Morpho menelaus (Linnaeus, 1758), in north-eastern Venezuela: description of a new subspecies

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Date of issue online: 15 July 2020
Zoobank Registered: urn:lsid:zoobank.org:pub:472C167A-E11B-4976-A311-43176281A945
Electronic copies (ISSN 2575-9256) in PDF format at: http://journals.fcla.edu/troplep; https://zenodo.org; archived by the Institutional Repository at the University of Florida (IR@UF), http://ufdc.ufl.edu/ufir; **DOI**: 10.5281/zenodo.3931775.

Abstract: A new subspecies of the common species *Morpho menelaus* (Linnaeus, 1758) is described from north-eastern Venezuela, and named *Morpho menelaus chantalae* Neild, Johnson & Blandin **ssp. nov.** Its relationship with *M. menelaus orinocensis* Le Moult, 1925, described from the Orinoco Delta, is discussed. The discovery of this new taxon emphasises the importance of the conservation of forest ecosystems in north-eastern Venezuela, where the distribution and diversification of species may have been driven by local geodynamics and the evolution of ecological contexts.

Resumen: Una nueva subespecie de *Morpho menelaus* (Linnaeus, 1758), especie de amplia distribución, se describe del noreste de Venezuela y se nombra *Morpho menelaus chantalae* Neild, Johnson & Blandin, **ssp. nov.** Se debate sobre su afinidad con *M. menelaus orinocensis* Le Moult, 1925, descrita del Delta del Orinoco. El descubrimiento de este nuevo taxón resalta la importancia de la conservación de los ecosistemas forestales en el noreste de Venezuela, donde la distribución y diversificación de especies puede haber sido impulsada por la geodinámica local y la evolución de contextos ecológicos.

Résumé: Une nouvelle sous-espèce de l'espèce commune *Morpho menelaus* (Linnaeus, 1758) est décrite du nord-est du Venezuela, et nommée *Morpho menelaus chantalae* Neild, Johnson & Blandin **ssp. nov.** Ses relations avec *M. menelaus orinocensis* Le Moult, 1925, décrite du delta de l'Orénoque, sont discutées. La découverte du nouveau taxon met en relief l'importance de la conservation des écosystèmes forestiers dans le nord-est du Venezuela, où la distribution et la diversification des espèces ont été probablement influencées par la géodynamique locale et par l'évolution des contextes écologiques.

Key words: Orinoco Delta, *Morpho menelaus*, *Morpho menelaus chantalae* **ssp. nov.**, *Morpho menelaus orinocensis*, Serranía de Turimiquire, Venezuela.

INTRODUCTION

Morpho menelaus (Linnaeus, 1758), one of the commonest *Morpho* species, is widely distributed in the rainforests of South America. More precisely, it occurs in the Brazilian Atlantic Forest (in the broadest sense), throughout Amazonia to the Andean foothills, and in the Guianan region (Blandin, 2007a, b). Seventeen subspecies were recognized by Blandin (2007a, b), of which five occur in Venezuela, including two which were described in Neild (2008).

From a biogeographical viewpoint, Venezuela is a complex region (Neild, 2008: 18), resulting from its geological history, in particular the evolution of the Pebas aquatic system which separated the Andes from the Guiana Shield, and the formation of the Orinoco river that became progressively oriented to the east (Blandin & Purser, 2013). This complexity is reflected by the distribution of *Morpho* species and subspecies (Blandin, 2007a; Neild, 2008; Blandin & Purser, 2013; Gayman *et al.*, 2016), notably the five *M. menelaus* subspecies (Fig. 1), including: the Andean *M. m. neildi* Blandin, 2008, occurring along the eastern slopes of the Cordillera de Mérida (states of Táchira and Barinas), and *M. m. laurellae* Neild, 2008, occurring along western slopes of this cordillera and along the eastern slopes of the Sierra de Perijá; the Amazonian *M. m. offenbachi* Bryk, 1953, distributed from Amazonas state across the extreme west and whole of southern Bolívar state (occupying the Pantepui, Ventuari, and Imerí biogeographical regions, see Neild, 2008: 18), where a transition probably exists with the Guianan nominotypical subspecies, which is encountered in the north-eastern quadrant of the state, from south of the Orinoco up to but excluding the southern highlands; and finally *M. m. orinocensis* Le Moult, 1925, which occurs in the Orinoco Delta (Blandin & Neild, 2020).

