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RESEARCH ARTICLE

Two new *Neonerita* Hampson species with redescription of *Neonerita dorsipuncta* Hampson, 1901 (Lepidoptera: Erebiidae: Arctiinae: Phaegopterina)

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Abstract: Two new species of the genus *Neonerita* are described from Guatemala and French Guiana: *Neonerita bernardoespinozai* **sp. nov.** and *Neonerita martinezi* **sp. nov.** Detailed species descriptions are based upon morphological and molecular characters as well as distribution data. These new taxa are discussed and compared to *Neonerita dorsipuncta*, species with which both new species were confused with up to now.

Key words: Arctiinae, Phaegopterina, Neotropical fauna, *Neonerita*, molecular phylogeny, biogeography.

Introduction

The genus *Neonerita* Hampson comprises 4 species and 1 subspecies (Vincent & Laguerre 2014). The most common species found within various collections is *Neonerita dorsipuncta* Hampson, 1901, described from a male holotype collected in Rio Grande do Sul, southern Brazil. This species is thus regularly quoted in various neotropical Arctiinae lists published from southern Brazil (Travassos 1945; Teston & Courseuil 2004, Teston *et al.* 2006; Ferro & Teston 2009, Ferro *et al.* 2012; Delfina & Teston 2013) or from Argentina (Beccacece *et al.* 2013). It is also reported from northern Brazil, in Pará state, (Hawes *et al.* 2009; Teston *et al.* 2012), from French Guiana (Vincent 2008; Tassel 2007; Toulgoët, 1982, 1987) from Mexico (Turrent Diaz 1996; Balcazar & Beutelspacher 2000; Hernandez-Baz

2011), from Guatemala (Monzon Sierra *et al.* 2010) or from Ecuador (Pinas 2006; Pinas *et al.* 2000).

The experience we have of the subfamily Arctiinae casts some doubts on such a wide geographic distribution, with different habitats and fauna (for instance Mexico and French Guiana). We decided to review comprehensively and systematically (genitalia and barcode) specimens of each above-mentioned regions. Genitalia examination along with barcoding of specimens from these countries revealed that three species are involved, two of which being new and described here. *Neonerita dorsipuncta* is redescribed and compared to closely related species.

Material and methods

Adult genitalia were prepared by boiling abdomens during 15 minutes with 2 pellets of potash in 5 ml of water. After being washed with water and then alcohol, genitalia were photographed in natural position suspended in 95% alcohol, then types and museum specimens were mounted in Euparal. Photos were taken with a CoolPix 4500 Nikon camera attached to a trinocular Nikon stereomicroscope SMZ-10A.

We had the opportunity to use analysis of short sequences of DNA corresponding to the COI mitochondrial gene. This gene is now routinely used for specific discrimination and identification (Hebert *et al.* 2003). The use of these sequences is currently known as "DNA barcoding". A project concerning Neotropical Arctiinae has been initiated within the framework of "ALL-LEPS BARCODE OF LIFE" (see website www.lepbarcoding.org) which objective is to archive the DNA barcodes of all known Lepidoptera. DNA was extracted, amplified and sequenced at the "Canadian Centre for DNA Barcoding" (CCDB) in Guelph, Ontario, starting from dry legs removed from specimens coming from the authors' collections (details are given for each species). Details of various protocols have been described in Vaglia *et al.* (2008).

The sequences were aligned and downloaded from BOLD and analyzed using MEGA6 (Tamura *et al.* 2013) for a cladistics analysis. Bootstrap values (Felsenstein 1985) were used to estimate branch support: they were calculated in MEGA6 after 1000 random replications. Distance calculations were performed using the Kimura 2-parameter (K2P) method in MEGA6 (Kimura 1980) including all sites, with the pairwise deletion option and assuming both a homogeneous pattern of divergence among lineages and a uniform rate of substitutions among sites.

Repository abbreviations are as follows:

BMNH: Natural History Museum London, England, UK.

MNHN: Muséum National d'Histoire Naturelle, Paris, France.

MWM: Museum Witt, Munchen, Germany.

USNM: National Museum of Natural History, Smithsonian Institution, Washington DC, USA.

UVGC: Universidad del Valle Collection of Arthropods, Guatemala City, Guatemala.

WSU: M. T. James Entomological Collection, Washington State University, Pullman, Washington, USA.

AC: Personal collection of Alex Cahurel, Le Plessix, 22330 Le Gouray, France.

BV: Personal collection of Benoit Vincent, 56 boulevard des Galaxies, 31130 Quint-Fonsegrives, France.

CG: Personal collection of Christian Gibeaux, le Val Changis, 2 bis rue des Basses-Loges, 77210 Avon, France.

JMS: Personal collection of José Monzón Sierra.

ML: Personal collection of Michel Laguerre, 31 rue de la Haute-Lande, 33850 Léognan, France.

Results

Neonerita dorsipuncta Hampson, 1901 (Figs 1E-F)

Type material: Male holotype [BMNH], examined. Type locality: Brazil, Rio Grande do Sul.

Male redescription

Head. Frons light grey with a dark grey line dorsally, vertex pinkish yellow. Antennae ciliate, brownish grey, scape pinkish red. Palpi light brownish grey, darker dorsally; first segment very hairy below, and white. *Thorax.* Patagia light pinkish orange, bordered by light creamy yellow, and a very thin line of pinkish red hairs. Tegulae light creamy yellow centered with light pinkish orange with some scattered golden metallic scales, a very thin border of pinkish red hairs. Thorax light yellowish grey with some indistinct pinkish red spots and a line of pinkish red hairs near patagia. First pair of legs with tibia and femur brownish grey, tarsi light pinkish orange with brown claws, coxae white centered with an elongated pinkish patch. The two last pairs of legs pure white with claws brown. *Abdomen.* Very hairy basally. Tergites pinkish red, with a pure white triangular patch on segments 1 and 2, some yellow scales on distal margin of T8. Sternites pure white.

Forewing. Length: 13-16 mm (n=18). Dorsal surface: the basal third of the forewing brownish pink, thinly speckled with dark grey scales; costa brownish grey interspaced with pinkish scales. At the basis of wing a pure black streak slightly bend downwards continued as a thin lack line up to the margin, the basal part below bright pinkish red. A short black dash just in the middle of the anal border. An irregular yellow and pinkish orange patch just below the costa and the cell. The central third of forewings entirely occupied by an ivory yellow concave translucent patch stopping just before the costa. Two black tiny dots, one at the centre of costa, the second at the centre of termen. Basal border thinly lined with black with a tiny black tooth just in the middle. The apical third of forewings purplish brown, with three blurred patches: a long rectangular and dirty pink one just at the apex, a shorter almost square and pinkish just below and a small yellow triangular one just above the ivory patch. Ventral surface: basal third of forewing pinkish slightly translucent showing the upper side through the wing, costa grey thinly lined with black outside. A black kidney-shaped spot at the beginning of the cell. The second third of the wing entirely occupied by an ivory concave patch, its basal border almost rectilinear outlined with a thin and very dark grey band. Two tiny dark spots just on the border of the patch one in the middle of the costa, the other in the middle of termen. In some cases a small dark tooth just in the middle of the basal border. The last apical third entirely dark grey with three pinkish orange spots. The first one rectangular just at the apex, the second shorter and almost square just below and the last one small and triangular just above the ivory patch. In some cases some very tiny dark dots on the termen below the ivory patch.

Hindwing. Dorsally thinly scaled, pink turning light yellowish pink toward the center. Costa white. Ventrally light pinkish orange with an indistinct whitish border at costa.

