

TWO NEW SUBSPECIES OF *PEREUTE LINDEMANNAE* AND ONE OF *PSEUDOPIERIS VIRIDULA* FROM PANTEPUI, VENEZUELA (PIERIDAE)

JÜRGEN DE MARMELS, JOSÉ A. CLAVIJO AND MARÍA E. CHACÍN

Museo del Instituto de Zoología Agrícola "Francisco Fernández Yépez", Facultad de Agronomía,
Universidad Central de Venezuela, Apartado 4579, Maracay 2101-A, Venezuela

ABSTRACT. *Pereute lindemanna pemon*, new subspecies, *Pereute lindemanna piaroa*, new subspecies, and *Pseudopieris viridula mimaripa*, new subspecies from the Venezuelan Pantepui region are described, diagnosed and illustrated. Their biogeography is outlined and their distribution mapped. A probable sound-producing organ in the male genitalia of *Pereute* is presented.

Additional key words: biogeography, sound-producing organ, taxonomy.

In recent years the exploration of the remote and almost inaccessible region of Pantepui (Guyana highlands) has been significantly intensified, especially due to the effort of numerous expeditions, partly carried out by non-governmental organizations such as "FUDECI," and "Fundación TERRAMAR" (both in Caracas). Three new subspecies of Pieridae from this interesting region are described in the present paper. All types are deposited in the Museo del Instituto de Zoología Agrícola "Francisco Fernández Yépez" (MIZA) of the Universidad Central de Venezuela, at Maracay.

Pereute lindemanna pemon De Marmels, Clavijo & Chacín, new subspecies (Figs. 1–4, 16)

Description. MALE: FW length 31.0 mm. Dorsally: deep black; FW with pale postdiscal band fading from pale yellow between Sc and $SR+M_1$ to white in the medio-cubital space (M_3-Cu_1), this portion widely separated from the rest of the pale cross-band by black scales. Small groups of scattered blue scales subapically between R_3 and M_1 and between M_1 and M_2 , as well as between Cu_1 and Cu_2 . Base of wing pale steel blue between discal cell and anal margin, along which this color reaches to level of origin of Cu_1 . Scattered blue scales also within proximal half of discal cell; fringe dark brown. HW black with steel blue area extending from base to about outer margin of median area; small groups of scattered blue scales also along outer margin of wing, between M_1 and M_2 , and between M_2 and Cu_1 . Subcostal space broadly white along costal margin. Ventrally: FW dark brown, darker in discal cell, paler beyond yellow postdiscal band; an additional, but ill-defined marginal spot of scattered yellow scales between Cu_1 and Cu_2 . Extensive red scaling in basal third of discal cell; scattered white scales in costal space and on Sc near base of wing. HW dark brown, veins darker; red spot within humeral expansion, an annectant red spot in the angle between Sc and discal cell, penetrating somewhat into the latter; distally of red spot a yellow streak, which is more than two thirds as wide as subcostal space and reaches distally to about level of end of discal cell; a third red spot near wing base, between A_1 and A_2 , but entering space between Cu_2 and A_1 ; a white spot at wing root and a small patch of scattered white scales at wing margin, between Rs and M_1 . Labial palps black with complete white latero-ventral, and shorter dorso-lateral line of same color. Antennae white. Thorax with tuft of orange hairs laterally at base of FW and ventrally between and behind second and third pair of legs; a tuft of white hairs between first and second pair of legs. Thorax dorsally with canescent pubescence. Abdomen narrowly black on dorsum, steel blue laterally and white ventrally. Legs sparsely beset with white scales. Genitalia: Tip of uncus

obtuse or scarcely emarginated (Fig. 16). FEMALE: FW length 31.3–32.3 mm; FW of more rounded shape. Dorsally: Color pattern as in male, but all-yellow postdiscal band broader, with few white scales at wing margin between Cu_1 and Cu_2 ; steel blue area of HW slightly smaller than in male; blue scales at outer margin of wing absent. Ventrally: yellow streak in subcostal space about three fourths as wide as this space, reaching to about level of distal end of discal cell.

