



Taxonomic revision of the “*Pierella lamia* species group” (Lepidoptera: Nymphalidae: Satyrinae) with descriptions of four new species from Brazil

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Abstract

Four new species of *Pierella* Westwood, 1851 from Brazil are described: *P. angeloi* Zacca, Siewert & Mielke **sp. nov.** from Maranhão, *P. kesselringi* Zacca, Siewert & Paluch **sp. nov.** from Paraíba, Pernambuco, Alagoas and Sergipe, *P. nice* Zacca, Siewert & Paluch **sp. nov.** from Bahia and *P. keithbrowni* Siewert, Zacca & Casagrande **sp. nov.** from Bahia, Espírito Santo, Rio de Janeiro, São Paulo, Paraná and Santa Catarina. Additionally, *P. chalybaea* Godman, 1905 **stat. rest.** and *P. boliviana* F.M. Brown, 1948 **stat. nov.** are recognized as valid species and not as subspecies of *P. lamia* (Sulzer, 1776), while *P. l. colombiana* Constantino & Salazar, 2007 **syn. nov.** is synonymized to the former. Lectotype and paralectotype of *Papilio dyndimene* Cramer, 1779 (a synonym of *Pierella lamia*) and *Pierella chalybaea* Godman, 1905 **stat. rest.** are designated. Habitus and illustrations of male and female genitalia are provided for all species, as well as a geographical distribution map.

Key words: Atlantic Forest, Amazonian region, Semiarid, Haeterini, subspecies

Introduction

Haeterini includes some of the most beautiful butterflies among the Neotropical Satyrinae (Lepidoptera: Nymphalidae). Twenty-four valid species are included in this group, allocated in five genera (Lamas 2004; Penz *et al.* 2014). The great majority of the adults are recognized by their gliding flight close to the ground of dense forests and their transparent wings with the outer margin of the hind wings bright-coloured (Masters 1970; D’Abrera 1988). The absence of tibial spurs and the midtibia dorsally covered by spines are a combination of adult features that distinguish the members of Haeterini from other Satyrinae (Miller 1968). However, the phylogenetic position of Haeterini within Satyrinae is still uncertain (see Marín 2011 for more details).

Pierella Westwood, 1851 is the richest Haeterini genera, with eleven described species distributed throughout Central and South America, and founded from sea level to 1,600 meters (Lamas 2004; Constantino & Rodriguez 2009). Adults of *Pierella* are well-differentiated from all other Haeterini genera by the predominant brown wing colour and a yellow stain on dorsal forewings in males. According to the viewed angle, the latter could be seen as a greenish iridescence due the differences on the scales morphology, as such in *P. luna* (see Vigneron & Simonis 2010).

Pierella lamia (Sulzer, 1776) currently comprises four subspecies: *P. lamia lamia* (Sulzer, 1776), *P. lamia boliviana* F.M. Brown, 1948, *P. lamia chalybaea* Godman, 1905 and *P. lamia colombiana* Constantino & Salazar, 2007 (Lamas 2004; Salazar & Constantino 2007). In Brazil, *P. l. lamia* and *P. l. chalybaea* occurs allopatrically in lower and upper Amazonian areas respectively, but there are several records in literature and museums of *P. l. lamia* in Atlantic Forest (Cardoso 1949; Kesselring & Ebert [1982]; Brown & Freitas 2004; Brown *et al.* 2007; Francini *et al.* 2011; Paluch *et al.* 2011; Zacca *et al.* 2011), which let us to investigate its taxonomic status and

geographical boundaries. Based on comparative morphology, the status of all subspecies of *P. lamia*, herein treated as “*Pierella lamia* species group” are revised and discussed. A previous unrecognized new species from Amazonian Forest and three new species from Brazilian Atlantic Forest are described. In addition, illustrations and descriptions of the female genitalia of *Pierella lamia*, *P. chalybaea* **stat. rest.** and *P. boliviana* **stat. nov.** are provided for the first time, and the taxonomic value of the female genitalia is discussed. Identification key based on external characters and a map of geographical distribution are provided for all taxa.

Material and methods

The specimens studied had their abdomen detached and soaked in a heated test tube with 10% potassium hydroxide solution (KOH) for five minutes before dissection of the genitalia. Illustrations were performed with the aid of a camera lucida attached to a stereomicroscope and edited on GIMP v.2.8. Full lines represent sclerotized structures; thin lines, membranous structures; dashed lines, structures visible through transparency. Taxonomic classification follows Lamas (2004) with modifications proposed here. Nomenclature to wings follows Neild (2008). Dissected specimens were marked with an asterisk after the voucher number in the material examined section.

According to Nijhout (1991), ocelli are elements of the wings pattern coloration comprising a dark circular spot, with a pupil at the center, surrounded by concentric rings of different colours. Here, we use the term “incomplete ocelli” to refer the absence of such rings.

Biogeographical regions nomenclature follows Morrone (2014). Distributional data were obtained from public and private entomological collections, in addition to literature. Species systematic catalogues were elaborated only considering references with illustrations or photos of the specimens, due the phenotypical similarities on this group. Abbreviations used: FW = forewing; HW = hind wing; D = dorsal; V = ventral.

All material examined belongs to the following institutions (with acronyms in bold):

AN—Andrew Neild collection, London, United Kingdom

CEUFS—Entomological Collection of Universidade Federal de Sergipe, São Cristóvão, Sergipe, Brazil

DZUP—Entomological Collection Padre Jesus Santiago Moure, Universidade Federal do Paraná, Curitiba, Paraná, Brazil

IOC—Entomological Collection of Instituto Oswaldo Cruz, Rio de Janeiro, Brazil

MB—Mohamed Benmesbah collection, Lyon, France

MZFS—Entomological Collection Johann Becker, Universidade Estadual de Feira de Santana, Feira de Santana, Bahia, Brazil

NHM—The Natural History Museum, London, United Kingdom

OM—Olaf Hermann Hendrik Mielke collection, Curitiba, Paraná, Brazil

UFPE—Entomological Collection of Universidade Federal de Pernambuco, Recife, Pernambuco, Brazil

ZUEC—Museu de Zoologia Adão José Cardoso, Universidade Estadual de Campinas, Campinas, São Paulo, Brazil

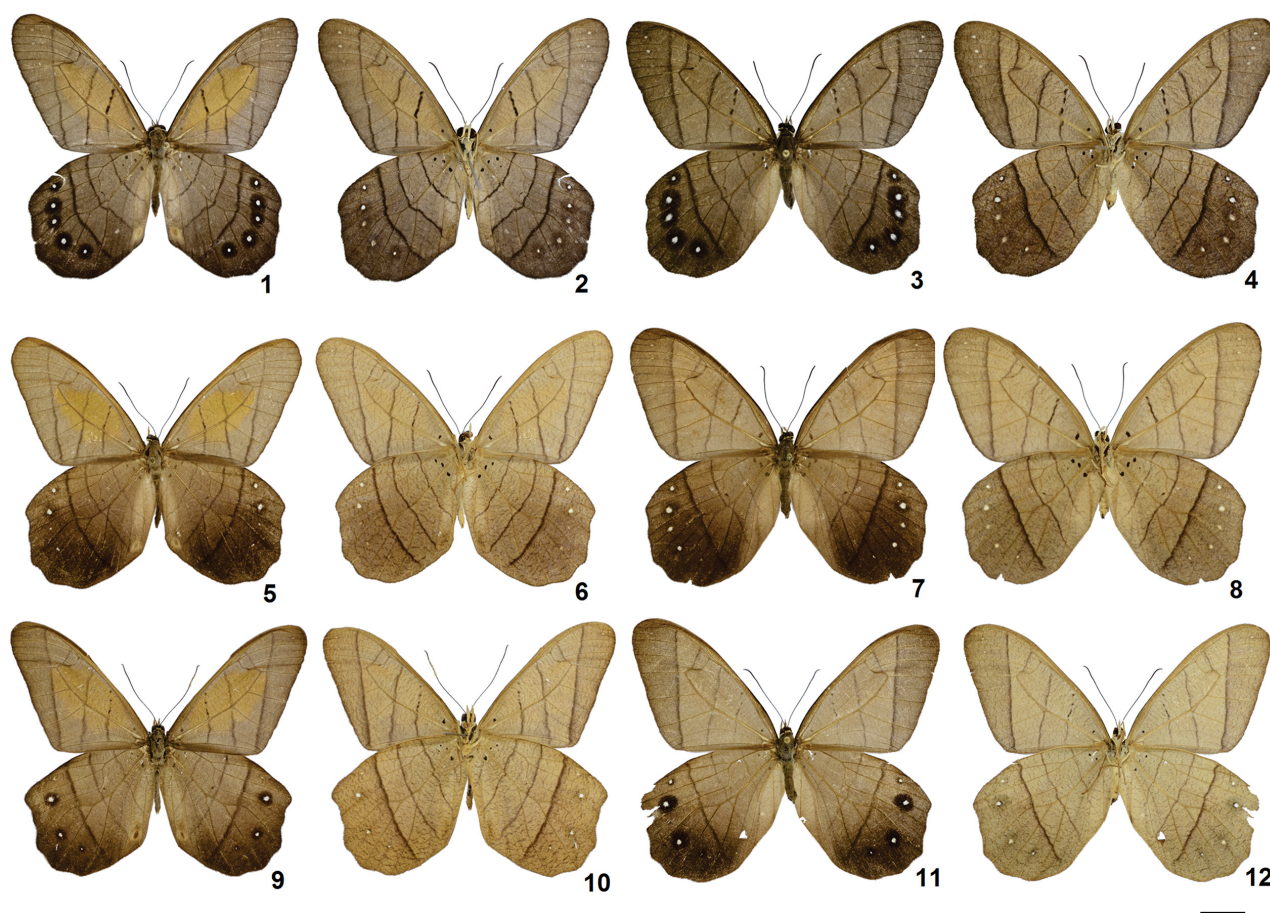
Results

The “*Pierella lamia* species group”

This group comprises *P. lamia*, *P. chalybaea* **stat. rest.**, *P. boliviana* **stat. nov.**, *P. angeloi* **sp. nov.**, *P. kesselringi* **sp. nov.**, *P. nice* **sp. nov.** and *P. keithbrowni* **sp. nov.** The wing colour pattern of these species are similar to *P. astyoche* (Erichson, [1849]) and *P. luna* (Fabricius, 1793), but can be immediately distinguished from the former by the absence of a transverse band on both wings underside and by the absence of ringlet ocelli on hind wings, and from *P. luna* by the presence of four or five even-sized black ocelli with white pupils in each one on DHW.

The “*Pierella lamia* species group” is characterized by the following features: post-genal area white; eyes glabrous and brown; antennae glabrous; thorax dorsally brown and ventrally white. FW shape: triangular, costal margin convex, apex rounded, outer margin convex and inner margin straight. DFW with a variable extension of

the yellow stain in discal cell or beyond it; wings with three lines located in the postbasal, submedian and postmedian areas, from costal margin to inner margin, with distinct thickness; postbasal line darker than the other lines and discontinuous in discal cell; post-discal line diagonal, between Radius and M_3 . FW with a black small spot in proximal area of the discal cell. VFW with two or three submarginal small, white incomplete ocelli in R_5 - M_1 , M_1 - M_2 and M_2 - M_3 . HW shape: costal margin convex, apex rounded and outer margin crenulated between M_1 - CuA_2 , tornus rounded and inner margin convex. DHW with an androconial patch between 2A and inner margin, differing in size and shape on the central area in each species, surrounded by creamy scales; five or four submarginal incomplete ocelli in M_1 - M_2 , M_2 - M_3 , M_3 - CuA_1 , CuA_1 - CuA_2 and CuA_2 -2A, the last three might be faded or not. VHW between postmedian line and outer margin the same colour or darker than the background, five or four small white pupils in submarginal area; fringes dark brown. Abdomen dorsally brown, ventrally lighter. Except for *P. boliviana* **stat. nov.**, the male genitalia has a similar morphology in all species of this group, with tegumen laterally sub-squared, almost same length of uncus; gnathos absent; anterior projection of saccus elongated and cylindrical; valva two times length of uncus with elongated bristles ventrally, inner side with an evident spine in distal area, apex pointed or truncated and serrated, dorsal projection serrated or with small teeth; aedeagus straight, same length of valva, with a dorso-laterally opening for the vesica, serrated at margin. In fact, the male genitalia seems somewhat homogeneous in *Pierella* (see illustrations in Brown 1948 and Constantino 1995), with subtle differences on uncus size and valvae shape. In female genitalia, sternum VIII could be fused or not with tergum VIII; papillae anales sclerotized at the basal area, covered by variable size setae in the distal area; ductus bursae membranous or sclerotized with variable length relative to the corpus bursae length; paired signa variable in size and position in the corpus bursae.