Male genitalia. (Figs 3I-L). Uncus bifid with two tubular processes pointing downwards, each process with a small dorsal carina pointing slightly distally, tegumen thin, saccus present, small and rounded. Valvae subrectangular protruding slightly just above juxta, apex trapezoidal in ventral view and slightly rounded in lateral view, shorter than the base of uncus. Dorsally they exhibit a long, thin and sclerotized process S-shaped, slightly spatulate at the extremity and pointing upwards with a small spine. Juxta sclerotized, subtriangular. Penis short and cylindrical, caecum penis very short. Vesica with a short and slightly scobinated dorsal lobe and a very long and undulated ventral lobe with very small spicules just at the tip.

Female. (Figs 2E-F). 13-16 mm (n=7). Identical to male except as follows: antennae filiform, the hindwings upper side carmine red with the costa pinkish.

Female genitalia. (Fig. 4C) with pseudopapillae anales wholly fused. Papillae anales rectangular. Anterior apophyses with a bifid process at their basis. Posterior apophyses threadlike. A pair of pheromone glands tubular and short, type "I" (Bendib & Minet, 1998). Ductus bursae short, tubular, slightly sclerotized. Corpus bursae ovoid, smooth with two very small and spinose signa in the median area. Ductus seminalis wrinkled, emerging from the ductus bursae, with a very large and pyriform bulla seminalis. Seventh sternite with a crescent-shaped fold with two shoulders and two slightly marked downturns.

Material examined in addition to the holotype: BRAZIL: 1♂, Parana, Route de Guaratuba à Castelhanos Km 3, 766 m, 21-X-2011, 25°51'23,6" S, W 48°55'43,43" W, J. Haxaire & D. Herbin *leg.*, in BV. 2♂, São Paulo, Apiai, 750 m, 2-I-2005, C. Mielke *leg.*, in BV; 1♂, São Paulo, Apiai, 8-VIII-2006, 750 m, -24.50 -48.83, C. Mielke *leg.*, in ML. 1♂, Espírito Santo, Réserve Biologique Augusto Ruschi, Route Santa Teresa à Fundao, km 10, 15-XI-2012, 814 m, 19°54'50''S 40°31'58''W, B. Vincent *leg.*, genitalia dissected by Michel Laguette n° ML 2484, in BV. 1♂, Parana, Marumbi Morretes, 550 m, 6-X-1967, O. Mielke *leg.*, genitalia dissected by Christian Gibeaux n° CG 7558, in MNHN. 1♀, idem, genitalia dissected by Christian Gibeaux n° CG 7561, in MNHN. 1♂, Santa-Catarina, Hansa Humboldt, 60 m, september 1925, A. Malter *leg.*, genitalia dissected by H. de Toulgoët n° AS 2121a, in MNHN. PARAGUAY: 1♂, Caazapa, Tavaï, Est Olmedo, 26-IX-05-X.2008, 150 m, 26°13' S 55°36' W, U. Dreschel *leg.*, in BV; 6♂, Alto Parana, Puerto Bertoni, 01-04-X.2004, 25°39' S 54°36' W, U. Dreschel *leg.*, in BV. 1♂, Kanindeyu, Carapa, 14-18-III.2005, 24°22' S 54°23' W, U. Dreschel *leg.*, in BV. 2♂, Kanindeyu, Agro Amiticio, 25-30-IV-2009, 24°34' S 54°32' W, U. Dreschel *leg.*, in BV. 1♂, Caazapa, Colonia Neufeld, 24-X-2008, 110 m, -26.476 -55.903, U. Drechsel *leg.*, Barcode Process ID ARCTC932-11, Sample ID MILA1394, genitalia dissected by Michel Laguette n° ML 1955, in ML; 1♂, Caazapa, Colonia Neufeld, 24-X-2008, 110 m, -26.476 -55.903, U. Drechsel *leg.*, Barcode Process ID ARCTC946-11, Sample ID MILA1408, in ML; 1♂, Caazapa, Tavaï, Est Olmedo, 26-IX-2008, 150 m, -26.217 -55.599, U. Drechsel *leg.*, Barcode Process ID ARCTC947-11, Sample ID MILA1409, in ML; 1♂, Alto Parana, Estancia Dimas, 6-V-2011, 200 m, -25.550 -55.217, U. Drechsel *leg.*, in ML; 1♂, Alto Parana, Estancia Dimas, 3-II-2011, 200 m, -25.550 -55.217, U. Drechsel *leg.*, in ML. ARGENTINA: 1♂, Misiones, Finca Panambi, Dos de Mayo, 29-XII-2005, 500 m, R. Foerster *leg.*, Barcode Process ID ARCTC931-11, Sample ID MILA1393, genitalia dissected by Michel Laguette n° ML 2456, in ML.

Biology: Immature stages and food plants are unknown.



Figure 1. Males of *Neonerita martinezi* Laguerre & Vincent **sp. nov.**; *N. bernardoespinozai* Laguerre & Vincent **sp. nov.** and *N. dorsipuncta* Hampson, 1901. **A**, Holotype of *N. martinezi* **sp. nov.**, dorsal view; **B**, Holotype of *N. martinezi* **sp. nov.**, ventral view; **C**, Holotype of *N. bernardoespinozai* **sp. nov.**, dorsal view; **D**, Holotype of *N. bernardoespinozai* **sp. nov.**, ventral view; **E**, Holotype of *N. dorsipuncta*, dorsal view; **F**, specimen of *N. dorsipuncta* from Brazil, Parana, ventral view.

Remarks: Travassos (1945) described the species, illustrated the venation and provided several drawings of male genitalia.

Neonerita martinezi Laguerre & Vincent **sp. nov.** (Figs 1A-B)

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Type material: Holotype: 1♂, FRENCH GUIANA, Maripasoula, Crique Alama (DZ), 330m, 11-24-III-2015, 02°14'01'' N 54°26'59'' W, J. Barbut & E. Poirier *leg.* (white printed label); La Planète revisitée MNHN / PNI Guyane 2015 Autorisation : APA-973-1 (white printed label), genitalia dissected by Michel Laguerre n°ML2483 (white printed label) / HOLOTYPE (red printed label); Barcode Process ID MIAPD666-15, Sample ID BEVI1904 (white printed label), deposited *in* MNHN, Paris.