Types. Holotype ♂: VENEZUELA, Bolívar State, Sierra de Lema, Road El Dorado-Santa Elena de Uairén, km 125, 1090 m, 18 May 1985 (J. De Marmels; Expedition MIZA). Paratypes: Same locality, date and collector, 1 ♂, 2 ♀.

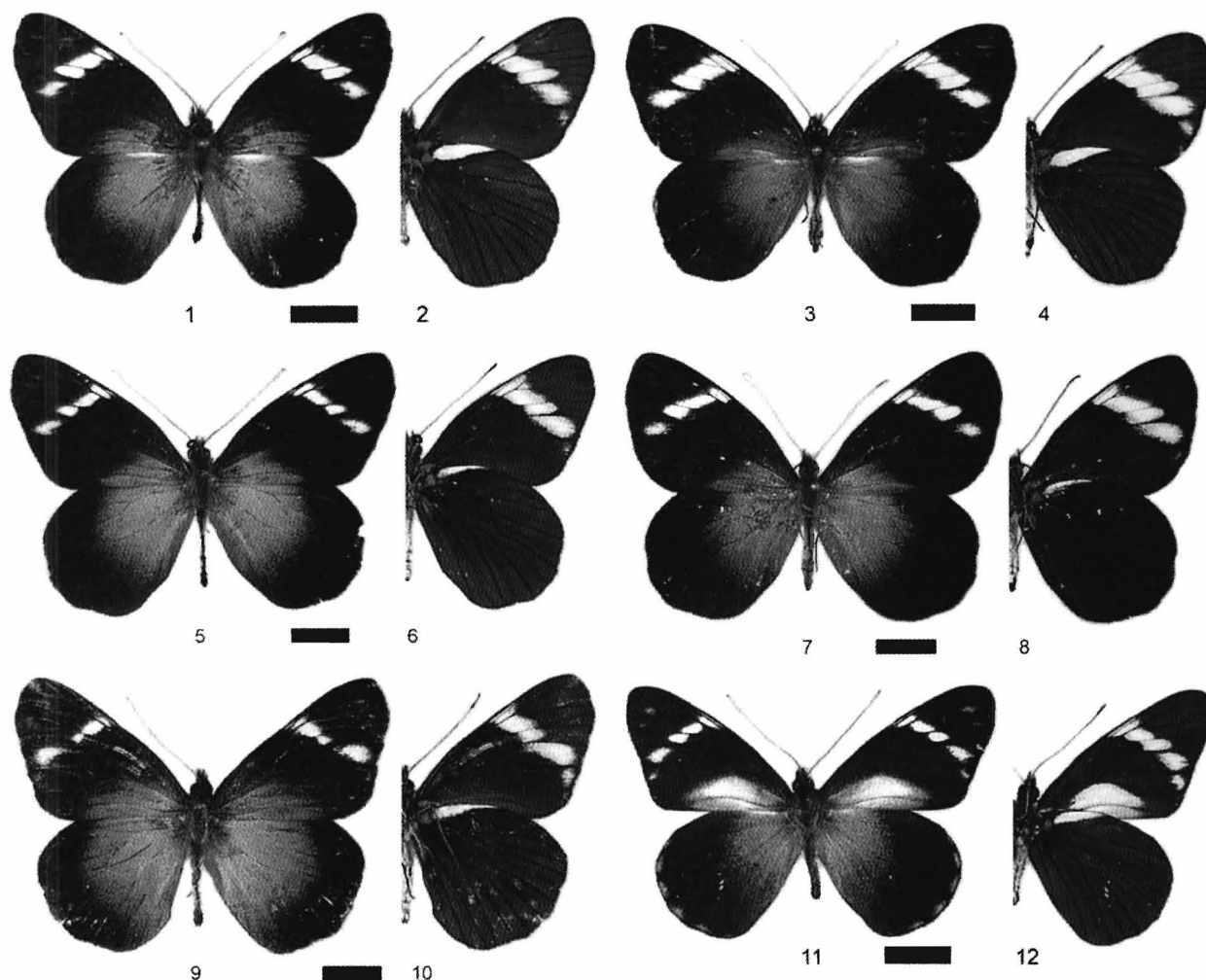
Etymology. The "Pemon" are a local Indian tribe.

