, 50, 100, 100, 20 µm, respectively.

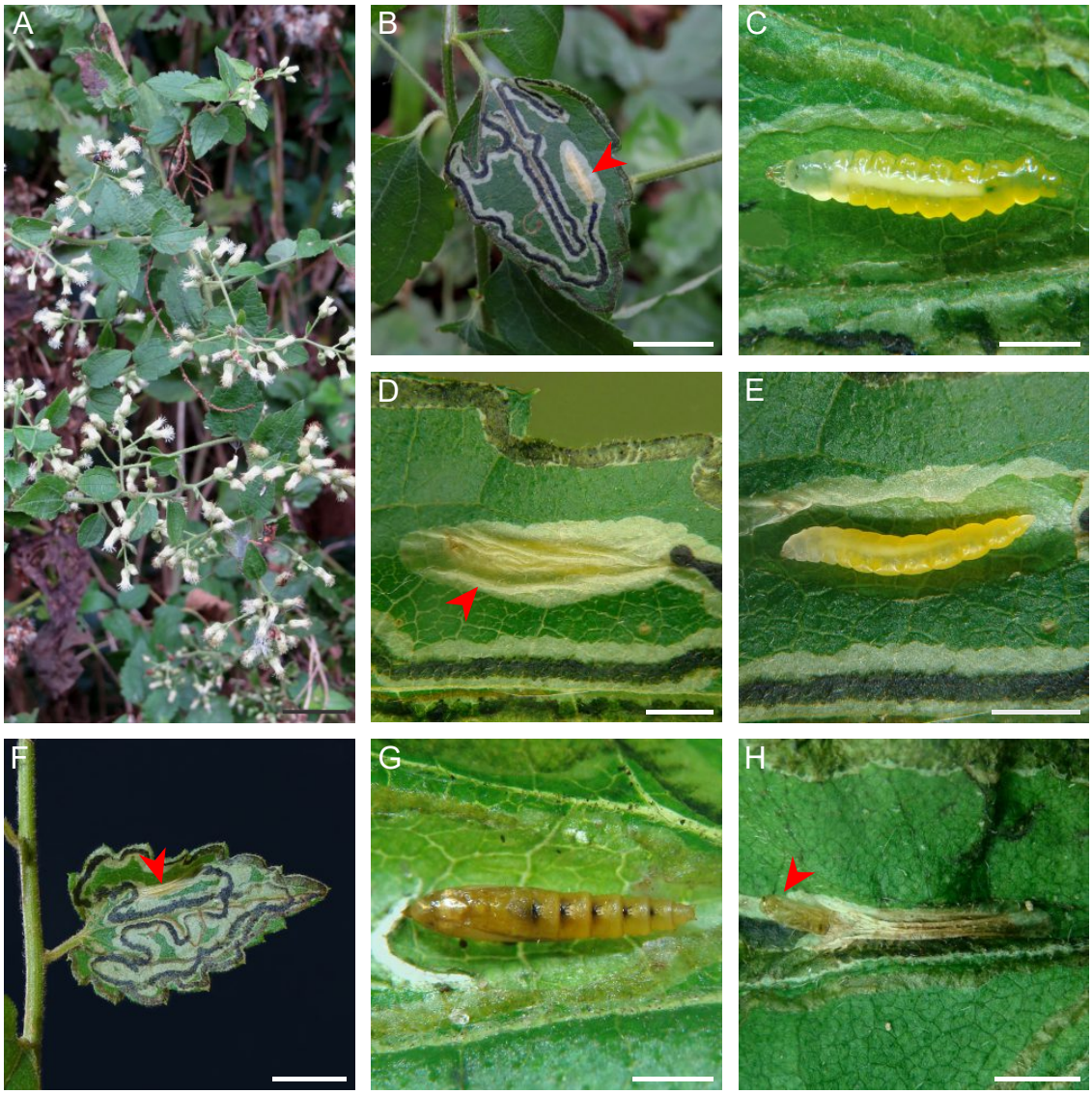

Fig 7. Natural history of *P.* sp. 1, **sp. nov.** on *Baccharis anomala*: **A** close up of leaves and flowers of a scandent host plant at the type locality; **B** leaf mine on adaxial leaf surface (arrow indicating sap-feeding larva); **C** sap-feeding larva out of the mine, dorsal; **D** cocoon (arrow) under construction, dorsal; **E** spinning larva, dorsal; **F** leaf mine after pupation (arrow indicates cocoon associated with the wrinkling and partial folding of the leaf); **G** pupa, dorsal; **H** pupal exuvium protruded (arrow) from the cocoon after adult emergence. Scale bars: 35, 5, 1, 1, 1, 10, 1, 2 mm, respectively.

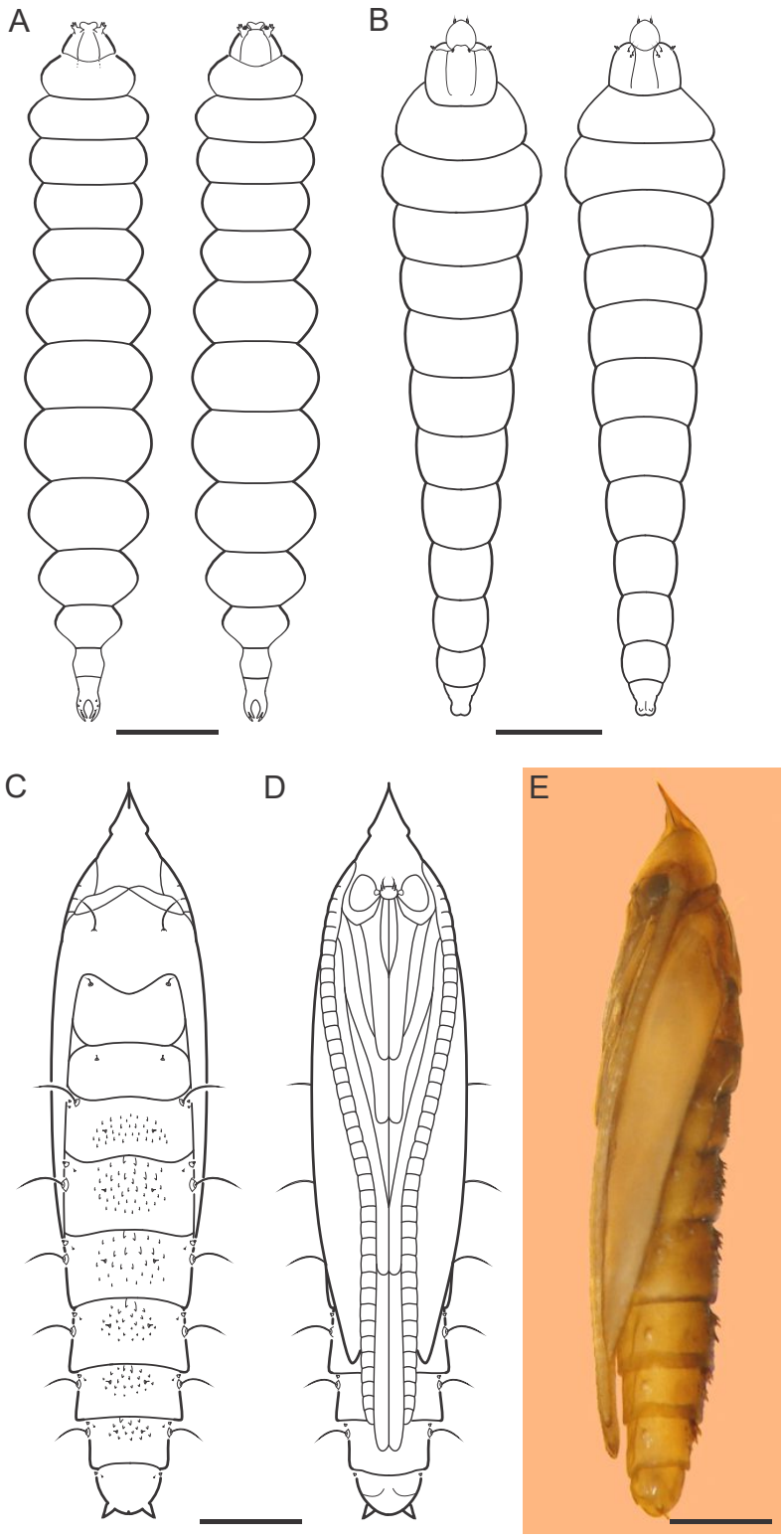

Fig 8. Larval and pupal morphology of *P.* sp. 2, **sp. nov**. under light microscopy: **A** sap-feeding larva, dorsal and ventral views; **B** spinning larva, dorsal and ventral; **C-E** pupa, in dorsal, ventral and lateral views, respectively. Scale bars: 0.5 mm.

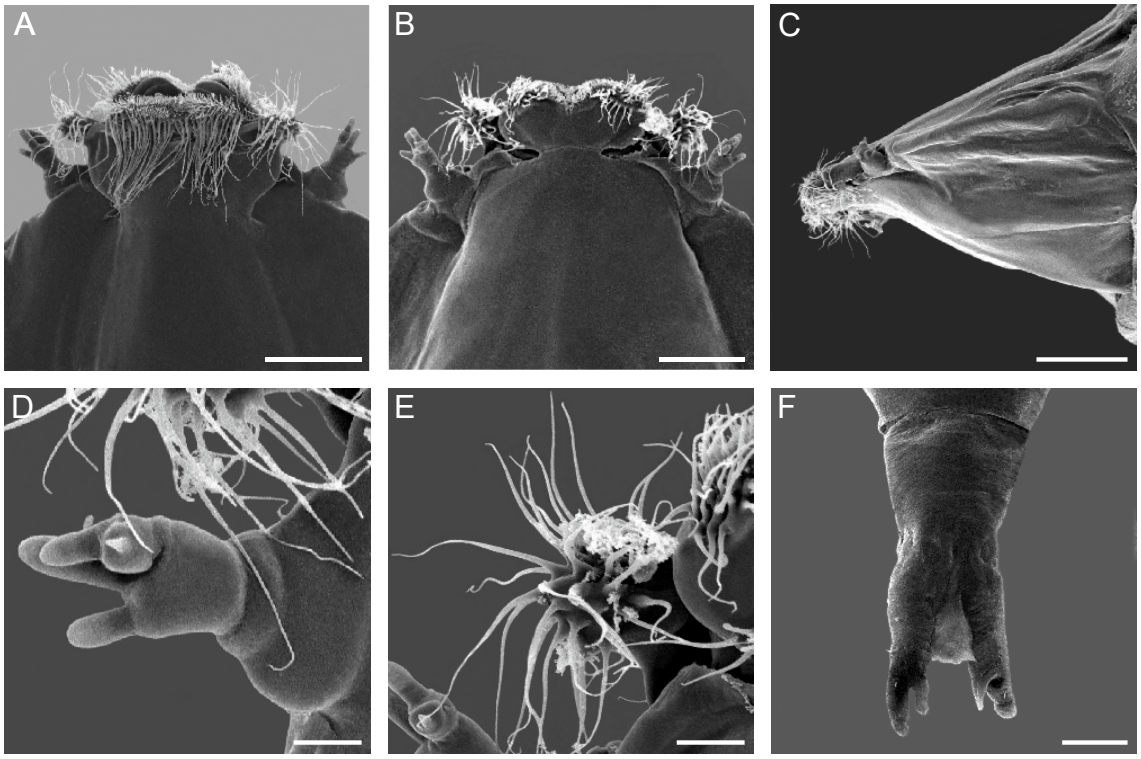

Fig 9. Sap-feeding larva of *P.* sp. 2, **sp. nov**. under scanning electron microscopy: **A**, **B**, **C** anterior portion of head, under dorsal, ventral and lateral views; **D** antenna, ventral view; **E** right maxilla, in detail; **F** last abdominal segments, dorsal. Scale bars: 50, 50, 100, 10, 10, 50 μm, respectively.

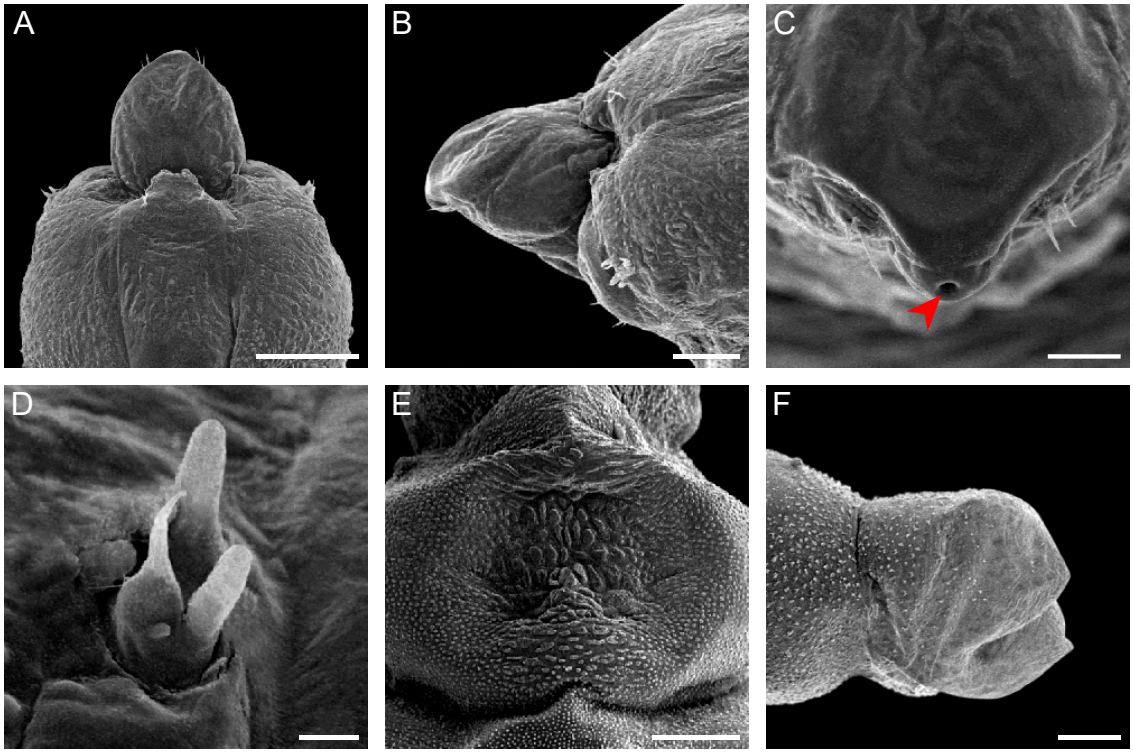

Fig 10. Spinning larva of *P.* sp. 2, **sp. nov**. under scanning electron microscopy: **A** head, general, dorsal view; **B** head, detail of modified mouthparts, lateral; **C** spinneret (opening indicated by arrow), ventral; **D** antenna, antero-dorsal; **E** prothoracic shield; **F** last abdominal segments, lateral. Scale bars: 100, 50, 20, 05, 100, 50 µm, respectively.

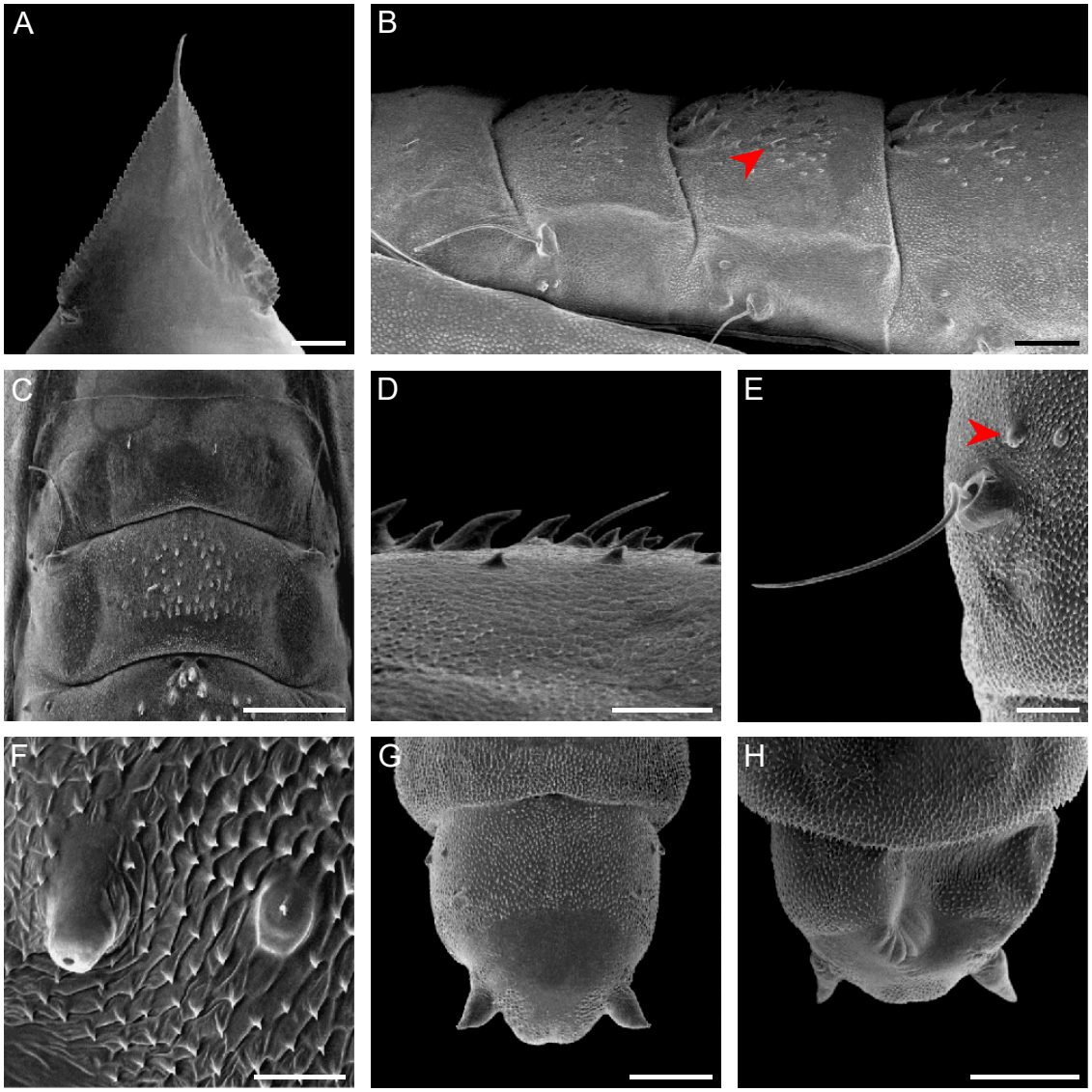

Fig 11. Pupa of *P.* sp. 2, **sp. nov.** under scanning electron microscopy: **A** cocoon-cutter, dorsal view; **B** abdominal segments A1-A4, lateral (arrow indicates seta among the set of spines); **C** abdominal segments A1-A2, dorsal; **D** tergal spines of abdominal segment A4, in detail, lateral; **E** lateral setae and spiracle of abdominal segment A6, dorsal view; **F** detail of spiracle and microseta of abdominal segment A6 (area pointed by arrow in E); **G-H** last abdominal segments, dorsal and ventral views, respectively. Scale bars: 50, 100, 200, 50, 50, 10, 100, 100 µm, respectively.

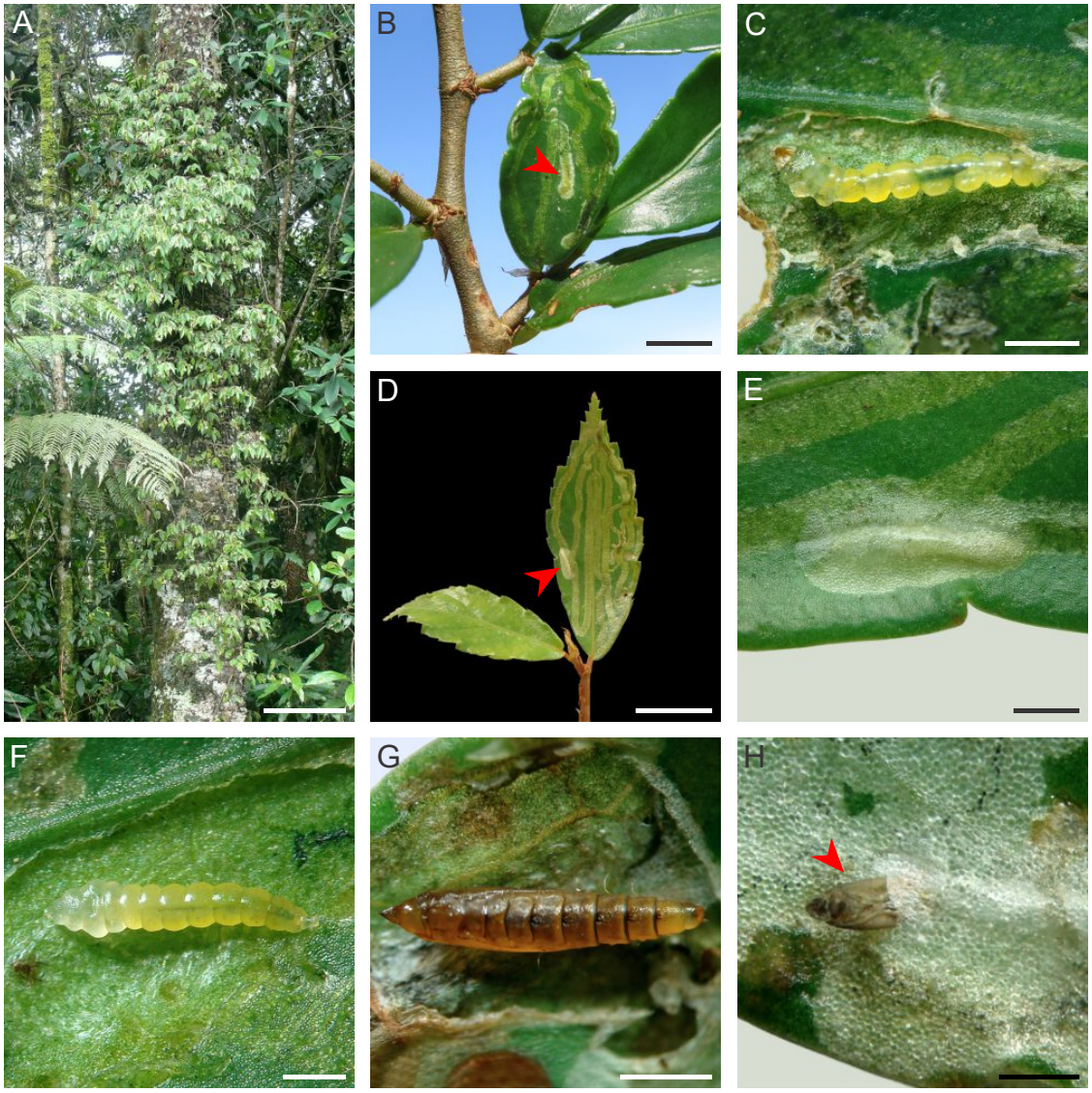

Fig 12. Natural history of *P.* sp. 2, **sp. nov.** on *Begonia fruticosa*: **A**, epiphytic host plant at the type locality; **B** leaf mine on adaxial leaf surface (arrow indicating sap-feeding larva); **C** sap-feeding larva, out of the mine, dorsal; **D** leaf mine showing pupal cocoon under construction (arrow); **E** cocoon in detail; **F** spinning larva, dorsal; **G** pupa, dorsal; **H** pupal exuvium (arrow) protruded from the cocoon after adult emergence. Scale bars: 250, 10, 1, 10, 1.5, 1, 1, 1.5 mm, respectively.

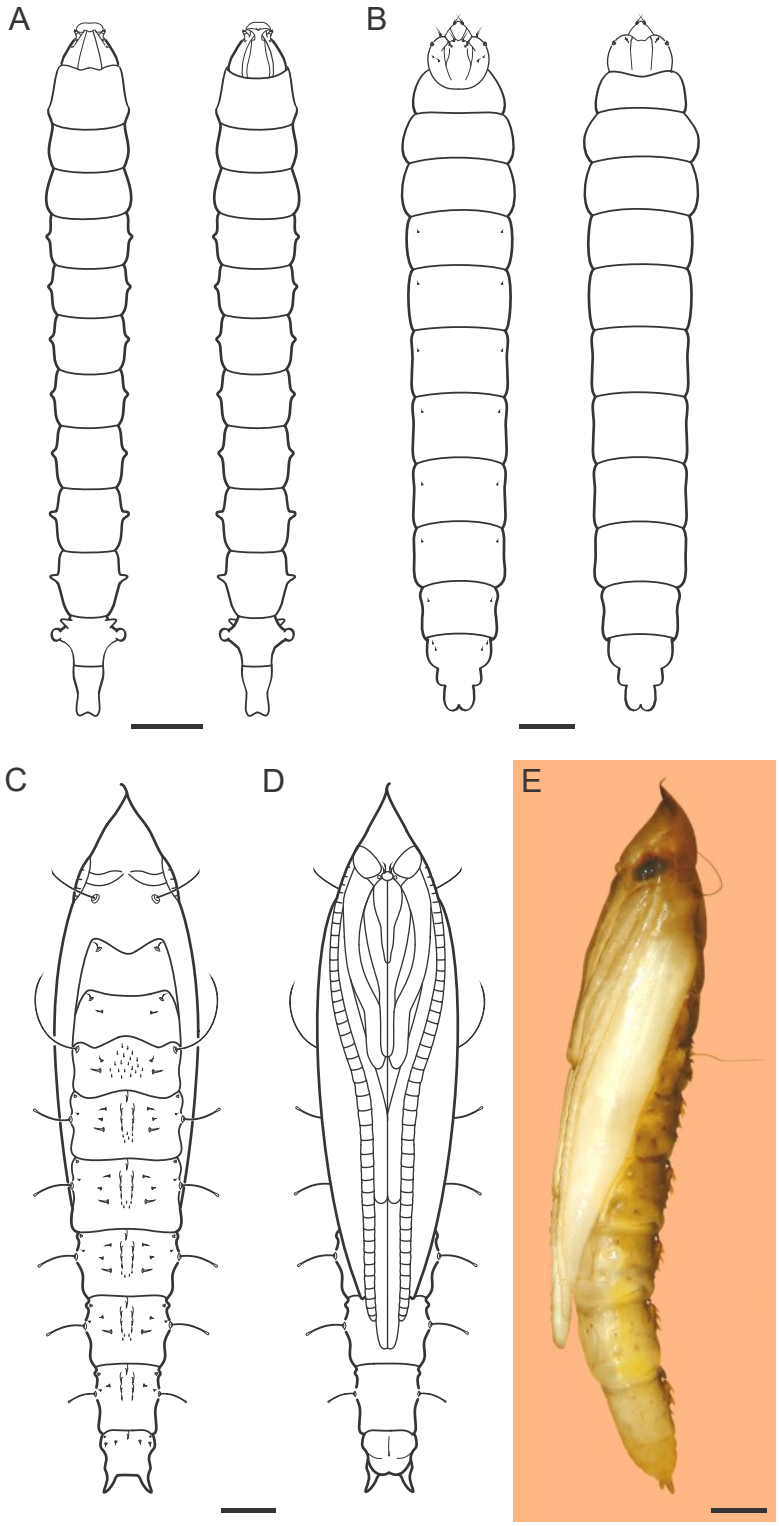

Fig 13. Larval and pupal morphology of *P.* sp. 3, **sp. nov.** under light microscopy: **A** sap-feeding larva, dorsal and ventral views; **B** spinning larva, dorsal and ventral; **C-E** pupa in dorsal, ventral and lateral views, respectively. Scale bars: 0.5, 0.25 mm, respectively.

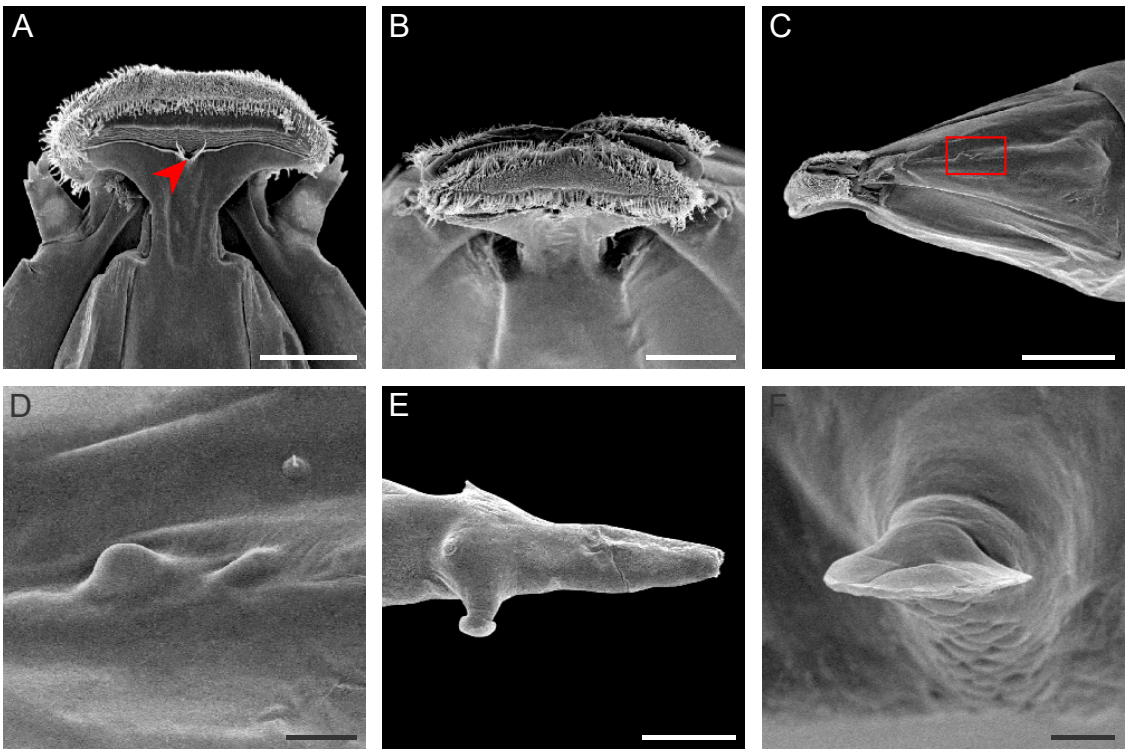

Fig 14. Sap-feeding larva of *P.* sp. 3, **sp. nov**. under scanning electron microscopy: **A-C** anterior portion of the head, under ventral, antero-ventral and lateral views (arrow indicates spinneret opening); **D** stemmata in detail, lateral (area indicated by rectangle in C); **E** last abdominal segments lateral; **F** lobe of abdominal segment A8, lateral. Scale bars: 50, 50, 100, 10, 200, 25 µm, respectively.