Paratypes: 15♂, 3♀, FRENCH GUIANA: 1♂, Maripasoula, Crique Alama (DZ), 330 m, 11 au 24-III-2015, 02°14'01'' N 54°26'59'' W, J. Barbut & E. Poirier *leg.*; La Planète revisitée MNHN / PNI Guyane 2015 Autorisation : APA-973-1, deposited in MNHN, Paris. 1♂, Piste de Kaw, PK 37.5 + 2, 200 m, 30-VII-2003, 4.561500 -52.139829, M. Laguerre *leg.*, Barcode Process ID ARCTB097-08, Sample ID MILA0756, genitalia dissected by Michel Laguerre n° ML 1952, *in ML*. 1♂, Piste de Kaw, PK 28, 280 m, 24-II-2006, 4.563393 -52.194614, M. Laguerre *leg.*, Barcode Process ID ARCTA268-07, Sample ID MILA0268, *in ML*. 1♀, Piste de Kaw, PK 32 + 2.3, 240 m, 2-VIII-2003, 4.572076 -52.190947, M. Laguerre *leg.*, Barcode Process ID ARCTB089-08, Sample ID MILA0748, genitalia dissected by Michel Laguerre n° ML 2418, *in ML*. 1♀, Piste Patagaï, 58 m, 14-XII-2013, 5.342843 -53.213292, D. Herbin *leg.*, *in ML*. 1♂, Piste Patagaï-Counamama, 05°23'56,69" N 53°11'21,91" W, 47 m, 27-XI-2013, D. Herbin *leg.* 1♂, Piste Patagaï-Counamama, 05°20'34,23" N 53°12'47,86" W, 58 m, 19-XII-2013, D. Herbin *leg.* 1♂, Réserve Naturelle de la Trinité, DZ Aya, 27-31.X.2008, 144 m, 04°36'02" N; 53°24'43" W, A. Lévêque *leg.*, Barcode Process ID ARCTB783-09, Sample ID BEVI0678, *in BV*. 1♂, Roura, Montagne des Chevaux, Delmas *leg.*, *in BV*. 1♂, Saül, III-1978, G. Lecourt *leg.*, genitalia dissected by H. de Toulgoët n° AS 2121, in MNHN. 1♂, Saint Laurent du Maroni, Piste Plateau des Mines, Moutouchin PK 6.7, 10-II-2015, C. Gibeaux *leg.* 1♂, *idem*, 14-II-2015. 1♂, *idem*, 26-II-2015. All in CG. VENEZUELA: 1♂, Bolivar, Route El Dorado - Sta Elena, PK 13, 5-VIII-1995, 100 m, M. Laguerre *leg.*, genitalia dissected by Michel Laguerre n° ML 2454, *in ML*. 1♂, Bolivar, R[ou]te Santa-Elena à Icabaru, 700 m, Piste Betania, 21-XI-1990, P. Bleuzen *leg.*, genitalia dissected by Christian Gibeaux n° CG 7564, *in MNHN*. BRAZIL: 1♂, Rondonia, Umg. Cacauplandia, Rancho Grande, 01-26-III-1999, 350 m, Alves d. Santos *leg.*, *in MWM*. ECUADOR: 2♂, Orellana, Yasuni Reserve Station., ca 40 km SE Limacocha, 3-6-IV-2001, Peter Landolt *leg.*, *in WSU*. 1♂, Pastazza, Santa Clara, Cabañas Piatua, 600 m, V-2007 to X-2007, A. Cahurel *leg.*, genitalia dissected by Michel Laguerre n° ML 2485, *in AC*. BOLIVIA: 1♀, Santa-Cruz, Route Okinawa à Trinidad, PK 274, 300 m, VII-1994, J. Haxaire & D. Herbin *leg.*, genitalia dissected by Christian Gibeaux n° CG 7562, *in MNHN*.

Male description

Head. Similar to *N. dorsipuncta* except the frons pinkish yellow with a dark grey line dorsally, vertex pinkish red anteriorly, and creamy yellow posteriorly.

Thorax. Patagia light pinkish orange, largely bordered by light creamy yellow and a very thin line of pinkish red hairs. Tegulae light creamy yellow, centered with light pinkish orange with some scattered golden metallic scales. A very thin border of pinkish red hairs. Thorax light yellowish grey with some indistinct pinkish red spots and an indistinct twin grey spot near patagia. First pair of legs with tibia and femur brownish grey, tarsi light pinkish orange with claws and last segment brown, coxae pinkish orange. The two last pairs of legs pure white with claws brown.

Abdomen. Tergites pinkish red, hairy basally, with a line of 2 or 3 pure white spots of decreasing size on segments 1 to 3. Sternites creamy white.

Forewing. Length: 12-14 mm (n=17). Dorsal surface: very similar to *N. dorsipuncta* except the small quadrangular yellowish area located at the end of the translucent ivory patch: the two black teeth arising from the upper and lower border of the patch near the termen and almost delimiting totally the patch on the termen, this patch being in turn more opaque than in the two other species. Generally speaking the purplish-brown areas have a more reddish

hue than in *N. dorsipuncta* where they display a purplish tint and a more greyish cast in *N. bernardoespinozai* **sp. nov.**

Ventral surface: here also very similar to *N. dorsipuncta* but the general color is more pinkish-red compared to the purplish cast of *N. dorsipuncta*. Moreover the ivory patch is less bordered basally by black lines than in the two other species and the small yellowish patch on the termen appeared completely isolated from the ivory patch.

Hindwing. Thinly scaled, pink turning light yellowish pink toward the center.

Male genitalia. (Figs 3A-D). Uncus bifid with two tubular processes pointing downwards, each process with a clear dorsal carina pointing distally, tegumen thin with clear "shoulders" below uncus, saccus present but small and rounded. Valvae subrectangular pointing outwards, with a small protrusion slightly above juxta, apex triangular ventrally and ovoid laterally, largely shorter than the base of uncus. Dorsally they exhibit a long, thin and sclerotized process S-shaped, slightly spatulate at the extremity and pointing upwards with a small spine. Juxta slightly sclerotized, elongated. Penis short and cylindrical, caecum penis very short. Vesica with a short dorsal lobe with the basal half covered with small cornuti and some small spines near the base and a very long and undulated ventral lobe finishing in a cylindrical tube covered with small and thin spicules. A patch of deciduous cornuti at the junction of the two lobes.

Female. (Figs 2A-B). Forewing length: 13-14 mm (n=2). Identical to male except as follows: antennae filiform. Patagia and tegulae less contrasted, more uniformly pinkish orange, the abdomen upper side carmine red and the underside pure white. The hindwings upper side carmine red with the costa pinkish. The underside of the wings more contrasted with a general color light carmine red.

Female genitalia. (Fig. 4A). Very similar to *N. dorsipuncta* except the ductus bursae with narrow antrum. Ductus seminalis wide, slightly wrinkled. Bulla seminalis pyriform and more stretched, with an ovoid pocket. Seventh sternite exhibiting downturn with broader shoulders.

Etymology: This species is dedicated to Stéphane Martinez-Raposo, former work colleague of the second author, for his friendship, his kindness and his availability.

***Neonerita bernardoespinozai* Laguerre & Vincent sp. nov.** (Figs 1C-D)

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Type material: Holotype: 1♂, GUATEMALA, Petén, Carmelita, 2-6-XII-2008, 235 m, 17.460632 -90.057540, J. Monzon & F. Camposeco *leg.* (white printed label), genitalia dissected by Michel Laguerre n° ML 1953 (white hand-written label) / HOLOTYPE (red printed label) / Barcode Process ID ARCTC903-11, Sample ID MILA1365 (yellow printed label) / will be deposited *in* MNHN.

Paratypes: 24♂, 4♀, GUATEMALA: 1♂, Petén, Cerro Cahui, El Remate, 20-IV-2009, 130 m, 16.999216 -89.707307, J. Monzon & F. Camposeco *leg.*, in ML; 1♂, Alta Verapaz, Road Chisec to Coban Km 30.3, Parque Hun Nal Ye, 04-IX-2010, 356 m, 15°40'20,4" N 90°18'59,8" W, B. Vincent *leg.* in BV. 2♂, Zacapa, La Union, Finca Los Chorros, 08-IX-2010, 1556 m, 14°56'05,7" N 89°16'35,5" W, B. Vincent *leg.*, in BV. 3♂, Suchitepequez, pente sud-est du volcan Atitlan, 14 kms nord de Patulul, Las Tarrales Reserve, 12-IX-2010, 1045 m, 14°32'02,3" N 91°08'51,3" W, B. Vincent *leg.*, in BV. 1♂, Suchitépéquez, pente sud du volcan Atitlan, réserve Refugio del Quetzal, 13&14-IX-2010, 1556 m, 14°32'52,6" N