Diagnosis. Postdiscal band on FW dorsally yellow; extensive red scaling in basal third of discal cell, on FW ventrally. Yellow streak between $Sc+R_1$ and discal cell on HW ventrally two thirds to three fourths as wide as that space at level of origin of Rs; a patch of scattered yellow scales at wing margin between Rs and M_1 , on HW ventrally. In conventionally spread specimens a white area is visible near $Sc+R_1$ in space between that vein and discal cell, on HW dorsally. Genitalia: Uncus in dorsal view (Fig. 16) very similar to that of *P. telthusa* (Fig. 18); tip of uncus obtuse or shallowly emarginated.

Remarks. All specimens were caught feeding on a bush with small, white flowers, at the border of a narrow stream in primary forest.

Pereute lindemanna piaroa De Marmels, Clavijo & Chacín, new subspecies (Figs. 5–8, 17)

Description. MALE: FW length 29.5–34.7 mm (the latter figure of holotype). Dorsally: FW deep black with pale postdiscal band, which fades from yellow between Sc and $Rs+M_1$ to white in the medio-cubital space (S_3), pale mark here widely separated from rest of pale cross-band, by black scales; a group of scattered blue scales near tip of wing between R_3 and M_1 . Wing base pale steel blue between discal cell and anal margin along which this color reaches to level of origin of Cu_1 ; only few blue scales within discal cell near base of wing; fringe dark brown. HW black with steel blue area extending from base to about outer margin of median area. Ventrally: FW black proximally of yellow postdiscal band, dark brown beyond it; the cross-band itself prolonged into space between Cu_1 and Cu_2 ; scattered yellow scales in costal space and on Sc near base of wing. Only single or no red scales in discal cell



FIGS. 1–12. 1–4, *Pereute lindemanna pemona*, new subspecies: 1, Holotype ♂ (dorsally); 2, Same (ventrally). 3, Paratype ♀ (dorsally); 4, Same (ventrally). 5–8, *Pereute lindemanna piaroa*, new subspecies: 5, Holotype ♂ (dorsally); 6, Same (ventrally). 7, Paratype ♀ (dorsally); 8, Same (ventrally). 9–10, *Pereute lindemanna lindemanna* Reissinger: 9, ♂ from Cerro Neblina, Venezuela (dorsally); 10, Same (ventrally). 11–12, *Pereute telthusa* Hewitson: 11, ♂ from Tingo María, Peru (dorsally); 12, Same (ventrally). Scale bar = 10 mm.

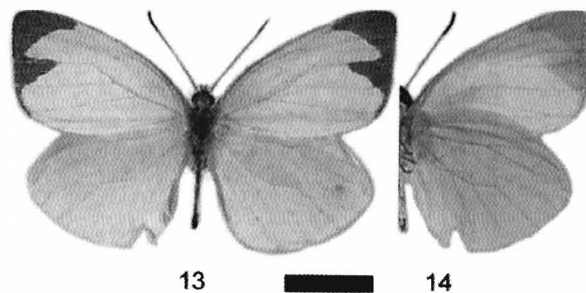
near base of wing. HW dark brown, veins darker; red spot within humeral expansion, an annectant red spot in angle between Sc and discal cell; distally of it a yellow streak which is less than half as wide as subcostal space at level of origin of Rs and reaches to about level of origin of M_2 ; a third red spot near base of wing between A_1 and A_2 , penetrating also into space between Cu_1 and Cu_2 ; a patch of white scales at wing root. Labial palpi black with complete white ventrobasal and shorter dorsolateral line. Antennae pale yellow. Thorax with tuft of orange hairs laterally at base of FW, and ventrally between and behind second and third pair of legs; a tuft of white hairs between first and second pair of legs. Thorax otherwise with canescent dorsal pubescence. Abdomen on dorsum narrowly black, steel blue laterally and white ventrally. Legs sparsely beset with white scales. Genitalia: Tip of uncus obtuse or slightly emarginated (Fig. 17). FEMALE. FW length 30.0–34.5 mm; FW of more rounded shape. Dorsally: Color pattern as in male, but FW postdiscal band all yellow, and steel blue area in HW distally scarcely surpassing end of discal cell. Ventrally: FW with few (10–30) red scales at base of discal cell.