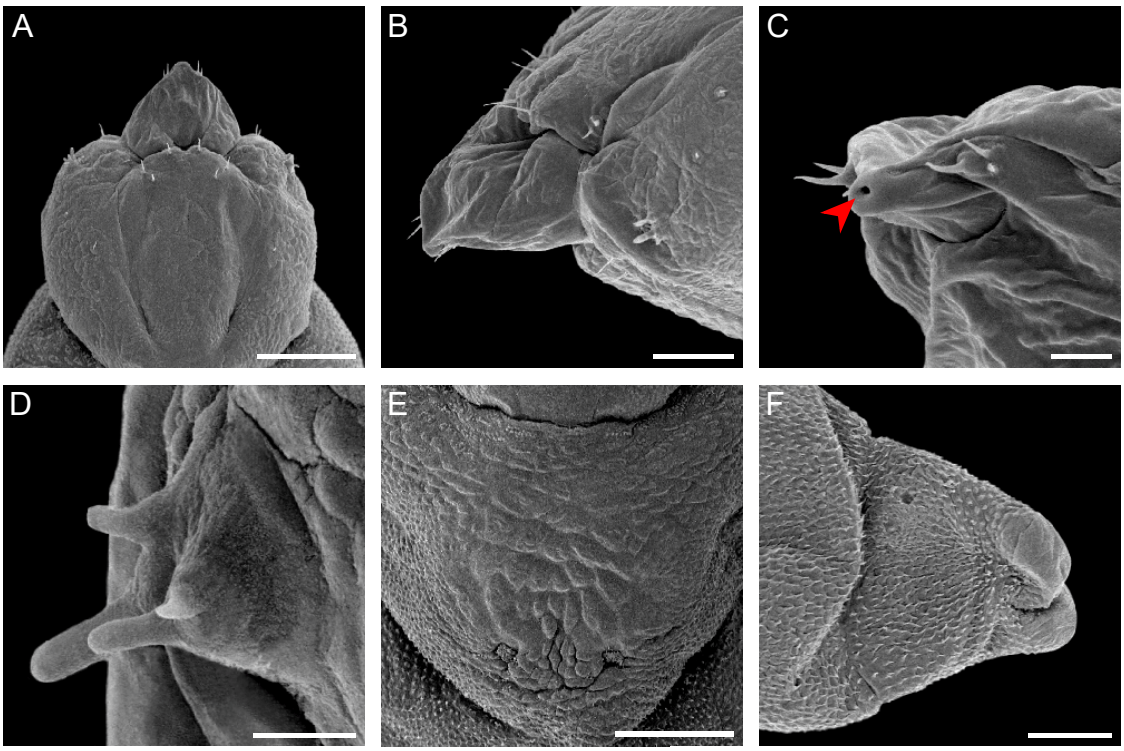

Fig 15. Spinning larva of *P.* sp. 3, **sp. nov**. under scanning electron microscopy: **A** head, general, dorsal view; **B** head, detail of modified mouthparts, lateral; **C** spinneret (opening indicated by arrow), latero-ventral; **D** antenna, antero-lateral; **E** prothoracic shield, dorsal; **F** last abdominal segments, lateral. Scale bars: 100, 50, 10, 10, 100, 50 µm, respectively.

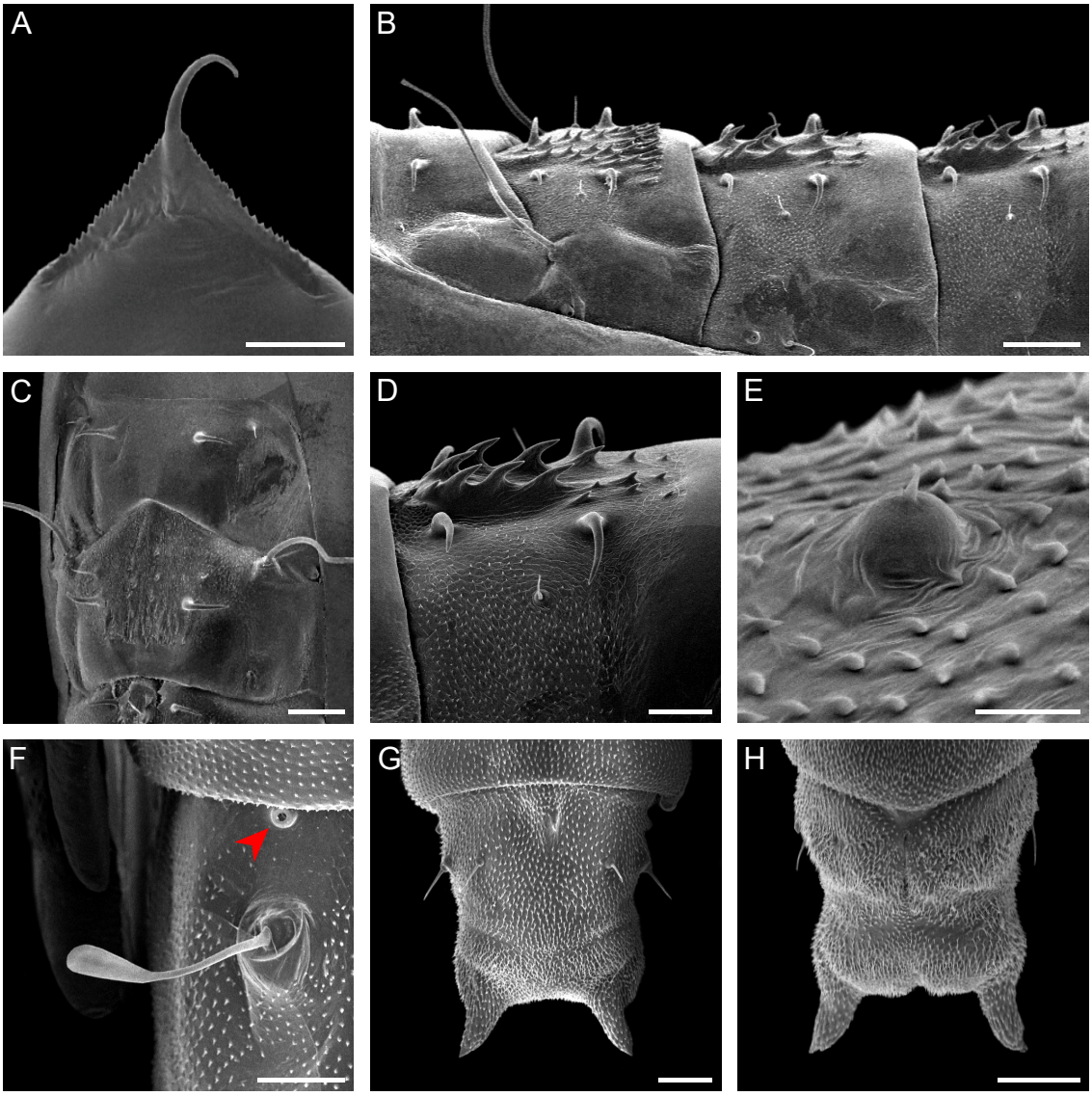

Fig 16. Pupa of *P.* sp. 3, **sp. nov.** under scanning electron microscopy: **A** cocoon-cutter, dorsal view; **B** abdominal segments A1-A4, lateral; **C** abdominal segments A1-A2, dorsal; **D** tergal spines of abdominal segment A4, in detail, lateral; **E** lateral microsetae abdominal segment A5, lateral; **F** detail of spiracle (arrow) and seta of abdominal segment A6; **G-H** last abdominal segments, dorsal and ventral views, respectively. Scale bars: 50, 100, 50, 100, 50, 10, 50, 50 µm, respectively.

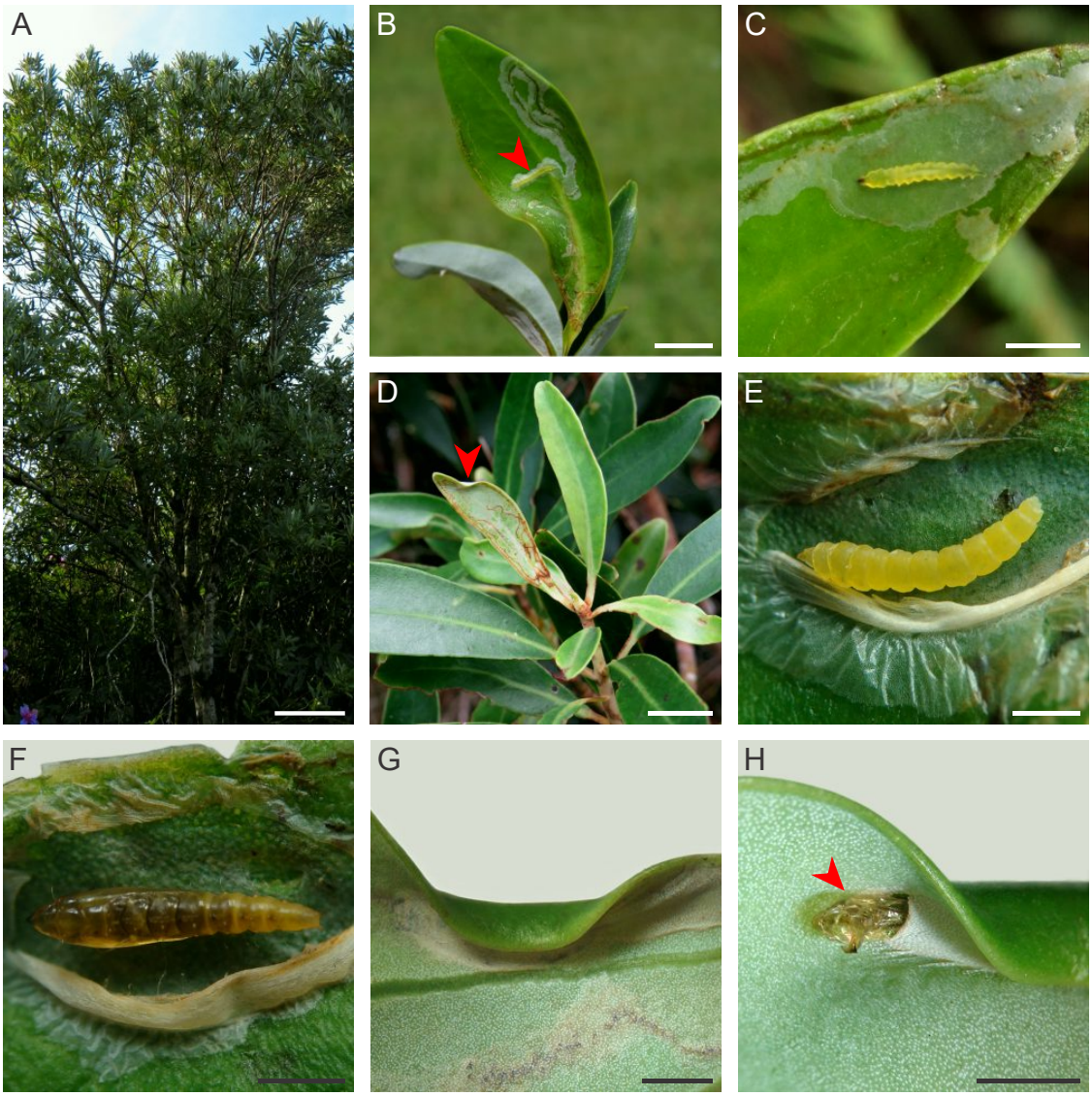

Fig 17. Natural history of *P.* sp. 3, **sp. nov.** on *Drimys angustifolia*: **A** general view of a host plant at the type locality; **B** leaf mine on adaxial leaf surface (arrow shows sap-feeding larva); **C** sap-feeding larva, in detail; **D** leaf mine after pupation (arrow indicating location of the cocoon, associated with leaf wrinkling and folding); **E** spinning larva, dorsal; **F** pupa, dorsal; **G** cocoon, in detail, ventral; **H** pupal exuvium protruded (arrow) from the cocoon after adult emergence. Scale bars: 300, 05, 2.5, 20, 1, 1, 1.5, 1 mm, respectively.

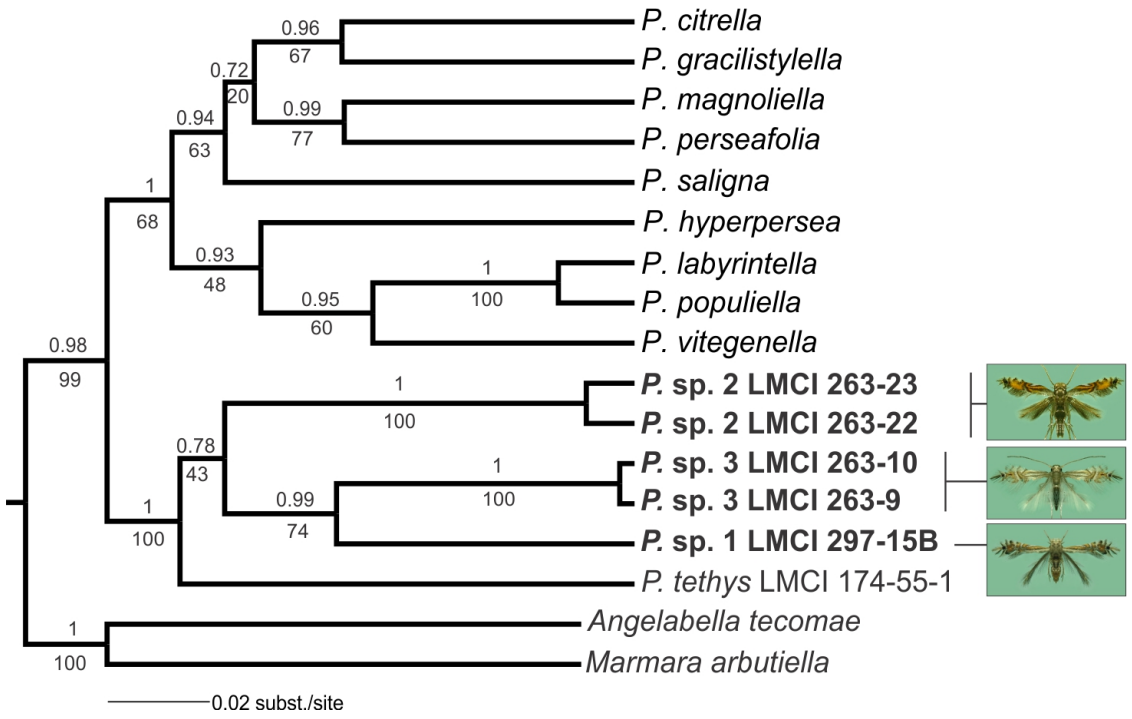

Fig. 18. Bayesian consensus tree for the three new species of *Phyllocnistis* based on 658 bp of the mitochondrial cytochrome oxidase c subunit I gene ('DNA barcode' region). Numbers above branches indicate Bayesian posterior probability (BPP), and below represent bootstrap support values for maximum likelihood inference (see material and methods for details).

Table 1. *Phyllocnistis* specimens used in this study to infer the phylogenetic status and relationships based on 658 base pairs of cytochrome oxidase subunit I gene sequences. Asterisks indicate new species described here with original data.

Group	Genus	Species	Voucher*	Locality	Accession Number	
					Genbank	BOLD Systems
Ingroup						
	Phyllocnistis					
		citrella	-	-	KF919121	GREC094-12
		gracilistylella	-	-	AB614510	-
		hyperpersea	-	-	HQ971045	RDOPO395-10
		magnoliella	-	-	KF492018	LTOL1038-11
		sp. 1*	**LMCI 297-15B**	**Brazil: RS, Montenegro**	**KY006927**	**MISA013-16**
		saligna	-	-	AY521491	-
		sp. 3*	**LMCI 263-10**	**Brazil: RS, São Francisco de Paula**	**-**	-
			LMCI 263-9	**Brazil: RS, São Francisco de Paula**	**KY006929**	**MISA015-16**
		sp. 2*	**LMCI 263-22**	**Brazil: RS, São Francisco de Paula**	**KY006928**	**MISA014-16**
			LMCI 263-23	**Brazil: RS, São Francisco de Paula**	**-**	-
		perseafolia	-	-	HM382097	RDOPO394-10
		populiella	-	-	KR941466	CNRVE3067-15
		tethys	LMCI 174-55-1	Brazil: RS, São Francisco de Paula	JX272049	-
		vitegenella	-	-	KR938941	-
Outgroup						
	Angelabella					
		tecomae	-	-	KM983605	-
	Marmara					
		arbutiella	-	-	FJ412783	LBCS922-07

Table 2. Estimates of evolutionary divergence between sequences based on 658 base pairs of the cytochrome oxidase I (COI) gene using the Kimura 2-parameter model. Mean number (± standard error) of base substitutions per site over all sequence pairs between groups obtained by a bootstrap procedure of 1000 replicates is shown. Comparisons including the new species are highlighted in bold.

Species	**1.**	**2.**	**3.**	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.
1. *P.* sp. 2													
2. *P.* sp. 3	**0.14±0.02**												
3. *P.* sp. 1	**0.14±0.02**	**0.14±0.02**											
4. *P.citrella*	**0.14±0.02**	**0.15±0.02**	**0.17±0.03**										
5. *P. gracilistylella*	**0.16±0.02**	**0.18±0.03**	**0.18±0.03**	0.10±0.02									
6. *P. hyperpersea*	**0.14±0.02**	**0.21±0.03**	**0.20±0.03**	0.14±0.02	0.17±0.02								
7. *P. labyrintella*	**0.15±0.02**	**0.17±0.02**	**0.17±0.03**	0.09±0.02	0.15±0.02	0.12±0.02							
8. *P. magnoliella*	**0.14±0.02**	**0.17±0.02**	**0.20±0.03**	0.15±0.02	0.16±0.02	0.14±0.02	0.14±0.02						
9. *P. perseafolia*	**0.17±0.02**	**0.18±0.03**	**0.17±0.03**	0.13±0.02	0.18±0.03	0.15±0.02	0.14±0.02	0.16±0.03					
10. *P. populiella*	**0.13±0.02**	**0.15±0.02**	**0.16±0.02**	0.08±0.02	0.13±0.02	0.12±0.02	0.03±0.01	0.14±0.02	0.12±0.02				
11. *P. salignella*	**0.14±0.02**	**0.15±0.02**	**0.19±0.03**	0.15±0.02	0.14±0.02	0.16±0.02	0.15±0.02	0.16±0.03	0.18±0.03	0.14±0.02			
12. *P. tethys*	**0.16±0.02**	**0.16±0.02**	**0.21±0.03**	0.14±0.02	0.17±0.03	0.21±0.03	0.16±0.02	0.18±0.03	0.20±0.03	0.15±0.02	0.19±0.03		
13. *P. vitegenella*	**0.12±0.02**	**0.14±0.02**	**0.15±0.02**	0.09±0.02	0.12±0.02	0.14±0.02	0.09±0.02	0.13±0.02	0.15±0.02	0.08±0.02	0.15±0.02	0.14±0.02	
14. Outgroup	**0.22±0.03**	**0.23±0.03**	**0.27±0.03**	0.20±0.02	0.23±0.03	0.22±0.03	0.22±0.03	0.23±0.03	0.21±0.03	0.25±0.03	0.27±0.03	0.19±0.02	0.25±0.03

CAPÍTULO II

TAXONOMIC REVISION OF THE NEOTROPICAL *PHYLLOCNISTIS* ZELLER, 1848 (LEPIDOPTERA: GRACILLARIIDAE), WITH DESCRIPTIONS OF SEVEN NEW SPECIES AND HOST PLANT ASSOCIATIONS

ABSTRACT: The Neotropical diversity of micromoths is vastly understudied with thousands of species yet to be described. Leaf-mining micromoths of the genus *Phyllocnistis* Zeller, 1848 (Lepidoptera, Gracillariidae) are a good example of a poorly studied group with only 20 species known to occur for the whole Neotropical region. Here we revise the Neotropical species of this genus, and describe four new species from French Guiana: *Phyllocnistis* sp. 4 Brito & Lopez-Vaamonde, sp. nov., *P.* sp. 5 Brito & Lopez-Vaamonde, sp. nov., *P.* sp. 6 Brito & Lopez-Vaamonde, sp. nov., *P.* sp. 10 Brito & Lopez-Vaamonde, sp. nov., and three new species from Brazil: *P.* sp. 7 Brito & Moreira, sp. nov., *P.* sp. 8 Brito & Moreira, sp. nov. and *P.* sp. 9 Brito & Becker, sp. nov. Lectotypes and paralectotypes are designated for *P. aurilinea* Zeller, *P. citrella* Stainton, *P. rotans* and *P. sexangula* Meyrick. Detailed descriptions of the pattern of forewing fasciae are provided for all species. Host plant associations, photographs of adults and illustrations of genitalia, when available, are provided for all described species of Neotropical *Phyllocnistis*. In addition, DNA barcodes were used for the delimitation of some species.

Key words: DNA barcoding, leaf mines; new species, Phyllocnistinae; South America, taxonomy.

INTRODUCTION

Thousands of undescribed species of Lepidoptera, particularly small-sized moths, are estimated to live in the neotropics (Scheffers *et al*. 2012; Lepsys 2017). Among them, micromoths of the family Gracillariidae from the Neotropical region are particularly affected by insufficient sampling and a strong taxonomic impediment (Lees *et al*. 2014; Brito *et al*. 2016). Within gracillariids, the genus *Phyllocnistis* Zeller, 1848 currently includes 101 species described worldwide, with only 20 species known to occur in the neotropics (De Prins & De Prins 2016; De Prins *et al*. 2016; Brito *et al*. 2017). This

number of *Phyllocnistis* species is clearly an underestimate of the total diversity of this genus in the neotropics (Davis & Wagner 2011). Most of these species were described between mid-nineteenth and twentieth century, with intervals of up to 20 years, with a few new descriptions for the group recently (Brito *et al*. 2016).

There is no taxonomic review available for the genus *Phyllocnistis* regarding any biogeographic region on earth. These moths are considered difficult to identify, mainly due to their small size (maximum 7 mm of wingspan) and lack of genitalia variation (Davis & Wagner 2011; Kawahara *et al*. 2016). However, although small in size, the adults show great variation in color, particular regarding the forewings. In fact, several informative diagnostic characters have been lately identified in their forewings, such as the on the color, shape, size, and location of corresponding fasciae and strigulae. In addition, variation in morphology of their single frontal process (cocoon-cutter) on the pupa vertex and in the arragment of spines present on pupal abdominal terga have been provided usefull character for species identification (Brito *et al*. 2012; Kobayashi *et al*. 2013). However, the latter characteristics are known in detail for only nine (45%) of Neotropical *Phyllocnistis* species (Kawahara *et al*. 2009; Davis & Wagner 2011; Kobayashi *et al*. 2013; Brito *et al*. 2012; 2017), and thus variation in such characteristiscs present in the immature stages can not be fully used in this regard.

Thus, most species of Neotropical *Phyllocnistis* are known only by the adult type material deposited in museums, several with description based on a single specimen, which are thus avalaible for comparison in a broad scale. By examining and photographing types of all species recognized as valid for the genus *Phyllocnistis* in the Neotropics (De Prins *et al*. 2016), variation in the color pattern in their forewings is herein illustrated and described, and used to compare them for the first time from a taxonomic perspective. In summary, the goals of this paper are to review the taxonomy of Neotropical *Phyllocnistis* and to describe seven new species from Brazil and French Guiana. We pictured the holotypes and corresponding labels, map distribution of type localities, list and comment about conditions of type material and their depository, designated new ones when desirable, and summarize information on mines and natural history of each species, and about their host plants, when available. A tree based on DNA barcodes and associated genetic distances is also provided, and used for the delimitation of some species.

MATERIAL AND METHODS

MATERIALS

A total of 60 specimens were examined in this study (Tab. S1), 15 of which collected by one of the authors (C.L.-V.), Atsushi Kawakita (Kyoto University, Kyoto, Japan), Issei Ohshima (Kyoto Prefectural University, Kyoto, Japan) and Vitor O. Becker (Reserva Serra Bonita, Camacan, Brazil), and 45 loaned from various institutions (see list below). Six specimens of two species were reared from leaf mines collected in the field. Types of all 20 species of *Phyllocnistis* described from the neotropics and deposited in 13 institutions were examined and photographed. Holotypes of the four-new species collected in French Guiana are deposited at MNHN (France) and of three new species are deposited at VOB (Brazil).

ABBREVIATIONS FOR DEPOSITORIES

DZUP Coleção Entomológica Padre Jesus Santiago Moure, Universidade Federal do Paraná. Curitiba, Paraná, Brazil.

INBIO Instituto Nacional de Biodiversidad. Santo Domingo de Heredia, Costa Rica.

LMCI Laboratório de Morfologia e Comportamento de Insetos, Universidade Federal do Rio Grande do Sul. Porto Alegre, Rio Grande do Sul, Brazil.

MACN Museo Argentino de Ciencias Naturales. Buenos Aires, Argentina.

MCN Museo Miguel Lillo de Ciencias Naturales. Tucumán, Argentina.

MCNZ Museu de Ciências Naturais, Fundação Zoobotânica do Rio Grande do Sul. Porto Alegre, Rio Grande do Sul, Brazil

MCTP Museu de Ciências e Tecnologia da Pontifícia Universidade Católica do Rio Grande do Sul. Porto Alegre, Rio Grande do Sul, Brazil

MNHN Muséum National D'Histoire Naturelle. Paris, France.

NHMUK Natural History Museum. London, UK.

UCR Museo de Zoología, Universidad de Costa Rica. San José, Costa Rica.

UNCM Museo Entomologico Francisco Luis Gallego, Universidad Nacional de Colombia. Medellín, Colombia.

USNM United States National Museum, Smithsonian Institution. Washington DC, USA.

VOB Coll. Vitor O. Becker, Reserva Serra Bonita. Camacan, Bahia, Brazil.

ZMHB Museum für Naturkunde. Berlin, Germany.

ZMUC Statens Naturhistoriske Museum. Copenhagen, Denmark.

METHODS

For each valid taxon, a bibliographic catalogue was included in order to facilitate the understanding of the systematic history. For this catalog, bibliographies with the original descriptions of the taxon, with information related to biology and spelling errors were used. The catalogue uses abbreviations, such as: biol. – biology; fig.(s) – figure(s); pl.(s) – plate(s); tab.(s) – table(s); [sic] – misspelling/original spelling. The online database "Global Taxonomic Database of Gracillariidae", was used as a complement of species data (De Prins & De Prins 2016). The distribution map was created with SimpleMappr (Shorthouse 2010) and the information for each taxon was obtained through literature and available data from labels. Type labels have been photographed and available as supplemental material (Fig. S1). As starting point for the development of this review, we opted for using the checklist from De Prins *et al*. (2016), considered the most complete and more recent source of information on occurrence of gracillariids wordwide, adding three new species described recently (Brito *et al*. 2017) (Tab. 1).

Adult moths from French Guiana were collected at night using 15W lamps within light towers manufactured by Bioform (Germany) and powered by Lithium batteries (Hellpower, Austria). In addition, were collected leaf mines in the field and reared following Ohshima's (2005) protocol.

Photographs of mounted specimens were made a stereomicroscope attached to a camera. Each species was photographed several times, and posteriorly a focus stacking was accomplished with the software Helicon Focus (http://www.heliconsoft.com/). All images were manipulated and vectorized with the software CorelDraw® and CorelPhotoPaint® X7. For genitalia analysis, some specimens were cleared in a 10% potassium hydroxide solution, stained with Chlorazol black and posteriorly slide-mounted on Canada balsam. Observations and photographs were performed with the aid of stereomicroscope Nikon AZ 100M for posterior vectoring.