91°11'37,4" W, B. Vincent *leg.*, in BV. 1♂, Alta Verapaz, Coban, 50 km n: Finca Campar Submontan rainforest, 520 m, 15°39.57 N 90°28.74 W, 4-5-VII-2001, *in* MWM. 1♂, Suchitépéquez, Finca Los Tarrales ca. 10 km N of Patulul. 6 June 2005, N 14°32.247' W 91°09.401', 1066 m, MV/BL traps, R. S. Zack *leg.*, in WSU. 1♂, Petén. Parque Natural Ixpanpajul, Rt. CA-13 nr Santa Anna, 11 Sep 2009, 188 m, BL/MV light traps, N16°52.439' W 89°48.682' R. S. Zack *leg.*, in WSU. 2♂, Petén, Parque Natural Ixpanpajul, N16°51.373' W 89°48.895', 224 m elev., Rt CA-13, nr Santa Ana, 11/12-IX-2009, Peter Landolt *leg.*, in WSU. 1♂, IZABAL, Santo Tomas de Castilla, Pta de Palma, 4-XI-2000, 10 m, Monzon y Bailey *leg.*, in JMS. 1♂, Izabal, Livingstone, Punta de Palma, 24-XI-2000, 0 m, Bailey y Monzon *leg.*, in UVGC. 1♀, Izabal, Merendon, Finca Firmeza, 17-VII-2001, 1150 m, J. Monzon *leg.*, in UVGC. 1♂, Alta Verapaz, Santa Lucia, Laguna Lachua, 25-26-III-2002, C. Bailey *leg.*, in UVGC. 1♂, Suchitépéquez, Santa Barbara, Ref. Quetzal UVG, 20-25-IV-2008, 1600 m, Monzon, Sutton, Perez *leg.*, in UVGC /UVGA 8301/ (white printed label). 1♂, Petén Poptùn, Camino Posté, 13.5 km Oeste de carretera, 6-I-2009, 346 m, J. Monzon *leg.*, in UVGC. COSTA RICA: 1♂, Guanacaste, Santa Rosa, Barcode Process ID MHMXT635-08, Sample ID 07-SRNP-36580, in MNHN. 1♂, Guanacaste, Monte Cristo, 525 m, N11.014° W 85.425, Barcode Process ID MHMYG3064-10, Sample ID 09-SRNP-20977, in BMHN. 1♂, Alajuela, San Gabriel, Sector San Cristobal, 27-III-2007, 645 m, N 10.878° W 85.393°, O. Espinoza *leg.*, Barcode Process ID MHMXL624-07, Sample ID 07-SRNP-1162, in USNM. 1♀, Guanacaste, Sendero Natural, Sector Santa Rosa, 8-X-2004, 290 m, N 10.836° W 85.613°, R. Franco *leg.*, Barcode Process ID MHARB150-05, Sample ID 04-SRNP-14571, in BMHN. 1♀, Alajuela, Sendero Sotterey, Sector San Cristobal, 12-V-2003, 495 m, N10.9° W 85.383°, C. Cano *leg.*, Barcode Process ID XAA034-04, Sample ID 03-SRNP-6063, in USNM. 1♀, Alajuela, San Gabriel, Sector San Cristobal, 3-V-2007, 645 m, N 10.878° W 85.393°, E. Araya *leg.*, Barcode Process ID MHMXL623-07, Sample ID 07-SRNP-1492, genitalia dissected by Michel Laguerre n° ML 2537 in MNHN. HONDURAS: 1♂, Olancho, Route La-Union à El Dictamo, km 16, La Muralla, 1550 m, 19-VII-1995 Th. Porion & A. Grange *leg.*, genitalia dissected by Christian Gibeaux n° CG 7560, *in* MNHN. BELIZE: 1♂, Cayo, Five Blues Lake National Park, Hummingbird Hwy 32, 24-VI-1998, B. Vincent *leg.*, *in* BV. MEXICO: 1♂, Veracruz, Catemaco, 500 m, IX-X-1995, Th. Porion *leg.*, genitalia dissected by Christian Gibeaux n° CG 7559, *in* MNHN ; 1♂, Oaxaca, Route Puerto-Escondido à Oaxaca, rio Salado, 1250 m, 31-VII-1992, J. Haxaire *leg.*, genitalia dissected by Christian Gibeaux n° CG 7563, *in* MNHN.

Additional material examined: GUATEMALA: 1♂, Suchitépéquez, Los Tarralès (Finca) Reserve ca. 12 km N of Patulul. N14°31.998' W91°08.806' 1020 m. 14 Aug 2010, BL/MV light traps, R. S. Zack *leg.* 1♂, Suchitépéquez, Univ. del Valle de Guatemala Res. Stn. nr Aldea Adelaida/Finca Panama, Sta. Barbara. 1550 m, 11 Aug 2010. N14°32.881' W91°11.620' BL/MV light traps, R. S. Zack *leg.* 3 specimens - Same data but 10 June 2011. All in WSU. 1♂, Suchitépéquez, Finca Los Tarralès, Volcan Atitlàn, 1035 m elev., N14°32.003', W91°08.794' 9 June 2005, Peter Landolt *leg.* in WSU. MEXICO: 1♀, Tamaulipas, nr Gomez Farias, El Nacimiento, 600 ft elevation, 2 August 1992, Peter Landolt *leg.* in WSU. 1♂ 1♀, San Luis Potosi, Xilitla, 2800 ft elevation, 28 July to 1 August 1992, Peter Landolt *leg.* in WSU. 1♂, Chiapas, Lacanja, 20 August 1990, Peter Landolt *leg.* in WSU. COSTA RICA: 1♀, Cartago Province, Tuis, 900 m elevation, July 23-27, 1989, Peter Landolt *leg.* in WSU. VENEZUELA: 1♂, Tachira, Rte San Cristobal - Bariñas, PK 23, bord du Rio Frio, 9-VIII-1996, 450 m, M. Laguerre *leg.*, *in* ML; 1♂, Venezuela, Merida, Rte Sta Cruz de Mora - Canagua PK 4, 6-VIII-1996, 850 m, M. Laguerre *leg.*, genitalia dissected by Michel Laguerre n° ML 2455, *in* ML.