For decades, the population of *M. menelaus* from north-eastern Venezuela has remained undetected. In this paper, we compare specimens from this population around Caripe, in

Fig. 1. The distribution of *Morpho menelaus* subspecies in northern Venezuela: *M. m. laurellae* (medium blue dots); *M. m. neildi* (black dots); *M. m. chantalae* **ssp. nov.** (dark blue dots); *M. m. orinocensis* (lime green dots); *M. m. menelaus* (pale blue dots); *M. m. offenbachi* (pink dots). (Map Data © 2018 Google).

Monagas state in the Serranía de Turimiquire, with typical *M. m. orinocensis* specimens from the Orinoco Delta, and with other Venezuelan subspecies, and describe the north-east Venezuelan population as a new subspecies.

MATERIAL AND METHODS

We studied 27 specimens (21 ♂, 6 ♀) from the Caripe area, sent for study to Patrick Blandin by Marcial Garcia after an initial discussion with Andrew Neild. The descriptive terminology follows Blandin (2007a), adapted from Le Moult & Réal (1962-1963), and Neild (2008). Terms for wing venation follow the modified Comstock-Needham system suggested by Miller (1970).

The following abbreviations are used, singly or in combination: D: dorsal surface; V: ventral surface; FW: forewing; HW: hindwing; FWL: forewing length, measured from the articulation of the wing with the body to the extremity of the apex. Other abbreviations include: HT: holotype; PT: paratype; LT: lectotype; PLT: paralectotype. Acronyms used here for collections include: **AN:** Andrew Neild collection, London, UK; **JCS:** Juan Carlos De Sousa collection, Madeira, Portugal; **JO:** Jacques Ouvaroff collection, Courbevoie, France; **LCH:** Gilles Le Chapelain collection, Aix-les-Bains, France; **MC:** Mauro Costa collection, Caracas, Venezuela; **MGCL:** McGuire Center for Lepidoptera and Biodiversity, Florida Museum of Natural History, University of Florida, Gainesville, USA; **MIZA:** Museo del Instituto de Zoología Agrícola, Universidad Central de Venezuela, Maracay, Venezuela; **MNHN:** Muséum national d'Histoire naturelle, Paris, France; **NHMUK:** Natural History Museum, London, United Kingdom; **PB:** Patrick Blandin collection, Montrouge, France; **PJ:** Peter Johnson collection, San Juan Capistrano, USA; **RBINS:** Royal Belgian Institute of Natural Sciences, Brussels, Belgium; **RM:** Ray Murphy collection, Mzuzu, Malawi (on loan to AN); **RO:** Romero family collection, Maracay, Venezuela; **SA:** Stéphane Attal collection, Paris, France; **UMO:** University Museum, Oxford University, Oxford, England.

Specimens (and photos) of other *M. menelaus* subspecies examined for this paper include the following, although we also examined many hundreds of additional specimens during extensive research on the genus *Morpho* (see Blandin 2007a, table XVIII, p. 118, and Neild, 2008, including type data on pp. 238-239 and the list on p. 221 of all *M. menelaus* types examined). For distributions of relevant taxa, see Fig. 1.

Morpho menelaus laurellae (8 ♂, 3 ♀): 3 ♂, 1 ♀ (PT) La Gira de Betijoque, Trujillo (AN). – 1 ♀ (PT) El Paramito, Trujillo (AN). – 1 ♂ (HT) Qda. La Blanca, Táchira (MIZA). – 1 ♂ La Gira de Betijoque, Trujillo (MNHN). – 1 ♂ Paramito, Trujillo (MNHN). – 1 ♂ San Juan de Colón, Táchira (PJ). – 1 ♀ La Azulita, Mérida (PJ). – 1 ♂ La Fría, Táchira (RO).

Morpho menelaus neildi (26 ♂, 9 ♀): 5 ♂ (PT) Barinitas, Santo Domingo road, Barinas (AN). – 1 ♂, 1 ♀ (PT) Río Frío, Táchira (AN). – 1 ♂, El Blanquito, P.N. Yacambú, Lara (JCS). – 1 ♂ (HT) Cerro Azul, Barinas (MIZA). – 2 ♂ (PT) San Miguel, Barinas (MNHN). – 1 ♂ (PT) La Popa, quebrada San Miguel, Barinas (MNHN). – 2 ♂ Reserva Forestal Caparo, Barinas (MNHN). – 1 ♂, 1 ♀ Barinitas, Barinas (MNHN). – 1 ♂ Altamira, Barinas (PJ). – 1 ♀ San Isidro, Barinas (PJ). – 8 ♂, 5 ♀ Río Frío/Río Negro, Táchira (RO). – 3 ♂, 1 ♀ Barinitas, Barinas (RO). [We have added to the map (Fig. 1), but not examined, specimens collected by Andrés Orellana (pers. comm.) in Terepaima National Park, Lara, Qda. Guayamure, at around 1000 m elevation, because these specimens represent the northernmost records for this species in the Venezuelan Andes, and are a new distribution record, not reported in the original description of *M. m. neildi* in Neild, 2008].