Nomenclature used for describing variation in wing color pattern is summarized in Fig. 1. Such forewing structures have already been used for characterization of *Phyllocnistis* species, but there is no consensus about corresponding therminologies (*e.g.* Kawahara *et al*. 2009; Kobayashi & Hirowatari 2011). Furthermore, preliminary observation among the Neotropical species of *Phyllocnistis* lead us to the conclusion that

variation of such structures is greater than that mentioned in the literature, particularly regarding the fasciae. A total of five isolated fasciae (one longitudinal and four transversals) located on surface, and seven strigulae on the fringes can be found in the forewing of a given Neotropical *Phyllocnistis* species (Fig. 1A). The first transversal fascia (**tf**$_1$) has been called either "costal fascia" when being fused to the longitudinal fascia (Kawahara *et al*. 2009), or "costal strigula" when isolated from the longitudinal one (Kobayashi & Hirowatari 2011). Thus, we interpreted such cases as variations of the general case proposed here, where the first transversal fascia appears reduced to the costal margin, either isolated (Fig. 1D) or fused with the longitudinal fascia (Fig. 1B). Fusion in the latter case may also include the second transversal fascia (Fig. 1C). Use of such name (costal) shoud not be restricted to one fascia only, since all of them are located in the costal region of wing, and particularly when they appear reduced in length. Furthermore, it should be better not call any of them strigula, to avoid confusion with the true strigulae that are located on the fringes (called "cilia" by Kobayashi & Hirowatari 2011). The strigulae, in particular, showed little variation in the specimens examined. The first tree (**a**, **b**, **c**) were always associated with the second (**tf**$_2$), third (**tf**$_3$) and fourth (**tf**$_4$) transversal fasciae, respectively, being all located on the costal fringe. The remaining occurred close to the wing apex (two on the costal, and two on the inner margin), in association with an almost present black spot (**as**) from which they emerge. Strigula named "**g**" in the present study has been called "tornal" by some authors (*e.g*. Kawahara *et al*. 2009), being located close to the distal end of the CuP vein, and thus indicating the anal angle (= tornus, the posterior corner of the wing; Torre-Bueno 1989). Corresponding variation allowed us differentiate all species of *Phyllocnistis* in the Neotropical region (for a comparison on variation and location of such structures among species, see respectively Tab. 3 and Fig. S2).

DNA was extracted and barcoded at the Canadian Centre for DNA Barcoding (CCDB, Biodiversity Institute of Ontario, University of Guelph). DNA barcode data and GENBANK numbers are given both in Tab. 2 and in the Barcode of Life Data Systems (BOLD) (Ratnasingham & Hebert 2007; www.barcodinglife.org). BOLD was used to estimate intra- and interspecic genetic distances, obtain Barcode Index Numbers (BINs) (Ratnasingham & Hebert 2013) and build a neighbor-joining (NJ) tree.

RESULTS

PHYLLOCNISTIS Zeller, 1848

Phyllocnistis Zeller, 1848. **Linn. Entomol.: Z. Entomol. Ver. Stettin. 3**, 250 (key), 264-266; species included: *P. sufusella* Zeller, *P. saligna* Zeller.- Herrich-Schäffer, 1853-1855. **Syst. Bearb. Schmett. Eur.** Text, Rev. Suppl., 16, 341.- Stainton, 1854a. **Lepidoptera: Tineina**, p. 285, *in* Stainton (Ed.). **Insecta Britanica 3**.- Stainton, 1854b. **List. Spec. Br. Anim. Coll. Br. Mus. XVI**: 161.- Frey, 1856. **Tin. Pteroph. Schweiz**, p. 314-315.- Herrich-Schäffer, 1857. **Correspondenz-Blatt des zoologisch-mineralogischen Vereines in Regensburg 11**, 56.- Clemens, 1859. **Proc. Acad. Nat. Sci. Philadelphia 11**, 317, 327.- Stainton, 1859. **A manual of British butterflies and moths 2**, 424-425.- Wocke, 1861. **Microlepidoptera**, p. 127, *in* Staudinger & Wocke (Eds.). **Catalog der Lepidopteren Europa's und der angrenzenden Länder II**.- Stainton, 1863. **Trans. Entomol. Soc. London**, 605-606, 608.- Chambers, 1871. **Can. Entomol. 3**, 206.- Wocke, 1871. **Microlepidoptera**, p. 333, *in* Staudinger & Wocke (Eds.). **Catalog der Lepidopteren des europaeischen Faunengebiets II**.- Clemens, 1872. **Tineina N. Amer.**, p. 82-83.- Zeller, 1873. **Verh. zool. Bot. Ges. Wien 23**, 314- Chambers, 1875. **Cinc. Quart. Journ. Sci. 2**, 106.- Heinemann & Wocke, 1877. **Schmetterlinge Deutschl. u. Schweiz syst. bearb.**, p.708.- Zeller, 1877. **Horae Soc. Entomol. Ross. 13**, 450.- Meyrick, 1895. **Handb. Brit. Lep.** p. 757.- Busck, 1900. **Proc. U. S. Nat. Mus. 23**, 252-253.- Rebel, 1901. **Famil. Pyralidae – Micropterygidae** [sic], p. 218, 278, *in* Staudinger & Rebel (Eds.). **Catalog der Lepidopteren des Palaearctischen Faunengebietes**.- Kirby, 1903. **The butterflies and moths of Europe**, p. xxxviii, xxxix.- van Deventer, 1904. **Tijdschr. entomol. 47**, 87.- Meyrick, 1906. **Trans. & Proc. Roy. Soc. South Australia 30**, 62.- Spuler, 1910. **Schmetterlinge Europas 2**, 421.- Meyrick, 1915a. **Exot. Microlep. 1**, 347, 618.- Hampson, 1918. **Novit. Zool. 25**, 387.- Forbes, 1923. **Memoir 68**, 149, 153, fig. 112.- Turner, 1923. **Trans. & Proc. Roy. Soc. South Australia 47**, 175- Braun, 1927. **Trans. Amer. Entomol. Soc. 53**, 194.- Meyrick, 1928. **Rev. Handb. Brit. Lep.,** p. 782.- Davis & Miller, 1984. **Checklist: Part 1**, p. 27, *in* Heppner (Ed.). **Atlas Neotrop**. **Lep**.- Davis, 1987. **Gracillariidae: Tineioidea**, p. 374, *in* Stehr (Ed.). **Immature Insects**.- Davis & Robinson, 1998. **Tineoidea & Gracillarioidea**, p.114 *in* Kristensen (Ed.). **Handb. Zool. 1**.- De Prins & Kawahara, 2009. **Nota Lepid**. **32**, 113-117.- Sohn *et al*., 2012. **Zootaxa 3286**, 39.- Brito *et al*., 2016. **Rev. Bras. Entomol**. **60**, tabs. S1, S2.- De Prins *et al*., 2016. **Zootaxa 4158**, 34.

Phylloenistis [sic]; Chambers, 1875. **Cinc. Quart. Journ. Sci. 2**, 303; species included: *P. populiella* Chambers, *P. ampelopsiella* Chambers.

Phylloetis [sic]; Chambers, 1876. **Can. Entomol. 8**, 19.

TYPE SPECIES. *Opostega suffusella* Zeller, 1847, designated by Hampson (1918).

SYSTEMATIC HISTORY. A detailed revision about the history of the genus *Phyllocnistis* was provided by De Prins & Kawahara (2009), from which the main points are reproduced here. The genus was proposed by Zeller, 1848, including *P. suffusella* (= *unipunctella* (Stephens, 1834)) and *P. saligna* (Zeller, 1839). In this same work, Zeller referred to four images as representatives of the genus (see original description figs. 31-34), which illustrates the head, fasciae, strigulae and venation of *P. suffusella* forewings. However, it is noteworthy that these drawings are not present in the same work that describes the genus; such drawings are found in the description of *P. suffusella* proposed by Zeller (1847), one year before the original description of *Phyllocnistis*.

For a long time, the taxonomic position of *Phyllocnistis* remained uncertain, and the genus being allocated many times in distinct groups and families. Herrich-Schäffer (1853–1855) was the first to include the genus in Tineidae; and Stainton (1854a, 1854b, 1859) the first to associate *Phyllocnistis* with Lyonetidae [sic], followed by other authors of that time (e.g. Frey 1856; Wocke 1861, 1871). At this same period, Herrich-Schäffer (1857) proposes a separated group inside Lyonetidae [sic], named as Phyllocnistina, and composed by the genus *Phyllocnistis*, *Bucculatrix* Zeller and *Cemiostoma* Zeller. However, based on wing venation characters, Clemens (1859) transfers *Phyllocnistis* to Lithocolletidae, grouping this time with, *Lithocolletis* Zeller, *Tischeria* Zeller and *Leucanthiza* Clemens. When analyzing the characters of leaf mines from 20 genera belonging to Lepidoptera, Stainton (1863) regroups *Phyllocnistis* with *Bucculatrix* and *Cemiostoma*, also adding *Lithocolletis*, *Nepticula* Heyden and *Lyonetia* Hübner; according to Stainton, all these genera, with the exception of *Bucculatrix*, exhibits an endophyllous larval stage remaining at the interior of the mine along the ontogenesis. Chambers (1871) also observes a few similarities between *Phyllocnistis* and *Lithocolletis* larvae, and in this same work he compares the adults of these genus. Many authors of that period allocated *Phyllocnistis* in Tineina, a group which included various Microlepidoptera genera (Zeller 1873, 1877; Chambers 1875; van Deventer 1904). Nevertheless, Heinemann & Wocke (1877) have treated *Phyllocnistis* as a separated family, grouping this genus with *Cemiostoma* and *Bucculatrix* in Phyllocnistidae. The grouping of these genera in the family was not recognized by some authors, Busck (1900) extended the definition of *Phyllocnistis* in his work, reallocating the genus once again in

Tineidae, a classification that was also used by Meyrick (1895, 1906). Rebel (1901) regroups the genus with *Bucculatrix*, *Cemiostoma* and adds *Opogona* Zeller and *Opostega* Zeller, in Phyllocnistinae, allocating this subfamily in Lyonetiidae. However, a few years later, Spuler (1910) retransfer *Phyllocnistis* to Phyllocnistidae. Meyrick (1915a) and Turner (1923) continued to reallocate the genus in Lyonetiidae, but later on and independently, Braun (1927) and Meyrick (1928), the latter analyzing the immature stages morphology, allocate the genus for the first time in Gracillariidae, this classification mostly used by current authors (Davis 1987; Davis & Robinson 1998; De Prins & Kawahara 2009; De Prins & De Prins 2016; De Prins *et al*. 2016). According to latest review on Gracillariidae (Kawahara *et al*. 2016), Phyllocnistinae is monophyletic, a derived lineage formed by the monotypic genus *Phyllocnistis*, sister to Oecomphyllembiinae and Marmarinae. These three subfamilies share the hypermetamorphic larvae, which present sap-feeding and spinning morphs, and thus lack a tissue-feeding larva.

DIAGNOSIS. Adults: They can be distinguished from those of other genera by the light gray scales covering the body, and by the presence of a set of fasciae and strigulae on the forewings (Figs. 2, S2; Tab. 3). Head: reduced compound eyes; labial palpi slender and well developed. *Thorax*: forewing lanceolate, usually presenting five distinct fasciae: one longitudinal (**lf**), and four transversal (**tf_1-tf_4**), that may vary in color among species; presence of oblique strigulae: three costal (**a - c**) emerging from **tf_2**, **tf_3** and **tf_4** and four apical (**d - g**); on the distal portion of forewing, the presence of well-marked black blotch, the apical spot (**as**), from where the apical strigulae emerge. Venation reduced, forewing with one discoidal cell and no accessory cells; R1 emerging from discoidal cell, and M3 and CuA2 absent; hindwing with open cell. Pupae: set of tergal spines on abdominal segments, varying in size and shape among species; cremaster modified, with a pair of caudal processes. Larvae: presenting hipermetamorphosis, initial three instars sap-feeding, followed by a last one spinning, shared only with Marmarinae and Oecophyllembiinae genera; pupal cocoon endophyllous.

Phyllocnistis abatiae Hering, 1958

(Figs.: 2A, 4, S1-2)

(Tab. 3)

Phyllocnistis abatiae Hering, 1958. **Acta Zool. Lillo. 15**, 310, 312, figs. 14D, 15-16.- Davis & Miller, 1984. **Checklist: Part 1**, p. 27, *in* Heppner (Ed.). **Atlas Neotrop**. **Lep**.- Brito *et al*., 2016. **Rev. Bras. Entomol**. **60**, tabs. S1, S2.- De Prins *et al*., 2016. **Zootaxa 4158**, 34.

TYPE MATERIAL. *Phyllocnistis abatiae* Hering, 1958 was described based on one male from Tucumán, Argentina. The holotype (Fig. 2A) illustrated by the author in the original description is deposited at ZMHB, with the following labels (separated by forward slash symbols, Fig. S1): / Holotypus / Mine an *Abatia stellata* Lillo / IM R Her. 3 / Tafí, 1700 m. Tucumán 1.III.1953 Wygodzinsky / *Phyllocnistis abatiae* Her. ♂ Holotype/. Next to the labels is found the dissected genitalia, slide-mounted with glycerin, containing the same information.

FOREWING LENGTH. 3.60 mm (n = 1).

DIAGNOSIS (Figs. 2A, S2; Tab. 3). *Dorsal forewing*: ground color silver, **lf** absent**; tf_1** short, slightly marked, light brown, reaching the median region of the wing (II); **tf_2** similar and parallel to **tf_1**, appearing as small golden-yellow blotches on the costal margin of the wing. On distal region, **tf_3** and **tf_4** are united and diffused, also forming a golden yellow distal blotch. Costal strigulae dark brown emerging from **tf_2**, **tf_3** and **tf_4**. *Phyllocnistis abatiae* is similar to *P. dorcas* Meyrick, *P. puyehuensis* Davis, *P. tethys* Moreira & Vargas and *P*. sp. 10 due to the absence of the **lf**. However, it differs from them by having much shorter **tf_1** and **tf_2**.

GEOGRAPHICAL DISTRIBUTION (Fig. 4). The type specimen was recorded for Quebrada de la Angostura, Tafí Del Valle, Tucumán province, Argentina, 1700 m. However, the original description cites 1800 m.

NATURAL HISTORY. Immature were collected and reared by Dr. Wygodzinsky (dated February 26^{th,} 1953). According to Dr. Wygodzinsky reports and the species author, mines are found on adaxial leaf surface, with a greenish serpentine shape. Larva usually begins the construction of the leaf mine next to the petiole, followed by a thin black trail of feces. During ontogenesis the mine increases in size and follows towards the leaf apex,

returning posteriorly to the base, where it constructs the endophyllous cocoon. When emerging, the adult leaves the pupal exuvium, half protruded outside of the cocoon.

HOST PLANT(S). *Abatia stellata* Lillo (Salicaceae).

EXAMINED MATERIAL. Holotype.

REMARKS. There was no record of other specimens collected after the original description of Hering (1958). Consequently, there are no data on literature that complements information regarding biology and morphology of *P. abatiae*. Due to the only specimen deposited at the collections, no genitalia was dissected for this review.

Phyllocnistis aurilinea Zeller, 1877
(Figs.: 2B, 4, S1-2)
(Tab. 3)

Phyllocnistis aurilinea Zeller, 1877. **Hor. Ent. Soc. Ross. 13**, 450, 488.- Davis & Miller, 1984. **Checklist: Part 1**, p. 27, *in* Heppner (Ed.). **Atlas Neotrop**. **Lep**.- Brito *et al*., 2016. **Rev. Bras. Entomol**. **60**, tabs. S1, S2.- De Prins *et al*., 2016. **Zootaxa 4158**, 34.

Phyllocnistis auriinea [sic] Zeller, 1877. **Hor. Ent. Soc. Ross. 13**, 450.

TYPE MATERIAL. *Phyllocnistis aurilinea* Zeller, 1877 was described based on unknown number of specimens, from Bogotá, Colombia. Two syntypes were found in the Zeller and Walsingham collections, at NHMUK; from these, one male (Fig. 2B) with the following labels (separated by forward slash symbols, Fig. S1) is here designated as lectotype: / Type / *Phyllocnistis aurilinea*, Bogotá / Abdomen missing / Zeller Coll. Wlsm. Coll. B.M. 1910-427 / 381 / *Phyllocnistis aurilinea* Zell. Hor. Soc. Ent. Ross. 3p.450 (1877) Type ♂ / BMNH(E) 1412371 /; other syntype, with no sex specified, with the following labels, is here designated as paralectotype: / el.20/23? / N. / Zeller Coll. Wlsm Coll. B. M. 1910-427. / BMNH(E) 1412357 /. This decision is made for the correct identification of the species. The lectotype has a label with the same locality of the original publication and the following additional labels were attached: / Lectotypus / Lectotypus *P. aurilinea* Zeller, 1877 Brito, Mielke & Moreira 2017 /. And to the paralectotype, the following labels were added: / Paralectotypus / Paralectotypus *P. aurilinea* Zeller, 1877 Brito, Mielke & Moreira 2017 /.

FOREWING LENGTH. 3.72 mm (n=2).

DIAGNOSIS (Figs. 2B, S2; Tab. 3). *Dorsal forewing*: ground color light gray. **lf** narrow, lanceolate and convex, with acute apex; formed by yellow scales, longitudinally marked and distally transversally marked with fine dark gray scales; this fascia emerges on the proximal region of the wing (I), where it lined with costal margin and then turning towards the inner margin, ending on distal region of the wing (III). **tf_1** and **tf_2** well-marked, both dark gray; **tf_1** is narrow, connected to **lf** reaching middle portion of the wing; **tf_2** v-shaped, crossing entirely the wing, merging to **tf_1** close to inner margin; on region III, a bright yellow blotch formed by the union of **tf_3** and **tf_4**. On the central region of this blotch and anterior to the black spot (**as**), a smaller, rounded, dark brown blotch. Costal and apical strigulae typical. *P. aurilinea* is similar to *P*. sp. 4, *P*. sp. 5 and *P*. sp. 8. However, it differs from these species regarding shape of the **lf** and **tf_2**, different from other species.

GEOGRAPHICAL DISTRIBUTION (Fig. 4). Type specimens have distribution records for Bogotá, Cundinamarca province, Colombia.

NATURAL HISTORY. There is no information available in relation to morphology of immature stages. According to the original description, one immature specimen was found feeding during March.

HOST PLANT(S). *Macleania rupestris* (Kunth) A. C. Sm., (Ericaceae).

EXAMINED MATERIAL. Lectotype and one paralectotype.

REMARKS. The genitalia morphology was not addressed by the author and due to the scarce number of specimens deposited at the NHMUK, genitalia were not dissected for this review.

Phyllocnistis baccharidis Hering, 1958
(Figs.: 2C, 4, S1-2)
(Tab. 3)

Phyllocnistis baccharidis Hering, 1958. **Acta Zool. Lillo. 15**, 308-310, figs. 11-12, 14B, 14C.- Davis & Miller, 1984. **Checklist: Part 1**, p. 27, *in* Heppner (Ed.). **Atlas Neotrop**. **Lep**.- Brito *et al*., 2016. **Rev. Bras. Entomol**. **60**, tabs. S1, S2.- De Prins *et al*., 2016. **Zootaxa 4158**, 34.

TYPE MATERIAL. *Phyllocnistis baccharidis* Hering, 1958 was described based on one male and three females, from Choromoro, Tucumán, Argentina. The male holotype (Fig. 2C) was illustrated by Hering and is deposited with the allotype and two paratypes at ZMHB. Holotype with the following labels (separated by forward slash symbols, Fig. S1): / Holotypus / Mine an *Baccharis* spec. / IM R. Her. 9 / Choromoro Tucumán 16/17.III.1953 Wygodzinsky / *Phyllocnistis baccharidis* ♂ Hering, Holotype /. Next to the labels is the dissected genitalia, slide-mounted with glycerin and containing the same information previously cited. Female allotype with the following labels (separated by forward slash symbols): / Allotypus / Mine an *Baccharis* spec. / IM R. Her. 9 / Choromoro Tucumán 16/17.III.1953 Wygodzinsky / *Phyllocnistis baccharidis* Hering, Allotype ♀ /. Female genitalia is also dissected and slide-mounted with glycerin, containing the same information. Paratypes (two females, with identical labels): / Paratypus / Mine an *Baccharis* spec. / IM R. Her. 9 / Choromoro Tucumán 16/17.III.1953 Wygodzinsky / *Phyllocnistis baccharidis* Hering, Paratype /.

FOREWING LENGTH. 3.25 mm (n=5).

DIAGNOSIS (Figs. 2C, S2; Tab. 3). *Dorsal forewing*: ground color light gray. **lf** lanceolate, with middle portion wider; light yellow with border light brown. It emerges on the proximal region of the wing (I), following centrally towards the median region (II), and ending diffuse close to the **tf_1** border. Four transversal light yellow fasciae with well-marked, light brown borders: **tf_1** c-shaped, crossing entirely the wing; **tf_2** short, partially connected to **tf_1** on the central region, where it ends, and slightly separated from **tf_3**; **tf_4** is narrower, similar and parallel to **tf_3**, preceding **as**. Inner marginal fringes with light yellow base, dark brown median region and light gray apex. Costal and apical strigulae typical. *Phyllocnistis baccharidis* is similar to *P. bourquini* Pastrana and *P*. sp. 1 in relation to pattern of the fasciae. However, it can be distinguished from these species by the **tf_1**, which in *P. baccharidis* reaches the inner margin, a characteristic not found on the other two species.

GEOGRAPHICAL DISTRIBUTION (Fig. 4). Recorded on original description are restricted to Quebrada de Las Higueras, Choromoro, Tucumán province, Argentina (800 m.).

NATURAL HISTORY. Immature of this species were reared by Dr. Wygodzinsky from collections accomplished on March 16th and 17th of 1953. According to him and the species author, up to two larvae were found feeding on the epidermis in a single leaf. The

mine is found on the adaxial region of the leaf, and the larva, during ontogenesis traces a path towards the leaf apex, posteriorly returning to the base, and so on. The mine is serpentine, narrow at first and increasing in size throughout larval development. The feces released on the interior of the mine have a liquid appearance. The cocoon is endophyllous, constructed at the final portion of the mine on the central region of the leaf. A leaf wrinkling is caused by the way silk is attached during the cocoon construction.

HOST PLANT(S). According to Hering (1958), larvae feed on an unidentified species of *Baccharis* L. (Asteraceae).

EXAMINED MATERIAL. Holotype, allotype, 2 paratypes and 1 specimen, with no identified sex, with the same type locality, deposited at MCN (this specimen is incorrectly labeled as a paratype). ARGENTINA: *Tucumán* – **Choromoro** (Quebrada de Las Higueras), 800 m, 16-17.III.1953, Wygodzinsky *leg*., 1 male and 3 females (ZMHB), 1 specimen (TLEP043) (MCN).

REMARKS. At the ZMBH, only two slides were found with genitalia, both dissected and illustrated by the species' author. Nevertheless, it is noteworthy that, the slide containing the male genitalia was damaged. Because there were few specimens deposited at the collection, none genitalia was dissected for this review.

Phyllocnistis bourquini Pastrana, 1960
(Figs.: 2D, 4, S1-2)
(Tab. 3)

Phyllocnistis bourquini Pastrana, 1960. **Acta Zool. Lillo. 17**, 217-219, figs. 1-2.- Davis & Miller, 1984. **Checklist: Part 1**, p. 27, *in* Heppner (Ed.). **Atlas Neotrop**. **Lep**.- Brito *et al*., 2016. **Rev. Bras. Entomol**. **60**, tabs. S1, S2.- De Prins *et al*., 2016. **Zootaxa 4158**, 35.

TYPE MATERIAL. *Phyllocnistis bourquini* Pastrana, 1960 was described based on 15 males and 16 females, from Tigre, Argentina. The male holotype (Fig. 2D) figured is deposited in the Pastrana collection at MACN, with the following labels (separated by forward slash symbols, Fig. S1): / HOLOTYPUS / Tigre, Prov. BA VIII.9.57 Bourquin leg. / *Phyllocnistis* ♂ *bourquini* sp n. 1958 J. A. Pastrana det /. The female allotype and 21 paratypes (10 males and 11 females) are deposited also at MACN. The other specimens

cited in the description, eight paratypes (four males and four females) are deposited in the Fernando Bourquin personal collection.

FOREWING LENGTH. 2.70 mm (n=2).

DIAGNOSIS (Figs. 2D, S2; Tab. 3). *Dorsal forewing*: ground color light gray. **lf** light yellow with dark brown borders, middle portion a little wider; this fascia emerges from proximal bases of the wing, running distally oblique to the inner margin, ending in the region II, where it is completely united to **tf$_1$**. Transversal fasciae with same coloration as **lf**. The **tf$_1$** is broad, emerging on the costal margin and ending at **lf**. The **tf$_2$** is parallel and similar to **tf$_1$**, emerges on the costal margin and reaches the inner margin; however, on the central region, it is partially interrupted by light grayish scales. The **tf$_3$** and **tf$_4$** cross the wing from the costal margin towards the inner margin; the **tf$_4$** is narrow and precedes **as**. *Phyllocnistis bourquini* is similar to *P. baccharidis*, differentiating from this species by the tied connection between **lf** with **tf$_1$** and by a complete separation between **tf$_1$** and **tf$_2$**. Also, by the shape of the two first fasciae morphology; that is, in *P. bourquini* the **tf$_1$** ends at the center of the wing and the **tf$_2$** reaches the inner margin, contrary to what is found in *P. baccharidis*.

GEOGRAPHICAL DISTRIBUTION (Fig. 4). Type specimens have distribution records for the city of Tigre, Buenos Aires province, Argentina.

NATURAL HISTORY. The specimens were reared by Mr. Fernando Bourquin, however, there is no information available for the immature in the original description.

HOST PLANT(S). *Tessaria integrifolia* Ruiz & Pav. (Asteraceae).

EXAMINED MATERIAL. Holotype and allotype.

Phyllocnistis citrella Stainton, 1856
(Figs.: 2E, S1-2)
(Tab. 3)

Phyllocnistis citrella Stainton, 1856. **Trans. Ent. Soc. London 3**, 302.- Vôute, 1934. **Korte Meded. Inst. Plziekt. Buitenz 19**, 2-3. Garrido Vivas, 1995. **IOBC/WPRS Bull**. **18**, 2.- Heppner, 1995. **Florida Entomol. 78**, 183-185.- Heppner & Dixon, 1995. **Amer. Entomol. 41**, 110-111.- Jacas & Garrido, 1996. **Florida Entomol. 79**, 603-605, figs. 1-2.-

Willink *et al*., 1996. **Avance Agroind. 16**, 15.- Achor *et al*., 1997. **J. Amer. Soc. Hort. Sci. 122**, 829.- Schauff *et al*., 1998. **J. Nat. Hist. 32**, 1012.- Vargas *et al.,* 1998. **Idesia 15**, 65.- Bernal *et al*., 1999. **Biotam 11**, 27-28.- Costa *et al.*, 1999. **J. Appl. Entomol. 123**, 237.- Chagas & Parra, 2000. **An. Soc. Entomol. Brasil 29**, 227-234 biol.- Legaspi *et al*., 2001. **Biol. Cont. 21**, 84-89.- Garcia *et al*., 2001. **Rev. Bras. Entomol**. **45**, 142.- Vargas *et al*., 2001. **Idesia 19**, 35-37, biol.- Parra *et al*., 2002. **Neotrop. Entomol. 31**, 365-367, biol.- Sánchez *et al*., 2002. **Entomotropica 17**, 167-172, Figs. 2-5, biol.- Sant'ana *et al*., 2003. **Biociências 11**, 178-181.- Bermúdez *et al*., 2004. **Florida Entomol. 87**, 10-16.- Hoy & Jessey, 2004. **Florida Entomol. 87**, 229.- Lioni & Cividanes, 2004. **Neotrop. Entomol. 33**, 407-414.- Causton *et al*., 2006. **Ann. Ent. Soc. Amer. 99**, 140.- Diez *et al*., 2006. **Florida Entomol. 89**, 328-334, fig.1-2.- Efrom *et al.,* 2006. **Man. Int. Plagas Agroecol. 78**, 46-53, fig.1-6.- Greve & Redaelli, 2006. **Neotrop. Entomol. 35**, 829-831, fig.1.- Jahnke *et al*., 2006. **Neotrop. Entomol. 35**, 357.- Landry & Roque-Albelo, 2006. **Galapagos Research 64**, 10, fig. 1.- Efrom *et al.,* 2007. **Arq. Inst. Biol. 74**, 121-126.- Jahnke *et al*., 2007. **Neotrop. Entomol. 36**, 747.- Goane *et al*., 2008. **Environ. Entom. 37**, 1026-1032.- Jesus *et al*., 2008. **Cienc. Rural 38**, 593-599.- Foelkel *et al*., 2009. **Rev. Colomb. Entomol. 35**, 157.- Paiva & Yamamoto, 2015. **Florida Entomol. 98**, 660.- Brito *et al*., 2016. **Rev. Bras. Entomol**. **60**, tabs. S1, S2.- De Prins *et al*., 2016. **Zootaxa 4158**, 35.

Phyllocnistis minutella Snellen, 1904 *in* van Deventer (Ed.), **Tijdschr. Entomol. 46**, 87, pl. X, figs.4a-c.

Phyllocnistis citricola Shiraki, 1913. **Formosa Agr. Expt. Sta. Spec. Rpt**., p. 330.

Note: Only references for the Neotropical region are listed.