FIGURES 1–12. Habitus of “*Pierella lamia*” species group. 1–4. *Pierella lamia*: 1. male, dorsal view; 2. male, ventral view; 3. Female, dorsal view; 4. Female, ventral view; 5–8. *Pierella chalybaea* **stat. rest**: 5. male, dorsal view; 6. male, ventral view; 7. female, dorsal view; 8. female ventral view; 9–12. *Pierella boliviana* **stat. nov.**: 9. male, dorsal view; 10. male, ventral view; 11. female, dorsal view; 12. female, ventral view. Scale bar = 10 mm.

***Pierella lamia* (Sulzer, 1776)**
(Figures 1–4, 29, 36–41, 48–49)

Papilio rhea Fabricius, 1775 [preocc. *Papilio rhea*, Poda 1761]; Möschler, 1882, p. 319.—Weymer, 1911, p.178 [in. part.].—
D'Abbrera, 1988, p. 730.

Papilio dyndimene Cramer, 1779, p. 11, pl. 198, fig. F, G [lectotype and paralectotype designated herein].

Pierella luna ab. *albina* Oberthür, 1896, p. 32, pl. 2, fig. 10.

Pierella lamia f. *fabriciana* Ebert, 1965, p.82-83 [repl. name for *Papilio rhea* Fabricius, 1775].

Pierella lamia Sulzer, 1776, p. 145, pl. 18, fig. 1.—Weymer, 1911, p.178 [in. part.].

Diagnosis. *Pierella lamia* is distinguished from its congeners by the androconial patches with a marked dark central oval area (Fig. 29). When compared to those new species described here, female papillae anales with a reduced postapophysis, rounded ostium bursae, and a sclerotized plate on the underside of the ductus bursae (Figs 48–49).



FIGURES 13–28. Habitus of “*Pierella lamia*” species group. 13–16. *Pierella angeloi* sp. nov.: 13. male holotype, dorsal view; 14. male holotype, ventral view; 15. female allotype, dorsal view; 16. female, ventral view; 17–20. *Pierella kesselringi* sp. nov.: 17. male holotype, dorsal view; 18. Male, ventral view; 19. Female allotype, dorsal; 20. Female ventral view. 21–24. *Pierella nice* sp. nov.: 21. Male holotype, dorsal view; 22. Male, ventral; 23. Female allotype, dorsal; 24. Female, ventral view; 25–28. *Pierella keithbrowni* sp. nov.: 25. Male holotype, dorsal view; 26. Male, ventral view; 27. Female allotype, dorsal view; 28. Female, ventral view. Scale bar = 10 mm.

Distribution (Fig. 62). The available data suggest that *P. lamia* is associated with humid forests of northeastern Venezuela, Guyana, Suriname, French Guiana and northern Brazil (Amazonas, Pará and Maranhão) lowlands, and rainfall levels between 1500–2000 mm/year (Brown 1948; Brown & Ab’Saber 1979; Constantino 1995) in the Roraima and Pará provinces of the Boreal Brazilian dominion.

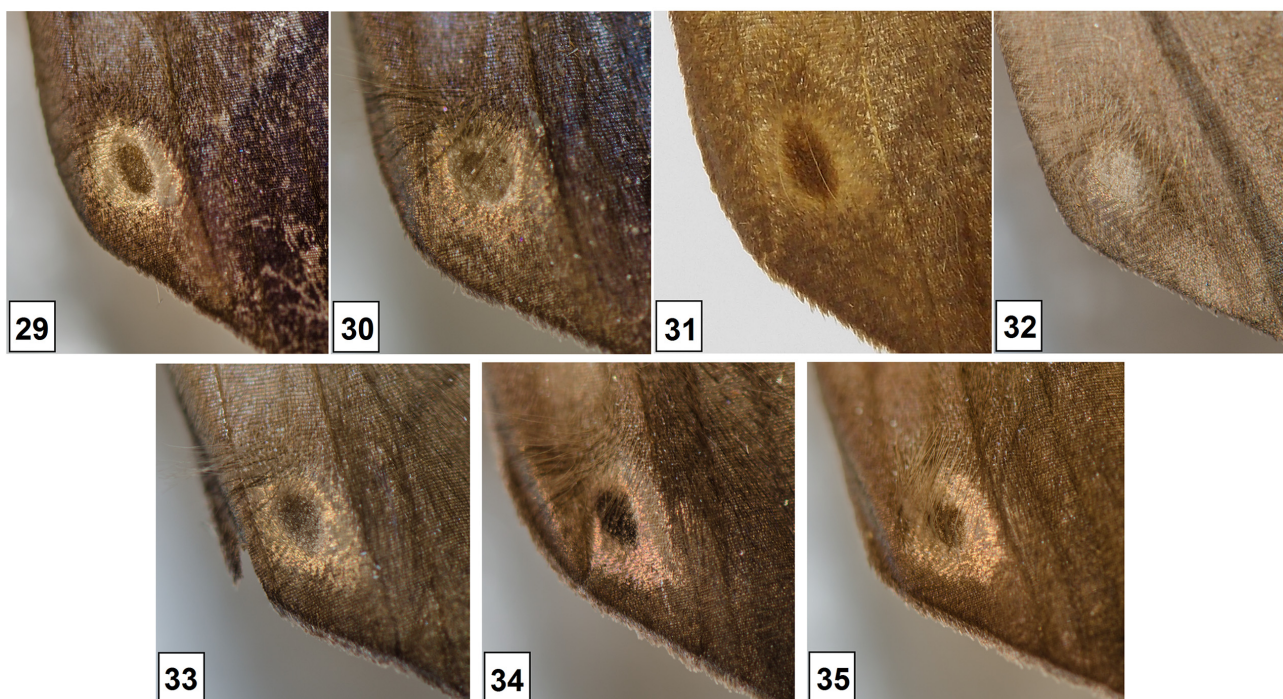
Host plant. *Heliconia* sp. (Heliconiaceae) (Ackery 1988).

Remarks. *Papilio lamia* Sulzer, 1776 was described based on an unknown number of specimens with the vague type locality “Amerika”. *Papilio rhea* Fabricius, 1775 was also described based on an undetermined number of specimens from “Indiis”, but Fabricius (1787, 1793) later cited its locality as “Cajennae” (French Guiana). The type series is likely lost (Zimsen 1964), and the specimen figured in BOA website (Warren *et al.* 2014) is a syntype of *Papilio dyndimene* Cramer, 1779. *Papilio dyndimene* was described based on undetermined number of specimens from Suriname and later synonymized with *P. lamia* by Weymer (1911). Two females of *P. dyndimene* from Cramer’s type series are deposited at NHM and here, they are designated as lectotype and paralectotype. Lectotype female hereby designated with the following labels (separated by forward slash symbols): N° 88 DYNDIMENE, Cr. III. 198. FG/ Dyndimene F./ *Pierella rhea* Fabricius, det. M. Clifton 1968/ BMNH(E)# 781041. Paralectotype female with the following labels (separated by forward slash symbols): TYPE/ Surinam Coll/ FELDER COLLN./ Rotschild Bequest B.M. 1989–1 / *Pierella rhea* Fabricius, det. M. Clifton 1968/ BMNH(E)# 781042.

Ebert (1965) pointed out that the name *Papilio rhea* is preoccupied by *Papilio rhea* Poda, 1761 (currently synonymized to swallowtail *Parnassius apollo* (Linnaeus, 1758) being *Pierella lamia* (Sulzer, 1776) the valid name for this species. According to Brown (1948), *Pierella rhea* (currently *P. lamia*) has two subspecies: *P. r. rhea* and *P. r. chalybaea* Godman, 1905. The former is characterized by the same background colour pattern in both wings and no steely blue reflections on the hind wings. Brown (1948) also considered *P. lamia* as a form of *P. r. rhea* based on the hind wings darker than the forewings, mainly towards the external margin, and usually with steely blue reflections at the hind wing base. Our examination of 41 specimens indicated that Brown’s abovementioned characters are variable within the *P. lamia*, even between individuals collected in the same area. D’Abrera (1988) followed Brown’s hypothesis, but the specimen figured (p. 730) is clearly *P. lamia*, as already indicated by Constantino (1995). *Pierella luna* ab. *albina* was described from Guatémala (French Guiana), and the illustration provided by Oberthür (1896: pl. II, fig. 10) and Warren *et al.* (2014) clearly confirms its identity as an aberration of *P. lamia* (Lamas 2004).

Material examined. GUYANA—[Roraima], Carimang River, 1 male, H. Whitely *leg.*, BMNH(E) #781004* (NHM); Essequibo River, 17.X.1929, 1 female, Oxf. Univ. Expedn. B.M.1929–485, BMNH(E) # 781010* (NHM). FRENCH GUIANA—no specific locality, 2008, 1 female, B. Mohamed *leg.* (BM); *Saint-Laurent-du-Maroni*: Säul, Mont Galbao, 6.X.2011, 1 female, B. Mohamed *leg.* (BM); no specific locality, 4.IX.2011, 1 female, B. Mohamed *leg.* (BM), 8.VIII.2012, 1 male, B. Mohamed *leg.* (BM); **Antecume-Pata**, 13.III.2012, 1 female, B. Mohamed *leg.* (BM); *Cayenne*: **Kaw**, road of Kaw, point kilometric 27, 17.IX.2010, 1 male, B. Mohamed *leg.* (BM). BRAZIL—*Amazonas*: **Manaus**, Tarumã, 2.VII.1981, 1 female, Mielke & Casagrande *leg.*, DZ 30.702 (DZUP); *Amapá*: **Serra do Navio**, 29.VII.2007, 1 male, Mielke & Casagrande *leg.*, DZ 30.813 (DZUP); no specific locality, 6.IX.1963, 1 female, D’Almeida *leg.*, DZ 30.694 (DZUP), Rio Amapari, 100 m, XI.1959, 1 male and 1 female, Ebert *leg.*, DZ 30.692, DZ 30.693 (DZUP); *Pará*: **Altamira**, Marabá, Km 129, 10.IX.1979, 1 male, Gifford *leg.*, DZ 30.707 (DZUP); **Belém**, Utinga, 4.VIII.1936, 1 male, D’Almeida *leg.* (IOC), 29.VIII.1958, 1 male, Ebert *leg.*, DZ 30.687 (DZUP), 25 m, 12.IX.1959, 8 males, Ebert *leg.*, DZ 30.664*, DZ 30.684, DZ 30.685, DZ 30.686, DZ 30.688, DZ 30.689, DZ 30.692, DZ 30.694 (DZUP), 21.X.1966, 2 females, Ebert *leg.*, DZ 30.690, DZ 30.691* (DZUP), 22.XI.2004, 2 males, Mielke & Casagrande *leg.*, DZ 30.709, DZ 30.710 (DZUP); Murucutu, 12.VIII.1936, 1 male, D’Almeida *leg.* (IOC); **Benevides**, Neópolis, 23–24.XI.2004, 1 female, Mielke & Casagrande *leg.*, DZ 30.708 (DZUP); **Cuminá**, Rio Cuminá, Cachoeira do Tronco, 27.VIII.1936, 1 female, D’Almeida *leg.* (IOC), 31.VIII.1936, 2 males, D’Almeida *leg.* (IOC), DZ 30.700 (DZUP), 21.IX.1936, 1 female, D’Almeida *leg.*, DZ 30.663* (DZUP); **Juriti**, VI.1977, 1 male, J. Kesselring *leg.*, DZ 30.701 (DZUP); **Óbidos**, IV.1968, 1 female, R. Frey *leg.*, DZ 30.696 (DZUP), VI.1968, 1 female, Ebert *leg.*, DZ 30.699* (DZUP), IX.1968, 1 male, Ebert *leg.*, DZ 30.695 (DZUP), I. 1969, 1 male, J. Kesselring *leg.*, DZ 30.698 (DZUP), IX.1971, 1 male, J. Kesselring *leg.*, DZ 30.697 (DZUP); **Santa Bárbara do Pará**, 6.II.2010, 1 male, Carneiro, Dolibaina, Dias & Moreira *leg.*, DZ 30.704 (DZUP); **Santarém**, no date, 1 male, Garbe *leg.* IOC 28.139 (IOC); no specific locality, I.1957, 1 male, R. Frey *leg.*, DZ 30.711 (DZUP); **no specific locality, no date**, 1 male, Wallace *leg.*, BMNH(E)

#781020* (NHM). Maranhão: Santa Luzia, Faz[enda] Terrasse, Km 108, Açailândia-Santa Luzia road, 31.VII.1974, 1 male, Mielke leg., DZ 30.706 (DZUP).