Morpho menelaus offenbachi (23 ♂, 2 ♀):
1 ♂ Tobogán de la Selva, Amazonas (AN). – 3 ♂, 1♀ Pintado, Amazonas (AN). – 1 ♂ Quebrada de Jaspe, Bolívar (AN). – 1 ♂ Los Pijiguaos, Bolívar (MC). – 1 ♂ Bauxilum, Bolívar (MNHN). – 3 ♂ San Carlos de Río Negro, Amazonas (MNHN). – 2 ♂ Salto Pará, Bolívar (MNHN). – 2 ♂, San Francisco de Yuruaní, Bolívar (MNHN). – 5 ♂, 1♀ Los Pijiguaos, Bolívar (SA). – 4 ♂ San Francisco de Yuruaní, km 7 vía Roraima, Bolívar (SA).

Morpho menelaus menelaus (18 ♂, 11 ♀):
1 ♂ Km 84 South of El Dorado, Bolívar (AN). – 4 ♂ El Pao, Bolívar (MNHN). – 1 ♂, 1 ♀ "Jabillal", Bolívar (MNHN). – 4 ♂, 4 ♀ Lower Caura river, Bolívar

(RM). – 2 ♂ Las Claritas ("Km. 88"), Bolívar (RM). – 6 ♂, 6 ♀ Las Claritas area, Bolívar (RO).

Morpho menelaus orinocensis (45 ♂, 6 ♀). Most specimens we have examined were supplied by Eugène Le Moult to public and private collections from 1925 onwards. Many of these were labelled "Delta Orénoque", "Tucupita, delta de l'Orénoque", or "Tucupita, bas-Orénoque". We designated one such specimen as the lectotype, and considered others with Le Moult labels to be paralectotypes – for details, see Blandin & Neild (2020). For brevity we refer to these specimens below solely by the acronyms "LT" and "PLT", and without repeating locality data: ♂ LT (MNHN). – 13 ♂ PLT (MNHN). – 1 ♂ PLT, 3 ♀ PLT (MGCL). – 5 ♂ PLT (NHMUK). – 9 ♂ PLT, 1 ♀ PLT (RBINS). – 1 ♂ PLT (UMO). – 2 ♂ PLT (JO). – 3 ♂, 1 ♀ Bajo Delta (MIZA). – 1 ♂ Caño Guayo (MIZA). – 7 ♂, 1 ♀ Delta de l'Orénoque (MNHN). – 1 ♂ Curiapo, 1921 (MNHN). – 1 ♂ San Francisco de Guayo, Orinoco Delta, sea level, 3-6 June 2009 (PJ). As there are so few localities reported for this subspecies we add here two more sight observations, both by Alan Highton (pers. comm.): lower Caño Buja, Monagas state; middle Caño Manamo (near Orinoco Delta Lodge), Monagas state.

RESULTS

Morpho menelaus chantalae Neild, Johnson & Blandin, **ssp. nov.** (Figs. 2, 3, 6)

Description: Male holotype (Fig. 2): FWL: 73 mm. The FW apex is clearly protruding and the HW distal margin is slightly crenulated. The black wing margins are 1.0-1.5 mm wide. The FW apex is black, and the dorsal blue color is relatively pale. A small, submarginal white spot occupies space R_5-M_1, and another, small and blurred, within the blue area in space M_1-M_2. A prominent subapical pupillary spot, white with violet-blue scales, is present in the subcostal region of space R_5-M_1. The elongated costal spot situated beyond the FW cell-end is blue, with a few white scales near the wing edge. The ventral surface is a deep brown, with strong silvery-green marks and a distal cover of light violet scales. The inner circles of the ocelli are a light reddish color. The marginal lines are ochre-yellow on both wings, while the premarginal lines are more orange-brown on the FW, and more reddish on the HW.