TYPE MATERIAL. *Phyllocnistis citrella* Stainton, 1856 was described based on two specimens from Calcutta, India, sent by Mr. Atkinson to Mr. H. T. Stainton for description. The specimens, without sex identification, are deposited at NHMUK. The syntype, here designated as lectotype (Fig. 2E), has the following labels (separated by forward slash symbols, Fig. S1): / Holotype / Type / Calcutta Atkinson 1855 / Stainton Coll. Brit. Mus. 1893-134. / *Phyllocnistis citrella*, Sta. TYPE / BMNH(E) #1055796 /. The syntype, with no specified sex and with the following labels is here designated as paralectotype: / Paratype / Calcutta Atkinson 1855 / Stainton Coll. Brit. Mus. 1893-134 / *Phyllocnistis citrella*, Sta. P.TYPE / BMNH(E) 1412443 /. This decision is made for the correct identification of the species. The lectotype has a label with the same locality of the original publication and it is now attached with the following labels: / Lectotypus / Lectotypus *P. citrella* Stainton, 1856 Brito, Mielke & Moreira 2017 /. And, to the

paralectotype the following labels were attached: / Paralectotypus / Paralectotypus *P. citrella* Stainton, 1856 Brito, Mielke & Moreira 2017 /.

FOREWING LENGTH. 2.47 mm (n=8).

DIAGNOSIS (Figs. 2E, S2; Tab. 3). *Dorsal forewing*: ground color silver. **lf** light yellow without clearly identified borders, emerging on the costal margin, and running towards to the median region of the wing, connecting distally with the **tf$_1$** in region II. **tf$_1$** thin and brown, as the **tf$_2$**. The latter is oblique, crossing the wing from the costal margin towards to inner margin without touching the **tf$_1$**. On the distal region, the **tf$_3$** and the **tf$_4$** are united, forming a wide blotch, with scales of same coloration as **lf**. Presence of a small, whitish stripe preceding **as**. Fringe on the inner margin with yellowish base, median region dark brown and light yellow apex. Costal and apical strigulae typical. *Phyllocnistis citrella* forewings resembles those of *P. dorcas* Meyrick, *P.* sp. 9 and *P.* sp. 10, however they differ by the **lf**, which is absent in *P. dorcas* and *P*. sp. 10, and is inconspicuous in *P*. sp. 9.

GEOGRAPHICAL DISTRIBUTION. The species is considered cosmopolitan due to its wide geographical distribution. According to the studied material and literature data, there are several records for this species in addition to type locality in Calcutta, West Bengal province, India, including the neotropics: Antigua & Barbuda, Barbados, British Guiana, British Virgin Islands, Dominica, French Guiana, Grenada, Netherlands Antilles, Martinique, Peru, Saint Kitts & Nevis, Saint Lucia and Trinidad-Tobago (CABI 2016); Argentina (Willink *et al*. 1996); Bahamas, Belize, Cayman Islands, Costa Rica, Cuba, Dominican Republic, Honduras, Jamaica, Mexico, Nicaragua and Puerto Rico (Heppner & Dixon 1995); Bermuda (Hoy & Jessey 2004); Brazil (Costa *et al*. 1999); Chile (Vargas *et al*. 1998); Colombia (Castaño *et al*. 1996); Ecuador (INIAP 1995); Ecuador: Galapagos Islands (Landry & Roque-Albelo 2006); Panama (Garrido Vivas 1995); Uruguay (De Prins *et al*. 2016) and Venezuela (Schauff *et al*. 1998).

NATURAL HISTORY. Known worldwide as the citrus leaf miner, *P. citrella* is one of the most studied species due to the economic damage caused by its larvae. According to Heppner & Fasulo (2010), eggs are deposited individually over the abaxial leaf surface, and after 10 days the larva hatches migrating to the adaxial surface and begins the construction of the serpentine mine. Larvae present four instars, the first three are sap-feeding, followed by the last spinning instar. Both larval forms have a minute size (ca. 3

mm) and a translucent coloration that varies from yellow to green. The cocoon is endophyllous, covered with silk and constructed next to the leaf margin, causing a slight curl on the leaf. Characteristics related to pupal morphology are provided by Kobayashi *et al* (2013). Usually one mine is found per leaf, but in cases of great infestations, it may be found a higher number, including on fruits (Heppner 1995). Adults emerge at dawn and are active in the morning, and may present several generations throughout the year (Heppner & Fasulo 2010).

HOST PLANT(S). According to Stainton (1856), the larvae found by Mr. Atkinson were reared on leaves of an unidentified species belonging to the genus *Citrus* L. (Rutaceae). On the Neotropic, there are records of immature feeding on the following species: *Citrus aurantifolia* (Cristm.) Swingle and *C. reticulata* Blanco, in Brazil and Ecuador (Garcia *et al*. 2001; Bermúdez *et al*. 2004); *C. aurantium* L., *C. grandis* L. Osbeck and *C. paradisi* Macf. in Ecuador (Bermúdez *et al*. 2004); *C. latifolia* Tanaka in Mexico (Bautista *et al*. 1996) and *C. sinensis* Osbeck in Brazil, Ecuador and Venezuela (Garcia *et al*. 2001; Bermúdez *et al*. 2004; Sánchez *et al*. 2002).

EXAMINED MATERIAL. Lectotype and paralectotype (these specimens are erroneously labeled as holotype and paratype); six additional specimens, with no sex identification, from others localities. INDIA: *West Bengal* - **Calcutta**, 1855, Atkinson *leg*., 2 specimens (BMNH(E) #1055796, BMNH(E) 1412443) (NHMUK). DOMINICA: *Saint Andrew* - **Woodford Hill** (Agricultural Station), 7.I.1999, no collector, 3 specimens (BMNH(E)1412413, BMNH(E)1412405, BMNH(E)1412406) (NHMUK). GRENADA: *Saint Andrew* – **Mirabeau** (Propagating Station), 21.VII.1998, no collector, 1 specimen (BMNH(E)1412436) (NHMUK). TRINIDAD-TOBAGO: *Tunapuna-Piarco* - **Saint Agustine** (nurseries), VIII.1998, L. Vine *leg*., 2 specimens (BMNH(E)1412437, BMNH(E)1412455) (NHMUK).

REMARKS. Two names that were later proposed, *P. minutella* van Deventer, 1904 and *P. citricola* (Shiraki, 1913), are currently considered as subjective synonyms of *P. citrella*. The series with the specimens used for *P. minutella* description is currently deposited on RNHL (Naturalis Biodiversity Center, Leiden, Netherlands) and the series used for *P. citricola* was not found for this review. Both species were synonymized by Voûte (1934). No genitalia was dissected for this review.

Phyllocnistis dorcas Meyrick, 1915

(Figs.: 2F, 4, S1-2)

(Tab. 3)

Phyllocnistis dorcas Meyrick, 1915(b). **Trans. Ent. Soc. London. 2**, 241.- Davis & Miller, 1984. **Checklist: Part 1**, p. 27, *in* Heppner (Ed.). **Atlas Neotrop**. **Lep**.- Brito *et al*., 2016. **Rev. Bras. Entomol**. **60**, tabs. S1, S2.- De Prins ***et al***., 2016. **Zootaxa 4158**, 36.

TYPE MATERIAL. *Phyllocnistis dorcas* Meyrick, 1915 was described based on a single specimen from Mallali, Upper Demerara-Berbice, British Guiana. The specimen identified as female is deposited at NHMUK. The holotype (Fig. 2F) has the following labels (separated by forward slash symbols, Fig. S1): / Holotype / Mallali, Brit. Guiana. Parish. 3.13 [III.1913] / Meyrick Coll. B. M. 1938-290 / *dorcas* Meyr. / *Phyllocnistis dorcas* 1/1 Meyr. E. Meyrick det. in Meyrick Coll. / BMNH(E) 1412349 /.

FOREWING LENGTH. 2.86 mm (n=1).

DIAGNOSIS (Figs. 2F, S2; Tab. 3). *Dorsal forewing*: ground color silver. **lf** absent. **tf_1** thin and faded, with scales that varies from light gray to dark brown, emerging from the costal margin and crossing inclined posteriorly towards the center of the wing, where it ends. **tf_2** with same coloration and thickness, obliquely to **tf_1**, crossing to the inner margin close to the border between regions II and III. **tf_3** and **tf_4** are united forming a yellowish blotch on the distal region. The **tf_4** is distally followed by light gray band, preceding **as**. As previously mentioned, *P. dorcas* is similar to *P. citrella*, being differentiated from this species by the absence of **lf**.

GEOGRAPHICAL DISTRIBUTION (Fig. 4). This species has only one record for Mallali, Upper Demerara-Berbice region, British Guiana.

NATURAL HISTORY. Information not available.

HOST PLANT(S). Unknown.

EXAMINED MATERIAL. Holotype.

REMARKS. The author did not described the genitalia morphology of this species. Due to the scarce number of specimens at the NHMUK, no genitalia was dissected for this review. Due to the loss of many setae and scales from the forewing, possibly associated

with aging, we were unable to analyze the strigulae of the single specimen deposited at the museum.

Phyllocnistis drimiphaga Kawahara, Nishida & Davis, 2009
(Figs.: 2G, 4. S1-2)
(Tab. 3)

Phyllocnistis drimiphaga Kawahara, Nishida & Davis, 2009. **Zookeys 27**, 12-17, figs. 2A, 4A-E, 7A-L, 10A-K.- Brito *et al*., 2016. **Rev. Bras. Entomol**. **60**, tabs. S1, S2.- De Prins *et al*., 2016. **Zootaxa 4158**, 36.

TYPE MATERIAL. *Phyllocnistis drimiphaga* description was based on two males, four females, two larvae and three pupae, from 6 km ENE of Vara Blanca, Cerro de la Muerte, La Cãnón, Genesis II and Paraíso del Quetzal, Costa Rica. The female holotype (Fig. 2G), figured and illustrated by the authors on the original description, is deposited at USNM. The holotype has the following labels (separated by forward slash symbols, Fig. S1): / HOLOTYPE *Phyllocnistis drimiphaga* Kawahara, Nishida and Davis ♂ / COSTA RICA, Prov. Heredia 6 km ENE Vara Blanca 2050 m, 10º 10'34" N, 084º06'41" W 27-I-2004 adult emergence INbio–OET-ALAS transect col./rear: Kenji NISHIDA / Digital Image Captured / pupae collected: 30-XII-2003 host plant: *Drimys granadensis* leaf miner on underside *Phyllocnistis* sp. with pupal shell / Digital Image Captured. According to the original description, the paratypes (two males, three females, two larvae and three pupae) are deposited with the holotype at USNM, and one paratype female at INBIO and another at UCR.

FOREWING LENGTH. 3.12 mm (n=1).

DIAGNOSIS (Figs. 2G, S2; Tab. 3). *Dorsal forewing*: ground color light gray. **lf** golden yellow with dark brown borders, emerging at the base of the costal margin, running slightly concave, diagonally to center, reaching the **tf_1**. On the median portion, connected to **lf** and close to the inner margin, there is a small, dark brown blotch. **tf_1** and **tf_2** with same coloration as **lf**; **tf_1** is strongly inclined to the apex, reaching the middle portion of the wing; **tf_2** v-shaped, with narrow central region. From this fascia towards the distal region (III) of the wing, an orange blotch formed by the **tf_3** + **tf_4**. Strigulae are typical for the genus. Inner fringes with coloration varying from golden yellow to dark yellow at

basis, and apex light gray. *Phyllocnistis drimiphaga* is similar to *P. tropaeolicola* Kawahara, Nishida & Davis; however, differs from this species by having a broader **lf** and a small brown blotch attached median-posteriorly to it, and also by the absence of a second black blotch at the wing apex.

GEOGRAPHICAL DISTRIBUTION (Fig. 4). The original description mentions Talamanca Cordillera and Central Volcanic Cordillera , 2000 m, more precisely at 6 km ENE of Vara Blanca, Heredia province; Paraíso del Quetzal and Cerro de la Muerte, San José province; and Genesis II and Cerro de la Muerte, Cartago province, both provinces from Costa Rica. At Chirripó National Park, San José province, it was also found mines belonging to this species, on regions of high altitudes varying from 2200-2700 m.

NATURAL HISTORY. According to the authors, mines constructed by *P. drimiphaga* are narrow and followed by a black thin path of feces. At the initial stage, larvae construct a spiral-shaped mine around the site where the egg was deposited, that changes during ontogenesis into a serpentine mine of greenish yellow coloration. Most of the mines were found on young leaves at apical branches of the host plant, and most of the times only a single mine was found, usually on the abaxial surface of the leaf. Many mines were found empty or containing dead larvae; corresponding mortality is possibly due either to rupture of leaf epidermis causing the desiccation of larvae or to the attack from parasitoids. As other congeneric species from this genus, it builds an endophyllous cocoon close to the leaf border.

HOST PLANT(S). *Drymis granadensis* L. F. (Winteraceae).

EXAMINED MATERIAL. Holotype female (labeled as a male).

REMARKS. Last instar larva and pupa, as well as the adults including genitalia morphologies were figured and described in detail in the original description. The authors indicate as diagnostic characters on female genitalia the presence of one pair of dissimilar signa, and on pupae the presence of a flattened cocoon-cutter; followed by a pair of short and curved spines.

Phyllocnistis maxberryi Kawahara, Nishida & Davis, 2009
(Figs.: 2H, 4, S1-2)
(Tab. 3)

Phyllocnistis maxberryi Kawahara, Nishida & Davis, 2009. **Zookeys 27**, 17-20, figs. 2B, 5A-F, 8A-L, 11A-L.- Brito *et al*., 2016. **Rev. Bras. Entomol**. **60**, tabs. S1, S2.- De Prins *et al*., 2016. **Zootaxa 4158**, 36.

TYPE MATERIAL. *Phyllocnistis maxberryi* description was based on seven males, three females, nine larvae and nine pupae, from Villa Mills and 6 km ENE Vara Blanca, Costa Rica. The female holotype (Fig. 2H), figured and illustrated is deposited at USNM and has the following labels (separated by forward slash symbols, Fig. S1): / HOLOTYPE *Phyllocnistis maxberryi* Kawahara, Nishida, Davis 2009 / ♀ genitalia on slide 4474 D. R. Davis / Costa Rica: Prov. San José Cerro de la Muerte, Villa Mills 3100m, 13-III-2003 (emergence) col./rear: Kenji NISHIDA / host plant: *Gaiadendron punctatum* (Loranthaceae), upper surface leaf miner phyllocnistine / Digital Image Captured /. According to the original description, the paratypes (seven males, two females, nine larvae, nine pupae and three additional slides, one of these containing the genitalia of a male (USNM 33279) and two containing female genitalia (USNM 33280, 33286)) are currently deposited with the holotype at the USNM. One paratype with no sex identification is deposited in the UCR collection.

FOREWING LENGTH. 2.85 mm (n=1).

DIAGNOSIS (Figs. 2H, S2; Tab. 3). *Dorsal forewing*: ground color light gray. **lf** faded, light brown, with thin dark brown borders, emerging from the costal base of the wing and following diagonally towards the center region (II); costal border of **lf** touching the central region of $\mathbf{tf_1}$ and inner border reaching the $\mathbf{tf_2}$. $\mathbf{tf_1}$ wide and oval, with same coloration as **lf**, but with the proximal border thicker, and with distal portion overlapping the distal portion of **lf**. $\mathbf{tf_2}$ c-shaped, crossing entirely the wing, and preceding a light brown blotch located on the distal region (III), formed by $\mathbf{tf_3}$ + $\mathbf{tf_4}$. Distal border of $\mathbf{tf_4}$ thin, preceding the **as**. The costal strigulae typical, and **as** greatly reduced. This species differs from all Neotropical *Phyllocnistis* by the $\mathbf{tf_1}$ wide and oval, with proximal border enlarged, and by the size-reduced **as**.

GEOGRAPHICAL DISTRIBUTION (Fig. 4). Specimens were collected in regions with high altitudes, varying from 1950 to 3000 m, located in the Talamanca Cordillera, more precisely at Cerro de la Muerte, Villa Mills, Cartago province and in the Central Volcanic Cordillera, at 6 km ENE from Vara Blanca, Heredia province, Costa Rica.

NATURAL HISTORY. According to the authors, the mines are found on young leaves, located on apical branches of young host plants located in open areas, as along trails and roads. Most of the mines were found on the adaxial leaf surface, up to three larvae found feeding on the same leaf. The mines constructed by the larvae are serpentine in shape and followed by a trace of feces that darkens throughout the growth of the larva. The egg of *P. maxberryi* is usually deposited at the central vein, on the middle of the leaf. When hatching, the larva penetrates the tissues initiating the mine construction. The larva follows the central vein towards the petiole, posteriorly returning to the apex, moving closer to the border. At the apex, the larva crosses the central vein migrating to the other half of the leaf, following again towards the petiole, next to this region the spinning instar constructs the endophyllous cocoon provoking a leaf folds next to the border.

HOST PLANT(S). *Gaiadendron punctatum* (Ruiz & Pav.) G. Don (Loranthaceae).

EXAMINED MATERIAL. Holotype.

REMARKS. The immature stages and adults including their genitalia, were figured and described in the original description. In addition to forewing color pattern, they cite other diagnostic characters such as on pupal cocoon-cutter, long, curved and spine shaped; and, on female genitalia the presence of broad signa that occupies almost all of the corpus bursae.

Phyllocnistis meliacella Becker, 1974
(Figs.: 2I, 4, S1-2)
(Tab. 3)

Phyllocnistis meliacella Becker, 1974. **Turrialba 24** (3), 334-335, figs. 3a-c.- Becker, 1976. **Microlepidopteros asociados con *Carapa*, *Cedrela* y *Swietenia* en Costa Rica**, p. 84-85, figs. 10A-C, 11E-G; *in* Whitmore (Ed.). **Studies on the Shootborer *Hypsipyla grandella* (Zeller) Lep. Pyralidae**.- Davis & Miller, 1984. **Checklist: Part 1**, p. 27, *in* Heppner (Ed.). **Atlas Neotrop**. **Lep**.- Brito *et al*., 2016. **Rev. Bras. Entomol**. **60**, tabs. S1, S2.- De Prins *et al*., 2016. **Zootaxa 4158**, 36.

TYPE MATERIAL. *Phyllocnistis meliacella* description was described on six specimens from Turrialba, Costa Rica. The male holotype figured in this review (Fig. 2I) is deposited at the USNM and has the following labels (separated by forward slash symbols, Fig. S1):

/ HOLOTYPE *Phyllocnistis meliacella* USNM 72096 / Ex leaves sp. *Swietenia macrophylla* / Turrialba, Costa Rica 600 m 8.V.1973 V. O. Becker col. /. According to the original description, three paratypes with no sex identification are currently deposited at the USNM and two additional paratypes also with no sex identification are deposited at UCR.

FOREWING LENGTH. 2.04 mm (n=1).

DIAGNOSIS (Figs. 2I, S2; Tab. 3). *Dorsal forewing*: ground color light gray. **lf** pale yellow, short (restricted to region I, slightly touching distally on **tf_1**) and entirely located on costal portion. On the inner portion of region I, a pale yellow blotch with darkned border. **tf_1** with the same coloration as **lf**, c-shaped, wih blackened borders, crossing entirely the wing on the anterior portion of region II, bearing a small black dot on inner margin. **tf_2** faded and short, parallel to **tf_1**, forming a small and faded blotch on the costal margin. **tf_3** and **tf_4** absent. **As** absent. Similarities on the forewing of this species are found when comparing to *P*. sp. 6 because both present the **tf_1** in an c-shape, **tf_2** short, presence of a small blotch on the proximal region of the wing and the absence of **as**. However, it differs by the **lf** border is absent in *P*. sp. 6 but blackened in *P. meliacella*. Also regarding to **tf_3** and **tf_4**, which are absent in *P. meliacella* and present in *P*. sp. 6.

GEOGRAPHICAL DISTRIBUTION (Fig. 4). Specimens have distribution records for Turrialba, Cartago province and for Liberia city, Guanacaste province, Costa Rica, 600 m. However, the original description mentions 620 m of altitude.

NATURAL HISTORY. According to Becker (1976), the larvae were found feeding on tissues of young leaves, bellow the epidermis of the abaxial surface. The mine is irregular, serpentine shaped and increasing in size during the larval development. The cocoon, constructed by the last instar larva, is covered with silk and located at the final portion of the mine next to the leaf border. For most of times, a single feeding larva is found per leaf. This species is considered multivoltine, because its larvae have a short life cycle (approximately one month), and were found active over the year.

HOST PLANT(S). There are records of larvae from this species feeding on *Cedrela odorata* L., *C. angustifolia* Sessé & Moc., *C. tonduzzi* C. de Candolle*, Swietenia mahagoni* (L.) Jacq., and *S. macrophylla* King (Meliaceae).

EXAMINED MATERIAL. Holotype.

REMARKS. According to the original description, the holotype was ruined during the shipment of part of the type material of Costa Rica to Brazil. Thus, the author designates on the original description another holotype, from a male paratype that is currently deposited at USNM. The author illustrated schematically the genitalia of both sexes, which due the difficulty in drawing by the absence of an appropriate equipment available at that time, few morphological features are highlighted to distinguish them from other species belonging to the genus. Details regarding immature morphology were provided in an additiomal publication (Becker, 1976), in which the author highlights on the pupae, the existence of inverted arch-shaped spines located at the abdominal terga.

Phyllocnistis perseafolia Davis & Wagner, 2011
(Figs.: 2J, 4, S1-2)
(Tab. 3)

Phyllocnistis perseafolia Davis & Wagner, 2011. **ZooKeys 97**, 65-70, figs. 2D, 3C, 4A–B, 14A–F, 15A-D, 19A–E. - Brito *et al*., 2016. **Rev. Bras. Entomol**. **60**, tabs. S1, S2. - De Prins *et al*., 2016. **Zootaxa 4158**, 37.

TYPE MATERIAL. *Phyllocnistis perseafolia* description was based on ten males, eight females and five pupae from Villamaria, Colombia. The male holotype (Fig. 2J), figured and illustrated on the original description, is deposited at USNM. The holotype figured has the following labels (separated by forward slash symbols, Fig. S1): / HOLOTYPE *Phyllocnistis perseafolia* Davis & Wagner ♂ / Genitalia slide By DRD USNM 34075 ♂ / COLOMBIA: Caldas Villa Maria Apr. 2008 F. Posada / HOST: Avocado. var. Hass leafminer /. According to the original description, the paratypes (nine males with one genitalia on slide (USNM 34078) and eight females, with two genitalia on slides (USNM 34076, 34077)) are deposited at USNM. Five pupae and one pupa on slide included glycerin (USNM 34072) are deposited at the USNM and UNCM collections.

FOREWING LENGTH. 2.58 mm (n=1).

DIAGNOSIS (Figs. 2J, S2; Tab. 3). *Dorsal forewing*: ground color silvery. **lf** faded, light yellow scales with brown border, emerging from the basis of costal margin (region I), thus running convex towards the median region, where it narrower, ending near **tf**$_1$ (region II). **tf**$_1$ and **tf**$_2$ fused, with same coloration as **lf**. The **tf**$_1$ is v-shaped, crossing the wing entirely, connecting to the central region of **tf**$_2$, which is short, restricted to the costal

margin. A blotch is found on the distal region of the wing (III) formed by **tf$_3$** and **tf$_4$**; on the **tf$_3$** region the scales are light yellow and on the **tf$_4$** they are darker. Strigulae typical for the genus. This species differe from all by the **lf** convex and **tf$_2$** restricted to costal margin, connected to **tf$_1$**.

GEOGRAPHICAL DISTRIBUTION (Fig. 4). Specimens have distribution records for Villamaria, Caldas Department, Colombia. However, according to the authors, there might be chances of finding more specimens at the north region of South America, where there is a higher number of the host plant cultivars.

NATURAL HISTORY. Similar to the other Neotropical *Phyllocnistis,* specimens of *P. perseafolia* present thin serpentine mines, having a black fine trace of feces, either on the adaxial or abaxial leaf surface. Pupal development occurs in an elliptical chamber, slightly enlarged on the final portion of the mine. According to the authors, some mines were found on the avocado, the fruit produced by the host plant, at the type locality. The adults of this species usually emerge in April.

HOST PLANT(S). *Persea americana* Mill., Hass variety (Lauraceae).

EXAMINED MATERIAL. Holotype.

REMARKS. The authors figured and described in detail this species regarding the adults and pupa, however, egg and larvae were not examined.

Phyllocnistis puyehuensis Davis, 1994
(Figs.: 2K, 4, S1-2)
(Tab. 3)

Phyllocnistis puyehuensis Davis, 1994. **Trop. Lep. 5**, 72-74, figs. 4, 54-57.- Brito *et al*., 2016. **Rev. Bras. Entomol**. **60**, tabs. S1, S2.- De Prins *et al*., 2016. **Zootaxa 4158**, 37.

TYPE MATERIAL. *Phyllocnistis puyehuensis* description was based on two males from Puyehue, Aguas Calientes National Park, Chile. The male holotype (Fig. 2K), figured is deposited at ZMUC, with the following labels (separated by forward slash symbols, Fig. S1): / HOLOTYPE *Phyllocnistis puyehuensis* Davis / CHILE, Osorno 16: Parque Nacional Puyehue, Aguas Calientes, 450 m, 12.xii.1981 Nielsen & Karsholt /. According

to the original description, the male paratype is also deposited at ZMUC, with the same data of the holotype.

FOREWING LENGTH. 2.65 mm (n=1).

DIAGNOSIS (Figs. 2K, S2; Tab. 3). *Dorsal forewing*: ground color light gray. **lf** absent. **tf_1** fused to **tf_2**, forming together a thicker golden yellow bar with dark brown borders that cross entirely the wing on middle region (II). They extend to the basis of the wing as a fine, dark brown strip that is lined with the costal margin. On the distal region (III), there is a second blotch of similar color, formed by fusion of **tf_3** + **tf_4**. Costal and apical strigulae typical for the genus. A light gray stripe precedes the **as**. This species is different from all other Neotropical *Phyllocnistis* by the absence of **lf**, and presence of a brown line along the costal margin in connection with the fused **tf_1** + **tf_2**.

GEOGRAPHICAL DISTRIBUTION (Fig. 4). This species is known from the Puyehue National Park, Aguas Calientes, Osorno, Los Lagos province, Chile at 450 m of altitude, a region known by the cold and humid Valdivian Forests, south of Chile.

NATURAL HISTORY. No information available.

HOST PLANT(S). Unknown.

EXAMINED MATERIAL. Holotype.

REMARKS. The authors of this species illustrated only the male genitalia, and give informations regarding female genitalia; immature stages and biology were not provided.

Phyllocnistis rotans Meyrick, 1915
(Figs.: 2L, 4, S1-2)
(Tab. 3)

Phyllocnistis rotans Meyrick, 1915. **Trans. Ent. Soc. London. 2**, 242.- Davis & Miller, 1984. **Checklist: Part 1**, p. 27, *in* Heppner (Ed.). **Atlas Neotrop**. **Lep**.- Brito *et al*., 2016. **Rev. Bras. Entomol**. **60**, tabs. S1, S2.- De Prins *et al*., 2016. **Zootaxa 4158**, 37.

TYPE MATERIAL. Description of *Phyllocnistis rotans* Meyrick, 1915 was based on five specimens from Alauzi, Ecuador. Five syntypes with no sex identification were found on Meyrick's collection at NHMUK. The syntype herein designated as lectotype (Fig. 2L),

presents the following labels (separated by forward slash symbols, Fig. S1): / SYNTYPE / Alausi Ecuador P. 9450 .6.14 / *rotans* Meyr. / Meyrick Coll. B. M. 1938-290. / *Phyllocnistis rotans* 1/5 Meyr. E Meyrick det. in Meyrick Coll / *PHYLLOCNISTIS* Z. / BMNH(E) 1412616 /; the other syntype, with the following labels is herein designated as paralectotype: / SYNTYPE / Alausi Ecuador P. 9450 -6-14 / Meyrick Coll. B. M. 1938-290. / *Phyllocnistis rotans* 2/5 Meyr. E Meyrick det. in Meyrick Coll. / BMNH(E) 1412347 /. This decision is made for the correct identification of the species. To the lectotype and the paralectotype the following labels were added: / Lectotypus / Lectotypus *P. rotans* Meyrick, 1915 Brito, Mielke & Moreira 2017 /. And to the paralectotype: / Paralectotypus / Paralectotypus *P. rotans* Meyrick, 1915 Brito, Mielke & Moreira 2017 /.

FOREWING LENGTH. 2.68 mm (n=5).

DIAGNOSIS (Figs. 2L, S2; Tab. 3). *Dorsal forewing*: ground color grayish. **lf** wide, yellowish, with brown borders, emerging at the costal margin basis, running straight to center of the wing, ending completely separated from other transversal fasciae. These have the coloration pattern similar to **lf**. The c-shaped **tf_1**, emerges from the costal margin and crosses entirely the wing, and having a narrower central region. **tf_2** short, restricted to costal region. **tf_3** and **tf_4** fused, forming a large blotch on the distal region (III). Costal and strigulae similar, typical for the genus. The wide and straight, light yellow, brown bordered **lf,** completely separated from a full developed **tf_1**, is a unique characteristic for this species compared to other Neotropical congeneric species.

GEOGRAPHICAL DISTRIBUTION (Fig. 4). Known only from Alausi, Chimborazo province, Ecuador, at 2880 m of altitude (9450 ft).

NATURAL HISTORY. No information available.

HOST PLANT(S). Unknown.