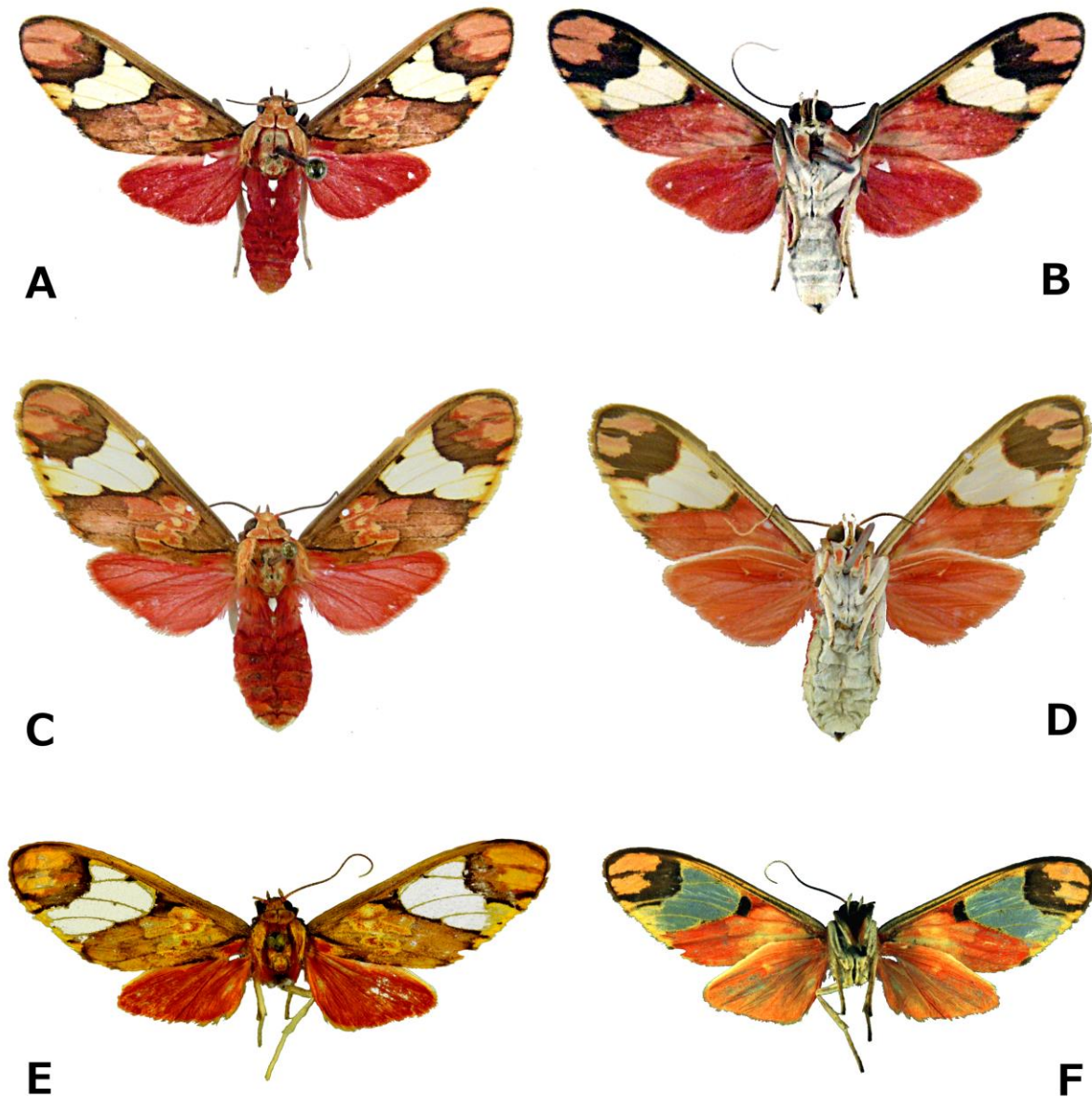


Figure 2. Females of *Neonerita martinezi* Laguerre & Vincent **sp. nov.**; *N. bernardoespinozai* Laguerre & Vincent **sp. nov.** and *N. dorsipuncta* Hampson, 1901. **A**, *N. martinezi* **sp. nov.**, dorsal view; **B**, *N. martinezi* **sp. nov.**, ventral view; **C**, *N. bernardoespinozai* **sp. nov.** dorsal view; **D**, *N. bernardoespinozai* **sp. nov.**, dorsal view; **E**, *N. dorsipuncta*, dorsal view; **F**, *N. dorsipuncta* from Brazil, Parana, ventral view.

Male description

Generally speaking, a duller and less contrasted species, in fact the least bright of the three species. Head identical to *N. dorsipuncta* except frons light pinkish yellow with a brownish grey line dorsally, vertex light yellowish pink. Patagia light pinkish orange largely bordered by light creamy yellow and a very thin line of pinkish red hairs. Tegulae light creamy yellow centered with light pinkish orange with some scattered golden metallic scales. A very thin border of pinkish red hairs. Thorax light yellowish grey with some indistinct pinkish red spots and an indistinct twin grey spot near patagia. First pair of legs with tibia and femur light brownish grey, tarsi very light orange with claws and last segment brown, coxae with a light orange patch. The two last pairs of legs creamy white with claws brown.

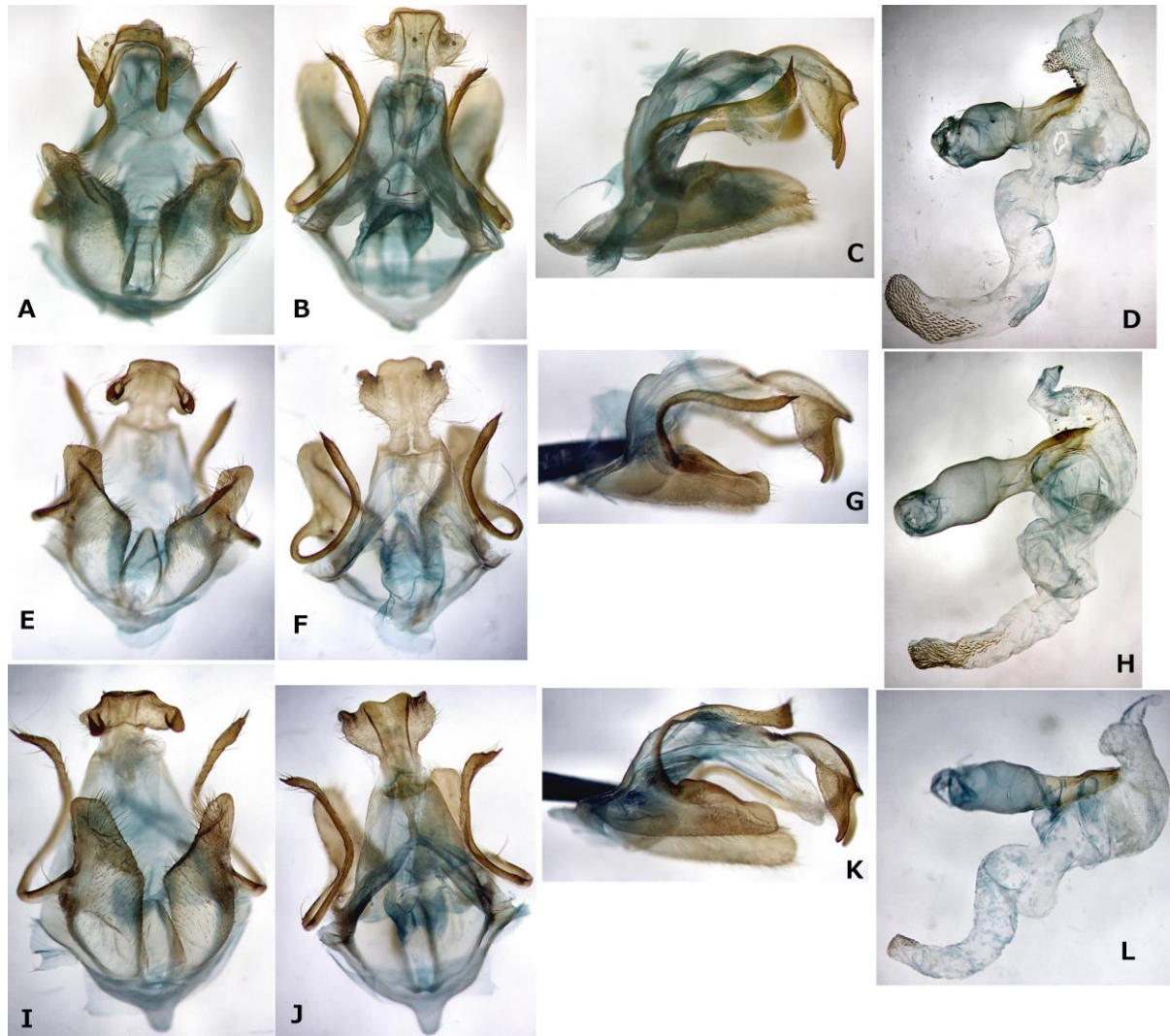


Figure 3. Genitalia male of *Neonerita martinezi* Laguerre & Vincent **sp. nov.**; *N. bernardoespinozai* Laguerre & Vincent **sp. nov.** and *N. dorsipuncta* Hampson, 1901. (A–D, Holotype of *N. martinezi* **sp. nov.**), A, ventral view; B, dorsal view; C, lateral view; D, penis with devaginated vesica; (E–H, Holotype of *N. bernardoespinozai* **sp. nov.**), E, ventral view; F, dorsal view; G, lateral view; H, penis with devaginated vesica; (I–L, spécimen from Brazil, Parana, of *N. dorsipuncta*), I, ventral view; J, dorsal view; K, lateral view; L, penis with devaginated vesica.