Types. Holotype ♂: VENEZUELA, Amazonas State, Cerro Yutajé, 1750 m, 5°45'N, 66°08'W, 12–17 February 1995 (J. Clavijo; Expedition TERRAMAR). Paratypes: same locality, date and collector

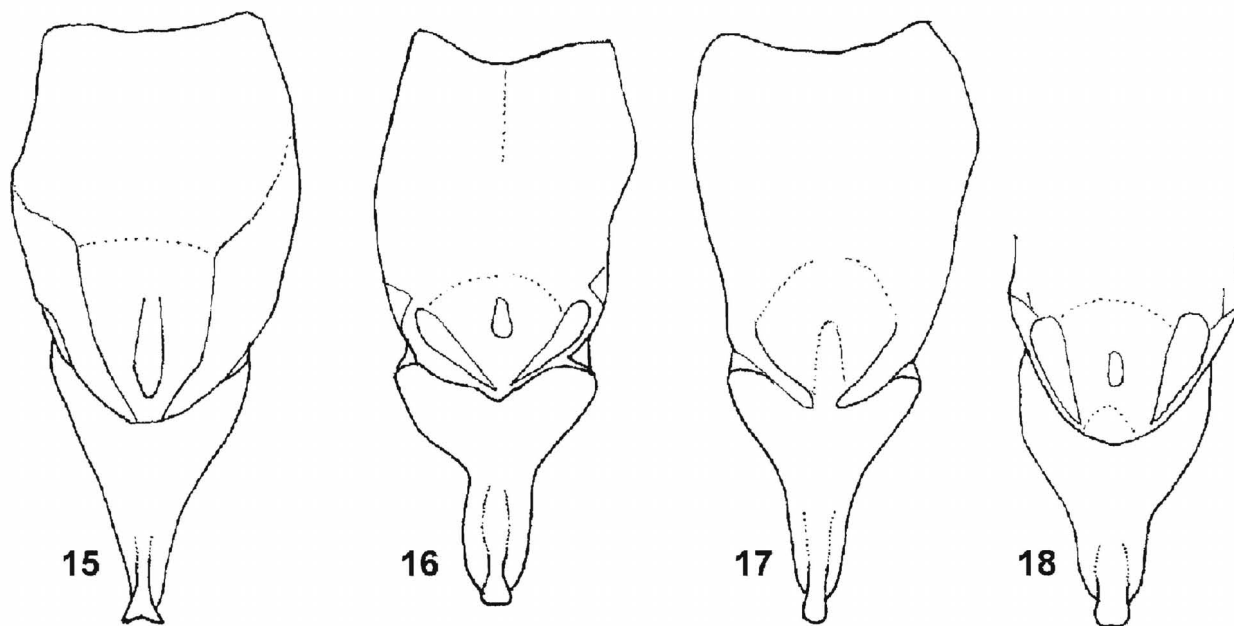
7 ♂, 5 ♀; same locality, 17–24 February 1995, 2 ♂, 1 ♀, (J. L. García; Expedition TERRAMAR).

Etymology. The “Piaroa” are a local Indian tribe.

Diagnosis. Postdiscal band on FW dorsally yellow. Only few or no red scales in basal third of discal



FIGS. 13–14. *Pseudopieris viridula mimaripa*, new subspecies: 13, Holotype ♂ (dorsally); 14, Same (ventrally). Scale bar = 10 mm.



FIGS. 15–18. Uncus (dorsal view) in *Pereute* of the “*telthusa* group”: 15, *P. l. lindemannae* (Mt. Neblina); 16, *P. l. pemona* (paratype); 17, *P. l. piaroa* (paratype); 18, *P. telthusa* (Tingo María).

cell, on FW ventrally; yellow streak between SC+R₁ and discal cell on HW ventrally less than half as wide as that space at level of origin of Rs; same space in HW dorsally appearing entirely blue in conventionally spread specimens; no patch of scattered yellow

scales at wing margin between Rs and M₁ on HW ventrally. Genitalia: Tip of uncus obtuse or slightly emarginated.