EXAMINED MATERIAL. Lectotype and 4 paralectotypes with no sex identified. ECUADOR: *Chimborazo* – **Alausi**, 2880 m, 14.VI, Parish *leg*., 5 specimens (BMNH(E)1412616, BMNH(E)1412347, BMNH(E)1412364, BMNH(E)1412351, BMNH(E)1412365) (NHMUK).

REMARKS. The genitalia was not described by the author and due to the scarce number of specimens at NHMUK, none was dissected for this review.

Phyllocnistis sciophanta Meyrick, 1915
(Figs.: 2M, 4, S1-2)
(Tab. 3)

Phyllocnistis sciophanta Meyrick, 1915. **Trans. Ent. Soc. London. 2**, 241-242.- Davis & Miller, 1984. **Checklist: Part 1**, p. 27, *in* Heppner (Ed.). **Atlas Neotrop**. **Lep**.- Brito *et al*., 2016. **Rev. Bras. Entomol**. **60**, tabs. S1, S2.- De Prins *et al*., 2016. **Zootaxa 4158**, 37.

TYPE MATERIAL. *Phyllocnistis sciophanta* Meyrick, 1915 was described based on a single specimen [holotype] from Lima, Peru. This specimen identified as male, is deposited at NHMUK. The holotype (Fig. 2M) has the following labels (separated by forward slash symbols, Fig. S1): / Holotype / Lima, 500 ft, Peru. Parish 8-14 [VIII.1914]. / *sciophanta* Meyr / Meyrick Coll. B. M. 1938-290. / *Phyllocnistis sciophanta* 1/3 Meyr. E. Meyrick det. in Meyrick Coll. / Abdomen missing / BMNH(E) 1412343 /.

FOREWING LENGTH. 2.97 mm (n=1).

DIAGNOSIS (Figs. 2M, S2; Tab. 3). It was herein inferred from the author's description, since the only specimen deposited at NHMUK is not in good conditions, having an unclearly defined pattern of forewing fasciae. *Dorsal forewing* (tentative): ground color silvery. **lf** light yellow with grayish borders, oblique, emerging from the base of the proximal region and ending at the middle region of the wing. **tf_1** also light yellow, emerging from the costal margin, apparently connected with **lf**. **tf_2** apparently crossing enterily the wing. Distal region composed by a yellowish blotch (fused **tf_3**+**tf_4**) that is preceded by a darkish bar, and located anterior to **as** (partially missing with the apical strigulae in the type specimen). Presence of three diffused gray costal strigulae and two apical strigulae. It is apparently close to *P. sexangula*, also from Peru, to which it should be better compared when additional material is available.

GEOGRAPHICAL DISTRIBUTION (Fig. 4). Lima, Lima region in Peru, at 152 m (500 ft).

NATURAL HISTORY. No information available.

HOST PLANT(S). Unknown.

EXAMINED MATERIAL. Holotype.

REMARKS. The description of *P. sciophanta* was accomplished with no illustration of adults and no information regarding genitalia. The single specimen deposited at the museum is not in good conditions for providing accurate description of color. We herein maintain its species status as valid until additional specimens are sampled at the type locality, and thus more information is available for comparison. Due to the scarce number of specimens at NHMUK, no genitalia were dissected for this review.

Phyllocnistis sexangula Meyrick, 1915
(Figs.: 2N, 4, S1-2)
(Tab. 3)

Phyllocnistis sexangula Meyrick, 1915. **Trans. Ent. Soc. London. 2**, 242.- Davis & Miller, 1984. **Checklist: Part 1**, p. 27, *in* Heppner (Ed.). **Atlas Neotrop**. **Lep**.- Brito *et al*., 2016. **Rev. Bras. Entomol**. **60**, tabs. S1, S2.- De Prins *et al*., 2016. **Zootaxa 4158**, 37.

TYPE MATERIAL. Description of *Phyllocnistis sexangula* Meyrick, 1915 was based on two specimens (syntypes) from Matucana, Peru. Two syntypes with no sex identification were found in Meyrick's collection at NHMUK. The syntype herein designated as lectotype (Fig. 2N) has the following labels (separated by forward slash symbols, Fig. S1): / SYNTYPE / Matucana Peru P. 7780 -7-14 / *sexangula* Meyr. / Meyrick Coll. B. M. 1938-290. / *Phyllocnistis sexangula* 1/3 Meyr. E. Meyrick det. in Meyrick Coll. / Abdomen missing / BMNH(E) 1412359 /; the other syntype is herein designated as paralectotype, has the following labels: / SYNTYPE / Matucana Peru P. 7780 -7-14 / Meyrick Coll. B. M. 1938-290. / *Phyllocnistis sexangula* 2/3 Meyr. E. Meyrick det. in Meyrick Coll. / BMNH(E) 1412356 /. These decisions is made for the correct identification of the species. To the lectotype the following labels were added: / Lectotypus / Lectotypus *P. sexangula* Meyrick, 1915 Brito, Mielke & Moreira 2017 /. And to the paralectotype: / Paralectotypus / Paralectotypus *P. sexangula* Meyrick, 1915 Brito, Mielke & Moreira 2017 /.

FOREWING LENGTH. 4.25 mm (n=2).

DIAGNOSIS (Figs. 2N, S2; Tab. 3). *Dorsal forewing*: ground color light gray. Bright yellow fasciae with dark brown borders. **lf** narrow, emerging from the costal margin base and running slightly convex towards the center region of the wing. **tf_1** inclined towards apex reaching the middle portion of the wing where it merges to distal section of **lf**. A small dark brown blotch attached to middle section of **lf** border on inner portion of region I. **tf_2** v-shaped, crossing entirely the wing. **tf_3** slightly shorter, emerging from the costal margin reaching the middle portion of the wing. **tf_4** forming a blotch on the distal region and crossing entirely the wing; on its center, another smaller and blackened blotch. Transverse fasciae are connected to each other at the center by a diffuse line of brownish scales. A thin light gray band separates **tf_4** from **as**. Strigulae are typical for Neotropical *Phyllocnistis*. Fringes of inner margin have dark brown base, a thin and black line limits this region from the apical one, which is pale gray. This species is similar to *P. drimiphaga* is distinguished from it by the separation between the **tf_3** and **tf_4**, which is not distinct in the former, and by the presence of blotch dark brown within **tf_4**, absent in *P. drimiphaga*.

GEOGRAPHICAL DISTRIBUTION (Fig. 4). This species has a single record for Matucana, Lima region, Peru, at 2.371 m of altitude (7780 ft).

NATURAL HISTORY. No information available.

HOST PLANT(S). Unknown.

EXAMINED MATERIAL. Lectotype and paralectotype.

REMARKS. The original description of *P. sexangula* does not provide illustrations or information regarding genitalia morphology, neither on immature stages and life history. Due to the scarce number of samples for this species at the NHMUK, no genitalia was dissected for this review.

Phyllocnistis tethys Moreira & Vargas, 2012
(Figs.: 2O, 4, S1-2)
(Tab. 3)

Phyllocnistis tethys Moreira & Vargas, 2012 in *Brito et al*. 2012. **Zootaxa 3582**, 4-10, figs. 1-8.- Brito *et al*., 2016. **Rev. Bras. Entomol**. **60**, tabs. S1, S2.- De Prins *et al*., 2016. **Zootaxa 4158**, 36.

TYPE MATERIAL. *Phyllocnistis tethys* was described based on seven specimens from the Centro de Pesquisas e Conservação da Natureza Pró-Mata (CPCN Pró-Mata), municipality of São Francisco de Paula, Rio Grande do Sul, Brazil. The holotype male (Fig. 2O) is deposited at DZUP, with the following labels (separated by forward slash symbols, Fig. S1): / *Phyllocnistis tethys* Moreira & Vargas HOLOTYPE ♂ / 155-58 Brasil. RS. Pró-Mata 05-08.V.2011 GRPM et al. (leg.) / DZ 22.623 /. According to the original description, two paratypes females (LMCI 155-41, 155-43) are deposited at DZUP (22.633, 22.643, respectively); two paratypes, one male and one female (LMCI 155-31, 155-26) at MCNZ (81901, 81902, respectively); and two paratypes, one male and one female (LMCI 155-35, 155-30) at MCTP (28635, 28636, respectively).

FOREWING LENGTH. 2.56 mm (n=2).

DIAGNOSIS (Figs. 2O, S2; Tab. 3). *Dorsal forewing*: ground color light gray. **lf** absent. **tf_1 - tf_4** fused into a large orange blotch that covers interily the distal wing portion (III) preceding **as**. Costal and apical strigulae well-marked, typical for the genus. Fringes of inner margin dark gray. This species is similar to *P. abatiae*, *P. dorcas* and *P. puyehuensis* due to the absence of **lf**, but differs from them, especially regarding fusion of all transversal fasciae, forming a large orange blotch on the distal wing region.

GEOGRAPHICAL DISTRIBUTION (Fig. 4). Known only from to type locality, 900 m of altitude.

NATURAL HISTORY. According to the authors, the mines are found usually at the abaxial leaf surface. The egg is deposited on secondary veins, adhered to the leaf by a cement substance. After hatching the larva begins the mine construction, which is circular and expands in size along the larval development, and can form a great blotch. The feces are fine, dark gray and, found along the path covered by the larva. The three sap-feeding instars are known by feeding from the spongy parenchyma; however, when densities per leaf are great, the larvae may feed from the palisade parenchyma. According to authors, up to 13 larvae can be found per leaf. The cocoon is endophyllous and constructed by the spinning larva at the final portion of the mine. The sampling was accomplished between summer and autumn, suggesting more than one generation per year.

HOST PLANT(S). *Passiflora organensis* Gardner (Passifloraceae).

EXAMINED MATERIAL. Holotype and 1 specimen, with no sex identified. BRAZIL: *Rio Grande do Sul* – **São Francisco de Paula** (Centro de Pesquisas e Conservação da Natureza – Pró-mata), 900 m, 05-08.V.2011, G. R. P. Moreira *et al*. *legs*., 1 male (DZ 22.623) (DZUP), 1 specimen (LMCI 155-24) (LMCI).

REMARKS. Adults and immature stages of *P. tethys* were figured and described in detail on the original description. According to them, the presence of a conspicuous cornuti on the aedeagus, a single signum at the corpus bursae and the absence of strong spines on abdominal terga of the pupae may be considered in association as diagnostic characters to distinguish *P. tethys* from the other Neotropical species from which these structures are known.

Phyllocnistis tropaeolicola Kawahara, Nishida & Davis, 2009
(Figs.: 2P, 4, S1-2)
(Tab. 3)

Phyllocnistis tropaeolicola Kawahara, Nishida & Davis, 2009. **Zookeys 27**, 20-24, 27-28, figs. 2C, 6A-E, 9A-L, 12A-H.- Brito *et al*., 2016. **Rev. Bras. Entomol**. **60**, tabs. S1, S2.- De Prins *et al*., 2016. **Zootaxa 4158**, 38.

TYPE MATERIAL. *Phyllocnistis tropaeolicola* was described based on ten males, seven females, one spinning larva and one pupa, from Cerro de la Muerte, Villa Mills, Costa Rica. Holotype male (Fig. 2P) is deposited at the USNM with the following labels (separated by forward slash symbols, Fig. S1): / HOLOTYPE *Phyllocnistis tropaeolicola* Kawahara, Nishida and Davis ♂ / Costa Rica: Prov. Cartago Cerro de la Muerte, Villa Mills 3100 m, 13-III-2003 (emergence) col./rear: Kenji NISHIDA / host plant: *Tropaeolum emarfinatum* leaf miner mine with pupal fold collected: 6-III-2003 / Digital Image Captured /. According to the original description, the paratypes (nine males, six females, one spinning larva, one pupa (USNM 34036) and four genitalia on slides (USNM 33281, 33285, 33280, 33282)) are deposited at the USNM. One female paratype is deposited at INBIO and another at UCR.

FOREWING LENGTH. 3.62 mm (n=1).

DIAGNOSIS (Figs. 2P, S2; Tab. 3). *Dorsal forewing*: ground color light gray. **lf** thin, elongated and slightly convex, formed by brownish scales without deferentiated borders,

emerging from the proximal basis of costal margin and extending up to the distal limit median region (II), where it connects to the **tf_1**. **tf_1** wider than **lf**, inclined toward apex, formed by light brown scales and dark brown borders. **tf_2** v-shaped, with coloration similar **tf_1**, crossing entirely the wing, but narrowed at the center. **tf_3** and **tf_4** fused, forming a light yellow blotch; the latter bears a small blackened blotch that precedes **as**. Costal and apical strigulae well-marked, typical for the genus. Fringes of inner margin with ca. 1/3 of its basal portion brownish. This species shares the general shape of the **tf_2** with *P. drimiphaga* and *P. sexangula*. However, the latter presents the **tf_2** with a widened central region and *P. drimiphaga* does not have a blackened blotch preceding **as**. Moreover, the absence of an additional blotch attached to the inner border of the **lf**, distinguish *P. tropaeolicola* from these two species that present such a characteristic.

GEOGRAPHICAL DISTRIBUTION (Fig. 4). *Phyllocnistis tropaeolicola* specimens were registered only for the type locality, Cerro de la Muerte, Villa Mills, Cartago province, Costa Rica, at 3100 m of altitude.

NATURAL HISTORY. Accoding to original description, mines from this species are found on the adaxial leaf surface, usually on apical branches. They are serpentine and whitish green, forming an irregular path along larval development. On most leaves examined only one mine was found, however, there are records containing up to three mines per leaf. The last larval instar sap-feeding was found feeding on the mesophyll. The cocoon of this species is covered with silk, being constructed next to leaf margin.

HOST PLANT(S). *Tropaeolum emarginatum* Turcz (Tropaeolaceae).

EXAMINED MATERIAL. Holotype.

REMARKS. Illustrations of immature stages and adults were provided in the original description, and information regarding life cycle was also provided. The authors points out as diagnostic characteristics of *P. tropaeolicola,* the presence of a narrow band-shaped signum surrounding the median region of the corpus bursae, on the female genital; and the cone-shaped cocoon-cutter followed by two long processes that surpass its height, on the pupa.

Phyllocnistis wygodzinskyi Hering, 1958
(Figs.: 2Q, 4, S1-2)
(Tab. 3)

Phyllocnistis wygodzinskyi Hering, 1958. **Acta Zool. Lilloana 15**, 309-311, figs. 13, 14A, 15-16.- Davis & Miller, 1984. **Checklist: Part 1**, p. 27, *in* Heppner (Ed.). **Atlas Neotrop. Lep**.- Brito *et al*., 2016. **Rev. Bras. Entomol**. **60**, tabs. S1, S2.- De Prins *et al*., 2016. **Zootaxa 4158**, 38.

TYPE MATERIAL. *Phyllocnistis wygodzinskyi* Hering, 1958 description was based on four specimens from Tucumán, Argentina. The male holotype (Fig. 2Q), illustrated by author, is deposited with the allotype and one paratype at ZMHB with the following labels (separated by forward slash symbols, Fig. S1): / Holotypus / Mine an Composit / IM R Her. 13 / Tafí del Valle Tucumán 21/23.V.1953 Wygodzinsky / *Phyllocnistis wygodzinskyi* Hering ♂ Holotype /. The dissected genitalia, slide mounted in glycerin, containing the same information previously mentioned, is found with the labels. The female allotype has the following labels: / Allotypus / Mine an Composit. / IM R. Her. 13 / Tafí del Valle Tucumán 21/23.V.1953 Wygodzinsky / *Phyllocnistis wygodzinskyi* Hering ♀ Allotype /. Corresponding female genitalia is dissected in glycerin, with the same information. The paratype with no sex identified has the following labels: / Paratypus / Mine an Composit. / IM R. Her. 13 / Tafí del Valle Tucumán 21/23.V.1953 Wygodzinsky / *Phyllocnistis wygodzinskyi* Hering Paratype /. The other paratype with no sex identified is deposited at MCN with the following labels: / Paratypus / Mine an Composit. / IM R. Her. 13 / Tafí del Valle Tucumán 21/23.V.1953 Wygodzinsky / *Phyllocnistis wygodzinskyi* Hering, Paratype / PARATIPO / TLEP044 /.

FOREWING LENGTH. 4.35 mm (n = 4).

DIAGNOSIS (Figs. 2Q, S2; Tab. 3). *Dorsal forewing*: ground color silvery. **lf** curved, with thick dark brown borders, emerging from the proximal region near the costal margin, being widening and then narrowing progressively towards the median region of the wing; in the first section its scales are most yellowish, changing into dark brown on this distal section. A large dark brown blotch attached to the inner border on the middle section of **lf**. **tf_1** inclined to apex, yellowish, with thin dark brown borders, restricted to costal portion of the wing and connected to **lf**. **tf_2** with same coloration as **tf_1**, crossing the wing entirely, and having borders slightly displaced and narrow at their central portion. **tf_3** short,

restricted to costal section. **tf4** crossing enterily the wing; a narrow, light gray band separate it from **as**. Costal and apical strigulae typical of the genus. Inner marginal fringe with yellowish base, central region dark brown and apex light gray. This species is similar to *P. baccharidis*, *P. bourquini* and *P. sexangula*, for sharing the four distinct transversal fasciae. However, *P. wygodzinskyi* diverges from the first two by presenting a large conspicuous dark brown blotch attached to **lf** in the inner section of region I. It diverges from *P. sexangula* by the absence of the blackened blotch in the **tf4**.

GEOGRAPHICAL DISTRIBUTION (Fig. 4). The specimens have distribution records for Quebrada del Mastil, Tafí del Valle, Tucumán province, Argentina, 2200 m.

NATURAL HISTORY. According to the author of this species, up to four mines can be found per leaf. Mines are epidermal, serpentine in shape and followed by a liquid trace of feces. The cocoon is constructed at the final portion of the mine, at the central region of the leaf, where it provokes a leaf wrinkling; presents a white silver coloration that varies to a rusty brown according to development.

HOST PLANT(S). Larvae were found feeding on an unidentified Asteraceae species.

EXAMINED MATERIAL. Holotype, allotype and 2 paratypes.

REMARKS. After Hering (1958) description, there was no other record for the species; therefore, information regarding the immature stages morphology and other aspects related to life history do not exist. Due to the scarce number of specimens available, no additional genitalia were dissected for this review.

Phyllocnistis sp. 1

(Figs.: 2R, 4, S1-2)

(Tab. 3)

Phyllocnistis sp. 1 *in* Brito *et al*., 2017. **Austral Entomol.** figs. 1A,D, 2A-C, 3A-E, 4A-I, 5A-I, 6A-H, 7A-H, 18.

TYPE MATERIAL. Description of *Phyllocnistis* sp. 1 was based on five specimens from Montenegro, Rio Grande do Sul (RS), Brazil. The male holotype (Fig. 2R) is deposited at DZUP and has the following labels (separated by forward slash symbols, Fig. S1): / 297-65 Brasil, RS. Montenegro 26.V.2015 Moreira et al. ♂ / DZ 33.343 /. Along with the

labels the holotype genitalia is found, mounted in Canada balsam (GRPM 50-115). According to the original description, the paratypes are as follows: one male (LMCI 297.66) with genitalia on slide (GRPM 50-116) and one female (LMCI 297.26), both deposited at DZUP (33.353, 33.363, respectively); the others, one male (LMCI 297-67) with genitalia on slide (GRPM 50-117) and one female (LMCI 297-28) are deposited at MCTP (MCTP 57.616 and 57.617, respectively).

FOREWING LENGTH. 2.65 (n=2).

DIAGNOSIS (Figs. 2R, S2; Tab. 3). *Dorsal forewing*: ground color light gray. **lf** light orange with dark gray borders, emerging on the base of the costal margin and follows diagonally towards the median region, partially connecting to **tf$_1$** (II). Transverse fasciae with the same coloration: **tf$_1$** short, reaching the distal limit of **lf**; **tf$_2$** completely separated from **tf$_1$**, crossing entirely the wing, and having the central region broken by grayish scales. A light orange blotch on the distal region of the wing (III), formed by fusion of **tf$_3$** + **tf$_4$**. A light gray stripe precedes the **as**. Costal and apical strigulae typical of the genus. Inner marginal fringes with orange base, central region dark brown and apex light gray. There are similarities of this species with *P. baccharidis* and *P. bourquini*; however, *P.* sp.1 can be distinguished from such species by the large orange blotch on the distal region of the wing formed by fusion **tf$_3$** + **tf$_4$** that is absent on them.

GEOGRAPHICAL DISTRIBUTION (Fig. 4). Restricted to the type locality, where specimens are found at low elevation (18 m), at the limit of the transition between the Atlantic Forest and Pampa biomes.

NATURAL HISTORY. *P.* sp. 1 mines are found on the adaxial leaf surface, are serpentine shaped and raising in size along ontogenesis. Larvae has three initial sap-feeding instars that feed on the suction of sap through the dilacerations of tissue and a final spinning instar which does not feed and is responsible the construction of the cocoon. The pupal cocoon is covered in silk and it provokes a leaf wrinkling of the leaf, at the final portion of the mine. When emerging, the pupal cocoon is ruptured by the cocoon-cutter and the exuvium is abandoned by the adult, being projected to the outer side of the cocoon. According to Santos *et al*. (2009), this species has a greater density during winter and spring.

HOST PLANT(S). *Baccharis anomala* DC (Asteraceae).

EXAMINED MATERIAL. Holotype and paratype female. BRAZIL: *Rio Grande do Sul* – **Montenegro**, 18 m, 27.V.2015, G.R.P. Moreira, R. Brito, C.M. Pereira & G.T. Silva *legs*., 1 male (DZ 33.343), 1 female (DZ 33.363) (DZUP).

REMARKS. The immature stages and the adults were illustrated and figured by authors at the original description and aspects regarding biology were provided. According to the authors, the pupal morphology has unique characteristics that are capable of distinguish them from the other *Phyllocnistis* Neotropical from which these structure are known, such as the tergal spine arrangements on the abdomen, which from the third to the seventh abdominal segments are followed by a strong pair of spines facing towards the lateral region of the body.

***Phyllocnistis* sp. 2**

(Figs.: 2S, 4, S1-2)

(Tab. 3)

Phyllocnistis sp. 2 *in* Brito *et al*., 2017. **Austral Entomol.** figs. 1B,E, 2D-F, 8A-E, 9A-F, 10A-F, 11A-H, 12A-H, 18.

TYPE MATERIAL. Description of *Phyllocnistis* sp. 2 was based on five specimens, from the Centro de Pesquisas e Conservação da Natureza Pró-Mata (CPCN Pró-Mata), São Francisco de Paula, Rio Grande do Sul (RS), Brazil. The male holotype (Fig. 2S) is deposited at DZUP and has the following labels (separated by forward slash symbols, Fig. S1): / 306-54 Brasil, RS PROMATA 22_24.06.2016 G.R.P. Moreira et al. ♂ / DZ 33.373 /. The holotype genitalia is dissected in Canada balsam (GRPM 50-118). According to the original description, the paratypes are as follows: one male (LMCI 306-55) with genitalia on slide (GRPM 50-119) and one female (LMCI 200-14) are deposited at DZUP (33.383, 33.393, respectively); the others, one male (LMCI 263-24) and one female (LMCI 306-56) with genitalia on slide (GRPM 50-120), are deposited at MCTP (57.618 and 57.619, respectively).

FOREWING LENGTH. 2.78 (n=2).

DIAGNOSIS (Figs. 2S, S2; Tab. 3). *Dorsal forewing*: ground color gray, with bright ochre fasciae bordered with dark brown. **lf** slightly convex, emerging at basis of costal margin and running to the median region of the wing (II), fusing with the costal section of **tf_1**.

This has a second, separated section located at the inner margin and that projects basaly. **tf_2** with diffuse borders, crossing entirely the wing; its inner section joins the **tf_3 +tf_4**, forming a large, diffuse, bright ocher blotch that precedes **as** on the distal region of the wing (III). Strigulae are typical for the genus. *Phyllocnistis* sp. 2 differs from other species reviewed herein by the isolation and atypical shape of second section of **tf_1**, and by slight fusion of **tf_2** + **tf_3** + **tf_4**.

GEOGRAPHICAL DISTRIBUTION (Fig. 4). Registered for type locality at 900 m of altitude.

NATURAL HISTORY. According to the authors, mines are found solely on the adaxial leaf surface. They are thin, serpentine shaped and followed by a trace of black feces. There is no pattern for an oviposition site, the larvae begins the mine construction on any leaf portion. From all leaves examined, only one specimen was found feeding per leaf. The larval stage presents three sap-feeding instars, followed by the last, spinning instar. The cocoon is covered with silk, and has an oval shape and whitish color. *Phyllocnistis* sp. 2 specimens possibly present multivoltine life-cycles, larvae being found feeding in the field during March, April, June and December.

HOST PLANT(S). *Begonia fruticosa* (Klotzsch) A.DC (Begoniaceae).

EXAMINED MATERIAL. Holotype and one paratype male. BRAZIL: *Rio Grande do Sul* – **São Francisco de Paula** (Centro de Pesquisas e Conservação da Natureza – Pró-mata), 900 m, 21-24.VI.2016, G.R.P. Moreira, R. Brito & J. Fochezato *legs*., 1 male (DZ 33.373) (DZUP); 04-06.IV.2014, G.R.P. Moreira & R. Brito *legs*., 1 male (MCTP 57.618) (MCTP).

REMARKS. On the original description, immature stages and adults were illustrated and described, and information about life cycle was also provided. The authors highlight some additional diagnostic characters to distinguish it from other Neotropical *Phyllocnistis* species, such as the acute cocoon-cutter and a group of small tergal spines followed by a pair of lateral setae from the second to seventh abdominal segment. On female genitalia, the authors highlight as unique a pair of signa located at the extremities of the corpus bursae.

***Phyllocnistis* sp. 3**

(Figs.: 2T, 4, S1-2)

(Tab. 3)

Phyllocnistis sp. 3 *in* Brito *et al*., 2017. **Austral Entomol.** figs. 1C,F, 2G-I, 13A-E, 14A-F, 15A-F, 16A-H, 17A-H, 18.

TYPE MATERIAL. Description of *Phyllocnistis* sp. 3 was based on five specimens from the Centro de Pesquisas e Conservação da Natureza Pró-Mata (CPCN Pró-Mata) São Francisco de Paula, Rio Grande do Sul (RS), Brazil. The male holotype (Fig. 2T) is deposited at DZUP and has the following labels (separated by forward slash symbols, Fig. S1): / 236-22 Brasil, RS Promata 07.03.2014 GRPMoreira&RBrito ♂ / DZ 33.403 /. The holotype genitalia is slide-mounted in Canada balsam (GRPM 50-121). According to the original description, the paratypes are as follows: one male (LMCI 263-18) with genitalia on slide (GRPM 50-122) and one female (LMCI 210-34), deposited at DZUP (33.413, 33.423, respectively); another male (LMCI 263-26) with genitalia on slide (GRPM 50-123) and one female (LMCI 263-28) are deposited at MCTP (57.620 and 57.621, respectively).

FOREWING LENGTH. 2.15 mm (n=2).

DIAGNOSIS (Figs. 2T, S2; Tab. 3). *Dorsal forewing*: ground color light gray. **lf** thin, light brown, without borders, emerging from the basis of costal margin and running straight to center, connecting to fused **tf_1-tf_2**. Transversal fasciae light yellow with light brown borders. **tf_1** short, restricted to costal section. **tf_2** crossing entirely the wing, merged with **tf_1**. At distal region (III), a light yellow blotch formed by fusion of **tf_3** + **tf_4**. At the center of this blotch there is another small black blotch. **As** preceded by a light gray stripe. Costal and apical strigulae typical. The shape of **lf**, in association with pattern of corresponding fusion with **tf_1+tf_2** are unique for this species, when compared to other Neotropical *Phyllocnistis*.

GEOGRAPHICAL DISTRIBUTION (Fig. 4). Records are restricted to type locality at 900 m of altitude.

NATURAL HISTORY. According to the original description, mines are transparent, serpentine shaped and usually followed by a brown trace of feces. Initially they thin, increasing in width along larval ontogenesis, and corresponding paths may cross each other forming blotches. The mines are found on the abaxial and adaxial leaf surfaces. The egg is deposited next to the petiole, and usually only one larva feeds per leaf. The cocoon

is covered with silk, being constructed at the border of the leaf, provoking a leaf wrinkling. Larvae were found on field, in the months of March and April, suggesting that this species is active as leaf-mining during later summer and early autumn.

HOST PLANT(S). *Drimys angustifolia* Miers (Winteraceae).

EXAMINED MATERIAL. Holotype and 1 specimen, with no sex identified. BRAZIL: *Rio Grande do Sul* – **São Francisco de Paula** (Centro de Pesquisas e Conservação da Natureza – Pró-mata), 900 m, 07.III.2014, G.R.P. Moreira & R. Brito *legs*., 1 male (DZ 33.403) (DZUP); 04-06.IV.2014, G.R.P. Moreira & R. Brito *legs*., 1 specimen (LMCI 263.21) (LMCI).

REMARKS. On the original description, additional diagnostic characters are provided for this species, such the absence of signum on the female genitalia, the acute, hook shaped cocoon-cutter and two pairs of strong tergal spines facing towards the lateral region of the body on the pupae abdominal segments.