Abdomen dull reddish orange, hairy basally, with a line of 2 or 3 pure white spots of decreasing size on segments 1 to 3. Abdomen below pure white.

Dorsal surface. forewing length: 13-14 mm (n=4). Similar to *N. dorsipuncta* except that the general color is duller with a clear greyish hint not reddish as in *N. martinezi* **sp. nov.** or purplish as in *N. dorsipuncta*. The yellowish quadrangular patch at the end of the ivory band clearly open as in *N. dorsipuncta*, faintly contrasting with the transversal band at the opposite of *N. martinezi* **sp. nov.**

Ventral surface. the lightest of the three species with a general color dull pinkish grey slightly translucent showing the upper side through the wing, costa yellowish grey. The two apical marginal patches light pinkish orange. Hindwings entirely very light pinkish white.

Male genitalia. (Figs 3E-H).

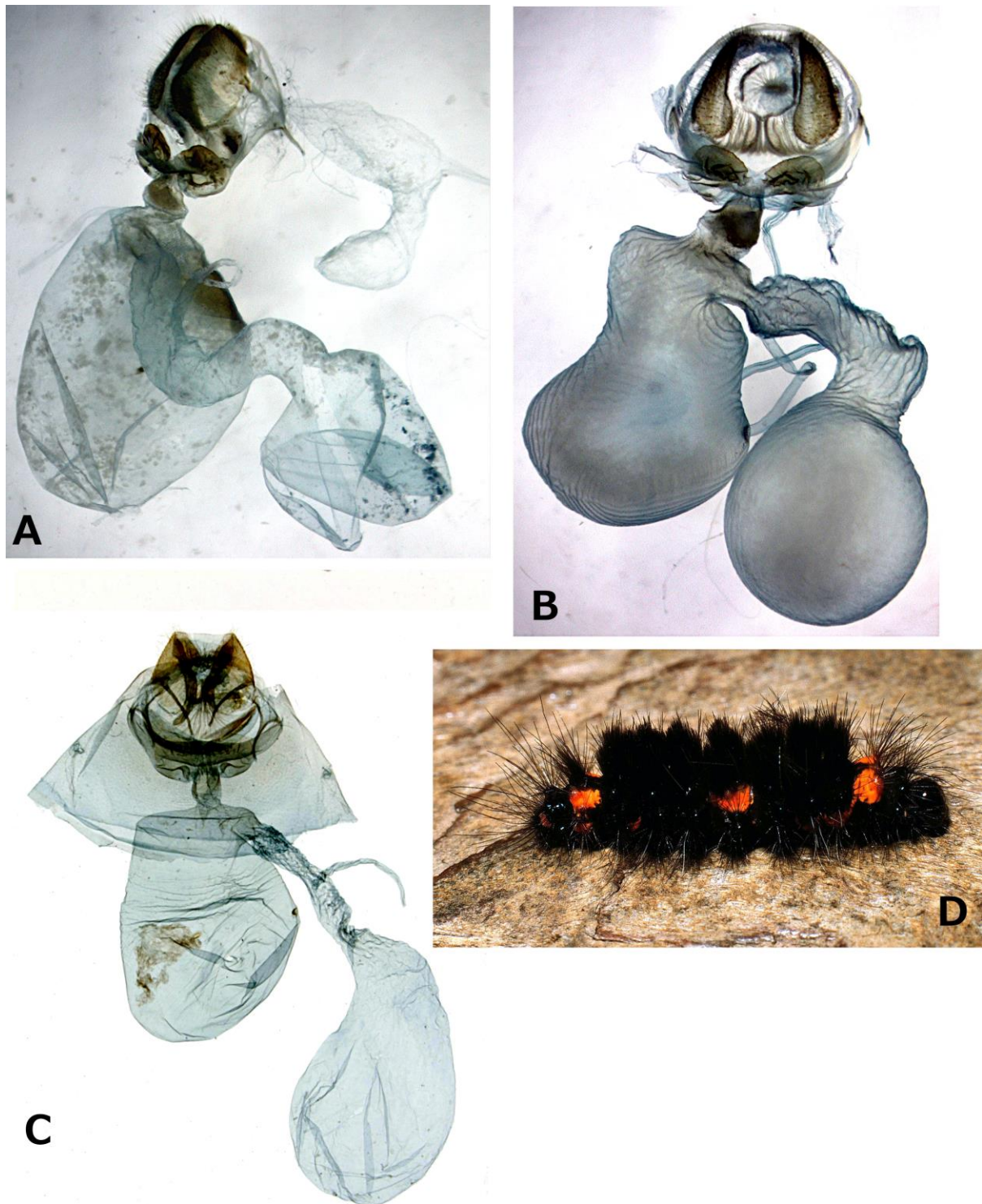


Figure 4. Genitalia female of *Neonerita martinezi* Laguerre & Vincent **sp. nov.**; *N. bernardoespinozai* Laguerre & Vincent **sp. nov.**; *N. dorsipuncta* Hampson, 1901 and immature stage of *N. bernardoespinozai* Laguerre & Vincent **sp. nov.**. **A**, *N. martinezi* **sp. nov.**, genitalia dissected by Michel Laguerre n°ML 2418, general view; **B**, *N. bernardoespinozai* **sp. nov.**, general view; **C**, *N. dorsipuncta*, general view; **D**, immature stages of *N. bernardoespinozai* **sp. nov.**, specimen number 03-SRNP-3875.

Uncus bifid with two tubular processes pointing downwards, each process with a clear dorsal carina pointing markedly distally, tegumen thin with clear "shoulders" below uncus, saccus present but extremely small. Valvae subrectangular with a clear protrusion slightly above juxta, apex rectangular ventrally and laterally, largely shorter than the base of uncus. Dorsally they exhibit a long, thin and sclerotized process S-shaped and pointing distally with a small spine. Juxta sclerotized, ovoid. Penis short and cylindrical, caecum penis very short. Vesica with a short and slightly scobinated dorsal lobe and a very long and undulated ventral lobe finishing in a cylindrical tube with very small and thin spicules. A patch of deciduous cornuti at the junction of the two lobes.

Female. (Figs 2C-D). Identical to male except the same morphological differences as for the previous two species.

The female genitalia (Fig. 4B) is very similar to *N. dorsipuncta* except the ductus bursae sclerotized and subtriangular. The corpus bursae and bulla seminalis are heavily wrinkled.

Etymology: This species is dedicated to our friend and colleague Bernardo Espinoza, an expert on Lepidoptera and more particularly Heterocera of Costa Rica.

Biology: Jansen & Hallwachs (2009) have studied for many years immature stages of Lepidoptera in Costa Rica. Several *N. bernardoespinozai* **sp. nov.** specimens have thus been reared up to the adult stage. Of these rearings, we can conclude that the emergences are held throughout the year with a predilection for the period from May to September. They feed almost exclusively on Sapotaceae and particularly on species of the genera *Chrysophyllum*, *Pouteria* and *Sideroxylon*. The caterpillar (22-24 mm) is black, very hairy, with areas of dense and homogeneous hairs interspersed with black long hairs (Fig. 4D). Dorsally, areas of dense bristles are absent on the mesothorax, anal segment and the middle of the abdomen. These areas are orange and form contrasting and clearly visible bright spots.