FIGURES 29–35. Hind wings androconial patches in dorsal view. 29. *Pierella lamia*; 30. *Pierella chalybaea* **stat. rest.**; 31. *Pierella boliviana* **stat. nov.**; 32. *Pierella angeloi* **sp. nov.**; 33. *Pierella kesselringi* **sp. nov.**; 34. *Pierella nice* **sp. nov.**; 35. *Pierella keithbrowni* **sp. nov.**

Pierella chalybaea* Godman, 1905 **stat. rest.*

(Figures 5–8, 30, 50–51)

Pierella chalybaea Godman, 1905, p. 185 [lectotype and paralectotypes designated herein].—Weymer, 1911, p.178.

Haetera lamia f. *columbina* Krüger, 1925.

Pierella lamia lamia (Sulzer, 1776); Casagrande, Mielke, Carneiro, Rafael & Hutchings, 2012, p. 25. [misidentification]

Pierella lamia chalybaea D’Abrera, 1988, p. 730. Lamas, 2004, p. 206;—Mielke, Carneiro & Casagrande, 2010, p. 289.

Pierella lamia colombiana Constantino & Salazar, 2007 [**syn. nov.**], p. 173–174, figs 5–7.

Diagnosis. *Pierella chalybaea* can be distinguished from *P. lamia* by the less prominent ocelli on DHW that is obscured by the dark background, and in many cases the white pupil in CuA_1-CuA_2 is not evident. This pupil is always strongly marked in *P. lamia*. Androconial patch is characterized by the weak rounded dark central area (Fig. 30). Female genitalia presents a well-developed, straight posterior aphophysis similar to *P. keithbrowni* **sp. nov.**, but the ductus bursae is sclerotized and approximately 1.6 times the length of corpus bursae, and the paired signa are located on the ventral side. Ostium bursae with a sclerotized projection out from the ductus bursae (Figs 50–51).

Distribution (Fig. 62). *Pierella chalybaea* is distributed in Brazilian and Chacoan sub-regions, from Colombia to Bolivia (Constantino 1995; Willmott *et al* 2011; Willmott & Hall 2014; Petit 2014) and North and Midwest Brazil (Roraima, Amazonas, Pará, Acre, Rondônia, Mato Grosso and Goiás), apparently associated with both low altitudinal regions (100–900 m) (Brown 1948) and high rainfall levels between 2000–5000 mm/year (Brown & Ab’Saber 1979).

Host plant. Unknown.

Remarks. Godman (1905) described *Pierella chalybaea* based on two males and one female collected by the American naturalist Herbert H. Smith on his expeditions to Chapada dos Guimarães, Mato Grosso, Brazil. This material is deposited at the NHM collection with lectotype and paralectotypes’ labels determined by M. Clifton in

1968, but these designations were never published. Here, they are designated: Lectotype male hereby designated with the following labels (separated by forward slash symbols): Jan/ Chapada, Matto Grosso, H. H. Smith/♀/ B.M. TYPE No Rh. 2512, *Pirella chalybaea*/ Godman & Salvin Coll. 1904–1./ BMNH(E)# 781092. Paralectotype male with the following labels (separated by forward slash symbols): July/ Chapada, Matto Grosso, H. H. Smith/ *Pirella rhea chalybaea* Godman, det. M. Clifton 1968/ BMNH(E)# 781082. Paralectotype female with the following labels (separated by forward slash symbols): Jan/ Chapada, Matto Grosso, H. H. Smith/♀/ B.M. TYPE No Rh. 2513, *Pirella chalybaea*/ Godman & Salvin Coll. 1904–1./ BMNH(E)# 781099.

Brown (1948) considered *P. chalybaea* as a subspecies of *Pierella rhea* (currently *P. lamia chalybaea*), but the marked differences in the female genitalia and the males androconial patch supports the decision in reinstate this taxa. *Haetera lamia* f. *columbina* Krüger, 1925 was described from Colombia, [Meta, Upín], 1000 m and synonymized with *Pierella lamia chalybaea* by Lamas (2004). In fact, the illustration of the type specimen (Warren *et al.* 2014) confirms its identity as a synonym of *P. chalybaea* **stat. rest.** Salazar & Constantino (2007) described *P. lamia colombiana* from Colombia, Peru, Ecuador and Brazil, based on the absence of the steely blue reflections on the dorsal hind wing. In addition, the authors discussed about the allopatric distribution of *P. lamia colombiana* and *P. lamia chalybaea*, the latter occurring in the savannahs and lowlands of the Orinoco river in Colombia and Venezuela, and in the state of Mato Grosso, Brazil. The study of 132 specimens revealed that the steely blue reflections are variable among the specimens of *P. chalybaea* **stat. rest.** An examined female from Benjamin Constant (Amazonas, Brazil) that is almost 20 km distant from the type locality of *P. lamia colombiana* (Leticia, Amazonas, Colombia), shows the same genitalia morphological pattern of specimens from Mato Grosso (considered as *P. lamia chalybaea* by Salazar & Constantino 2007).

Material examined. BRAZIL—*Roraima*: **Alto Alegre**, Ilha do Maracá, 24–31.VIII.1987, 2 males and 1 female, Mielke & Casagrande *leg.*, DZ 30.724, DZ 30.725, DZ 30.804 (DZUP); **Amajari**, Tepequén, 620 m, 14–16.VII.2006, 1 male, Mielke & Casagrande *leg.*, DZ 30.723 (DZUP); **Pacaraima**, 800 m, 1–2.III.1988, 1 male, Mielke & Casagrande *leg.*, DZ 30.783 (DZUP); **Surucucu**, 14.XI.1979, 1 male, Gifford *leg.*, DZ 30.722 (DZUP); *Amazonas*: **Benjamin Constant**, Rio Javari, VI.1942, 1 female, B. Pohl *leg.*, DZ 30.739* (DZUP); **Borba**, Rio Abacaxis, Comunidade Paxiúba, 2–4.VI.2008, 1 male, Mielke & Casagrande *leg.*, DZ 30.705 (DZUP); **Fonte Boa**, 1 male and 1 female, VI.1906, S. M. Klages *leg.*, BMNH(E)#781079, BMNH(E)#781088 (NHM); **Itacoatiara**, VIII.1968, 1 male, ex-coll. Ebert, DZ 30.782 (DZUP), 3.VII.1927, 1 male, no collector, IOC 28.136 (IOC); **Itaituba**, Rio Tapajós, VIII.1960, 1 male, ex-coll. H. Ebert, DZ 30.767 (DZUP); **Ipixuna**, Comunidade São Vicente, Rio Liberdade, 12–15.V.2011, 2 males and 1 female, Mielke & Casagrande *leg.*, DZ 30.815, DZ 30.816, DZ 30.817 (DZUP); Reserva Rio Gregório, 18–23.V.2011, 2 males, Mielke & Casagrande *leg.*, DZ 30.653, DZ 30.814 (DZUP); Lábrea, Rio Purus, 1 male, XI.1913, E. H. W. Wickham *leg.*, BMNH(E)#781075 (NHM); **Manaus**, Reserva Ducke, 3.IX.1987, 1 male, Mielke & Casagrande *leg.*, DZ 30.736 (DZUP), 10–13.VIII.2010, 4 males and 2 females, Dias & Bonfanti *leg.*, DZ 30.730, DZ 30.731, DZ 30.732, DZ 30.733, DZ 30.734, DZ 30.735 (DZUP); 47 km NW, Reserva ZF2, 17–20.VIII.2010, 1 male, Dias & Bonfanti *leg.*, DZ 30.738 (DZUP); **Maués**, no date, 1 male, Fassl *leg.* (IOC); no specific locality, 25.VIII.1927, 1 female, Zikán *leg.*, IOC 28.146 (IOC); 12.IX.1927, 1 female, Zikán *leg.*, IOC 28.148 (IOC); 19.IX.1927, 1 female, Zikán *leg.*, IOC 28.137 (IOC); 11.VII.1927, 1 male, Zikán *leg.*, IOC 28.145 (IOC); 12.VIII.1927, Zikán *leg.*, IOC 28.147 (IOC); Maués, 1 female, M. Furukawa *leg.*, BMNH(E)#781083 (NHM); Tabatinga, 1 female, no date, Degand *leg.*, BMNH(E)#781073 (NHM); **Tefé**, 1 female, XI.07, M. de Mathan *leg.*, BMNH(E)#781084 (NHM), 4–6.XII.1987, 1 male and 1 female, Mielke & Casagrande *leg.*, DZ 30.703, DZ 30.784 (DZUP); São José, Rio Solimões, 1 male, no date, no collector, BMNH(E)#781078 (NHM); São Paulo de Olivença, 1 male, VI–VII.1883, M. de Mathan *leg.*, BMNH(E)#781077 (NHM), 1 female, III.1883, M. de Mathan *leg.*, BMNH(E)#781086 (NHM); *Pará*: **Itaituba**, Rio Tapajós, no date, 1 female, Fassl *leg.*, IOC 28.142 (IOC); *Acre*: **Cruzeiro do Sul**, Rio Juruá, 200 m, 15–25.VII.1971, 1 female, Ebert *leg.*, DZ 30.721 (DZUP); 9–11.IX.1973, 1 male and 1 female, Ebert *leg.*, DZ 30.719, DZ 30.720 (DZUP); 23.X.1981, 1 male and 1 female, Fátima Bucher *leg.*, DZ 30.713, DZ 30.714* (DZUP); no date, 1 male, D’Almeida *leg.*, DZ 30.740 (DZUP); **Mâncio Lima**, Parque Nacional da Serra do Divisor, 200–400 m, 10–21.IX.2011, Dolibaina & Moura *leg.*, DZ 29.772 (DZUP); 20–27.VI.2013, 9 males and 1 female, Mielke, Casagrande, Carneiro, Dias & Dolibaina *leg.*, DZ 30.820, DZ 30.821, DZ 30.822, DZ 30.823, DZ 30.824, DZ 30.825, DZ 30.826, DZ 30.827, DZ 30.828, DZ 30.829 (DZUP); **Porto Acre**, Reserva Humaitá, 20–30.I.2009, 1 female, Mielke & Casagrande *leg.*, DZ 30.652 (DZUP); 28–30.I.2009, 1 male, Mielke & Casagrande *leg.*, DZ 30.812 (DZUP); **Santa Rosa dos Purus**, 6,4 km E, 3–4.VIII.2008, 1 male, Mielke & Carneiro *leg.*, DZ 30.715 (DZUP);