***Phyllocnistis* sp. 4** Brito & Lopez-Vaamonde, **sp**. **nov**.
(Figs. 2U, 3G, 3J, 4, S1-2)
(Tab. 3)

DIAGNOSIS. *Phyllocnistis* sp. 4 is distinguished from other Neotropical *Phyllocnistis* by the following set of external characters: **lf** slightly convex, located along the costal margin, distally connected to **tf**$_1$; **tf**$_2$ c-shaped, separated from **tf**$_1$, crossing entirely the wing and slightly distincted from **tf**$_3$; presence of a blotch on the distal region formed by **tf**$_3$+**tf**$_4$ that is ornamented with a small black blotch on the center. This species is morphologically similar to *P. aurilinea*, *P.* sp. 5 and *P.* sp. 8. However, it differs from *P. aurilinea* by having **tf**$_1$ separated from **tf**$_2$; from *P.* sp. 5 by the crossing of **tf**$_2$ from the costal to the inner margin; and, can be distinguished from *P.* sp. 8 by the connection between the **lf** and **tf**$_1$.

DESCRIPTION. Adults (Figs. 2U, S2; Tab. 3). Forewing length: 1.73 mm (n=1). *Head*: covered with light gray scales; antennae with same coloration, surpassing the length of wings. *Thorax:* forewing ground color light gray. **lf** yellowish, with dark brown borders, running on the costal margin from the basis of the wing to median (II) region, where it is connected with the **tf**$_1$. The latter is thin, dark brown and short, almost restricted to costal

margin. **tf2** c-shaped, similar in color, separated from **tf1**, but, partially connect to **tf3**, crossing enterily the wing. **tf3** and **tf4** fused, forming a golden yellow blotch on the distal region (III); a small black blotch is found at the center. Costal strigula **a** emerges from the basis of **tf2** and the other two (**b**, **c**) from the distal blotch. The apical strigulae (**d** - **g**) emerge all from **as**. Inner marginal fringes vary from golden yellow to dark brown. Hindwings light gray, reduced, with long light gray fringes. *Abdomen*: covered with light gray scales. *Male genitalia*: unknown. *Female genitalia*: Abdominal segment VII subrectangular, segment VIII reduced. Anterior and posterior apophyses similar in shape and size, both reaching the median region of the VIII abdominal segment; apophysis types with ~0.5 x the length of anal papillae. These are covered with setae of different sizes, most arranged along the distal margin (Fig. 3G). Ductus bursae membranous and slender. Anterior limit of corpus bursae reaching V abdominal segments; the bursa is wide and contains one pair of separated signa, of similar in size, with membranous base and spine-shaped (Fig. 3J).

GEOGRAPHICAL DISTRIBUTION (Fig. 4). The specimen of *P*. sp. 4 is known only from Nouragues Natural Reserve, French Guiana.

NATURAL HISTORY. The only adult found of this species was collected at light by the species co-author.

HOST PLANT(S). Unknown.

TYPE MATERIAL. French Guiana: Nouragues Natural Reserve, 4°2'16.8" N 52°40'22.8" W, 57 m altitude. Preserved dried and pinned. C. Lopez-Vaamonde *leg*., 05.IX.2010. HOLOTYPE: ♀ (Sample ID: CLV1381; Process ID: LNOUC318-10), with genitalia on slide (GRPM 50-140), deposited at MNHN. BIN registry for BOLD: AAV4618.

***Phyllocnistis* sp. 5** Brito & Lopez-Vaamonde, **sp**. **nov**.
(Figs. 2V, 3F, 3K, 4, S1-2)
(Tab. 3)

DIAGNOSIS. The set of characteristics found on the forewings of *P.* sp. 5 are distinct from the other species reviewed in this work. The **tf2** is short, little distinct from the dark gray ground color, separated from **tf1** and partially connected to the **tf3**; the latter forms a non-ornamented blotch with **tf4** on the distal region of the wing. This species is similar to *P.*

sp. 4, from which is promptly distinguished by the forewing ground color, and absence of secondary dark blotch on fused **tf_3-tf_4**.

DESCRIPTION. Adults (Figs. 2V, S2; Tab. 3). Forewing length: 1.78 mm (n=1). *Head*: covered with light gray scales. *Thorax:* forewing ground color dark gray. **lf** light yellow with dark brown borders, slightly convex, running at the costal margin from basis to median region (II). **tf_1** short, thin, dark brown and little distinct from background, emerging from the costal margin and connecting to distal portion of **lf**. **tf_2** short, almost restricted to costal margin, slightly distinct from ground color, completely separated from **tf_1** but partially connected to **tf_3+tf_4** that together form a dark orange blotch on the distal region (III). The costal strigula **a** emerges from **tf_2** and the other two (**b**, **c**) from distal blotch of the wing. The apical strigulae (**d - g**) are typical, emerging from the **as**. A great density of dark brown fringes is found at the inner margin of the wing. Hindwing reduced, with long light brown fringes. *Abdomen*: covered with dark brown scales. *Male genitalia*: unknown. *Female genitalia*: Abdominal segment VII subrectangular, VIII subtriangular and reduced. Apophyses similar in size and shape; the anterior ones reach the 1/3 of the VII abdominal segment and the posterior the VIII abdominal segment; having ~0.6 x the size of the anal papillae, which are covered with setae of different sizes mostly located on distal border (Fig. 3F). Ductus bursae thin, membranous and slender, connected to corpus bursae. This is wide, membranous and saculiform, located in between the V and VI abdominal segment. One pair of spniform signa, having base slightly sclerotized and half-moon-shaped, located on the corpus bursae (Fig. 3K).

GEOGRAPHICAL DISTRIBUTION (Fig. 4). Known only from the type locality, the Nouragues Natural Reserve, French Guiana.

NATURAL HISTORY. The only adult of this specie was collected at light by Dr. Atsushi Kawakita.

HOST PLANT(S). Unknown.

TYPE MATERIAL. French Guiana: Nouragues Natural Reserve, 4°2’16.8” N 52°40’22.8” W, 57 m altitude. Preserved dried and pinned. A. Kawakita *leg*., 05.IX.2010. HOLOTYPE: ♀ (Sample ID: AK0105; Process ID: GRANO105-11), with genitalia on slide (GRPM 50-141), deposited at MNHN. BIN registry for BOLD: AAW0506.

***Phyllocnistis* sp. 6** Brito & Lopez-Vaamonde, **sp**. **nov**.
(Figs. 2W, 3A, 4, S1-2)
(Tab. 3)

DIAGNOSIS. *Phyllocnistis* sp. 6 may be easily distinguished from other Neotropical *Phyllocnistis* by presenting the following set of characters: **lf** short, without clear marked borders; **tf$_2$** short and faded, almost restricted to costal margin; **tf$_3$** and **tf$_4$** distincted from each other, crossing entirely the wing; absence of **as**; presence of a small group of pale yellow scales, forming an additional, weakly defined blotch close to inner margin in region I. This species is similar to *P. meliacella*, from which in addition to the above listed differences differs by having an aedeagus with longer length.

DESCRIPTION. Adults (Figs. 2W, S2; Tab. 3). Forewing length: 2.02 mm (n=1). *Head*: covered with white silver scales; antennae with the same coloration, long and filiform. *Thorax*: forewing with ground color white silver and pale yellow fasciae. **lf** with no marked borders, emerging from the wing basis and running straight to median (II) region, ending close to **tf$_1$**. A small pale yellow blotch with no border is found on the inner margin, at the proximal region of the wing (I). The **tf$_1$** wide, c-shaped, and with darkened bordered, crossing entirely the wing; it bear on the inner margin of the distal border a small dark brown blotch. **tf$_2$** faded and short, almost restricted to the costal margin of middle (II) region. **tf$_3$** and **tf$_4$** distinct from each other, crossing entirely the wing in the distal (III) region**. As** absent. Costal strigulae (**a** - **c**) emerging from **tf$_2$** to **tf$_4$**, respectively; two additional strigulae emerge from the **tf$_3$** and **tf$_4$** at the inner margin. *Abdomen*: covered by white silver scales. *Male genitalia*: presence of one pair of coremata formed by long and flattened scales, located between the VIII and the IX abdominal segments, with ~1/2 length of valvae. Uncus absent. Tegumen membranous, wrinkled, slightly narrower on the basal region, not surpassing the length of valvae; one set of median size spines is found on the basal region of the tegumen. Saccus U-shaped, ~0.6 x the size of valvae. Valvae narrow and digitiform, with a small spine at the apex, surrounded by a set of small setae; along the valvae, median size spines are also found randomly arranged. Aedeagus long, ~1.5 x the length of valvae, cylindrical, membranous, wrinkled and with a slightly convex apex (Fig. 3A). *Female genitalia*: unknown.

GEOGRAPHICAL DISTRIBUTION (Fig. 4). *Phyllocnistis* sp. 6 is known only from Nouragues Natural Reserve, French Guiana.

NATURAL HISTORY. The only adult was collected at light, by the species co-author.

HOST PLANT(S). Unknown.

TYPE MATERIAL. French Guiana: Nouragues Natural Reserve, 4°2'16.8" N 52°40'22.8" W, 57 m altitude. Preserved dried and pinned. C. Lopez Vaamonde *leg*., 05.IX.2010. HOLOTYPE: ♂ (Sample ID: CLV1367; Process ID: LNOUC304-10), with genitalia on slide (GRPM 50-142), deposited at MNHN. BIN registry for BOLD: AAV4629.

***Phyllocnistis* sp. 7** Brito & Moreira, **sp**. **nov**.
(Figs. 2X, 3B, 4, S1-2)
(Tab. 3)

DIAGNOSIS. *Phyllocnistis* sp. 7 adult is easily distinguished from other Neotropical *Phyllocnistis* by the conjunction of the following characteristics: **tf_1** faded and short, slightly touching **lf**; **tf_2** interrupted at the central region by grayish scales; **tf_3** and **tf_4** fused forming a large yellow blotch on the distal region that is separated by a narrow light gray band from **as**.

DESCRIPTION. Adults (Figs. 2X, S2; Tab. 3). Forewing length: 2.29 mm (n=3). *Head*: covered with light gray scales, as the antennae that are longer than forewing in length. Labial palpus ~0.2 mm in length, covered with grayish scales. Proboscis short. *Thorax*: forewing with ground color light gray. **lf** formed by light yellow scales and light brown borders, emerging on the proximal region of the wing at the costal margin. **tf_1** short and faded, almost restricted to costal margin. **tf_2** c-shaped, with same coloration as **lf**, crossing the wing (region II), being interrupted by grayish scales and weakly defined in the center. A blotch with same coloration as other fasciae is formed by fusion of **tf_3** with **tf_4** (region III). A narrow band of light gray scales precedes **as**. Presence of three dark costal strigulae (**a** - **c**), the first emerging from the **tf_2** and the others from the blotch formed by the **tf_3** + **tf_4**. Apical strigulae (**d** - **g**) emerging from **as**. Inner margin fringes with yellow scales at the base, changing to dark brown towards the apex. Hindwings reduced, with long and light gray fringes. *Abdomen*: covered with light gray scales. *Male genitalia*: one pair of slightly flattened coremata, each one located laterally between membranes of VIII – IX abdominal segments, with ~2/3 the length of valvae. Uncus absent. Tegumen with membranous base, narrow at the central region and widening next to the apex, where it is

weakly sclerotized, slightly surpassing the valvae in height; a group of median size setae is found at the base of tegumen. Saccus U-shaped, well developed and ~0.5 x the length of valvae. These are digitiform, slightly narrow at the central region, widening towards the apex, and narrowing once more distally; scattered setae are found along the valvae. Aedeagus ~1.5 x the length of valvae, cylindrical, membranous and partially wrinkled at the base. Cornuti absent (Fig. 3B). *Female genitália*: unknown.

GEOGRAPHICAL DISTRIBUTION (Fig. 4). *Phyllocnistis* sp. 7 is known only for the type locality in Planaltina, Federal District (Brasília), Brazil.

NATURAL HISTORY. Specimens were collected during the day time by using an entomological net (V. O. Becker, Instituto Uiraçu, personnal communication).

HOST PLANT(S). Unknown.

TYPE MATERIAL. Brazil: Planaltina, Federal District, Brasília, 15º35' S, 47º42' W, 1000 m altitude, Brazil. All preserved dried and pinned. V. O. Becker *leg*., 5.VI.1984 (228-52); 26.VI.1984 (228-53); 15.VIII.1985 (228-54). HOLOTYPE: ♂ (LMCI 228-53), with genitalia on slide (GRPM 50-130), deposited at VOB (56.488). PARATYPES: 2♂♂ (LMCI 228-52 and 54), with genitalia on slide (GRPM 50-131 and 132, respectively), deposited at VOB (56.439 and 57.752, respectively).

***Phyllocnistis* sp. 8** Brito & Moreira, **sp**. **nov**.
(Figs. 2Y, 3C, 4, S1-2)
(Tab. 3)

DIAGNOSIS. *Phyllocnistis* sp. 8 differs from other species reviewed herein, by a conjunction of characters as follows; **lf** slightly convex, located entirely close to costal margin, and weakly connected to **tf$_1$**. The latter is v-shaped crossing entirely the wing. **tf$_2$** short and disconnected from other fasciae. The species herein described presents slight similarities in particular to *P.* sp. 4 and *P.* sp. 5, being differentiated from those by the **tf$_1$** which completely crosses the forewing in *P.* sp. 8, contrary to such species.

DESCRIPTION. Adults (Figs. 2Y, S2; Tab. 3). Forewing length: 2.27 mm (n=3). *Head*: covered with silver scales. Antennae long, filiform and dark gray, surpassing the length of wings. Labial palpus ~0.25 mm length, covered with light brown scales. *Thorax*:

forewing with ground color grayish. **lf** slightly convex, formed by yellowish scales and dark brown borders; emerging from the proximal region of the wing at the costal margin, and running towards the central region, where it is weakly connected to **tf_1** (region II). The latter is dark brown, v-shaped, crossing enterily the wing. **tf_2** short, almost restricted to costal margin, with the same coloration as **tf_1**. An orange brown blotch is found at the distal region of the wing, formed by fusion of **tf_3** and **tf_4**; on its center the presence of a small black blotch. A small stripe of grayish scales precedes **as**. The costal strigulae (**a** – **c**) emerge from the **tf_2** and from the blotch formed by **tf_3** + **tf_4**, respectively. Apical strigulae (**d** - **g**) emerging from **as**. Hindwings reduced, formed by light gray scales, with long fringes. *Abdomen*: covered with grayish scales. *Male genitalia*: one pair of lateral coremata formed by long scales, each one located laterally between membranes of VIII – IX abdominal segments, with ~1/2x the length of valvae. Uncus absent. Tegumen membranous; thin setae of median size are found from the base to the central region of the tegumen; apex slightly rounded surpassing the valvae height. Saccus rounded and U-shaped, ~0.6 x the length of valvae. The valvae are digitiform, with a few median size setae randomly arranged along the distal portion of the valvae; in addition to these setae, the presence of another group of setae next to the valvae base, facing towards the tegumen. Aedeagus cylindrical, widened and robust; membranous and wrinkled at the base; with length surpassing the size of valvae; cornutus absent (Fig. 3C). *Female genitalia*: unknown.

GEOGRAPHICAL DISTRIBUTION (Fig. 4). This species share the type locality with *P.* sp. 7*,* they are known from Planaltina, Federal District (Brasília), Brazil.

NATURAL HISTORY. *Phyllocnistis* sp. 8, specimens used for description were collected during the day time by using an entomological net (V. O. Becker, Instituto Uiraçu, personnal communication).

HOST PLANT(S). Unknown.

TYPE MATERIAL. Brazil: Planaltina, Federal District, Brasília, 15º35’ S, 47º42’ W, 1000 m altitude, Brazil. All preserved dried and pinned. V. O. Becker *leg*., 3.IV.1984 (228-57); 3.V.1984 (228-56); 10.V.1984 (228-55). HOLOTYPE: ♂ (LMCI 228-57), with genitalia on slide (GRPM 50-133), deposited at VOB (56.315). PARATYPES: 2♂♂ (LMCI 228-55 and 56), with genitalia on slide (GRPM 50-134 and 135, respectively), deposited at VOB (56.370 and 56.370, respectively).

***Phyllocnistis* sp. 9** Brito & Becker, **sp**. **nov**.
(Figs. 2Z, 3D, 3E, 3I, 4, S1-2)
(Tab. 3)

DIAGNOSIS. *Phyllocnistis* sp. 9 is distinguished from other species herein reviewed by having **lf** deeply faded; **tf$_1$** located on the costal margin, emerging narrow at the base and progressively widening towards apex, where it weakly merges to the c-shaped, completely developed **tf$_2$**. As previously mentioned, this species is similar to *P. citrella* and *P.* sp. 10, being differentiated from these by the faded **lf**.

DESCRIPTION. Adults (Figs. 2Z, S2; Tab. 3). Forewing length: 2.25 mm (n=4). *Head*: with light gray scales, antennae with the same coloration, filiform, surpassing the forewing in length. Labial palpus with ~0.3 mm in length, covered with light gray scales. *Thorax*: forewing with ground color light gray. **lf** thin and faded, light browh, as a line that runs straight to middle wing (region II). **tf$_1$** pale yellow with darkened border, located on the costal margin, emerging narrow at the base and progressively widening towards apex; in the middle region (II), it turns to middle, connecting to **tf$_2$**. The latter is also pale yellow, being delimited distally by dark brow scales, slightly c-shaped, crossing entirely the wing. **tf$_3$** and **tf$_4$** completely merged, forming with the basal portion of inner fringes, a large pale yellow blotch on the distal region of the wing. A narrow light gray band precedes **as** (region III). From the **tf$_2$** the first costal strigula (**a**) irradiates, and the last two costal strigulae (**b** - **c**) emerge from the pale yellow distal blotch. From the **as** irradiates the apical strigulae (**d** – **g**), (III). Inner margin fringes with light gray distal apex. Hindwing reduced, with fringes long formed by light gray scales. *Abdomen*: light gray. *Male genitalia*: presence of one pair of coremata formed by a group of flattened scales with ~1/2 the length of valvae. Uncus absent. Tegumen membranous, slightly sclerotized towards the apex, strongly narrowed at the base, bearing several median size setae; the tegumen apex is rounded and wider than the base, slightly surpassing the height of valvae. Saccus similar to other *Phyllocnistis* species described herein, U-shaped, and ~0.6 x the length of valvae. The latter are narrow and digitiform, with small spine on the apex facing the tegumen; this spine is surrounded by a group of small setae; along the distal portion of the valvae, presence of median size setae randomly arranged. Aedeagus cylindrical and robust; weakly sclerotized and wrinkled at the base, and surpassing the length of valvae. Cornuti absent (Fig. 3D). *Female genitalia*: The VII abdominal segment is slightly rectangular and the VIII reduced. The anterior and posterior apophyses are

similar in size, with ~0.7 x the length of anal papillae; the anterior and posterior apophyses reach, respectively the VII and VIII abdominal segments. Anal papillae covered with setae of different sizes, randomly arranged most distally (Fig. 3E). Ductus bursae thin and slender. Corpus bursae membranous, elongated and saculiform. Presence of one pair of spine-shaped signa of different sizes (one half the size of the other), both located at the interior of the bursae (Fig. 3I).

GEOGRAPHICAL DISTRIBUTION (Fig. 4). Records are restricted to the type locality, from Planaltina, Federal District (Brasília), Brazil.

NATURAL HISTORY. Some of the adults examined herein were reared from field-collected mines, and two specimens were collected during day time by using an entomology net, by the species co-author. The larvae from *P.* sp. 9 builts a serpentine mine on the adaxial leaf surface of host plant. The cocoon is constructed at the final portion of the mine, causing a wrinkling leaf, typical from other Neotropical *Phyllocnistis*.

HOST PLANT(S). *Xylopia aromatica* (Lam.) Mart. (Annonaceae). The genus *Xilopia* L. has ca. 33 species recorded for Brazil, and from these, 15 are endemic. *X. aromatica* is a shrub, widely distributed between the Amazon and Cerrado biomes (Flora do Brasil 2016).

TYPE MATERIAL. Brazil: Planaltina, Federal District, Brasília, 15º35' S, 47º42' W, 1000 m altitude. All preserved dried and pinned. V.O. Becker *leg*., 6.VII.1978 (228-43); 5.X.1982 (228-48); 25.IV.1983 (228-49); 15.VII.1985 (228-51). HOLOTYPE: ♂ (LMCI 228-48), with genitalia on slide (GRPM 50-136), deposited at VOB (40.388). PARATYPES: 2♂♂ (LMCI 228-43 and 49), with genitalia on slide (GRPM 50-137 and 138, respectively), deposited at VOB (34.769 and 40.950, respectively), 1 ♀ (LMCI 228-51), with genitalia on slide (GRPM 50-139), deposited at VOB (57.703, respectively).

***Phyllocnistis* sp. 10** Brito & Lopez-Vaamonde, **sp**. **nov**.
(Figs. 2AA, 3H, 4, S1-2)
(Tab. 3)

DIAGNOSIS. This species may be easily distinguished from others reviewed in this work by the following set of characters: absence of **lf**; the weakly defined shape of **tf_1**, restricted to costal margin and fused to **tf_2**; and, a distinct **tf_2**, with distal border marked by light

brown scales, crossing the wing from costal to the inner margin. As previously mentioned, this species is similar to *P. citrella* and *P.* sp. 9, being differentiated from these by the absence of **lf**.

DESCRIPTION. Adults (Figs. 2AA, S2; Tab. 3). Forewing length: 1.75 mm (n=2). *Head*: covered with white silver scales. Antennae long and filiform. *Thorax*: forewing ground color white silver. **lf** absent. **tf_1** pale yellow, weakly defined regarding shape, restricted to costal margin and fused to **tf_2**. The latter with same coloration, c-shaped, presenting a well-marked distal border with light brown scales, crossing entirely the wing. The last two fasciae, **tf_3** and **tf_4**, form a blotch covered by scales of same coloration as the **tf_2** (III). A narrow, weakly defined, light gray band precedes **as**. Costal strigulae (**a** - **c**), emerge from the **tf_2** and from the blotch formed by the **tf_3** and **tf_4**. Other strigulae emerge from **as**. Basal portion of inner fringes pale yellow, with distal apex light gray. Hindwing reduced, formed by light gray scales and long fringes. *Abdomen*: covered with white silver scales. *Male genitalia*: unknown. *Female genitalia*: abdominal segment VII subrectangular and VIII reduced. Apophyses similar in shape: the anterior almost reaching the limit between the VI and VII abdominal segments and the posterior ones the limit between the VIII and VII abdominal segments; present ~0.5 x the size of anal papillae. The anal papillae are covered with setae of different sizes and randomly arranged at distal margin (Fig. 3H). Ductus bursae thin and membranous, connected to the corpus bursae; the latter is wide, thin and membranous, not sclerotized. Signum absent.

GEOGRAPHICAL DISTRIBUTION (Fig. 4). Known only from the type locality, Paracou CIRAD Research Station, Sinnamary, French Guiana.

NATURAL HISTORY. *Phyllocnistis* sp. 10 adults were reared from two fied-collected leaf mines (voucher number of host plant: P2015A/CLV086). The holotype herein described emerged on 20.XI.2015. The species co-author collected a third leaf mine (voucher number of host plant: P2015A-CLV43), on 13.VI.2015, in the same host plant with a dead larva inside which was dissected out of the mine and succesfully barcoded (process ID: LEPPC1389-15).

HOST PLANT(S). *Vismia guianensis* (Aubl.) Pers. (Hypericaceae). The vouchers of the host plant from which both specimens were reared was identified by the tropical botanist Pascal Petronelli (Kourou, Guyane) and were deposited at the herbarium of the University Paul Sabatier, Toulouse, France (P2015A/CLV086 & P2015A-CLV43). The genus is

constituted by small trees and shrubs, with 80% of its species concentrated in Central and South America. *V. guianensis* is known to occur in Colombia, Venezuela, Guyana, French Guiana and Brazil (Mourão & Beltrati 2001; Di Stasi & Hiruma-Lima 2002). Almeida-Cortez & Melo-de-Pinna (2006) described the anatomy of a leaf mine on *V. guianensis*, associated to a unidentied microlepidopterous larva in Brazil that could be cospecific to *P*. sp. 10 and thus should be further examined.

TYPE MATERIAL. French Guiana: Sinnamary, Paracou Research Station, 5°16'28.5" N 52°55'25.3" W, 30 m altitude. Preserved dried and pinned. C. Lopez-Vaamonde *leg*., 11.XI.2015. HOLOTYPE: ♀ (Sample ID: IO0535; Process ID: LEPPC2393-16), with genitalia on slide (GRPM 50-143), deposited at MNHN. PARATYPE: with no sex identified (Sample ID: IO0536; Process ID: LEPPC2394-16), deposited at MNHN. BIN registry for BOLD: ACY6760.

MOLECULAR ANALYSIS

In total, 28 DNA barcodes of specimens of Neotropical *Phyllocnistis* were analyzed in this study (Tab. 2). We obtained full barcodes (658 bp) for 18 samples, barcodes above 500 bp for nine samples and one sample with a 300 bp fragment. BOLD assigned 20 unique BINs to 27 samples. There was a perfect correspondence between BIN memberships and the eight species recognized by the morphological analysis (Fig. 5). There are clear barcode gaps in the Neotropical *Phyllocnistis* with a mean intraspecific divergence of 0.43% versus a nearest-neighbour (NN) distance averaging 15%. The lowest interspecific distance (7.6%) was observed between LNOUD489-11 and LNOUD776-12 (Tab. 4).

DISCUSSION

SPECIES DISCOVERY & DNA BARCODING

The vast majority of Neotropical *Phyllocnistis* species remain to be discovered and named. Our study has revealed seven new species of *Phyllocnistis* from French Guiana and Brazil. Davis & Wagner (2011) based on host plant data and leaf mine morphology estimated that only at La Selva Biological Station in Costa Rica there could be up to ~60 species of *Phyllocnistis*. Indeed many more new species of this genus remain

to be described in the neotropics (Brito *et al*. 2016). For instance, only one invasive species (*P. citrella*) has been recorded from French Guiana (CABI, 2012), but our barcode analysis identified 15 *Phyllocnistis* species for that country. Overall, the barcode analysis identified 21 lineages of wich only 8 have names (Fig. 5). The 13 unnamed lineages (11 from French Guiana) are most likely new species, but are represented by immature stages, so more material (ie. adults) is needed to describe them.

HOST RANGE IN NEOTROPICAL *PHYLLOCNISTIS*

Neotropical species of *Phyllocnistis* are known to feed on 15 different genera belonging to 13 different host plant families (Tab. S3). Neotropical *Phyllocnistis* show a high level of host specificity with most species restricted to feeding on a single host plant genus or a single species (Tab. S3). Exceptions are the highly invasive *P. citrella*, known to feed on several species of *Citrus* and *P. meliacella* which attacks two genera of Meliaceae. This is a very partial view of the true host plant range of *Phyllocnistis* in the neotropics with many new host plants, even at family level, still to be discovered.

MORPHOLOGICAL DIAGNOSES

Our taxonomic revision used the pattern of the fasciae on forewings as a main diagnostic character to classify species. Analyzing the fasciae of Neotropical species, was possible to identify four distinct groups (Fig. 1). From the 27 species included in *Phyllocnistis*, 20 present the **lf** connected, or partially connected to the **tf$_1$**, and 11 present additionally the **tf$_1$** connected to the **tf$_2$**. Morphological similarities may be found on the fasciae of some species, Brito *et al*. (2017) recently brought attention to the presence of grayish scales interrupting the **tf$_2$** found on *P.* sp. 1. In this review, such similarity was also found for *P. bourquini*, however, differences on the distal portion of the wing of these two species allows their separation. *P. drimiphaga* and *P. tropaeolicola*, species belonging to Costa Rica, share the presence of the **tf$_2$** v-shaped, and the authors of such species highlighted differences found on **lf**, on the signa shape of female genitalia, and on the pupal morphology, as diagnostic characters to separate these species (Kawahara *et al*. 2009). In contrast to most Lepidoptera, genitalia in *Phyllocnistis* is rather uniform. Male genitalia shows some small variability of the valvae apex and the aedeagus shape. In the female genitalia, the shape of the signa, when found on corpus bursae, seems reliable for the identification of species if used in conjunction with other characters. For instance, *P.* sp. 6 is morphologically similar to *P. meliacella* when fasciae are compared;

however, *P.* sp. 6 aedeagus is long surpassing the size of valvae whereas *P. meliacella's* aedeagus is short and curved (Becker 1974). Similarly *P. citrella*, *P.* sp. 9 and *P.* sp. 10, show a similar fasciae pattern, but show also, diferences at the female genitalia. *P. citrella* has one pair of wide signa, occupying a large space of the corpus bursae (Kim *et al*. 2015); *P.* sp. 9 has one pair of different size signa; and *P.* sp. 10 does not have signum.

In conclusion, by using characteristics of forewing pattern, particularly regarding their fasciae we were able in this inedit review to identify all extant species of Neotropical *Phyllocnistis*. But is important to mention that is unlike the use of such criteria will be enough to separate close related species while searching for the hidden diversity still to be discovered within this genus. Recent studies carried with other gracillariids in the neotropics (e.g. Brito *et al*. 2013, Pereira *et al*. 2016) suggest there many species complex within each genus, associated probably with host shifts, which should be also explored in this genus. Preliminary observations made by us suggest for example that there is a complex of unidentified *Phyllocnistis* species using plants of *Baccharis* in southern South America. In such cases, a detailed description of immature stages in association with the adult stage, and in conjunction with DNA sequences and data related to their life history, to be used within an integrative approach will be required. Thus, we hope that by setting the basis about taxonomy of the Neotropical *Phyllocnistis* our study will encourage further, intensive research on the genus not only in this biogeographic region but beyond.