Remarks. All specimens were caught in primary forest flying through sun-hit spots.

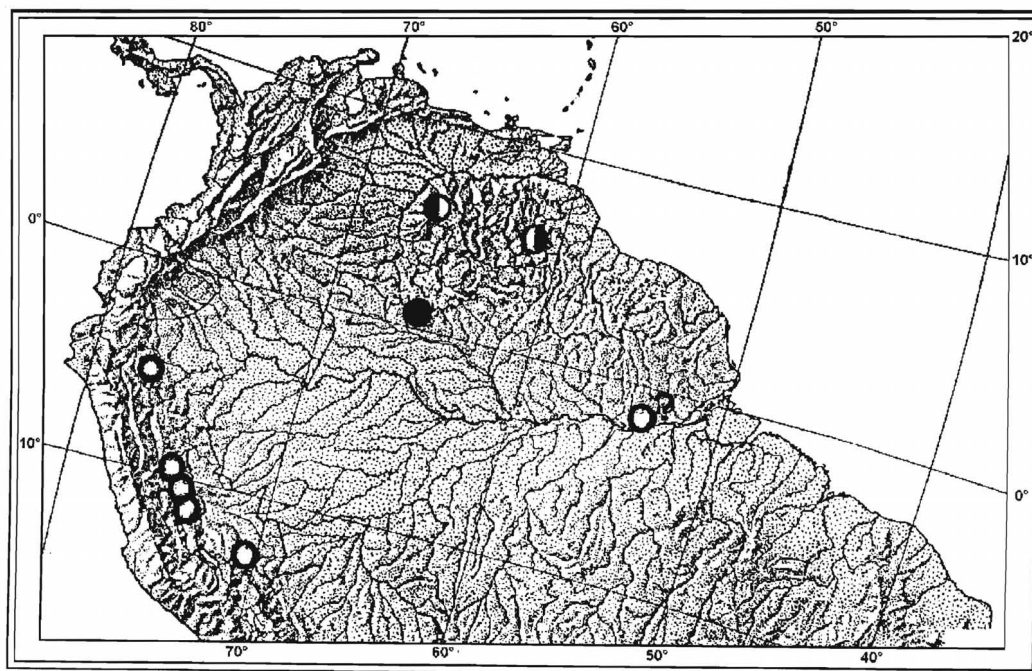
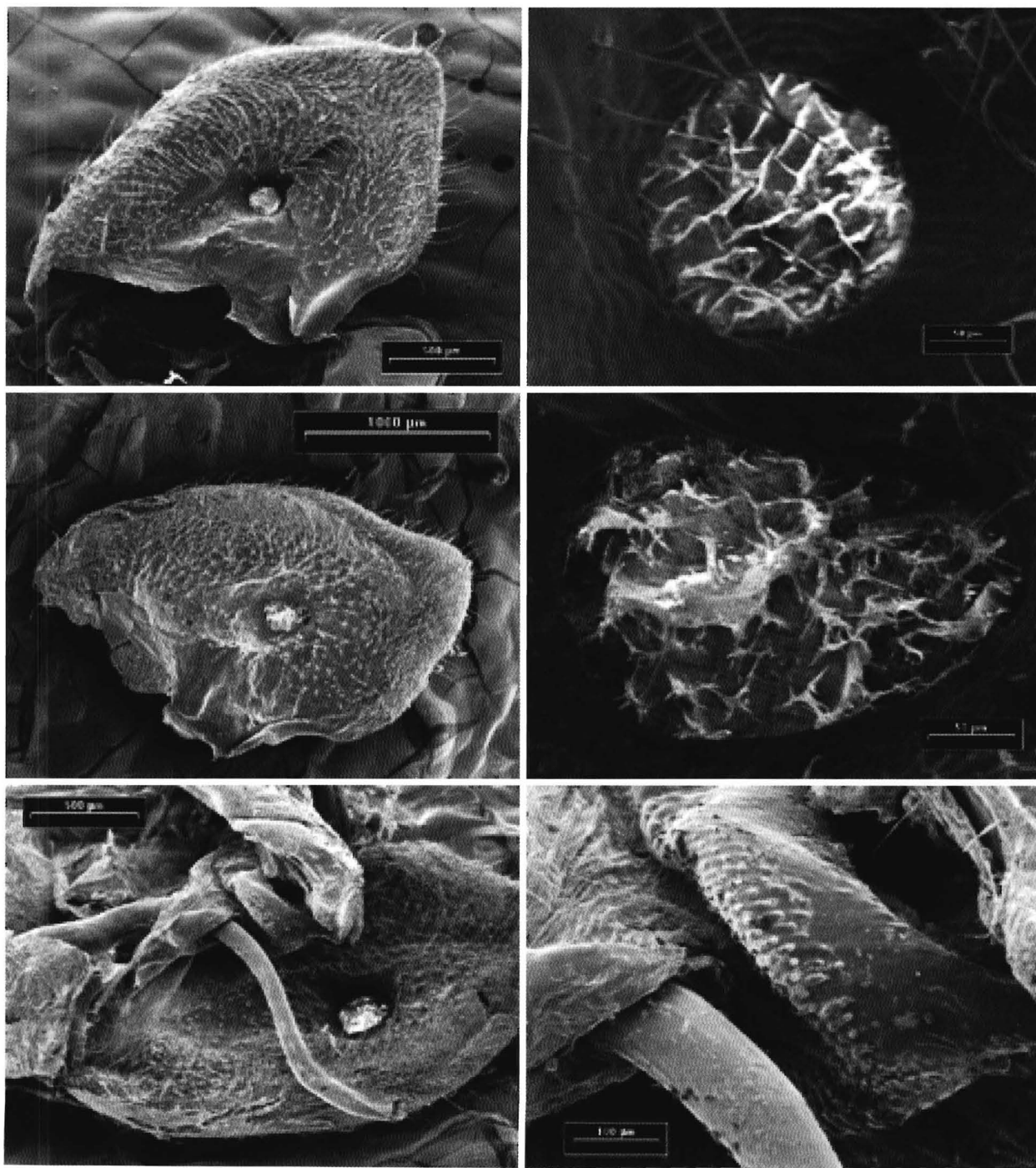