14,2 km SE, 12.VIII.2008, 1 male, Carneiro *leg.*, DZ 30.718 (DZUP); **Senador Guimard**, Reserva Catuaba, 200 m, 22.IX.2003, 1 male, Mielke & Casagrande *leg.*, DZ 30.717 (DZUP); 2–5.IX.2004, 1 male, Mielke & Casagrande *leg.*, DZ 30.716 (DZUP); 31.I–5.II.2009, 3 males, Mielke & Casagrande *leg.*, DZ 30.771, DZ 30.818, DZ 30.819 (DZUP); **Vila Taumaturgo**, Seringal Oriente, 29.VII.1956, 1 male, F. C. Novaes *leg.*, DZ 30.712 (DZUP); **Rondônia: Jarú**, 250 m, V.1977, 1 male and 1 female, Ebert *leg.*, DZ 30.726, DZ 30.777 (DZUP); X.1977, 1 male, Ebert *leg.*, DZ 30.741 (DZUP); **Ouro Preto d'Oeste**, 9–13.IX.1987, 1 male and 1 female, C. Elias *leg.*, DZ 30.729, DZ 30.737 (DZUP); 24–31.X.1987, 1 female, C. Elias *leg.*, DZ 30.728* (DZUP); **Porto Velho**, 1 male and 1 female, II–III.26, A. M. Moss *leg.*, BMNH(E)#781081, BMNH(E)#781090 (NHM); **Vila Rondônia [= Ji-Paraná]**, 26.I.1961, 1 male, Andrade & Pereira *leg.*, DZ 30.727 (DZUP); **Mato Grosso: Barra do Bugres**, 20.III.1974, 1 male, E. Furtado *leg.*, DZ 30.776 (DZUP); Alto Rio Paraguai, 150 m, 11.V.1974, 2 males, E. Furtado *leg.*, DZ 30.754, DZ 30.756 (DZUP); 16.VI.1974, 1 male, E. Furtado *leg.*, DZ 30.755 (DZUP); **Barra do Garças**, Vale dos Sonhos, 500 m, 22.VI.1972, 1 female, ex-coll. Ebert, DZ 30.749 (DZUP); 400 m, 22.VI.1972, 1 male, Mielke & Brown *leg.*, DZ 30.785 (DZUP); **Buriti**, 30 miles N. E. of Cuiabá, 2259 ft, 1–14.VII.27, C. L. Collenette *leg.*, BMNH(E)#781080 (NHM); 1 female, 17–30.VI.27, C. L. Collenette *leg.*, BMNH(E)#781089 (NHM); Chapada dos Guimarães, 600–800 m, 13.II.1967, 1 male and 1 female, ex-coll. D'Almeida, DZ 30.789, DZ 30.790 (DZUP); 28.III.1983, 1 male, C. Elias *leg.*, DZ 30.745 (DZUP); 28.III–3.IV.1983, 2 males, C. Elias *leg.*, DZ 30.774, DZ 30.775 (DZUP); 600–800 m, 11.II.1967, 1 male, ex-coll. D'Almeida, DZ 30.746 (DZUP); 14.II.1967, 1 female, ex-coll. D'Almeida, DZ 30.748* (DZUP); 700 m, 23.XII.1968, 1 male and 1 female, H. Ebert *leg.*, DZ 30.758, DZ 30.759 (DZUP); 600 m, 26.VI.1972, 2 males, Mielke & Brown *leg.*, DZ 30.760, DZ 30.761 (DZUP); 14.XI.2013, 1 male, G. Melo *leg.*, DZ 30.802; **Coronel Rio Branco**, Cáceres, Rio Vermelho, 400 m, 2.VII.1972, 1 male, Mielke & Brown *leg.*, DZ 30.779 (DZUP); 13.XI.1984, 1 female, Buzzi, Mielke & Elias *leg.*, DZ 30.794 (DZUP); **Cuiabá**, São Vicente, 700 m, 24.VI.1972, 2 males, Mielke & Brown *leg.*, DZ 30.778, DZ 30.780 (DZUP); 30.VI.1972, 1 male, Mielke & Brown *leg.*, DZ 30.786 (DZUP); **Diamantino**, Fazenda São João, Rio Arinos, 300–400 m, 11.I.1978, 1 male, Mielke & Furtado *leg.*, DZ 30.762 (DZUP); 12.I.1978, 5 males and 2 females, Mielke & Furtado *leg.*, DZ 30.665*, DZ 30.763, DZ 30.764, DZ 30.765, DZ 30.766, DZ 30.767, DZ 30.768 (DZUP); 14.I.1978, 1 female, Mielke & Furtado *leg.*, DZ 30.769 (DZUP), 15.I.1978, 1 male, Mielke & Furtado *leg.*, DZ 30.770 (DZUP); 17.I.1978, 1 male and 2 females, Mielke & Furtado *leg.*, DZ 30.771, DZ 30.772, DZ 30.669* (DZUP); 20.I.1978, 1 male, Mielke & Furtado *leg.*, DZ 30.773 (DZUP); 4.IX.1978, 1 female, Mielke & Furtado *leg.*, DZ 30.795 (DZUP), 21.XI.1984, 1 male and 1 female, Mielke & Casagrande *leg.*, DZ 30.744, DZ 30.788 (DZUP); 1–8.VIII.1974, 2 males and 2 females, H. & H. D. Ebert *leg.*, DZ 30.747, DZ 30.750, DZ 30.751, DZ 30.752 (DZUP); 2.V.1978, 1 male, H. & H. D. Ebert *leg.*, DZ 30.753 (DZUP); **Nova Xavantina**, Universidade do Estado do Mato Grosso, Bacabal, 17–19.VIII.1997, 2 males, Mielke *leg.*, DZ 30.742, DZ 30.743 (DZUP); **Goiás: Ilha do Bananal**, 14.VI.1979, 1 male, Gifford *leg.*, DZ 30.801 (DZUP); 19.IX.1980, 2 males, Gifford *leg.*, DZ 30.787, DZ 30.800 (DZUP); **Goianésia**, 900m, 2–7.IX.1969, 1 male and 2 females, K. & H. Ebert *leg.*, DZ 30.791, DZ 30.792, DZ 30.796 (DZUP); **Goias**, VII.1976, 1 male, Gifford *leg.*, DZ 30.793 (DZUP); 17.XI.1976, 1 female, DZ 30.799 (DZUP); 5.VI.1979, 1 female, Gifford *leg.*, DZ 30.797 (DZUP); 5.II.1980, 1 male, no collector, DZ 30.803 (DZUP); 6.XI.1980, 1 female, Gifford *leg.*, DZ 30.798 (DZUP).

***Pierella boliviana* F.M. Brown, 1948 stat. nov.**

(Figures 9–12, 31, 42–47, 52–53)

Pierella stollei boliviana F.M. Brown, 1948, p. 74–75.—D'Abbrera, 1988, p. 731.

Pierella hyceta (Hewitson, 1859); Lewis 1973, p. 65 [misidentification].

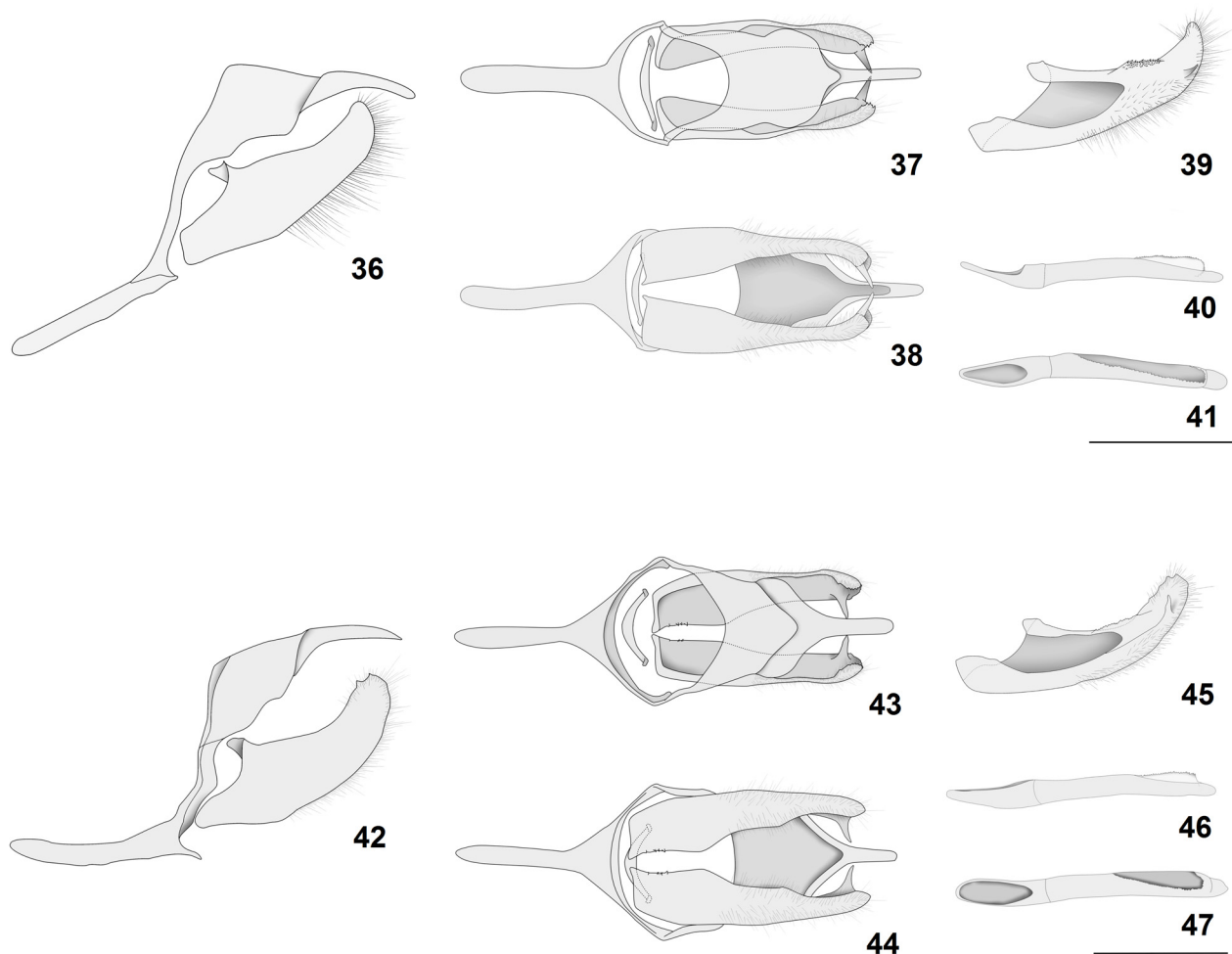
Pierella lamia boliviana; Lamas, 2004, p. 206.

Diagnosis. *Pierella boliviana* **stat. nov.** resembles *P. luna* (Fabricius, 1793) in size (male FW length: 38–39 mm [n = 3]; female FW length: 38–42 mm [n = 3]) and HW shape, but the ocelli of *P. luna* are restricted to Rs-M₁ and M₁-M₂. Within the “*P. lamia* species group”, *P. boliviana* **stat. nov.** is closely related to *P. lamia*, but differs from that by the straight HW costal margin and the outer margin projected at M₁. There are four incomplete ocelli on VHW, but some individuals might have a reduced ocellus in M₂-M₃. VHW post-discal and postmedian lines are straight. Androconial patch is characterized by a well-marked, elongated dark central area (Fig. 31). Tegumen is dorsally larger than in *P. lamia*, uncus straight and tapering at the apex, valva with apex projected out upwards and serrated

with some reduced spines on sacculus, aedeagus rounded at the anterior portion (Figs 42–47). In female genitalia, the papillae anales have a developed and curved posterior apophysis similar to *P. angeloi* sp. nov., corpus bursae almost the same length of ductus bursae, and with a paired signa on the ventral side (Figs 52–53).

Distribution (Fig. 62). This species is only known from the departments of Santa Cruz and Cochabamba, Bolívia, in the Yungas province of the South Brazilian dominion.

Host plant. Unknown.



FIGURES 36–47. Male genitalia of “*Pierella lamia* species group”. **36–41.** *Pierella lamia*: 36. lateral; 37. dorsal; 38. ventral; 39. valva, inner view; 40. aedeagus, lateral; 41. aedeagus, dorsal. **42–47.** *Pierella boliviana* stat. nov.: 42. lateral; 43. dorsal; 44. ventral; 45. valva, inner view; 46. aedeagus, lateral; 47. aedeagus, dorsal. Scales bar = 1 mm.

Remarks. Brown (1948) described *Pierella stollei boliviana* based on several specimens from Rio Yapacani, Santa Cruz, Bolivia. The holotype is deposited at the Carnegie Museum of Natural History, USA (CMNH) and paratypes are deposited at CMNH and NHM. Lamas (2004) proposed a new combination, *Pierella lamia boliviana*. Currently, *P. stollei* Ribeiro, 1931 is a subspecies of *P. astyoche* (Erichson, [1849]) (Lamas 2004). All *P. astyoche* subspecies have a lighter transverse band in the submarginal region of the VFW and VHW, not present in *P. lamia*. Based on the genitalia of both sexes and the wing colour pattern, there is no doubt that *P. boliviana* stat. nov. is a valid species and distinct from *P. lamia*.

Material examined. BOLÍVIA—*Cochabamba*: **Chapare**, no specific locality, 400 m, 30.V.1949, 1 female, R. Zischka leg., DZ 30.857* (DZUP); 28.X.1950, 1 male, R. Zischka leg., DZ 30.858 (DZUP); *Santa Cruz*: **Buenavista**, 5 km NW, 500 m, 30.IX–4.X.2001, 2 males and 2 females, Mielke & Casagrande leg., OM 54.730, OM 54.681*, OM 54.772*, OM 54.751 (OM).

***Pierella angeloi* Zacca, Siewert & Mielke sp. nov.**

(Figures 13–16, 32, 54–55)

Diagnosis. The background colour of *P. angeloi* sp. nov. has a grayish appearance, being lighter than other species of the “*P. lamia* species group”. Yellow stain restricted to the DFW discal cell in males or only to the distal area of the discal cell in females. Basal, discal, post-discal and submarginal lines are faint. Androconial patch characterized by the elongated dark central area (Fig. 32). Female slightly darker than male, and all ocelli are well-developed. Female papillae anales with a well-developed and curved posterior apophysis similar to *P. kesselringi* sp. nov., but the ductus bursae approximately three times longer than corpus bursae, and the paired signa are located latero-ventrally (Figs 54–55).