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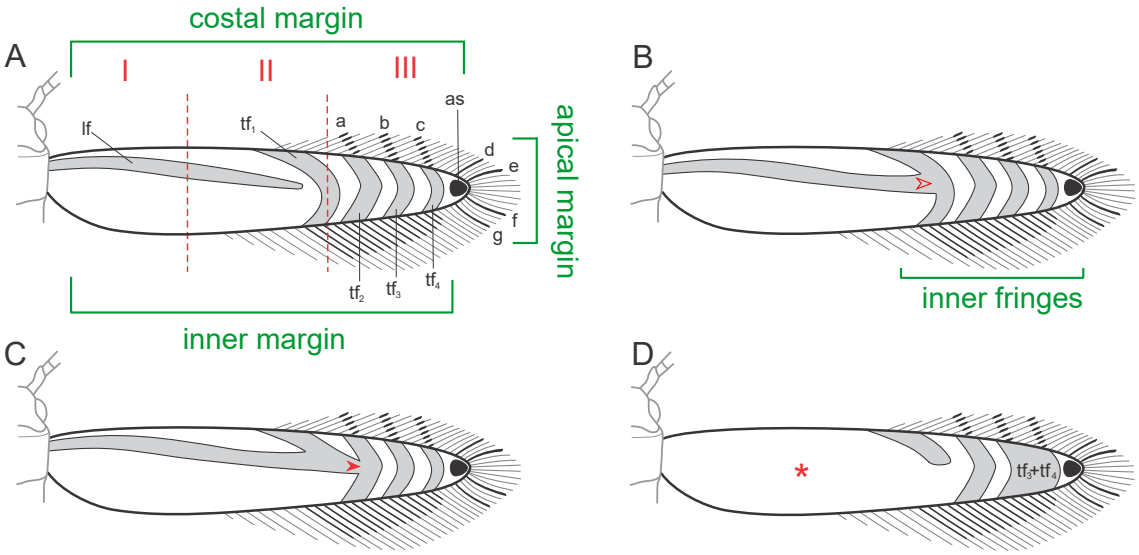

Fig. 1. Nomenclature adopted in this study for the characterization of forewing regions, fasciae and strigulae in Neotropical *Phyllocnistis*. Regions: I, proximal; II, median; III, distal. Fasciae: **lf**, longitudinal; **tf (1-4)**, transverses. Strigulae: **a - c**, costal; **d - g**, apical. **as**, apical spot. Corresponding differences in arrangement are schematically represented from A to D: (A**) lf** separated from **tf1**; (B**) lf** connected to **tf1** (indicated by open arrow); (C) **tf1** reduced to anterior marginal portion and mesally fused to **lf**, and both connected to **tf2** (indicated by closed arrow); (D) **lf** absent (indicated by asterisk), **tf1** reduced to anterior marginal portion, **tf3** and **tf4** fused (=**tf3+4**).

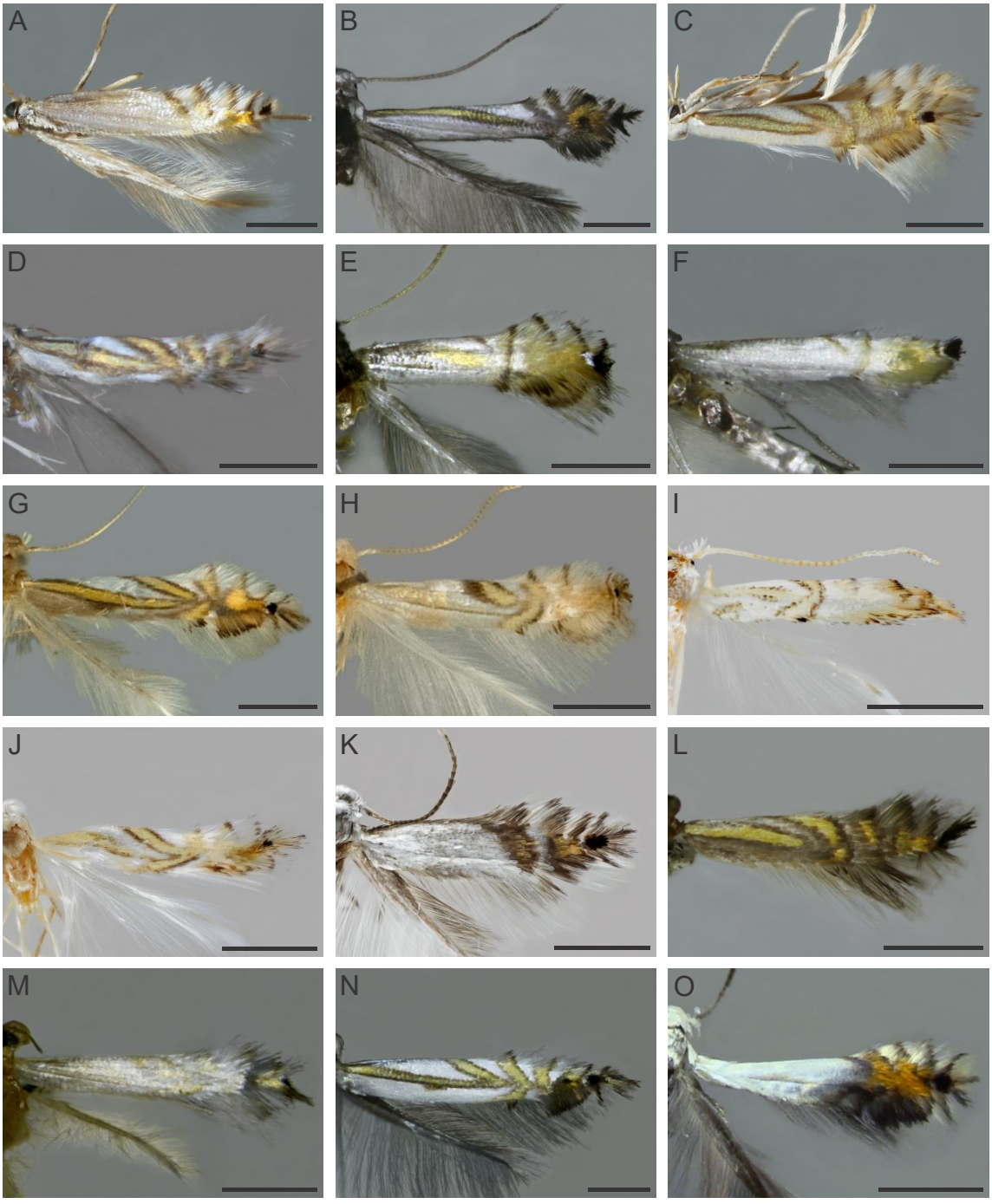
A
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Fig. 2. Forewings of Neotropical *Phyllocnistis*. (A) *P. abatiae* holotype (left forewing); (B) *P. aurilinea* lectotype (left); (C) *P. baccharidis* holotype (left); (D) *P. bourquini* holotype (right); (E) *P. citrella* lectotype (left); (F) *P. dorcas* holotype (right); (G) *P. drimiphaga* holotype (right); (H) *P. maxberryi* holotype (right); (I) *P. meliacella* holotype (right); (J) *P. perseafolia* holotype (left); (K) P. *puyehuensis* holotype (right); (L) *P. rotans* lectotype (right); (M) *P. sciophanta* holotype (left); (N) *P. sexangula* lectotype (left); (O) *P. tethys* specimen (right); (P) *P. tropaeolicola* holotype (right); (Q) *P. wygodzinskyi* holotype (left); (R) *P.* sp. 1 paratype (right); (S) *P.* sp. 2 paratype (left); (T) *P.* sp. 3 specimen (left); (U) *P.* sp. 4 holotype (right); (V) *P.* sp. 5 holotype (left); (W) *P.* sp. 6 holotype (right); (X) *P.* sp. 7 holotype (right); (Y) *P.* sp. 8 paratype (left); (Z) *P.* sp. 9 holotype (right); (AA) *P.* sp. 10 paratype (right). Scale bars: 1 (A-T), 0.5 (U-W), 1 (X), 0.5 mm (Y-AA).

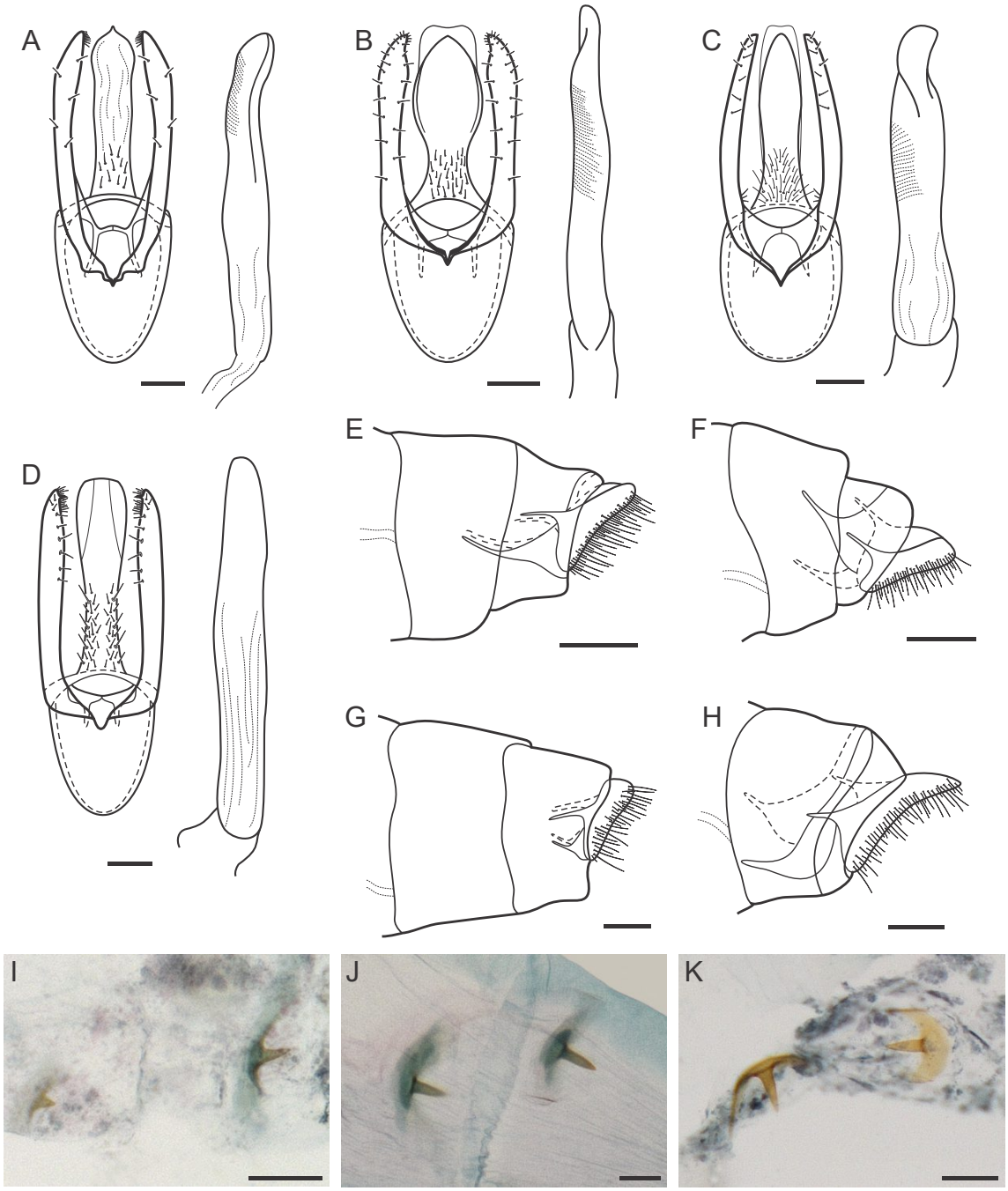

Fig. 3. Genital morphology of the new species of *Phyllocnistis*. (A) *P.* sp. 6; (B) *P.* sp. 7; (C) *P.* sp. 8; (D, E, I) *P.* sp. 9; (G, J) *P.* sp. 4; (F, K) *P.* sp. 5; (H) *P.* sp. 10. (A-D) male genitalia, ventral view; (E-H) female genitalia, lateral; (I-K) detail of female signa. Scale bars: 50 (A-D), 100 (E-H), 50 μm (I-K).

Fig. 4.Geographical distribution of *Phyllocnistis* species endemic to Neotropical region.

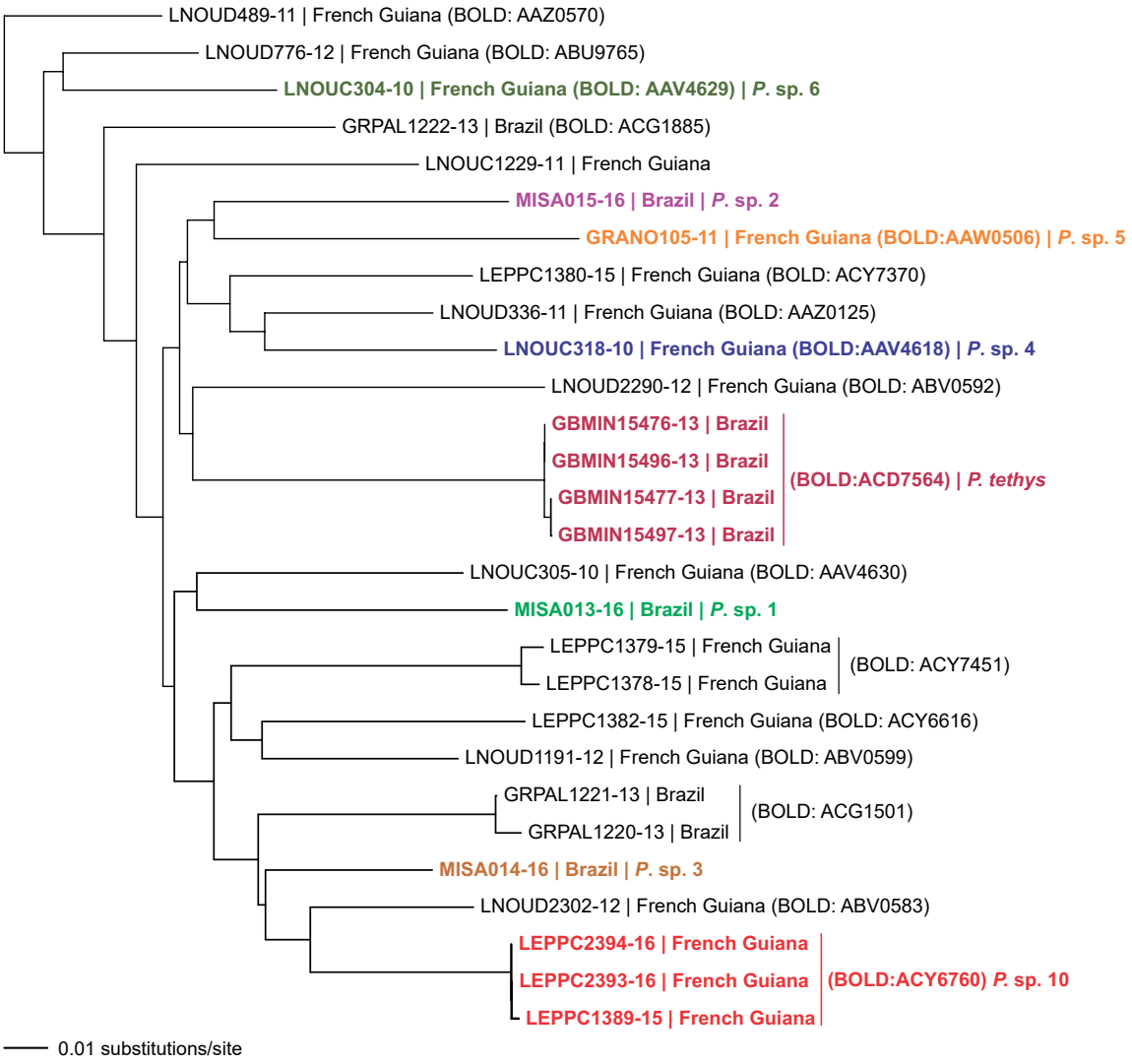

Fig. 5. A Neighbor-Joining tree, based on COI barcode fragment, generated under the K2P nucleotide substitution model, of the studied taxa. Each specimen is identified by its Process ID code (see Tab. 2). Branch lengths represent the number of substitutions per site. BIN numbers from BOLD system are given in parentheses for all clusters.

Table 1. Taxa included in *Phyllocnistis* that are distributed in the Neotropical region, according to De Prins *et al*. (2016) and Brito *et al*. (2017; submitted, indicated by asterisks).

	Taxa	**Distribution**
1	*P. abatiae* Hering, 1958	Argentina
2	*P. aurilinea* Zeller, 1877	Colombia
3	*P. baccharidis* Hering, 1958	Argentina
4	*P. bourquini* Pastrana, 1960	Argentina
5	*P. citrella* Stainton, 1856	Cosmopolitan
6	*P. dorcas* Meyrick, 1915	Guyana
7	*P. drimiphaga* Kawahara, Nishida & Davis, 2009	Costa Rica
8	*P. maxberryi* Kawahara, Nishida & Davis, 2009	Costa Rica
9	*P. meliacella* Becker, 1974	Costa Rica
10	*P. perseafolia* Davis & Wagner, 2011	Colômbia
11	*P. puyehuensis* Davis, 1994	Chile
12	*P. rotans* Meyrick, 1915	Ecuador
13	*P. sciophanta* Meyrick, 1915	Peru
14	*P. sexangula* Meyrick, 1915	Peru
15	*P. tethys* Moreira & Vargas, 2012	Brazil
16	*P. tropaeolicola* Kawahara, Nishida & Davis, 2009	Costa Rica
17	*P. wygodzinskyi* Hering, 1958	Argentina
18	*P.* sp. 1*	Brazil
19	*P.* sp. 2*	Brazil
20	*P.* sp. 3*	Brazil

Table 2. Specimens used for molecular analyses. Both "Sample ID" and "Process ID" codes are unique identifiers, linking record in BOLD database to voucher specimen from which each sequence is derived. Additional collection and specimen data are accessible in the BOLD and GenBank databases. Where pertinent, genitalia preparation number is given within square brackets in the "Sample ID" column.

Number	Sample ID	Process ID	Host plant	Country	GenBank accession COI	Reference
1	CLV3313	LNOUD489-11		French Guiana		Lees *et al*. 2014
2	CLV4347	LNOUD776-12		French Guiana		Lees *et al*. 2014
3	CLV1367 [GRPM 50-142]	LNOUC304-10		French Guiana		Lees *et al*. 2014
4	CLV5902	GRPAL1222-13		Brazil		Lees *et al*. 2014
5	AYK-FG10-135	LNOUC1229-11		French Guiana		Lees *et al*. 2014
6	LMCI 263-9	MISA015-16	*Begonia fruticosa*	Brazil	KY006929	Brito *et al*. 2017
7	AK0105 [GRPM 50-141]	GRANO105-11		French Guiana		Lees *et al*. 2014
8	LEAFMINE2015-0008	LEPPC1380-15	*Inga*	French Guiana		This paper
9	CLV2993	LNOUD336-11		French Guiana		Lees *et al*. 2014
10	CLV1381 [GRPM 50-140]	LNOUC318-10		French Guiana		Lees *et al*. 2014
11	AK0198	LNOUD2290-12		French Guiana		Lees *et al*. 2014
12	JX272051	GBMIN15476-13	*Passiflora organensis*	Brazil	JX272051	Brito *et al*. 2012
13	JX272052	GBMIN15496-13	*Passiflora organensis*	Brazil	JX272052	Brito *et al*. 2012
14	JX272049	GBMIN15477-13	*Passiflora organensis*	Brazil	JX272049	Brito *et al*. 2012
15	JX272050	GBMIN15497-13	*Passiflora organensis*	Brazil	JX272050	Brito *et al*. 2012
16	CLV1368	LNOUC305-10		French Guiana		Lees *et al*. 2014
17	LMCI 297-15B	MISA013-16	*Baccharis anomala*	Brazil	KY006927	Brito *et al*. 2017
18	LEAFMINE2015-0007	LEPPC1379-15	*Guatteria ouregou*	French Guiana		This paper
19	LEAFMINE2015-0006	LEPPC1378-15	*Guatteria ouregou*	French Guiana		This paper
20	LEAFMINE2015-0010	LEPPC1382-15	*Annona exsucca*	French Guiana		This paper
21	CLV1284	LNOUD1191-12		French Guiana		Lees *et al*. 2014
22	CLV5901	GRPAL1221-13	*Baccharis trimera*	Brazil		Lees *et al*. 2014
23	CLV5900	GRPAL1220-13	*Baccharis trimera*	Brazil		Lees *et al*. 2014
24	LMCI 263-22	MISA014-16	*Drimys angustifolia*	Brazil	KY006928	Brito *et al*. 2017
25	AK0210	LNOUD2302-12		French Guiana		Lees *et al*. 2014
26	IO0536	LEPPC2394-16	*Vismia guianensis*	French Guiana		This paper
27	IO0535 [GRPM 50-143]	LEPPC2393-16	*Vismia guianensis*	French Guiana		This paper
28	LEAFMINE2015-0017	LEPPC1389-15	*Vismia guianensis*	French Guiana		This paper

Table 3. Variation in shape, size and position of forewing color pattern among Neotropical *Phyllocnistis* species. Question mark indicates that character cannot be clearly seem in the specimens studied.

Number	Species	Fasciae					Strigulae		Apical spot (as)	Note
		Longitudinal (lf)	Transverse 1 (tf_1)	Transverse 2 (tf_2)	Transverse 3 (tf_3)	Transverse 4 (tf_4)	Costal (a - c)	Apical (d - g)		
1	*P. abatiae*	Absent	Present; short; reaching middle portion of the wing	Present; short; reaching middle portion of the wing	Present; merged to **tf_4**, forming a distal blotch	Present; merged to **tf_3**, forming a distal blotch	Present	?	Present	Distal portion of strigulae unclear in type material
2	*P. aurilinea*	Present; ; slightly convex; basal half portion lined with costal margin	Present; reaching middle portion of the wing and connected to **lf**	Present; v-shaped; crossing entirely the wing; merged to **tf_1** at inner margin	Present; merged to **tf_4**, forming a distal blotch	Present; merged to **tf_3**, forming a distal blotch	Present	Present	Present	A small spot within blotch formed by **tf_3-tf_4**
3	*P. baccharidis*	Present; middle portion a little wider	Present; c-shaped; crosses the wing reaching the inner margin	Present; short; partially connected to **tf_1**; little distinct from **tf_3**	Present; crossing entirely the wing	Present; crossing entirely the wing	Present	Present	Present	
4	*P. bourquini*	Present; middle portion little wider	Present; broad; connected to **lf**	Present; crosses entirely the wing; interrupted by light grayish scales on the middle portion	Present; crossing entirely the wing	Present; crossing entirely the wing	?	?	Present	Costal and distal portion of strigulae unclear in type material
5	*P. citrella*	Present; without clearly defined borders	Present; thin; reaching middle portion of the wing; and connected to **lf**	Present; narrow; crossing entirely the wing	Present; merged to **tf_4**, forming a distal blotch	Present; merged to **tf_3**, forming a distal blotch	Present	Present	Present	Distal portion of strigulae unclear on specimen examined
6	*P. dorcas*	Absent	Present; thin and faded; reaching middle portion of the wing	Present; narrow; crossing entirely the wing	Present; merged to **tf_4**, forming a distal blotch	Present; merged to **tf_3**, forming a distal blotch	?	?	Present	Strigulae unclear in type material

Number	Species	Fasciae					Strigulae		Apical spot (as)	Note
		Longitudinal (lf)	Transverse 1 (tf_1)	Transverse 2 (tf_2)	Transverse 3 (tf_3)	Transverse 4 (tf_4)	Costal (a - c)	Apical (d - g)		
7	*P. drimiphaga*	Present; distal portion slightly concave	Present; inclined towards apex; reaching middle portion of the wing; and connected to **lf**	Present; v-shaped; crossing entirely the wing; having a narrow central region	Present; merged to **tf_4**, forming a distal blotch	Present; merged to **tf_3**, forming a distal blotch	Present	Present	Present	**lf** with a small spot at the inner border
8	*P. maxberryi*	Present; faded	Present; oval; reaching middle portion of the wing; distally overlapping **lf**	Present; c-shaped; crossing entirely the wing	Present; merged to **tf_4**, forming a distal blotch	Present; merged to **tf_3**, forming a distal blotch	Present	?	Present; greatly reduced	Distal portion of strigulae unclear in type material
9	*P. meliacella*	Present; faded and short; restricted to region I	Present; c-shaped; crossing the wing entirely	Present; short	Absent	Absent	?	?	Absent	A blotch near the inner margin, within the region I; strigulae unclear in type material
10	*P. perseafolia*	Present; slightly convex; with distal half narrowing toward apex	Present; v-shaped; crossing the wing entirely	Present; short; fused with **tf_1** at middle portion of the wing	Present; merged to **tf_4**, forming a distal blotch	Present; merged to **tf_3**, forming a distal blotch	Present	Present	Present	
11	*P. puyehuensis*	Absent	Present; merged with **tf_2**; emerges at the basis of the costal margin of the wing	Present; crosses entirely the wing; fused to **tf_1**	Present; merged to **tf_4**, forming a distal blotch	Present; merged to **tf_3**, forming a distal blotch	Present	Present	Present	
12	*P. rotans*	Present, separated from other transversal fasciae	Present; c-shaped; crossing the wing entirely	Present; short; reaching the middle portion of the wing	Present; merged to **tf_4**, forming a distal blotch	Present; merged to **tf_3**, forming a distal blotch	Present	Present	Present	Distal portion of strigulae unclear on specimen examined

Number	Species	Fasciae					Strigulae		Apical spot (as)	Note
		Longitudinal (lf)	Transverse 1 (tf_1)	Transverse 2 (tf_2)	Transverse 3 (tf_3)	Transverse 4 (tf_4)	Costal (a - c)	Apical (d - g)		
13	*P. sciophanta*	?	?	?	?	?	?	?	Present	Tentative description regard fasciae and strigulae is provide in the text.
14	*P. sexangula*	Present; narrow	Present; inclined towards apex; reaching middle portion of the wing and connected to **lf**	Present; v-shaped; crossing the wing entirely	Present; short; reaching the middle portion of the wing	Present; crossing entirely the wing	Present	Present	Present	A small blotch close to inner border of the **lf**; a small spot on the center of **tf_4**
15	*P. tethys*	Absent	Present; fused (**tf_2-tf_4**), forming an orange blotch that covers the distal portion of the wing	Present; merged with **tf_1+tf_3+tf_4**	Present; merged with **tf_1+tf_2+tf_4**	Present; merged with **tf_1+tf_2+tf_3**	Present	Present	Present	
16	*P. tropaeolicola*	Present; narrow and elongated	Present; inclined toward apex; connected to **lf**	Present; v-shaped; crossing entirely the wing; narrow at central region	Present; merged to **tf_4**, forming a distal blotch	Present; merged to **tf_3**, forming a distal blotch	Present	Present	Present	A small spot at the center of blotch formed by **tf_3-tf_4**
17	*P. wygodzinskyi*	Present; curved; slightly wider in the basal portion and narrowing progressively towards the median region	Present; directed toward apex; reaching middle portion of the wing and connected to **lf**	Present; crossing entirely the wing; the central portion with unaligned borders	Present; short; reaching the middle portion of the wing	Present; crossing entirely the wing	Present	Present	Present	A large black blotch at the inner border of **lf**; distal portion of strigulae unclear on specimen examined

Number	Species	Fasciae					Strigulae		Apical spot (as)	Note
		Longitudinal (lf)	Transverse 1 (tf_1)	Transverse 2 (tf_2)	Transverse 3 (tf_3)	Transverse 4 (tf_4)	Costal (a - c)	Apical (d - g)		
18	*P.* sp. 1	Present	Present; short; reaching middle portion of the wing and partially connected to **lf**	Present; crossing entirely the wing and having a broken central portion	Present; merged to **tf_4**, forming a distal blotch	Present; merged to **tf_3**, forming a distal blotch	Present	Present	Present	
19	*P.* sp. 2	Present; slightly convex; fusing with the costal section of **tf_1**	Present; costal half fused distally with **lf**; inner half projecting basally	Present; crossing entirely the wing; slightly separated from **tf_1** at the inner margin	Present; merged to **tf_2** and **tf_4**, forming a distal blotch	Present; merged to **tf_2+tf_3**, forming a distal blotch	Present	Present	Present	
20	*P.* sp. 3	Present; thin and faded	Present; short; restricted to costal section and merged with **tf_2**	Present; crossing entirely the wing	Present; merged to **tf_4**, forming a distal blotch	Present; merged to **tf_3**, forming a distal blotch	Present	Present	Present	A small spot at the center of blotch formed by **tf_3-tf_4**
21	*P.* sp. 4	Present; slightly convex; entirely located close to the costal margin	Present; thin and short; connected to **lf**	Present; c-shaped; crossing entirely the wing; little distincted from **tf_3**	Present; merged to **tf_4**, forming a distal blotch	Present; merged to **tf_3**, forming a distal blotch	Present	Present	Present	A small spot at the center of blotch formed by **tf_3-tf_4**
22	*P.* sp. 5	Present; slightly convex; entirely located close to the costal margin	Present; short and a little distinct from ground color; it is connected to distal portion of the **lf**	Present; short; a little distinct from ground color and partially connected **tf_3**	Present; merged to **tf_4**, forming a distal blotch	Present; merged to **tf_3**, forming a distal blotch	Present	Present	Present	

Number	Species	Fasciae					Strigulae		Apical spot (as)	Note
		Longitudinal (lf)	Transverse 1 (tf_1)	Transverse 2 (tf_2)	Transverse 3 (tf_3)	Transverse 4 (tf_4)	Costal (a - c)	Apical (d - g)		
23	*P.* sp. 6	Present; faded and short; without marked boarders	Present; c-shaped; crossing the wing entirely	Present; short and faded; almost restricted to costal margin	Present; crossing entirely the wing	Present; crossing entirely the wing	Present	?	Absent	A faded blotch close to inner margin on region I; additional strigulae on the inner margin; distal portion of strigulae unclear in type material
24	*P.* sp. 7	Present	Present; short and faded; slightly reaching the distal portion of **lf**	Present; crossing entirely the wing, central portion weakly defined	Present; merged to **tf_4**, forming a distal blotch	Present; merged to **tf_3**, forming a distal blotch	Present	Present	Present	
25	*P.* sp. 8	Present; slightly convex; located entirely close to costal margin	Present; v-shaped; crossing entirely the wing	Present; short and weakly defined; reaching central portion of the wing	Present; merged to **tf_4**, forming a distal blotch	Present; merged to **tf_3**, forming a distal blotch	Present	Present	Present	A small spot at the center of blotch formed by **tf_3 - tf_4**
26	*P.* sp. 9	Present: thin and deeply faded	Present lined with costal margin; with distal half wider and convex	Present; slightly c-shaped; crossing entirely the wing; merged to **tf_1** at middle portion	Present; merged to **tf_4**, forming a distal blotch	Present; merged to **tf_3**, forming a distal blotch	Present	Present	Present	
27	*P.* sp. 10	Absent	Present; weakly defined; merged to **tf_2**	Present; c-shaped; crossing entirely the wing	Present; merged to **tf_4**, forming a distal blotch	Present; merged to **tf_3**, forming a distal blotch	Present	Present	Present	Distal portion of strigulae unclear on specimen examined

Table 4. Intra- and interspecific genetic divergences in DNA barcode sequences among Neotropical *Phyllocnistis* species. Kimura 2-parameter (K2P) distances (%) for barcode DNA sequences of the 21 analyzed species in the genus *Phyllocnistis*; minimal pairwise distances between species are given for each species pair; values in square brackets represent maximal intraspecific distances.