Remarks: In BMNH, beside the holotype of *N. dorsipuncta*, there is a series of 3 specimens labeled "*Neonerita sanguinea*" and "*Type*". The first specimen is labeled "*San Esteban, Venezuela, July, 1909, (S. M. Klages)*" "*Neonerita sanguinea Det. Roths*". The other two are labeled "*Las Quiguas, Esteban Valley N. Venezuela, Nov to March 10*". Despite extensive research, the original description of this supposed species could not be found. We are presumably in the presence of a manuscript name. These specimens from northern Venezuela (near Valencia), could match *N. bernardoespinozai* **sp. nov.** Only the dissection of genitalia would confirm this hypothesis.

Discussion

Within the *Neonerita dorsipuncta* group, separation of taxa based on habitus only is picky. However *Neonerita martinezi* **sp. nov.** often presents some smaller specimens with a forewing length shorter by 1 to 2 mm compared to the two other species. Moreover, this species has a yellowish cast on the marginal patch contiguous to the hyaline band of the forewing. This patch is more contrasted than the other two species and separated from the hyaline band by two small black teeth thus appearing closed at the opposite of the two other species. These elements must, however, be confirmed by the preparation of male genitalia (Fig. 3) which present more differences. Can be cited in particular *Neonerita dorsipuncta* which can be easily distinguished by the absence of cornuti on the vesica. *Neonerita*

martinezi sp. nov. presents cornuti on the long lobe AND cornuti on the short lobe of the vesica whereas *Neonerita bernardoespinozai* sp. nov. presents only cornuti on the long lobe. Moreover, *Neonerita martinezi* sp. nov. has short and truncated subtriangular valves while *Neonerita bernardoespinozai* sp. nov. has long and subrectangular valves. The species with a habitus close to the *Neonerita dorsipuncta* group is *Neonerita pulchra* Toulgoët, 1983. This species is described from Panama, Chiriqui. Toulgoët (1983) confirms this resemblance in his discussion by stating that the Panamanian species differs by more acute forewings, median straw yellow spot (and not hyaline) and the absence of the white punctuation on the abdomen.

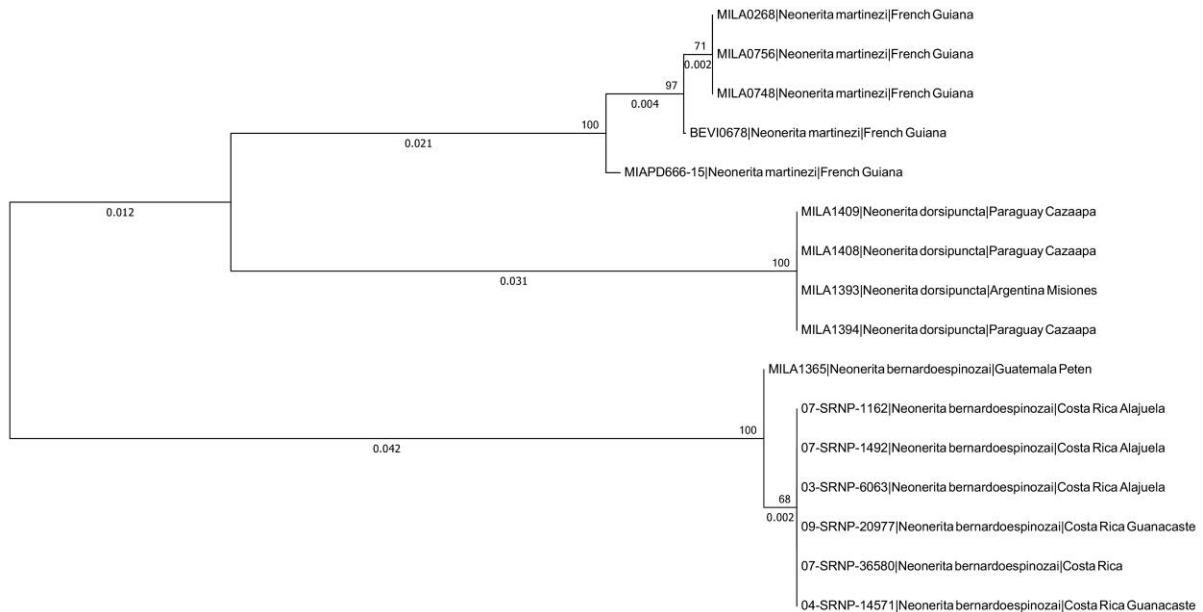


Figure 5. Neighbor-Joining Tree (Saitou & Neil, 1987) for the 16 specimens of *Neonerita dorsipuncta* group. Distances in % are given below each branch and bootstrap supports are given above each branch (only if larger than 60%) (obtained with MEGA6, see Tamura *et al.*, 2013).

The location of specimens (Figs 6-7) can also contribute to the discrimination of these taxa. *Neonerita bernardoespinozai* sp. nov. appears limited to Central America from the southern half of Mexico to Panama. Nevertheless some specimens collected in south-west Venezuela near the Colombia border and on the N.W. slope of the Merida Cordillera are very likely conspecific. More intense collection in northern Colombia would eventually confirm its presence in South America. *Neonerita martinezi* sp. nov. is present, in addition to the Guyana Shield, across the Amazon basin down to Bolivia and Rondônia in Brazil. Further south, in the area of the Mata Atlantica, the southern part of Brazil and the adjacent parts of Paraguay and Argentina, *Neonerita dorsipuncta* is the only species present.

This group of three species experiences a very vast distribution, mainly because the genera of their food plants are widely present in the whole Neotropics, this presence being reinforced by the fact that several species produce edible fruits (Sapote) and thus are more or less cultivated in the whole tropical area.

A careful checking of the NJ tree (Fig. 5 and Table 1) of 16 specimens reveals that despite very similar habitus, the three species involved are widely separated. The more northern species (*N. bernardoespinozai* sp. nov.) is the most divergent of the three with respectively distances of 7.6-8.1 % with *N. martinezi* sp. nov. and 8.6-8.8 % with *N.*