FIG. 19. Map of north western South America showing localities of *Pereute telthusa* (empty circles) (after Lamas pers. com., 7 April 1998); *P. l. lindemannae* (solid circles); *P. l. pemona* (circle with left half white); *P. l. piaroa* (circle with right half white); *Pseudopieris v. mimaripa* (same as *P. l. pemona*).



FIGS. 20–24. **20**, Lateral view of left valva of *P. lindemannae piaroa*. **21**, Detail of the hole of the valva of *P. lindemannae piaroa*. **22**, Lateral view of left valva of *P. charops*. **23**, Detail of the hole of the left valva of *P. charops*. **24**, Ventral view of the genitalia of *P. charops*. **25**, Detail of the gnathos of *P. charops*. Note: Scale of the bar = 10 mm.

Pereute lindemannae lindemannae Reissinger
(Figs. 9, 10, 15)

The nominate subspecies was described from the Brazilian (southern) slope of Mount Neblina (Reissinger 1970) and is here recorded from Venezuela (northern slope) for the first time. The female is still

unknown. D'Abrera (1981) does not mention the species, as there are no specimens in the Natural History Museum, London.

Diagnosis. MALE: Forewing (FW) length 31.6–34.2 mm. Narrow, mealy-white postdiscal band on FW dorsally. Only single or no red scales in basal

third of discal cell on FW ventrally. Yellow streak between $Sc+R_1$ and discal cell on hindwing (HW) ventrally about half as wide as that space at level of origin of R_s ; same space on HW dorsally with white scaling reduced to region near costal margin and not visible in conventionally spread specimens (costal space appearing entirely blue). No patch of yellow scales at wing margin between R_s and M_1 , on HW ventrally. Antennae white. Genitalia: Tip of uncus slightly bifid, ending in two small, laterad directed points (Fig. 15). FEMALE. Unknown.