Female paratype (Fig. 3): FWL: 79 mm. The FW and HW distal margins are crenulated, and the white interspaces are touched with a yellowish tinge. The FW apex is slightly protruding. On the dorsal surface the blue color is relatively pale, with a subtle deep violet sheen in the FW basal area; on the FW this blue reaches the two posterior pupillary spots (in M_3-Cu_1 and Cu_1-Cu_2), and it passes beyond the discocellular veins, covering with a light blue sheen the white postdiscal area, but not the white costal mark. The white HW submarginal spots, and to a lesser extent those of the FW, contain a small number of thin silvery-blue scales which give the illusion of a greyish tonality with a subtle hint of mauve around the edges. The ventral surface is mostly deep brown, with a subtle yellowish cast, which results in a strong contrast with the distal areas, which are densely covered with light scales that produce coppery and mauve reflections. The inner circles of the ocelli are yellow-orange, as are the marginal and pre-marginal lines.

Etymology: This subspecies is named in memory of Chantal Blandin-Capeillère (1943-2018), the late wife of Patrick Blandin, who for 50 years put up with a *Morpho*-lover in her home, allowed him to build a large collection, and shared his decision to donate this collection to the Muséum national d'Histoire naturelle (Paris).

Types: HOLOTYPE. ♂ Matura, Río Caripe *ca.* 15 km E of Caripe, *ca.* 10°10'N 63°21'W, 450 m, Monagas Venezuela, 16-21 vii 2018. *Leg*. Marcial Garcia (PB, to be donated to the MIZA).

PARATYPES (20 ♂, 6 ♀): 1 ♂ Río Pajaral, 15 km ENE of Caripe, 10°12'44.61"N 63°22'48.20"W, 770 m, Monagas, Venezuela, 10 iv 2018. *Leg.* Marcial Garcia (PB, to be donated to the MIZA). – 2 ♂ Matura, Río Caripe, *ca.* 15 km E of Caripe, *ca.* 10°10'N 63°21'W, 450 m, Monagas Venezuela, 16-21 vii 2018. *Leg.* Marcial Garcia (PB, to be donated to the MIZA). – 1 ♀ *idem*, 5-10 vi 2018 (PB, to be donated to the MIZA). – 1 ♂ Río Pajaral, 15 km ENE of Caripe, 10°12'44.61"N 63°22'48.20"W, 770 m, Monagas, Venezuela, 6 iv 2018. *Leg.* Marcial Garcia (MNHN). – 1 ♀ *idem*, x 2019. *Leg.* Marcial Garcia (MNHN). – 1 ♂ Matura, Río Caripe, *ca.* 15 km E of Caripe, *ca.* 10°10'N 63°21'W, 450 m, Monagas, Venezuela, 7 vi 2018. *Leg.* Marcial Garcia (MNHN). – 8 ♂ *idem*, 16-21 vii 2018. *Leg.* Marcial Garcia (MNHN). – 1 ♀ *idem*, 16-21 vii 2018. *Leg.* Marcial Garcia (MNHN). – 1 ♂ NE Venezuela: Río Pajaral, 15 km ENE of Caripe, Monagas. 10°12'44.61"N 63°22'48.20"W. A. Neild Coll.; *Leg.* M. Garcia. 770 m elevation. March 2018. (AN). – 1 ♂ *idem*, 10 iv 2018 (AN). – 1 ♀ *idem*, Oct. 2019 (AN). – 1 ♂ Río Pajaral, 15 km ENE of Caripe, *ca.* 10°12'N 63°22'W, 600 m, Monagas, Venezuela, 3 iv 2018. *Leg.* Marcial Garcia (LCH). – 1 ♂ *idem*, viii 2019. *Leg.* Marcial Garcia (LCH). – 2 ♂, 1 ♀ Matura, Río Caripe, *ca.* 15 km E of Caripe, *ca.* 10°10'N 63°21'W, 450 m, Monagas, Venezuela, vi-vii 2018. *Leg.* Marcial Garcia (PJ). – 1 ♀ Matura, Río Grande, East of Caripe, 450 m, 4 xii 2019. *Leg.* Marcial Garcia (PJ). – 1 ♂ Río Pajaral, 15 km ENE of Caripe, 10°12'44.61"N 63°22'48.20"W, 770 m, Monagas, Venezuela, iv 2018. *Leg.* Marcial Garcia (SA).