Description. *Head.* Front white. Vertex white mixed with light brown. Antennae dark brown. Labial palpi with elongated white scales mixed with light brown externally and white on the inner margin. *Thorax.* Prothoracic legs white; meso and metathoracic legs brown on the upper side and lighter on the underside. *Forewing length:* male: 31–32 mm (n = 5); female length: 34–37 mm (n = 7). *Forewing upper side* (Figs 13–15). Mostly grayish brown, with a yellow stain covering the discal area. *Forewing under side* (Figs 14–16). Mostly light brown, outer margin dark and ripple pattern brown. Three reduced white incomplete ocelli in R₅-M₁, M₁-M₂ and M₂-M₃. *Hind wing upper side* (Figs 13–15). Mostly dark brown, lighter towards to base. Five incomplete ocelli in Rs-M₁, M₁-M₂, M₂-M₃, M₃-CuA₁ and CuA₁-CuA₂, and the white pupil of the latter is reduced. Three black spots on the basal region. Four convex dark brown lines, the most distal line wider. Androconial patch with an elongated dark central area (Fig. 32). *Hind wing under side* (Figs 14–16). Similar to DHW. Outer margin light brown in males and brown in females, and five incomplete ocelli in Rs-M₁, M₁-M₂, M₂-M₃, M₃-CuA₁ and CuA₁-CuA₂.

Male genitalia. Similar to *P. lamia* (see Figs 36–41).

Female genitalia (Figs 54–55). Tergum VIII trapezoid. Papillae anales with setae at the distal area, approximately three times higher than longer, sclerotized at the basal half. Sternum VIII not fused with the lamella antevaginalis. Corpus bursae completely membranous, with paired signa located latero-ventrally signa; ductus bursae about three times longer than corpus bursae, sclerotized and dilated on the anterior portion.

Distribution (Fig. 62). This species is restricted to semideciduous forests enclaves in Cerrado province of the Chacoan dominion at Maranhão state, Brazil. So far, *P. angeloi* sp. nov. is known only from the type locality and Tuntum (5°43'50"S 44°46'32"W), the latter with a unique record of a female collected in the 1970s.

Host plant. Unknown.

Etymology. The species name honors the Brazilian entomologist Angelo Barbosa Monteiro Machado.

Type material. Holotype male with the following labels (separated by forward slash symbols): / HOLOTYPUS/ *Pierella angeloi* Zacca, Siewert & Mielke det. 2014/ Brasil, Maranhão, 26 km E Feira Nova do Maranhão, Faz[enda] Forquilha dos Brejos, 07°00'29"S 46°26'30"W 14–21–VIII–2011, O. Mielke leg./ DZ 30.672/ (DZUP). Allotype female with the following labels (separated by forward slash symbols): /ALLOTYPUS/ *Pierella angeloi* Zacca, Siewert & Mielke det. 2014/ Brasil, Maranhão, 26 km E Feira Nova do Maranhão, Faz[enda] Forquilha dos Brejos, 07°00'29"S 46°26'30"W 14–21–VIII–2011, O. Mielke leg. DZ 30.679/ (DZUP).

Paratypes. BRAZIL—*Maranhão:* **Feira Nova do Maranhão**, 26 km E, Fazenda Forquilha dos Brejos (7°00'29"S 46°26'30"W), 15–25.II.2012, 4 males and 5 females, O.-C. Mielke leg., DZ 30.673, DZ 30.674, DZ 30.675*, DZ 30.681 (DZUP), 14–21–VIII–2011, 1 male and 5 females, DZ 30.681, DZ 30.678, DZ 30.680, DZ 30.676, DZ 30.677*, DZ 30.682* (DZUP); **Tuntum**, 25.VII.1973, 1 female, A. Cardoso leg., DZ 30.683 (DZUP).

***Pierella kesselringi* Zacca, Siewert & Paluch sp. nov.**

(Figures 17–20, 33, 56–57)

Pierella lamia (Sulzer, 1776); Cardoso, 1949, p. 428.—Brown, Freitas, Schoultz, Saura & Saura, 2007, p. 472. [misidentification]

Pierella sp. nov.; Kesselring & Ebert [1982], p. 118.

Pierella lamia ssp.; Paluch, Mielke, Nobre, Casagrande, Melo & Freitas, 2011, p. 235.

Diagnosis. *Pierella kesselringi* sp. nov. can be distinguished from *P. keithbrowni* sp. nov. by the DFW yellow stain restricted to discal area and wings completely brown in females. Androconial patch characterized by the large and

well-marked dark rounded central area (Fig. 33). Female genitalia present the papillae anales with a well-developed and curved posterior aphophysis similar to *P. angelo* sp. nov., but the ductus bursae is 1.5 times longer than corpus bursae. Ostium bursae with a sclerotized projection from the ductus bursae, similar to *P. chalybaea* stat. rest, but the paired signa of the latter is located on the underside of the corpus bursae (Figs 56–57).

Description. *Head.* Front brown. Antennae dark brown. Labial palpi with elongated scales, white on the underside and mixed with brown and light brown scales on the upper side. *Thorax.* Prothoracic legs white; meso and metathoracic legs brown on the upper side and lighter on the underside. *Forewing length:* male: 33–36 mm (n = 22); female: 36–38 mm (n = 8). *Forewing upper side* (Figs 17, 19). Mostly brown, with a yellow stain covering about 2/3 of the wing. Discal cell with three black dots. *Forewing under side* (Figs 18, 20). Similar to DFW. Mostly light brown with outer margin darker in males. Three reduced incomplete ocelli in R_5-M_1 , M_1-M_2 and M_2-M_3 . *Hind wing upper side* (Figs 17, 19). Mostly dark brown, lighter towards to base. Five incomplete ocelli in R_s-M_1 , M_1-M_2 , M_2-M_3 , M_3-CuA_1 and CuA_1-CuA_2 , the second and the fourth are the largest. Four black spots on the basal region. Four convex dark brown lines, the most distal thicker and well-marked. Androconial patch with a large and well-marked dark rounded central area (Fig. 33). *Hind wing under side* (Figs 18, 20). Similar to DHW. Outer margin brown and five incomplete ocelli in R_s-M_1 , M_1-M_2 , M_2-M_3 , M_3-CuA_1 and CuA_1-CuA_2 .

Male genitalia. Similar to *P. lamia* (see Figs 36–41).

Female genitalia (Figs 56–57). Tergum VIII trapezoid. Papillae anales with setae at the distal area, approximately 2/3 taller than longer, sclerotized at the basal half. Sternum VIII not fused with the lamella antevaginalis. Corpus bursae completely membranous, with paired signa located dorsally; ductus bursae about three times longer than corpus bursae, anterior portion sclerotized and dilated; ostium bursae with a sclerotized projection out from ductus bursae.

Distribution (Fig. 62). This species occurs in the Northeast Brazil (Paraíba, Pernambuco, Alagoas and Sergipe states) in Caatinga province (Chacoan dominion) and Atlantic and Parana Forest provinces (Parana dominion).

Host plant. Unknown.

Etymology. This species honours to Swiss-Brazilian naturalist Hans Jorge Kesselring, who collected several specimens examined in the present study.

Remarks. Kesselring & Ebert [1982] suggested this species as a new one close related to “*Pierella lamia*” in their list of butterflies from “Mata do Buraquinho”, Paraíba, Brazil, but they did not described this species. Paluch *et al.* (2011) pointed out that individuals collected in the Ecological Park João Vasconcelos Sobrinho, Caruaru, Pernambuco, Brazil might constitute a distinct subspecies of *P. lamia*, however they also did not describe that. In the present study, morphological evidences from androconial patches and female genitalia were founded and its support the Kesselring & Ebert’s opinion, in addition to the differences in the chromosomal number on this species (Brown *et al.* 2007).

Type material. Holotype male with the following labels (separated by forward slash symbols): /HOLOTYPUS/ *Pierella kesselringi* Zacca, Siewert & Paluch det. 2014/ 6–7–II–2006, R[eserva] P[articular de] P[atrimônio] N[atural] Frei Caneca, Jaqueira, Pe[rnambuco], 650m. Mielke & Casagrande leg./ DZ 29.614/ (DZUP). Allotype female with the following labels (separated by forward slash symbols): /ALLOTYPUS/ *Pierella kesselringi* Zacca, Siewert & Paluch det. 2014/ 28–X–1945 Maceio, Alagoas, A. Cardoso leg./ Ex-coleção A. Cardoso/ DZ 29.618/ (DZUP).

Paratypes. BRAZIL—*Paraíba:* **João Pessoa**, 19.XII.1953, 1 male, J. Kesselring leg., DZ 29.599 (DZUP); 10–50 m, 4.VI.1953, 1 male, J. Kesselring leg. DZ 29.600 (DZUP); 23.VI.1954, 1 female, J. Kesselring leg. DZ 29.601* (DZUP); 10–50 m, 16.VIII.1954, J. Kesselring leg. DZ 29.598 (DZUP); *Pernambuco:* **Igarassu**, V–VI.2007, 1 male, C.E.B. Nobre (UFPE); **Recife**, 20–80 m, 29.X.1960, 1 male, H. Ebert leg. DZ 29.602 (DZUP); 13.VII.1959, 1 male, H. Ebert leg. DZ 29.604 (DZUP); 7.IX.1957, 1 male, H. Ebert leg. DZ 29.605 (DZUP); 20–50 m, 30.I.1954, 1 male, H. Ebert leg. DZ 29.606 (DZUP); 20–80 m, 28.X.1958, 1 male, H. Ebert leg. DZ 29.608 (DZUP); Dois Irmãos, 20–50 m, 1.IX.1957, 1 male, H. Ebert leg. DZ 29.609 (DZUP); 31.VIII.1957, 1 male, H. Ebert leg. DZ 29.610 (DZUP); **São Lourenço da Mata**, Tiúma, 100 m, 20.VI.1952, 1 male, H. Ebert leg. DZ 29.607 (DZUP); 15.VII.1973, 1 male, H. Ebert leg. DZ 29.616 (DZUP); Goiana, 20–50 m, 2.XII.1957, 1 male, H. Ebert leg. DZ 29.611 (DZUP); Jaqueira, RPPN Frei Caneca, 650 m, 6–7.II.2006, 1 male, Mielke & Casagrande leg. DZ 29.612 (DZUP); *Alagoas:* **Maceió**, 28.X.1945, 2 females, A. Cardoso leg. DZ 29.617, DZ 30.671* (DZUP); 15.VI.1945, 1 female, A. Cardoso leg. DZ 26.219 (DZUP); 11.V.1973, 1 male, A. Cardoso leg. DZ 29.620 (DZUP); 8.VI.1974, 1 male, A. Cardoso leg. DZ 29.621 (DZUP); VI.1967, 1 female, A. Cardoso leg. DZ 29.622

(DZUP); 8.XI.1972, 1 female, A. Cardoso *leg.* DZ 29.624 (DZUP); 26.XI.1972, 1 female, A. Cardoso *leg.* DZ 29.625 (DZUP); 28.I.1975, 1 female, A. Cardoso *leg.* DZ 29.626 (DZUP); 22.VII.1973, 1 male, A. Cardoso *leg.* DZ 29.627 (DZUP); 28.I.1975, 1 male, A. Cardoso *leg.*, DZ 30.667* (DZUP); 20.IV.1976, 1 male, A. Cardoso *leg.* DZ 29.628 (DZUP); 7.IV.1974, 1 male, A. Cardoso *leg.* DZ 29.629 (DZUP); **São José da Lage**, Usina Serra Grande, 300 m, 16–17.III.1997, 1 male, Mielke & Casagrande *leg.* OM 48.402 (OM); *Sergipe: Itabaiana*, Parque Serra de Itabaiana, 22.XI.2013, 1 male, Leite L.A.R *leg.* CEUFS 4.296 (CEUFS); 31.V.2014, 1 male, Santos & Silva *leg.* CEUFS 4.297 (CEUFS); 1–3.VII.2014, 1 male and 1 female, Leite, Queiroz, Santos, Silva & Carmo *leg.* CEUFS 4.298, CEUFS 4.299 (CEUFS).

***Pierella nice* Zacca, Siewert & Paluch sp. nov.**

(Figures 21–24, 34, 58–59)

Pierella lamia ssp.; Zacca, Bravo & Araújo, 2011, p. 141

Diagnosis. *Pierella nice* sp. nov. resembles to *P. chalybaea* stat. rest, but can be distinguished from the latter by the yellow stain covering beyond the discal cell, and the completely absence of steely blue reflection on the hind wings. Androconial patch is characterized by the well-marked dark rounded central area (Fig. 34). Female genitalia present papillae anales with a well-developed straight posterior aphophysis similar to *P. keithbrowni* sp. nov., but the ductus bursae is sclerotized, about the same length as the corpus bursae, and paired signa located ventrally (Figs 58–59).