Material examined. VENEZUELA, Amazonas State, Cerro Neblina, 1800 m, 0°50'40"N, 65°58'10"W, 1870 m, 2 ♂, 30 November 1984 (A. Chacón and E. Osuna; Expedition FUDECI); 1 ♂, 2 December 1984 (R. L. Brown; Expedition FUDECI).

Discussion. As already stated by Reissinger (1970), *P. lindemanna* is most related to *P. telthusa* (Hewitson 1860). Following Croizat's (1976:565) view of the biogeography of Pantepui, a common ancestor of these two species was already distributed across the whole Guyana plateau and from there southwestwards to the eastern foothills of the (present) Andes, prior to Andean orogeny. As a consequence of the Andean uplift, which began in the Eocene (Schubert & Huber 1989), the Guyana plateau also rised, probably through isostasy. The plateau population of the ancestral form became separated from that of the lowland and progressively adapted to high elevation life, evolving into the *lindemanna* stock (primary vicariance and speciation event). The populations at the western edge of distribution of this group were "captured" by the uplifting Andes, but were raised to a lesser extent and did not subspecifically differentiate at a noticeable degree. The supposed occurrence of some isolated lowland populations of *telthusa* in the Amazon region, e.g., near Obidos (Röber in Seitz 1924) is emphatically denied by Dr G. Lamas, Lima, Peru (in litt., 19 Jan 1999). The Guyana plateau became at once fractioned by the uplifting movement, the pieces further dissected by erosion and reduced to what can be seen today as isolated remnant mounts and table-top mountains known as "tepui" (see also Chapman 1931, Tate 1938). It is this secondary vicariance and (sub-)speciation event, which explains best the presence in Pantepui of the so far three disjunct subspecies of *P. lindemanna*. There is, however, also good morphological evidence supporting separation at the species level of *lindemanna* and *telthusa*: Male FW is narrower in *telthusa* than in *lindemanna*, with C almost straight in the former, while in *lindemanna* C is visibly arched after first fourth to third of its length. White areas are totally absent from FW (both sexes) in *lindemanna*, but conspicuous in *telthusa*. The red spot in humeral area of HW ventrally of *telthusa* is much reduced in

comparison with same spot in *lindemanna*. At least in male FW, branching of R_{4+5} from R_{2+3} occurs always distally of yellow postdiscal band (ventral view) in *telthusa*, but within this band in *lindemanna*. In ventral view, yellow postdiscal band (FW) is sharply limited externally against dark ground color in *telthusa*, but blurred in *lindemanna*. Finally, distal margin of valva of *lindemanna* with its shallow subapical sinuosity resembles the valva of *P. charops* more closely than that of *telthusa*, which has a straight outer border.

Although we did not study the genitalia in detail due to lack of large series of specimens, we noticed a very interesting hole located in the middle of the valvae of *P. telthusa*, *P. charops* and the three subspecies of *P. lindemanna* examined. Shape of these holes apparently varies depending on species and possibly can be used as a taxonomic character (Figs. 20–23). The presence of these holes, together with the inflated structure of the valvae, their shape and the way how the valves are exposed in live specimens, as well as structure of gnathos with its numerous denticles (Figs. 24, 25), and the strongly sclerotized aedeagus, all suggest that the genitalia may be used for sound production. Analogous structures are found in other body areas of many Lepidoptera (Scoble 1992). This, of course, needs to be studied in detail, indeed a very promising field for future research.