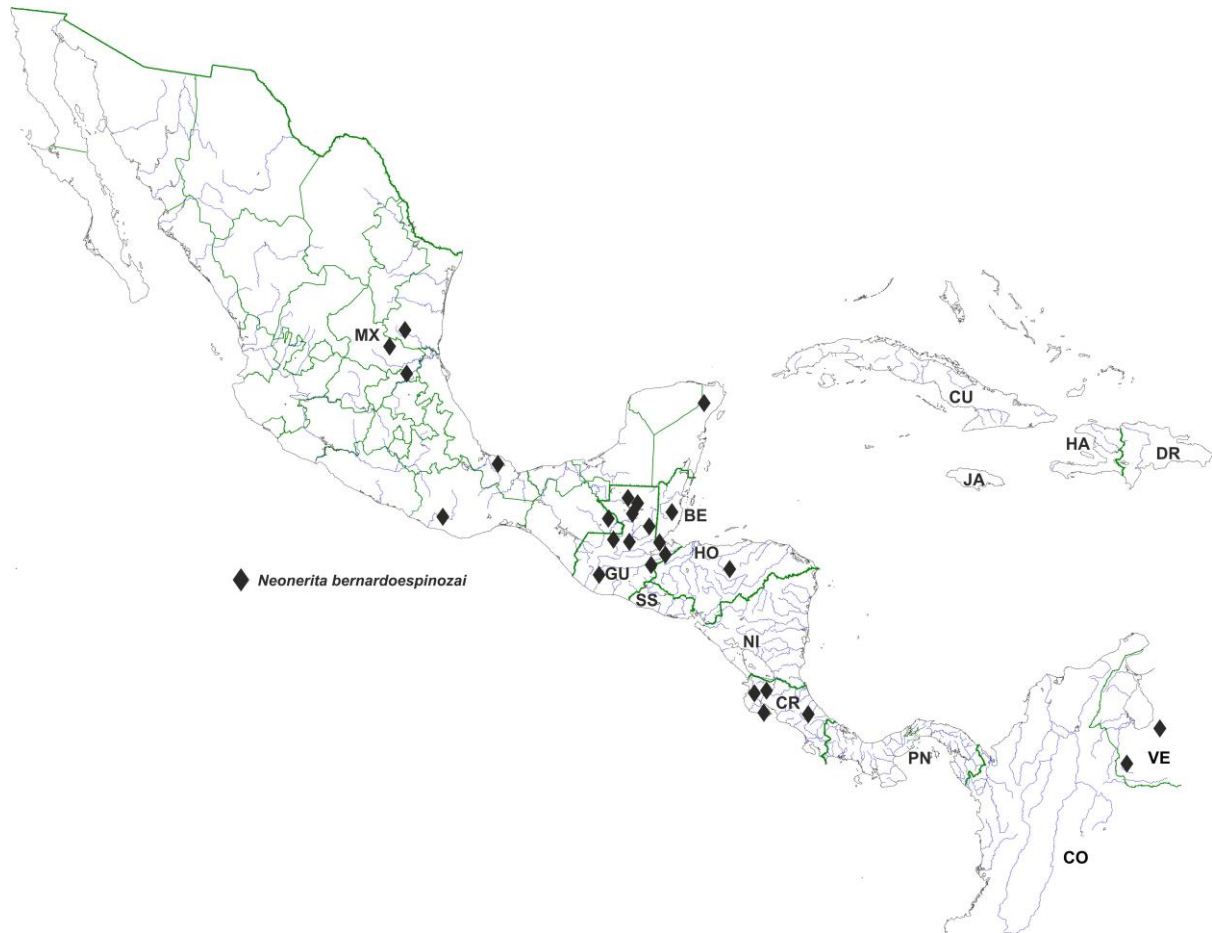


Figure 6. Distribution map of *Neonerita bernardoespinozai* Laguerre & Vincent **sp. nov.** in Central America.

Table 1. Data for *Neonerita dorsipuncta* complex specimens used in the NJ Tree.

GenBank Code	BOLD access code	GenBank Code	BOLD access code
JF840927	MILA 1365	JF840950	MILA 1393
GU661149	BEVI 0678	KX047587	MILA 0756
JF840962	MILA 1409	KX047588	MILA 0748
JF840961	MILA 1408	KX047589	MILA 0268
JF840951	MILA 1394	KX047586	MIAPD666-15

dorsipuncta, whereas the two southern species diverge only by 5.5-5.7 %. The intraspecific distances are low (from 0 % to a 0.6 % maximum). Nevertheless, the interspecific distances are very high for so similar species. This demonstrates once again that a taxon with a geographical distribution throughout the entire Neotropics (from Mexico to southern Brazil or Argentina) corresponds in fact to several taxa at least for the Arctiinae subfamily. This is extremely clear following a perusal of the general tree of the Neotropical Arctiinae containing more than 22 500 sequences where numerous examples can be found in all tribes. Can be cited for example *Lophocampa atriceps*, which distribution used to be considered from Costa Rica to Bolivia from side to side of the Andes. Vincent & Laguerre (2010) demonstrated that under this species name, there are actually 5 taxa. But in this case, and at

the opposite case of the *Neonerita dorsipuncta* complex, the observation of the color of the abdomen and ornamentation of the forewings is sufficient to discriminate different species.

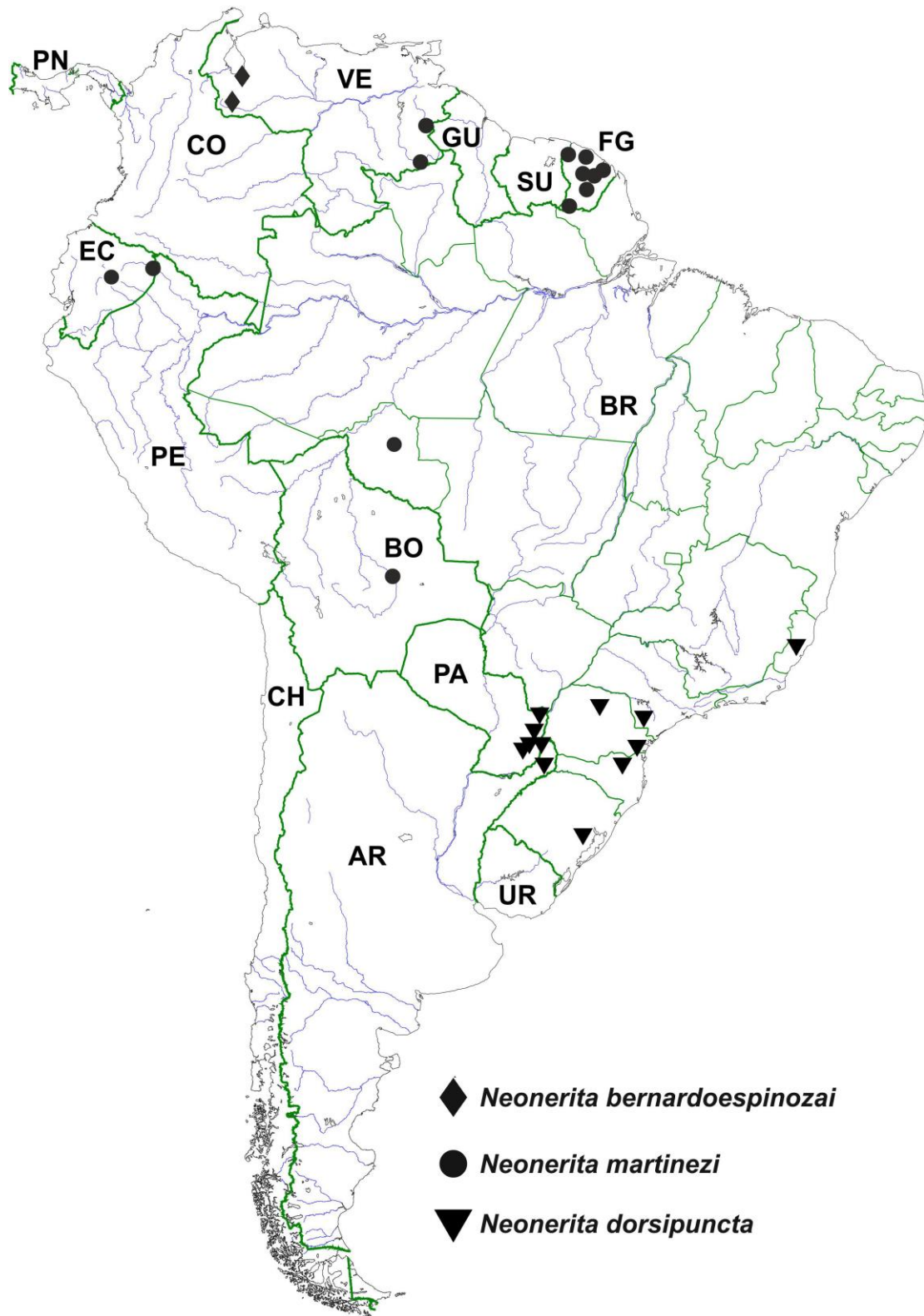


Figure 7. Distribution map of *Neonerita martinezi* Laguerre & Vincent **sp. nov.**, *N. bernardoespinozai* Laguerre & Vincent **sp. nov.** and *N. dorsipuncta* Hampson, 1901 in South America.

Acknowledgements

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