Description. *Head.* Front brown. Antennae dark brown. Labial palpi with elongated scales, white on the underside and mixed with brown and light brown scales on the underside. *Thorax.* Prothoracic legs creamy on the upper side and white on the underside; meso and metathoracic legs brown on the upper side and lighter on the underside. *Forewing length:* male: 35–37 mm (n = 7); female: 38–39 mm (n = 3). *Forewing upper side* (Figs 21, 23). Mostly brown, with a yellow stain covering about 2/3 of the wing. *Forewing under side* (Figs 22, 24). Similar to DFW. Mostly light brown, outer margin dark and ripple pattern brown. Two reduced white incomplete ocelli in R_5-M_1 and M_1-M_2 . *Hind wing upper side* (Figs 21, 23). Mostly dark brown, lighter towards to the base. Five incomplete ocelli in $Rs-M_1$, M_1-M_2 , M_2-M_3 , M_3-CuA_1 and CuA_1-CuA_2 , the second larger than the others, the third reduced, and the last ocellus faded. Three black spots on the basal region. Four convex dark brown lines, the most distal line thicker and well-marked. Androconial patch with a well-marked dark rounded central area (Fig. 34). *Hind wing under side* (Figs 22, 24). Similar to DHW. Outer margin brown and with five white pupils in $Rs-M_1$, M_1-M_2 , M_2-M_3 , M_3-CuA_1 and CuA_1-CuA_2 .

Male genitalia. Similar to *P. lamia* (see Figs 36–41).

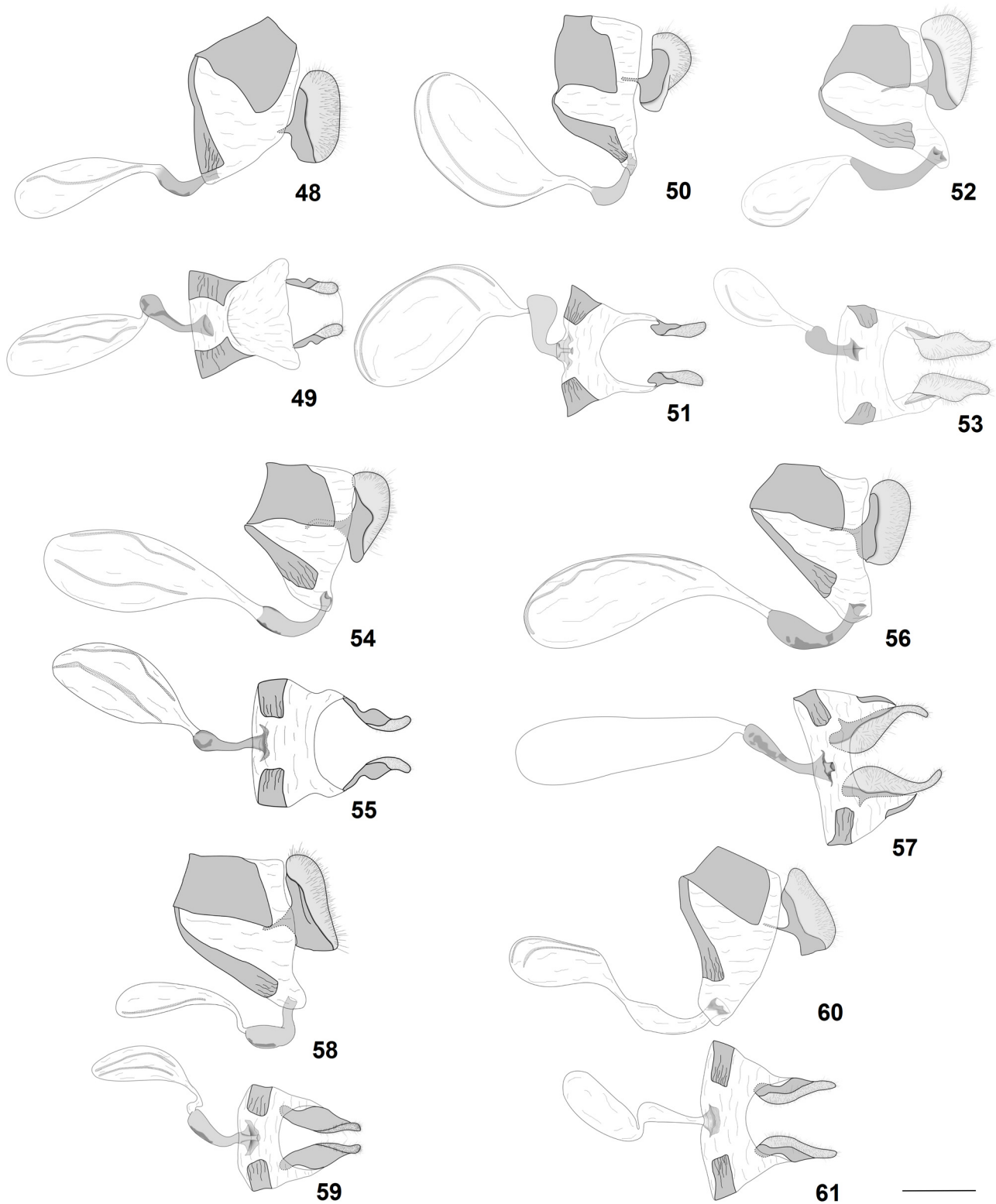
Female genitalia (Figs 58–59). Tergum VIII trapezoid. Papillae anales with setae at the distal area, approximately three times taller than longer, sclerotized at the basal half. Sternum VIII not fused with the lamella antevaginalis. Corpus bursae completely membranous, with paired signa located ventrally; ductus bursae about same length as the corpus bursae, anterior portion sclerotized and dilated.

Distribution (Fig. 62). This species is currently known only from the Atlantic province (Parana dominion), Bahia state, Brazil, between 200–1,000m altitude.

Host plant. Unknown.

Etymology. The species name honors both mothers of the senior and second authors, Adenice B. Santos and Janice R. Siewert.

Remarks. During fieldworks at Serra da Jibóia, Bahia, Brazil, Zacca *et al.* (2011) noticed some phenotypical differences on the wings of *Pierella lamia* specimens collected in this area, and suggested it might be considered a new subspecies. Detailed morphological studies on eighteen specimens from distinct localities in Bahia revealed the constant morphology of the female genitalia and the androconial patches, being evidences that support *P. nice* sp. nov. as a good species. Furthermore, based on geographic distributional data and phytophysiognomies similarities between Una and Itabuna (approximately distance of 50 km each other) is possible that *P. nice* sp. nov. and *P. keithbrowni* sp. nov. are sympatric, but no specimens were seen in the examined collections.



FIGURES 48–61. Female genitalia of “*Pierella lamia* species group”. **48–49.** *Pierella lamia*: 48. lateral; 49. ventral. **50–51.** *Pierella chalybaea* **stat. rest.**: 50. lateral; 51. ventral. **52–53.** *Pierella boliviana* **stat. nov.**: 52. lateral; 53. ventral. **54–55.** *Pierella angeloi* **sp. nov.**: 54. lateral; 55. ventral; **56–57.** *Pierella kesselringi* **sp. nov.**: 56. lateral; 57. ventral. **58–59.** *Pierella nice* **sp. nov.**: 58. lateral; 59. ventral. **60–61.** *Pierella keithbrowni* **sp. nov.**: 60. lateral; 61. ventral. Scale bar = 1 mm.

Type material. Holotype male with the following labels (separated by forward slash symbols): HOLOTYPUS /*Pierella nice* Zacca, Siewert & Paluch det. 2014/ 6–8–IV–2002 AMARGOSA, BA[HIA] 750m O.-C. MIELKE LEG./ OM 56.227/ (OM). Allotype female with the following labels (separated by forward slash symbols): / ALLOTYPUS/ *Pierella nice* Zacca, Siewert & Paluch det. 2014/ Ibirapitanga—BA, 10/XI/2013, Paluch, M. & D. Carvalho Silva leg., DZ 30.880 (DZUP).

Paratypes. BRAZIL—Bahia: **Água Comprida [= Simões Filho]**, 50 m, 14.IX.1957, 1 male, H. Ebert leg. DZ 29.636 (DZUP); **Ibirapitanga**, 6.X.2013, 4 females, M. Paluch & D. C. Silva leg., DZ 30.873, DZ 30.874*, DZ 30.875, DZ 30.876 (DZUP); 2 males, 10.XI.2013, M. Paluch & D. C. Silva leg., DZ 30.877, DZ 30.879* (DZUP); **Itabuna**, I.1967, 1 female, V. Becker leg., DZ 29.632 (DZUP); CEPLAC [Comissão Executiva de Plano de Lavoura Cacaueira], 10 m, 21.X.1998, 1 male, Mielke & Casagrande leg. OM 49.586 (OM), 19–20.X.1998, 1 male, Mielke & Casagrande leg. OM 49.360 (OM); **Jitaúna**, 150 m, 26.III.1961, 3 males and 1 female, H. Ebert leg. DZ 29.630, DZ 29.668, DZ 30.668*, DZ 29.631* (DZUP); **Ubatã**, 20.XII.1966, 1 male and 1 female, Brown leg. DZ 29.634, DZ 29.635 (DZUP).

***Pierella keithbrowni* Siewert, Zacca & Casagrande sp. nov.**

(Figures 25–28, 35, 60–61)

Pierella rhea [in part]; Weymer, 1911, p. 178.

Pierella ? sp.; D’Abrera, 1988, p. 730.

Pierella lamia ssp. nov.; Brown & Freitas, 2000, p. 103.

Pierella lamia (Sulzer, 1776); Otero & Marigo, 1990, p. 54–55.—Freitas & Brown, 2004, p. 365.—Silva, Guimarães, Vitalino, Bagni, Martins, Cordeiro & Oliveira, 2010, p. 10.—Francini, Duarte, Mielke, Caldas & Freitas, 2011, p. 65.—Soares, Bizarro, Bastos, Tangerini, Silva, Silva & Silva, 2011, p. 75. [misidentification]

Diagnosis. *Pierella keithbrowni* sp. nov. resembles *P. nice* sp. nov., but the ocelli on the DHW are not faded and the background is lighter, especially in females. Androconial patch characterized by the small dark rounded central area (Fig. 35). Papillae anales with a well-developed straight posterior apophysis similar to *P. nice*, sp. nov., but ductus bursae longer than corpus bursae and completely membranous (Figs 60–61).

Description. *Head.* Front brown. Antennae dark brown. Labial palpi with elongated white scales. *Thorax.* Prothoracic legs white; meso and metathoracic legs brown on upper side and lighter on underside. *Forewing length:* male: 31–40 mm (n = 82); female: 35–41 mm (n = 45). *Forewing upper side* (Figs 25, 27). Mostly brown, with an intense yellow-greenish iridescent patch from basal region to submarginal line. *Forewing under side* (Figs 26, 28). Mostly light brown, outer margin dark and ripple pattern brown. Two white incomplete ocelli in R_5-M_1 and M_1-M_2 . *Hind wing upper side* (Figs 25, 27). Mostly dark brown, lighter towards to base. Five incomplete ocelli in $Rs-M_1$, M_1-M_2 , M_2-M_3 , M_3-CuA_1 and CuA_1-CuA_2 , the second larger than all others, the third one reduced and the last ocellus faded. Three black spots (in some cases four) on basal region in the discal cell. Four convex dark brown lines, the most distal line thicker and well-marked. Androconial patch with a small dark rounded central area (Fig. 35). *Hind wing under side* (Figs 26, 28). Similar to DHW. Outer margin brown and with five white incomplete ocelli $Rs-M_1$, M_1-M_2 , M_2-M_3 , M_3-CuA_1 and CuA_1-CuA_2 .

Male genitalia. Similar to *P. lamia* (see Figs 36–41).

Female genitalia (Figs 60–61). Tergum VIII trapezoid. Papillae anales with setae at the distal area, about two times taller than longer, and sclerotized at the basal half. Sternum VIII not fused with the lamella antevaginalis. Corpus bursae completely membranous, with paired signa located dorsally; ductus bursae similar in length to the corpus bursae, membranous and dilated on the anterior portion.

Distribution (Fig. 62). *Pierella keithbrowni* sp. nov. is distributed along the Atlantic and Parana Forest provinces of the Parana dominion, ranging from Bahia to Santa Catarina.