***Pseudopieris viridula mimaripa* De Marmels,
Clavijo & Chacín, new subspecies
(Figs. 13, 14)**

Description. MALE: FW length 23.5 mm. Dorsally: FW white with broad, brown black, mesially zig-zagged apical margin, beginning rather abruptly at the costal margin after branching point of R_2 , from where it extends more or less diagonally to middle of space between M_2 and M_3 , here sharply bending proximad, following M_3 until about half its length (i.e., for about 5 mm), thence again sharply bending outwards, running diagonally towards external margin and following the latter analwards to slightly beyond Cu_2 , ending at anal angle. Costa and fringe brown black. HW fringe white; broad band of silvery scales along costal margin; a pale, salmon sex brand on costal side of discal cell, beginning proximally of origin of R_s+M_1 and ending before branching point of these two veins. Ventrally: FW white with costal and apical region yellow; a long, salmon sex brand along cubital border of discal cell, from close to base of wing outwards to branching point of Cu_1 . HW yellow. Palpi white, dorsally and apically black; antennae brown black with ill-defined white annules on shaft. Head marbled dorsally, white ventrally. Thorax on dorsum covered with brown hairs anteriorly, with white hairs posteriorly; on venter bearing white and yellow scales and hairs; legs also beset with white and yellow scales. Abdomen mostly white. Genitalia: ill-preserved; uncus and gnathos do not seem to differ from those structures in *P. v. viridula* or *P. nehemia*. FEMALE (after A. Neild in litt., 6 Dec 1999): HW apex rounder. Color pattern almost identical to male. Dorsally: black apical region of FW little wider than in male, most notably at the outer margin of Cu_2-Cu_1 ; wider margin also extending basad along anterior edge of Cu_2 for slightly more than one millimeter. Ventrally: Suffusion of yellow scales in postdiscal/subapical region anterior to vein M_3 barely discernible, except at costal margin.

Types. Holotype ♂: VENEZUELA, Bolívar State, road El Dorado-Santa Elena de Uairén, km 125, 1090 m, 18 May 1985, J. Clavijo (Expedition Inst. Zool. Agrícola); paratypes: 4 ♂, 3 ♀, same area, but km 131.7, 1400 m, 11–14 February 1999 (A. Neild; currently in his private collection).

Etymology. The dorsal color pattern of the new taxon is reminiscent of *Leptophobia aripa* (Boisduval 1836) with which it does not coexist, however.

Diagnosis. Dorsally: FW white with broad, brown black area on tip and along external margin, and produced into a pointed jag mesially between M_3 and Cu_1 . HW with pale, salmon sex brand along costal side of discal cell. Ventrally: FW white with broadly yellow apical region and pale salmon sex brand along cubital border of discal cell. HW yellow.

Remarks. The holotype specimen was baited with viscera of a cracid bird. The paratype males and females were collected feeding on white flowers of low-growing *Eupatorium* bushes at the road side (A. Neild in litt., 6 Dec 1999).

Discussion. Some *Pseudopieris viridula* Felder from Ecuador (Napo) and all from the Venezuelan Coastal Cordillera have tip of FW dorsally only extremely narrowly lined brown black, lacking also the jag between M_3 and Cu_1 . In some specimens from Peru (Tingo María) and from Colombia (Valle del Cauca) the pattern is reminiscent of *P. nehemias* populations, also from Tingo María. No differences have been found in the genitalia (uncus and gnathos) of the specimens of the two taxa examined. Therefore, we consider *P. v. mimaripa* a well-defined (by color pattern and allopatry) subspecies of *P. viridula*.

The occurrence of *P. viridula mimaripa* in Pantepui, in disjunction from the populations in the Andes and in the Venezuelan Coastal Cordillera, is seemingly a

consequence of the same geohistorical processes described above for *Pereute lindemanna*.

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We wish to thank Mr. Andrew Neild, London (U.K.) for calling our attention on specimens of *Pseudopieris viridula mimaripa* collected by himself. His description and comments allowed us to include his specimens in the present paper as paratypes. Ing. Quintín Arias, Maracay, helped with the preparation of some genitalia and the solution of photographic and other technical problems. FUDECI (Caracas) organized the expedition to Mt. Neblina. Fundación TERRAMAR (Caracas) invited one of us (J. Clavijo) to participate in the expedition to Mt. Yutajé and neighboring tepuis, hence making the collection of one of the new taxa possible. Dr. Gerardo Lamas, Universidad Nacional de San Marcos, Lima (Peru), kindly forwarded distributional data of *Pereute telthusa* and made some useful comments. Fundación Polar (Caracas), Fundacite Aragua, Consejo Nacional de Investigaciones Científicas y Tecnológicas and the Consejo de Desarrollo Científico y Humanístico (CDCH) of the Universidad Central de Venezuela gave financial support.

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