	1.	2.	3	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.
1. LNOUD489-11	-																				
2. LNOUD776-12	7.6	-																			
3. LNOUC304-10 *P.* sp. 6	10.5	8.1	-																		
4. GRPAL1222-13	11.2	9.9	12.8	-																	
5. LNOUC1229-11	13.3	10.9	14.6	12.8	-																
6. MISA015-16 *P.* sp. 2	15.7	15.3	18.2	14.1	14.8	-															
7. GRANO105-11 *P.* sp. 5	16.7	15.9	15.5	18.5	15.8	15.3	-														
8. LEPPC1380-15	14.1	12.3	14.7	12.1	15.0	14.3	15.3	-													
9. LNOUD336-11	13.3	10.1	13.7	11.9	14.9	13.5	14.3	9.5	-												
10. LNOUC318-10 *P.* sp. 4	14.8	13.3	13.9	14.2	16.1	16.0	15.1	12.6	9.2	-											
11. LNOUD2290-12	17.5	16.3	18.6	15.6	15.6	17.3	16.8	15.3	14.8	13.7	-										
12. GBMIN15476-13 *P. tethys*	15.5	16.5	17.7	16.1	15.3	14.9	18.8	15.2	15.5	15.9	16.4	[0.15]									
13. LNOUC305-10	13.9	12.8	13.9	14.0	12.8	16.0	17.7	14.9	13.3	14.0	17.1	14.7	-								
14. MISA013-16 *P.* sp. 1	16.5	14.7	17.3	13.2	17.2	13.8	16.7	15.6	14.7	16.2	16.5	16.4	13.3	-							
15. LEPPC1379-15	15.4	14.6	15.7	15.9	15.1	18.3	17.5	15.1	15.7	16.9	17.3	17.9	16.1	16.0	[0.91]						
16. LEPPC1382-15	14.6	14.4	14.8	14.2	15.9	16.0	18.1	14.9	13.1	15.0	17.7	17.1	16.1	18.9	12.6	-					
17. LNOUD1191-12	13.0	13.5	14.4	12.2	14.1	14.9	16.5	13.8	11.3	14.8	16.5	16.1	12.4	14.8	13.7	10.6	-				
18. GRPAL1220-13	15.0	13.9	15.0	15.6	15.5	16.0	18.6	15.1	14.6	15.6	17.9	17.5	13.5	15.5	14.8	14.1	13.2	[0.61]			
19. MISA014-16 *P.* sp. 3	12.2	12.2	14.7	13.2	13.6	14.3	16.8	14.3	12.2	13.1	14.1	14.3	13.0	12.4	13.5	12.4	10.5	10.0	-		
20. LNOUD2302-12	14.6	14.0	14.8	15.4	15.5	16.2	17.5	14.5	13.7	15.7	16.1	14.7	13.3	13.6	14.4	11.2	10.3	10.6	7.8	-	
21. LEPPC2393-16 *P.* sp. 10	14.5	14.2	15.6	15.0	17.1	17.0	17.7	15.9	13.1	15.9	16.7	17.7	15.2	15.7	14.2	12.2	10.5	11.9	10.4	8.4	[0.15]

Fig. S1. Labels of Neotropical *Phyllocnistis* types found in museums. (A) *P. abatiae*; (B) *P. aurilinea*; (C) *P. baccharidis*; (D) *P. bourquini*; (E) *P. citrella*; (F) *P. dorcas*; (G) P. *drimiphaga*; (H) *P. maxberryi*; (I) *P. meliacella*; (J) *P. perseafolia*; (K) *P. puyehuensis*; (L) *P. rotans*; (M) *P. sciophanta*; (N) *P. sexangula*; (O) *P. tethys*; (P) *P. tropaeolicola*; (Q) *P. wygodzinskyi*; (R) *P*. sp. 1; (S) *P*. sp. 2; (T) *P*. sp. 3; (U) *P*. sp. 4; (V) *P*. sp. 5; (W) *P*. sp. 6; (X) *P*. sp. 7; (Y) *P*. sp. 8; (Z) *P*. sp. 9; (AA) *P*. sp. 10.

Fig. S2. Spatial distribution of longitudinal (**lf**) and transversal fasciae (arabic numbers), and strigulae (letters) on Neotropical *Phyllocnistis* studied. Question marks indicate characters can not clearly be seen in the specimen examined. Arrows indicate additional characters also used for identification (see text and tab.3 for corresponding description).


P. tropaeolicola
P. wygodzinskyi
P. sp. 1
P. sp. 2
P. sp. 3
P. sp. 4
P. sp. 5
P. sp. 6
P. sp. 7
P. sp. 8
P. sp. 9
P. sp. 10

Table S1. Summarized data of *Phyllocnistis* species used in the study.

Number	Species	BIN	Host Plant	Country	Type locality	Collector	Depository*	Collection date	Number of adults examined
1	*P. abatiae*		*Abatia stellata*	Argentina	Tafí del Valle (Quebrada de la Angostura) - Tucumán	Wygodzinsky	ZMHB	26.II.1953	1
2	*P. aurilinea*		*Macleania rupestris*	Colombia	Bogotá - Cundinamarca	-	NHMUK	-	2
3	*P. baccharidis*		*Baccharis* sp.	Argentina	Choromoro (Quebrada de la Higuera) - Tucumán	Wygodzinsky	ZMHB	16-17.III.1953	5
4	*P. bourquini*		*Tessaria integrifolia*	Argentina	Tigre - Buenos Aires	Bourquin, F.	MACN	09.VIII.1957	2
5	*P. citrella*		*Citrus aurantifolia*, *C. reticulata*, *C. aurantium*, *C. grandis*, *C. paradisi*, *C. latifolia*, *C. sinensis*.	India Cosmopolitan*	Calcutta - West Bengal	Atkinson	NHMUK	1855	8
6	*P. dorcas*		-	British Guyana	Mallali - Upper Demerara-Berbice	Parish	NHMUK	13.III.XX	1
7	*P. drimiphaga*		*Drymis granadensis*	Costa Rica	Vara Blanca (6 km ENE) - Heredia	Nishida, K.	USNM	27.I.2004	1
8	*P. maxberryi*		*Gaiadendron punctatum*	Costa Rica	Villa Mills (Cerro de la Muerte) - San José	Nishida, K.	USNM	27.I.2004	1
9	*P. meliacella*		*Cedrela odorata*, *C. angustifolia*, *C. tonduzzi*, *Swietenia mahagoni*	Costa Rica	Turrialba - Cartago	Becker, V.O.	USNM	8.V.1973	1
10	*P. perseafolia*		*Persea americana*	Colombia	Villamaria - Caldas Departament	Posada, F.	USNM	IV.2008	1
11	*P. puyehuensis*		-	Chile	Osorno (Parque Nacional Puyehue, Aguas Calientes) - Los Lagos	Nielsen & Karsholt	ZMUC	12.XII.1981	1
12	*P. rotans*		-	Ecuador	Alausi - Chimborazo	Parish	NHMUK	14.VI.XX	5
13	*P. sciophanta*		-	Peru	Lima - Peru	Parish	NHMUK	14.VIII.XX	1
14	*P. sexangula*		-	Peru	Matucana - Lima	Parish	NHMUK	14.VII.XX	2
15	*P. tethys*	BOLD:ACD7564	*Passiflora organensis*	Brazil	São Francisco de Paula (CPCN) - Rio Grande do Sul	Moreira, G.R.P. *et al*.	DZUP	05-08.V.2011	2
16	*P. tropaeolicola*		*Tropaeolum emarginatum*	Costa Rica	Villa Mills (Cerro de la Muerte) - Cartago	Nishida, K.	USNM	13.III.2003	1
17	*P. wygodzinskyi*		*Sp*. Asteraceae	Argentina	Tafí del Valle (Quebrada del Mastil) - Tucumán	Wygodzinsky	ZMHB	21-23.V.1953	4

Number	Species	BIN	Host Plant	Country	Type locality	Collector	Depository*	Collection date	Number of adults examined
18	*P.* sp. 1	BOLD: MISA013-16	*Baccharis anomala*	Brazil	Montenegro - Rio Grande do Sul	Moreira, G.R.P., Brito, R., Pereira, C.M. & Silva, G.T.	DZUP	27.V.2015	2
19	*P.* sp. 2	BOLD/ MISA015-16	*Begonia fruticosa*	Brazil	São Francisco de Paula (CPCN) - Rio Grande do Sul	Moreira, G.R.P. & Brito, R.	DZUP	04-06.IV.2014	2
20	*P.* sp. 3	BOLD: MISA014-16	*Drimys angustifolia*	Brazil	São Francisco de Paula (CPCN) - Rio Grande do Sul	Moreira, G.R.P. & Brito, R.	DZUP	07.III.2014	2
21	*P.* sp. 4	BOL:AAV4618	-	French Guiana	Nouragues Natural Reserve	Lopez-Vaamonde, C.	MNHN	05.IX.2010	1
22	*P.* sp. 5	BOLD: AAW0506	-	French Guiana	Nouragues Natural Reserve	Kawakita, A.	MNHN	05.IX.2010	1
23	*P.* sp. 6	BOLD:AAV4629	-	French Guiana	Nouragues Natural Reserve	Lopez-Vaamonde, C.	MNHN	05.IX.2010	1
24	*P.* sp. 7		-	Brazil	Planaltina, Federal District (Brasília)	Becker, V.O.	VOB	26.VI.1984	3
25	*P.* sp. 8		-	Brazil	Planaltina, Federal District (Brasília)	Becker, V.O.	VOB	3.IV.1984	3
26	*P.* sp. 9		*Xylopia aromatica*	Brazil	Planaltina, Federal District (Brasília)	Becker, V.O.	VOB	5.X.1982	4
27	*P.* sp. 10	BOLD: ACY6760	*Vismia guianensis*	French Guiana	Paracou CIRAD Research Station	Ohshima, I., Lopez-Vaamonde, C., Lamarre, G. & Guiguet, A.	MNHN	11.XI.2015	2

***DZUP** Coleção Entomológica Padre Jesus Santiago Moure, Universidade Federal do Paraná. Curitiba, Brazil.
MACN Museo Argentino de Ciencias Naturales. Buenos Aires, Argentina.
MNHN Muséum National D'Histoire Naturelle de Paris. Paris, France.
NHMUK Natural History Museum. London, UK.
USNM United States National Museum, Smithsonian Institution. Washington DC, USA.
VOB Coll. Vitor O. Becker, Reserva Serra Bonita. Camacan, Brazil.
ZMHB Museum für Naturkunde. Berlin, Germany.
ZMUC Statens Naturhistoriske Museum. Copenhagen, Denmark.

Table S2. Specimens of *Phyllocnistis* that were examined morphologically but not DNA barcoded. When pertinent, genitalia slide numbers are provided.

Number	Species and genitalia slide number (within parentheses)	Type	Stage (P-pupa, L – larva, A – adult), number of studied specimens in parentheses and Specimen ID	Host Plant	Country	Type locality	Collector	Depository*	Collection date
1	*P. abatiae*	Holotype	A (1)	*Abatia stellata*	Argentina	Tafí del Valle (Quebrada de la Angostura) - Tucumán	Wygodzinsky	ZMHB	26.II.1953
2	*P. aurilinea*	Lectotype	A (1), BMNH (E) 1412371	*Macleania rupestris*	Colombia	Bogotá - Cundinamarca	-	NHMUK	-
3	*P. aurilinea*	Paralectotype	A (1), BMNH (E) 1412357	*Macleania rupestris*	Colombia	Bogotá - Cundinamarca	-	NHMUK	-
4	*P. baccharidis*	Holotype	A (1)	*Baccharis* sp.	Argentina	Choromoro (Quebrada de la Higuera) - Tucumán	Wygodzinsky	ZMHB	16-17.III.1953
5	*P. baccharidis*	Allotype	A (1)	*Baccharis* sp.	Argentina	Choromoro (Quebrada de la Higuera) - Tucumán	Wygodzinsky	ZMHB	16-17.III.1953
6	*P. baccharidis*	Paratype	A (1)	*Baccharis* sp.	Argentina	Choromoro (Quebrada de la Higuera) - Tucumán	Wygodzinsky	ZMHB	16-17.III.1953
7	*P. baccharidis*	Paratype	A (1)	*Baccharis* sp.	Argentina	Choromoro (Quebrada de la Higuera) - Tucumán	Wygodzinsky	ZMHB	16-17.III.1953
8	*P. baccharidis*		A (1), TLEP043	*Baccharis* sp.	Argentina	Choromoro (Quebrada de la Higuera) - Tucumán	Wygodzinsky	MCN	16-17.III.1953
9	*P. bourquini*	Holotype	A (1)	*Tessaria integrifolia*	Argentina	Tigre - Buenos Aires	Bourquin, F.	MACN	09.VIII.1957
10	*P. bourquini*	Allotype	A (1)	*Tessaria integrifolia*	Argentina	Tigre - Buenos Aires	Bourquin, F.	MACN	09.VIII.1957
11	*P. citrella*	Lectotype	A (1), BMNH(E) #1055796	*Citrus* sp.	India	Calcutta - West Bengal	Atkinson	NHMUK	1855
12	*P. citrella*	Paralectotype	A (1), BMNH(E) 1412443	*Citrus* sp.	India	Calcutta - West Bengal	Atkinson	NHMUK	1855

Number	Species and genitalia slide number (within parentheses)	Type	Stage (P-pupa, L – larva, A – adult), number of studied specimens in parentheses and Specimen ID	Host Plant	Country	Type locality	Collector	Depository*	Collection date
13	*P. citrella*		A (1), BMNH(E)1412413	*Citrus* sp.	Dominica	Woodford Hill (Agricultural Station) - Saint Andrew	-	NHMUK	7.I.1999
14	*P. citrella*		A (1), BMNH(E)1412405	*Citrus* sp.	Dominica	Woodford Hill (Agricultural Station) - Saint Andrew	-	NHMUK	7.I.1999
15	*P. citrella*		A (1), BMNH(E)1412406	*Citrus* sp.	Dominica	Woodford Hill (Agricultural Station) - Saint Andrew	-	NHMUK	7.I.1999
16	*P. citrella*		A (1), BMNH(E)1412436	*Citrus* sp.	Grenada	Mirabeau (Propagating Station) - Saint Andrew	-	NHMUK	21.VII.1998
17	*P. citrella*		A (1), BMNH(E)1412437	*Citrus* sp.	Trinidad-Tobago	Saint Agustine (nurseries) - Tunapuna-Piarco	Vine, L.	NHMUK	VIII.1998
18	*P. citrella*		A (1), BMNH(E)1412455	*Citrus* sp.	Trinidad-Tobago	Saint Agustine (nurseries) - Tunapuna-Piarco	Vine, L.	NHMUK	VIII.1998
19	*P. dorcas*	Holotype	A (1), BMNH(E)1412349	-	British Guyana	Mallali - Upper Demerara-Berbice	Parish	NHMUK	13.III.XX
20	*P. drimiphaga*	Holotype	A (1)	*Drymis granadensis*	Costa Rica	Vara Blanca (6 km ENE) - Heredia	Nishida, K.	USNM	27.I.2004
21	*P. maxberryi*	Holotype	A (1)	*Gaiadendron punctatum*	Costa Rica	Villa Mills (Cerro de la Muerte) - San José	Nishida, K.	USNM	27.I.2004
22	*P. meliacella*	Holotype	A (1), USNM 72096	*Swietenia mahagoni*	Costa Rica	Turrialba - Cartago	Becker, V.O.	USNM	8.V.1973
23	*P. perseafolia*	Holotype	A (1)	*Persea americana*	Colômbia	Villamaria - Caldas Departament	Posada, F.	USNM	IV.2008
24	*P. puyehuensis*	Holotype	A (1)	-	Chile	Osorno (Parque Nacional Puyehue, Aguas Calientes) - Los Lagos	Nielsen & Karsholt	ZMUC	12.XII.1981
25	*P. rotans*	Lectotype	A (1), BMNH(E)1412616	-	Ecuador	Alausi - Chimborazo	Parish	NHMUK	14.VI
26	*P. rotans*	Paralectotype	A (1), BMNH(E)1412347	-	Ecuador	Alausi - Chimborazo	Parish	NHMUK	14.VI
27	*P. rotans*		A (1), BMNH(E)1412364	-	Ecuador	Alausi - Chimborazo	Parish	NHMUK	14.VI
28	*P. rotans*		A (1), BMNH(E)1412351	-	Ecuador	Alausi - Chimborazo	Parish	NHMUK	14.VI

Number	Species and genitalia slide number (within parentheses)	Type	Stage (P-pupa, L – larva, A – adult), number of studied specimens in parentheses and Specimen ID	Host Plant	Country	Type locality	Collector	Depository*	Collection date
29	*P. rotans*		A (1), BMNH(E)1412365	-	Ecuador	Alausi - Chimborazo	Parish	NHMUK	14.VI
30	*P. sciophanta*	Holotype	A (1), BMNH(E)1412343	-	Peru	Lima - Peru	Parish	NHMUK	14.VIII
31	*P. sexangula*	Lectotype	A (1), BMNH(E)1412359	-	Peru	Matucana - Lima	Parish	NHMUK	14.VII
32	*P. sexangula*	Paralectotype	A (1), BMNH(E) 1412356	-	Peru	Matucana - Lima	Parish	NHMUK	14.VII
33	*P. tropaeolicola*	Holotype	A (1)	*Tropaeolum emarginatum*	Costa Rica	Villa Mills (Cerro de la Muerte) - Cartago	Nishida, K.	USNM	13.III.2003
34	*P. wygodzinskyi*	Holotype	A (1)	Asteraceae	Argentina	Tafí del Valle (Quebrada del Mastil) - Tucumán	Wygodzinsky	ZMHB	21-23.V.1953
35	*P. wygodzinskyi*	Allotype	A (1)	Asteraceae	Argentina	Tafí del Valle (Quebrada del Mastil) - Tucumán	Wygodzinsky	ZMHB	21-23.V.1953
36	*P. wygodzinskyi*	Paratype	A (1)	Asteraceae	Argentina	Tafí del Valle (Quebrada del Mastil) - Tucumán	Wygodzinsky	ZMHB	21-23.V.1953
37	*P. wygodzinskyi*	Paratype	A (1), TLEP044	Asteraceae	Argentina	Tafí del Valle (Quebrada del Mastil) - Tucumán	Wygodzinsky	MCN	21-23.V.1953
38	*P.* sp. 7 (GRPM 50-130)	Holotype	A (1), 56.488	-	Brazil	Planaltina, Federal District (Brasília)	Becker, V.O.	VOB	26.VI.1984
39	*P.* sp. 7 (GRPM 50-131)	Paratype	A (1), 56.439	-	Brazil	Planaltina, Federal District (Brasília)	Becker, V.O.	VOB	5.VI.1984
40	*P.* sp. 7 (GRPM 50-132)	Paratype	A (1), 57.752	-	Brazil	Planaltina, Federal District (Brasília)	Becker, V.O.	VOB	15.VIII.1985
41	*P.* sp. 8 (GRPM 50-133)	Holotype	A (1), 56.315	-	Brazil	Planaltina, Federal District (Brasília)	Becker, V.O.	VOB	3.IV.1984
42	*P.* sp. 8 (GRPM 50-134)	Paratype	A (1), 56.370	-	Brazil	Planaltina, Federal District (Brasília)	Becker, V.O.	VOB	10.V.1984
43	*P.* sp. 8 (GRPM 50-135)	Paratype	A (1) 56.370	-	Brazil	Planaltina, Federal District (Brasília)	Becker, V.O.	VOB	3.V.1984
44	*P.* sp. 9 (GRPM 50-136)	Holotype	A (1), 40.388	*Xylopia aromatica*	Brazil	Planaltina, Federal District (Brasília)	Becker, V.O.	VOB	5.X.1982
45	*P.* sp. 9 (GRPM 50-137)	Paratype	A (1), 34.769	*Xylopia aromatica*	Brazil	Planaltina, Federal District (Brasília)	Becker, V.O.	VOB	6.VII.1978
46	*P.* sp. 9 (GRPM 50-138)	Paratype	A (1), 40.950	*Xylopia aromatica*	Brazil	Planaltina, Federal District (Brasília)	Becker, V.O.	VOB	25.IV.1983

Number	Species and genitalia slide number (within parentheses)	Type	Stage (P-pupa, L – larva, A – adult), number of studied specimens in parentheses and Specimen ID	Host Plant	Country	Type locality	Collector	Depository*	Collection date
47	*P.* sp. 9 (GRPM 50-139)	Paratype	A (1), 57.703	*Xylopia aromatica*	Brazil	Planaltina, Federal District (Brasília)	Becker, V.O.	VOB	15.VII.1985

***MCN**	Museo Miguel Lillo de Ciencias Naturales. Tucumán, Argentina.
MACN	Museo Argentino de Ciencias Naturales. Buenos Aires, Argentina.
NHMUK	Natural History Museum. London, UK.
USNM	United States National Museum, Smithsonian Institution. Washington DC, USA.
VOB	Coll. Vitor O. Becker, Reserva Serra Bonita. Camacan, Brazil.
ZMHB	Museum für Naturkunde. Berlin, Germany.
ZMUC	Statens Naturhistoriske Museum. Copenhagen, Denmark.

Table S3. Host plant range of Neotropical *Phyllocnistis* species studied.

Number	*Phyllocnistis* species	Plant family	Plant species	Reference
1	*P. abatiae* Hering, 1958	Salicaceae	*Abatia stellata*	Hering 1958
2	*P. aurilinea* Zeller, 1877	Ericaceae	*Macleania rupestris*	Zeller 1877
3	*P. baccharidis* Hering, 1958	Asteraceae	*Baccharis* sp.	Hering 1958
4	*P. bourquini* Pastrana, 1960	Asteraceae	*Tessaria integrifolia*	Pastrana 1960
5	*P. citrella* Stainton, 1856	Rutaceae	*Citrus aurantifolia*, *C. reticulata*, *C. aurantium*, *C. grandis*, *C. paradisi*, *C. latifolia*, *C. sinensis*.	Stainton 1856; Garcia *et al*. 2001; Bermúdez *et al*. 2004; Bautista *et al*. 1996; Sánchez *et al*. 2002
6	*P. dorcas* Meyrick, 1915	Unknown		Meyrick 1915
7	*P. drimiphaga* Kawahara, Nishida & Davis, 2009	Winteraceae	*Drymis granadensis*	Kawahara *et al*. 2009
8	*P. maxberryi* Kawahara, Nishida & Davis, 2009	Loranthaceae	*Gaiadendron punctatum*	Kawahara *et al*. 2009
9	*P. meliacella* Becker, 1974	Meliaceae	*Cedrela odorata*, *C. angustifolia*, *C. tonduzzi*, *Swietenia mahagoni*	Becker 1974
10	*P. perseafolia* Davis & Wagner, 2011	Lauraceae	*Persea americana*	Davis & Wagner 2011
11	*P. puyehuensis* Davis, 1994	Unknown		Davis 1994
12	*P. rotans* Meyrick, 1915	Unknown		Meyrick 1915
13	*P. sciophanta* Meyrick, 1915	Unknown		Meyrick 1915
14	*P. sexangula* Meyrick, 1915	Unknown		Meyrick 1915
15	*P. tethys* Moreira & Vargas, 2012	Passifloraceae	*Passiflora organensis*	Brito *et al*. 2012

Number	*Phyllocnistis* species	Plant family	Plant species	Reference
16	*P. tropaeolicola* Kawahara, Nishida & Davis, 2009	Tropaeolaceae	*Tropaeolum emarginatum*	Kawahara *et al*. 2009
17	*P. wygodzinskyi* Hering, 1958	Asteraceae	Unknown	Hering 1958
18	*P.* sp. 1	Asteraceae	*Baccharis anomala*	Brito *et al*. (2017)
19	*P.* sp. 2	Begoniaceae	*Begonia fruticosa*	Brito *et al*. (2017)
20	*P.* sp. 3	Winteraceae	*Drimys angustifolia*	Brito *et al*. (2017)
21	*P.* sp. 4	Unknown		
22	*P.* sp. 5	Unknown		
23	*P.* sp. 6	Unknown		
24	*P.* sp. 7	Unknown		
25	*P.* sp. 8	Unknown		
26	*P.* sp. 9	Annonaceae	*Xylopia aromatica*	
27	*P.* sp. 10	Hypericaceae	*Vismia guianensis*	

CONSIDERAÇÕES FINAIS

A taxonomia é considerada fundamental para o conhecimento da diversidade biológica. Trata-se de um dos ramos mais antigos das ciências biológicas, tendo como alvo a descrição, a nomenclatura e a classificação dos taxa (Godfray 2002; Schlick-Steiner *et al*. 2010). O taxonomista, ao nomear uma nova espécie, gera uma hipótese que poderá ser utilizada em outros ramos da biologia. Portanto, a acurada delimitação de uma espécie é fundamental para a compreensão e conhecimento da diversidade (Gaston & Mound 1993; Dayrat 2005; Carvalho *et al*. 2007).

De forma inédita nesta tese, as espécies pertencentes a *Phyllocnistis* da região Neotropical foram revisadas, sendo descritas adicionalmente dez novas espécies para o gênero (entre os dois capítulos descritos). Essa é uma contribuição importante para o conhecimento desse táxon, que visa ampliar o conhecimento a cerca da família e dos microlepidópteros minadores de folhas na região. Quanto à validade dos caracteres diagnósticos do grupo relacionados as espécies aqui revisadas, é possível destacarmos o padrão das fáscias encontradas nas asas anteriores, além de caracteres encontrados na morfologia pupal, já apontado por outros autores. No entanto, como não há informações de imaturos para a maior parte das espécies já descritas, a identificação a partir do padrão de coloração das asas anteriores é até o momento, o caracter estável e abrangente disponível. Na literatura, são encontrados poucos trabalhos utilizando análises moleculares para o gênero, principalmente relacionadas as espécies neotropicais, o que também dificulta uma análise comparativa destas ao nível do DNA. Essa tese, além de colaborar com informações relacionadas a taxonomia de *Phyllocnistis*, fornece as primeiras informações relacionadas às distâncias genéticas entre alguns representantes de *Phyllocnistis* neotropicais. O uso do DNA mitocondrial permite testar o status específico podendo confirmar junto à morfologia a validade e identidade dessas espécies.

Sabe-se que a diversidade de *Phyllocnistis* para o Neotrópico ainda é pouco conhecida e explorada. Diante disso, esse trabalho foi desenvolvido para estabelecer uma base taxonômica e sólida para os representantes do gênero, cujo conhecimento poderá contribuir para futuras descrições, podendo até mesmo encorajar novos taxonomistas à explorarem esse grupo.

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