Host plant. *Maranta* sp. (Marantaceae) (Otero & Marigo 1990, Freitas 1992 pers. comm. in Beccaloni *et al.* 2008, Brown & Freitas 2000).

Etymology. This species is named in honour of Keith Spalding Brown Junior for his great contribution to the study of the Neotropical butterflies.

Remarks. D’Abrera (1988) cited and illustrated a new species of *Pierella* from Midwest and Southern Brazil following the M. Clifton’s unpublished taxonomic work on this genus, based on specimens deposited at the NHM

collection. Brown & Freitas (2000) also noticed phenotypic wings variations in specimens from southern Brazil (Santa Teresa, Espírito Santo), when compared with the *P. lamia* from Amazonian region, and suggested that as a new subspecies. The comparative morphological studies supports the M. Clifton's proposal, and here this species is described. *Pierella keithbrowni* **sp. nov.** probably flies together with *P. nice* **sp. nov.** (see previous discussion in *P. nice* section), with a unique most northerly register for Sauípe de Dentro, Bahia.

Type material. Holotype male with the following labels (separated by forward slash symbols): / HOLOTYPE/ *Pierella keithbrowni* Siewert, Zacca & Casagrande det. 2014/ IV–1978 Linhares, E[spirito] S[anto] Elias leg./ DZ 29.671/ (DZUP). Allotype female with the following labels (separated by forward slash symbols): / ALLOTYPUS/ *Pierella keithbrowni* Siewert, Zacca & Casagrande det. 2014/ IX–1982 Linhares, E[spirito] S[anto] Elias leg./ DZ 29.650/ (DZUP).

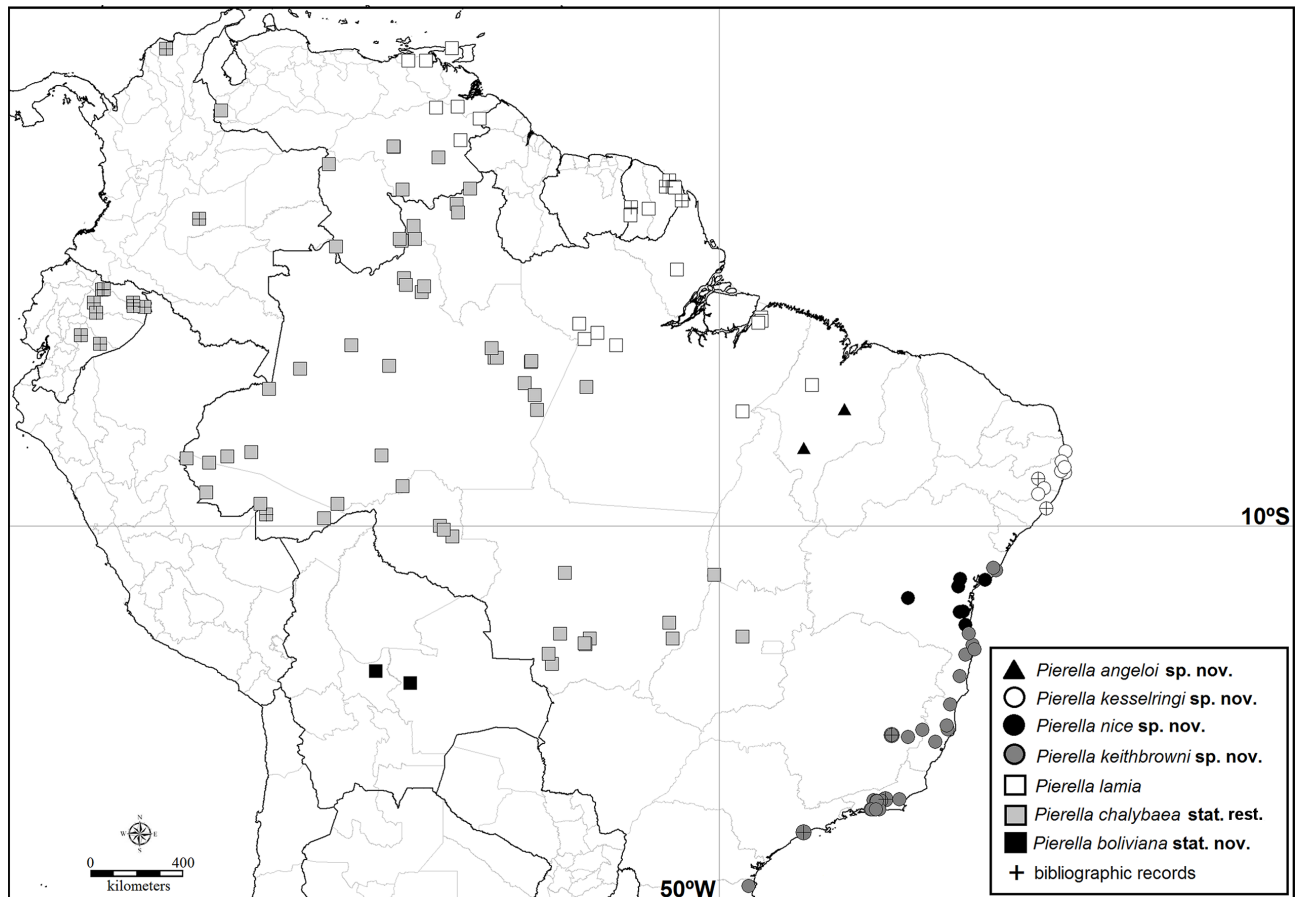


FIGURE 62. Geographical distribution of “*Pierella lamia*” species group.

Paratypes. BRAZIL—*Bahia*: **Belmonte**, Barrolândia, Fazenda Prosperidade, 4.I.1977, 1 male, no collector, MZFS 39.113 (MZFS); **Canavieiras**, Santa Luzia, Estação Experimental CEPLAC, 2.X.1987, 1 male, J. Becker leg., MZFS 39.111 (MZFS); **Itamarajú**, 28.X.1985, 1 male, J. Becker leg., MZFS 39.949 (MZFS); **Itanagra**, RPPN Lontra/ Saudade, 23.I.2012, 1 male, Linhares & Paluch leg., DZ 30.882* (DZUP), 24.I.2012, 1 female Paluch & Linhares leg., DZ 30.881* (DZUP); 28.IV.2012, 2 males, Linhares & Paluch leg., DZ 30.883, DZ 30.887 (DZUP), 22.VII.2012, 1 male, Linhares & Paluch leg. DZ 30.884 (DZUP), 21.VIII.2012, 1 male, Paluch & Linhares leg., DZ 30.885 (DZUP), 4.X.2012, 1 female, Paluch & Linhares leg., DZ 30.886 (DZUP); **Sauípe**, 6.V.2008, 1 male, T. Zacca leg. MZFS 39.114 (MZFS); **Una**, Reserva Biológica, 5.X.1987, 1 male, J. Becker leg. MZFS 39.112 (MZFS), 8.X.1987, 1 male, J. Becker leg. MZFS 39.110 (MZFS). *Espírito Santo*: **Conceição da Barra**, 5.IX.1967, 1 female, C. & C. T. Elias leg. DZ 29.645 (DZUP), 25 m, 6–11.V.1968, 1 male, C. Elias leg. DZ 29.691 (DZUP), 8–13.IV.1968, 1 male, Elias leg. DZ 29.685 (DZUP), 25 m, 6–11.V.1968, 1 male, Elias leg. DZ 29.686 (DZUP), 25.V.1968, 1 male, C. & C. T. Elias leg. DZ 29.656 (DZUP), 25 m, 19–29.VI.1968, 1 male, Elias leg. DZ 30.666* (DZUP), 20.VI.1968, 4 males and 1 female, C. & C. T. Elias leg. DZ 29.652, DZ 29.667, DZ

29.669*, DZ 29.675, DZ 29.674* (DZUP), 27.VI.1968, 1 male, C. & C. T. Elias *leg.* DZ 29.668 (DZUP), 4.VII.1968, 1 male and 1 female, C. & C. T. Elias *leg.* DZ 29.647, DZ 29.665 (DZUP), 17.VII.1968, 1 male, C. & C. T. Elias *leg.* DZ 29.660 (DZUP), 28.VIII.1968, 1 male, C. & C. T. Elias *leg.* DZ 29.655 (DZUP), 12.IX.1968, 2 males, C. & C. T. Elias *leg.* DZ 29.657, DZ 29.666 (DZUP), 18.X.1968, 1 female, C. & C. T. Elias *leg.* DZ 29.659 (DZUP), 25.XII.1968, 1 male, C. & C. T. Elias *leg.* DZ 29.672 (DZUP), 25.X.1968, 1 male and 1 female, C. & C. T. Elias *leg.* DZ 29.646, DZ 29.658 (DZUP), 22.II.1969, 1 male, C. & C. T. Elias *leg.* DZ 29.677 (DZUP), 18.V.1969, 1 male, C. & C. T. Elias *leg.* DZ 29.676 (DZUP), 18.VI.1969, 1 male, C. & C. T. Elias *leg.* DZ 29.661 (DZUP), 11.VIII.1969, 1 male, C. & C. T. Elias *leg.* DZ 29.648 (DZUP), 4.IX.1969, 1 male, C. & C. T. Elias *leg.* DZ 29.664 (DZUP), 10.XI.1969, C. & C. T. Elias *leg.* DZ 29.678 (DZUP), 26.IX.1969, 1 male, C. & C. T. Elias *leg.* DZ 29.651 (DZUP), 4.X.1969, 1 male, C. & C. T. Elias *leg.* DZ 29.670 (DZUP); **Linhares**, III.1973, 1 male, C. Elias *leg.* DZ 29.680 (DZUP), IV.1973, 1 male, C. Elias *leg.* DZ 29.642 (DZUP), Rio Doce, 25 m, 18–26.I.1975, 2 females, H. & H. D. Ebert *leg.* DZ 29.689, DZ 29.692 (DZUP), IV.1978, 2 males, C. Elias *leg.* DZ 29.682, DZ 29.641 (DZUP), V.1978, 1 male, C. Elias *leg.* DZ 29.644 (DZUP), IV.1979, 2 males, C. Elias *leg.* DZ 29.638, DZ 29.639 (DZUP), VII.1980, 1 male, C. Elias *leg.* DZ 29.690 (DZUP), IX.1982, 1 male, C. Elias *leg.* DZ 29.649 (DZUP), EM[presa] CA[pixaba de] P[esquisa e] A[agropecuária], 25.VIII.1977, 2 males, J. Becker *leg.*, MZFS 39.115, MZFS 40.772 (MZFS); **Pedro Canário**, 50–100 m, 22–27.VII.1967, 3 males and 2 females, K. Ebert *leg.* DZ 29.637, DZ 29.640, DZ 29.687, DZ 29.688*, DZ 29.694 (DZUP); **Santa Teresa**, 10.VI.1966, 1 male, C. & C. T. Elias *leg.* DZ 29.662 (DZUP), 12.V.1967, C. & C. T. Elias *leg.* DZ 29.654 (DZUP), 750 m, 3.III.1970, 1 male, K. Ebert *leg.* DZ 29.684 (DZUP); **Sooretama**, 19°03'21"S 25°08'49"W, 28.II–2.III.2010, 1 male, Moreira & Barão *leg.* DZ 29.681 (DZUP), Reserva Ecológica Sooretama, 19°03'25"S 40°08'50"W, 19–26.II.2013, 2 males, Mielke & Casagrande *leg.* DZ 29.695, DZ 29.696 (DZUP), 21–25.I.2014, 1 male, Mielke & Casagrande *leg.* DZ 29.697 (DZUP). **Rio de Janeiro**: **Casimiro de Abreu**, Barra de São João, 10 m, 30.VII.1972, 1 male, H. Ebert *leg.* DZ 29.741 (DZUP), 18.IV.1974, 1 male, K. Ebert & H. Ebert *leg.* DZ 29.742 (DZUP), 4.IX.1975, 1 male, H. Ebert *leg.* DZ 29.748 (DZUP), 14.XI.1993, 1 male, Mielke, Miers & Tangerini *leg.* OM 37.911 (OM); **Duque de Caxias**, Imbariê, 25 m, 22.I.1955, 1 female, H. Ebert *leg.* DZ 29.708 (DZUP), 25 m, 27.VIII.1955, 1 female, H. Ebert *leg.* DZ 29.722 (DZUP), 100 m, 7.I.1956, 1 male, H. Ebert *leg.* DZ 29.733 (DZUP), 23.XII.1956, 1 female, H. Ebert *leg.* DZ 29.717 (DZUP), 12.II.1964, 1 female, H. Ebert *leg.* DZ 29.724 (DZUP), 25 m, 15.VII.1964, 1 male, H. Ebert *leg.* DZ 29.727 (DZUP), 10.II.1965, 1 female, H. Ebert *leg.* DZ 29.738 (DZUP), 19.VII.1965, 1 female, H. Ebert *leg.* DZ 29.736 (DZUP), 100 m, 8.VII.1966, 3 males and 1 female, H. Ebert *leg.* DZ 29.726, DZ 29.732, DZ 29.735, DZ 29.739 (DZUP), 27.VII.1967, 1 female, H. Ebert *leg.* DZ 29.737 (DZUP), 25–150 m, 1.VIII.1968, 1 female, H. Ebert *leg.* DZ 29.720 (DZUP), 25–150 m, 30.VII.1969, 1 female, H. Ebert *leg.* DZ 29.719 (DZUP), 28.VIII.1971, 1 female, H. Ebert *leg.* DZ 29.740 (DZUP), 25 m, 15.VII.1975, 1 female, H. Ebert *leg.* DZ 29.712 (DZUP), 31.VII.1977, 1 female, H. Ebert *leg.* DZ 29.730 (DZUP), 25–150 m, 15.VII.1979, 1 female, H. Ebert *leg.* DZ 29.721 (DZUP); **Guapimirim**, 3.VI.1937, 2 females, no collector, DZ 29.706, DZ 29.709 (DZUP), 20.VII.1940, 1 male, no collector, DZ 29.705 (DZUP), 50 m, 24.II.1962, 1 male, Ebert *leg.* DZ 29.711 (DZUP), 50 m, 20.VII.1963, 1 male, Ebert *leg.* DZ 29.718 (DZUP), 19.II.1964, 1 male, Ebert *leg.* DZ 29.734 (DZUP), 12.II.1966, 1 female, H. Ebert *leg.* DZ 29.728 (DZUP); **Magé**, Vila Inhomirim, 50–200 m, 2.VIII.1961, 1 female, H. Ebert *leg.* DZ 29.725 (DZUP), 8.II.1968, 1 male, H. Ebert *leg.* DZ 29.731 (DZUP); **Niterói**, São Francisco, 150 m, 15.X.1950, 1 male, H. Ebert *leg.* DZ 29.714 (DZUP), 21.X.1956, 1 female, H. Ebert *leg.* DZ 29.729 (DZUP); **Petrópolis**, Independência, 900 m, no date, 1 female, Gagarin *leg.* DZ 29.707* (DZUP); **Rio de Janeiro**, Jacarepaguá, Três Rios, 9.II.1919, 1 male, ex-coll. D'Almeida, DZ 29.704 (DZUP), 3.X.1920, 1 male, ex-coll. D'Almeida, DZ 29.702 (DZUP), 30.VIII.1922, 1 female, ex-coll. D'Almeida, DZ 29.701 (DZUP), 26.IX.1937, 1 male, D'Almeida *leg.* (IOC), Estrada do Pau da Fome, 22.IV.1962, Mielke *leg.* OM 4.324 (OM), III.1972, 1 male and 1 female, Alvarenga *leg.* DZ 29.746, DZ 29.747 (DZUP), no specific locality, VI.1972, 2 males, Silveira *leg.* DZ 29.710, DZ 29.716 (DZUP), Represa Rio Grande, V.1972, 3 males and 2 females, F. M. Oliveira *leg.* DZ 29.698, DZ 29.699, DZ 29.700*, DZ 29.670, DZ 29.758 (DZUP), Vargem Grande, 16.VIII.1964, 1 male, Mielke *leg.* OM 3.619 (OM); **Xerém**, Serra de Tinguá, 50 m, 15.VIII.1954, 1 female, ex-coll. Ebert, DZ 30.670 (DZUP), 12.II.1955, 1 male, ex-coll. Ebert, DZ 29.744 (DZUP), 20.II.1956, 1 female, ex-coll. Ebert, DZ 29.715 (DZUP), 24.II.1958, 1 male, ex-coll. Ebert, DZ 29.745 (DZUP). **Minas Gerais**: **Caratinga**, Estação Biológica de Caratinga, 400m, 29.I–3.II.2003, 4 males, Mielke & Casagrande *leg.* DZ 29.759, DZ 29.761, DZ 29.762, DZ 29.764 (DZUP); **Itueta**, 24.V.1979, 2 males, no collector, DZ 29.679, DZ 29.760 (DZUP); **Marliéria**, Parque Estadual do Rio Doce, 200 m, 5.IX.1972, 1 male, H. Ebert *leg.* DZ 29.749 (DZUP), 9.XI.1972, 2 females, H. Ebert *leg.* DZ 29.751, DZ

29.752 (DZUP), 14.XII.1972, 1 male, H. & H. D. Ebert *leg.* DZ 29.750 (DZUP), 14.II.1974, 1 female, H. Ebert *leg.* DZ 29.755 (DZUP), 24.IX.1974, 2 males and 1 female, Gifford *leg.* DZ 29.754, DZ 29.756, DZ 29.757 (DZUP), 350 m, 8–9.III.1994, 2 males, Mielke *leg.* DZ 29.765, DZ 29.766 (DZUP). *Santa Catarina: Joinville*, 10–200 m, 8.III.1980, 1 male, Mielke & Miers *leg.* OM 58.688 (OM).

Identification key to adults of “*Pierella lamia* species group”

1. Wings background brown. Androconial patch variable 2
- 1'. Wings background grayish. Androconial path with an elongated dark central area (Fig. 32), BRAZIL, Maranhão (Fig. 62) . . .
..... *P. angeloi* **sp. nov.** (Figs 13–16)
2. DHW with a large incomplete ocellus in M_2 - M_3 . HW costal margin convex 3
- 2'. DHW with a reduced or without ocellus in M_2 - M_3 . HW costal margin straight and outer margin convex in M_1 BOLIVIA, Cochabamba, Santa Cruz (Fig. 62) *P. boliviana* **stat. nov.** (Figs 9–12)
3. DHW with homogeneous background 4
- 3'. DHW with marginal region darker or with steely blue reflections 5
4. HW with developed ocelli in M_2 - M_3 and CuA_1 - CuA_2 . Androconial patch with a dark oval central area surrounded by creamy scales (Fig. 29), VENEZUELA, GUYANA, SURINAME, FRENCH GUIANA; BRAZIL, Amazonas, Pará, Maranhão (Fig. 62) *P. lamia* **stat. rest.** (Figs 1–4)
- 4'. HW with reduced ocelli in M_2 - M_3 and CuA_1 - CuA_2 . Androconial patch with a small dark rounded central area surrounded by creamy scales (Fig. 33), BRAZIL, Paraíba, Pernambuco, Alagoas, Sergipe (Fig. 62) *P. kesselringi* **sp. nov.** (Figs 17–20)
5. FW with yellow patch restrict to the discal cell. DHW with steely blue reflections (sometimes absent). Androconial patch with a weak rounded central area surrounded by creamy scales (Fig. 30), COLOMBIA, PERU, BOLIVIA, BRAZIL, Roraima, Amazonas, Pará, Acre, Rondônia, Mato Grosso and Goiás (Fig. 62) *P. chalybaea* (Figs 5–8)
- 5'. FW with yellow patch extending out to the discal cell. DHW without steely blue reflections 6
6. DHW darker than DFW in males, ocelli faded. Androconial patch with a dark rounded central area surrounded by creamy scales (Fig. 34), BRAZIL, Bahia (Fig. 62) *P. nice* **sp. nov.** (Figs 21–24)
- 6'. DHW the same colour as DFW in males, slightly dark in the marginal region, ocelli not faded. Androconial patch with a great and well-marked dark rounded central area surrounded by creamy scales (Fig. 35), BRAZIL, Bahia, Espírito Santo, Rio de Janeiro, Minas Gerais, São Paulo, Paraná, Santa Catarina (Fig. 62) *P. keithbrowni* **sp. nov.** (Figs 25–28)

Discussion

Pierella has been hypothesized as the most basal genus among Haeterini (Schwanwitsch 1928; Miller 1968; Wahlberg *et al.* 2009) with its origin in Central America, and subsequent colonization in South America before the Andean uplift (Brown 1948; Miller 1968). The higher diversity of *Pierella* is in the Amazonian region (Brown 1948), and based on the current distributional pattern of the “*Pierella lamia* species group” it is possible that the connections between Amazonian and Atlantic Forest during Tertiary (Oliveira-Filho & Ratter 1995; Vivo 1997; Cavalcante 2005) allowed expansion and colonization of *Pierella* from the north to southeast and northeast Brazil.

Subspecies are widely recognized and used in taxonomic studies on butterflies, being recognized as allopatric populations of a species with some phenotypic variation that, at least in theory, shows potential to mating in hybridizations zones (Dobzhansky 1955; Mayr 1969; O’Brien & Mayr 1991; Braby *et al.* 2012). Therefore, variation of the genitalia morphology is not expected in subspecies, due its differences might act as breeding barriers by sexual or natural selections. Despite the phenotype similarities on wings elements pattern in “*Pierella lamia* species group”, a new taxonomic arrangement and descriptions of four new species are proposed, mainly based on the consistent morphological differences in the female genitalia of all species, and male genitalia of *P. boliviana*. Historically, male genitalia morphology has been widely used in taxonomic studies of butterflies, while female genitalia are generally overlooked. Although the structures of the male copulatory apparatus are strongly sclerotized, female genitalia consists in membranous or weakly sclerotized structures that might be damage, if in contact for a long time with hot KOH during the dissection procedure (the most common technique used for butterflies). In Satyrinae, for example, recent studies have demonstrated the usefulness of the examination of female genitalia to identification and delimitation of species (i.e. Pycz 2010; Siewert *et al.* 2014; Penz *et al.* 2014). In “*Pierella lamia* species group”, female genitalia are completely distinct each other concerning their total size, structures shape and signa position, while the male genitalia of almost all species of these group (except *P. boliviana*) is homogeneous. However, interspecific variation on male genitalia is not strong in the genus *Pierella*

(see illustrations in Brown 1948 and Constantino 1995), in contrast with those well-marked differences in the species of the genus *Cithaerias* (Penz *et al.* 2014).

In addition, the androconial patches on dorsal hind wings in males of “*Pierella lamia* species group” have distinct morphologies, even if compared with other *Pierella* species (i.e.: *P. amalia* Weymer, 1885, *P. astyoche* (Erichson, [1849] and *P. hyalinus* (Gmelin, [1790])). Such structures have been used in several taxonomic studies on satyrine butterflies to species delimitation, based on its presence, shape, colour and position (i.e. Zubek & Pyrcz 2011; Aguila *et al.* 2012; Freitas *et al.* 2013), and play a role on sexual selection by dissemination of pheromones to influence female behaviour (Hall & Harvey 2002). However, futures studies might be focused on ultrastructure comparative morphology of the scales from androconial patch, and chemical composition analysis of pheromones to evaluate the characters are among “*Pierella lamia* species group”.

Additional evidence that supports the hypothesis herein proposed, comes through the karyotypic studies performed by Brown *et al.* (2007), which demonstrated differences of the chromosomal number between *P. lamia* ($n = 28–30$), *P. chalybaea* ($n = 26–30$) and *P. kesselringi* ($n = 20$). This variability number has a fundamental role in maintaining postzygotic isolation between well-established species (Kandul *et al.* 2004, 2007; Saura 2013). Usually, karyotypic differences are gradually accumulated between allopatric sister taxa, that could explain the overlap between the number of the chromosomes of *P. lamia* and *P. chalybaea*, while these values are more distinctive between sympatric sister taxa (Kandul *et al.* 2007). In general, Haeterini does not exhibit large interspecific karyotypic variability when compared with Euptychiina and Pronophilina species, and in *Pierella* species the most common chromosome number is $n = 29$ (Brown *et al.* 2007). However, changes in the karyotype organization could effected the evolutionary course of these species, as probably occurs in *P. kesselringi* that differs from its Amazonian relatives by 6–8 chromosomes. Due to its distribution associated to Atlantic Forest enclaves inserted in Caatinga biome, probably *P. kesselringi* is the most recent species in this group associated with the recent formation of these enclave areas during Pleistocenic glaciations that allowed the expansion of vegetation associated to Caatinga biome (Cavalcante 2005), and consequent isolation and speciation of this species.

There is no doubt that “*Pierella lamia* species group” is a good model system to understand microevolutionary events, but genotypic and karyotypic studies are beyond the aims of the present study. In spite of morphological differences have demonstrated sufficient evidences for the hypothesis, futures studies might be focused on mitochondrial DNA analysis to evaluate the range of the genetic divergences as a result of the absence of gene flow between these species.

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