Comparison with *Morpho menelaus orinocensis:* Males of *M. m. chantalae* **ssp. nov.**, with a FWL of 63-77 mm, are on average a little larger than males of *M. m. orinocensis* (FWL: 55-70 mm), with their FW apex generally more protruding, and the outer margin more concave. Le Moult (1925) noted that the forewings of *M. m. orinocensis* are a little more rounded, and less falcate, than in the nominotypical subspecies; in this respect *M. m. chantalae* is closer to the nominotypical subspecies than *M. m. orinocensis*. The white costal spot, near the apex, is present in a large majority of *M. m. chantalae* males, as in *M. m. menelaus*, while it is much more often blurred or even missing in *M. m. orinocensis*.

Morpho m. orinocensis males (Fig. 4) are a paler blue than *M. m. chantalae* males (Fig. 2), while the latter have a blue color as intense as *M. m. menelaus* males, with a subtle variability in tone, some specimens being darker, others lighter, and some with a greenish tinge, but far less than in the nominotypical race. Considering the ventral surface, there is a strong difference between the dark brown ventral coloration of *M. m. chantalae* males (Fig. 2) and the pale brown coloration of *M. m. orinocensis* males (Fig. 4).

Most specimens of *M. m. orinocensis* that we have examined were probably collected in the 1920s, and it could be argued that their pigments have faded. As the saturation of the blue color depends on the quantity of melanin in the iridescent scales (Debat *et al.*, 2018), the fading of this pigment over time might explain the paler blue of *M. m. orinocensis* specimens we have inspected. To check this hypothesis, we compared Le Moult's *M. m. orinocensis* males with older *M. m. menelaus* males, housed in MNHN for more than 100 years. The differences between the dorsal and ventral colors, paler in *M. m. orinocensis* as noted by Le Moult (1925), are still obvious, while they are much less significant between these old *M. m. menelaus* males and the recently collected *M. m. chantalae*. Moreover, comparison of a recently (2009) collected male of *M. m. orinocensis* indicates the ventral brown color is similar to that of the *M. m. orinocensis* lectotype collected in 1925 (cf. Fig. 4). Therefore, we conclude that color differences between *M. m. orinocensis* and *M. m. chantalae* are not age-related and have a valid diagnostic value.

The following additional characters of males should be of diagnostic interest, but only on a statistical basis, and they need to be checked against larger samples. 1. The DFW rounded pupillary mark (on the subcosta, in the apical black area) is generally well demarcated, with white (and some blue) scales in *M. m. chantalae*, while it is more often faded or event absent

Fig. 2. *Morpho menelaus chantalae* **ssp. nov.**, holotype ♂ (to be donated to the MIZA). Dorsal (above) and ventral surfaces.

Fig. 3. *Morpho menelaus chantalae* **ssp. nov.**, paratype ♀ (MNHN). Dorsal (above) and ventral surfaces.

in *M. m. orinocensis*. 2. The DFW pre-marginal marks, near the apex, are more often visible in *M. m. chantalae*, and more often faded, or hardly visible, in *M. m. orinocensis*. 3. On the VHW basal areas, there are often brilliant yellowish-greenish tones in *M. m. orinocensis* (Neild, 2008; Blandin & Neild, 2020), while in *M. m. chantalae*, when they exist, such tones are much less obvious.

Too few females of both subspecies are known to be certain of diagnostic characters (see Figs. 3 and 5). However, based on these specimens, the following are likely to be valid characters: the FW apex should be more protruding in *M. m. chantalae*; on the FW dorsal surface, the blue reflections overlapping from the cell into the white postdiscal area are more intense in *M. m. chantalae*; and the brown basal areas on the ventral surface are very probably darker in *M. m. chantalae*.

In males and females of *M. m. chantalae*, the color of the inner circle of the ventral ocelli is more variable than in *M. m. orinocensis*, ranging from a rather light reddish to a pale yellowish tone (Fig. 6). Similarly, there are color variations in the VFW and VHW premarginal and marginal lines. This remarkable variability is more accentuated than in *M. m. orinocensis*.

Comparison with the other Venezuelan subspecies: The dorsal blue colors of *M. m. chantalae* **ssp. nov.**, *M. m. laurellae*, *M. m. neildi*, *M. m. offenbachi*, and *M. m. menelaus* males are fairly similar, being intense and brilliant, with subtle individual variation towards more green or violet hues. The ventral dark brown coloration is also quite similar, except in the case of Venezuelan (and Guyanan) populations of the nominotypical subspecies, which are usually paler.

Morpho m. chantalae males (FWL: 63-77 mm) are obviously smaller than those of *M. m. laurellae* (FWL: 80-90 mm), and their black margins are clearly narrower. In

Fig. 4. *Morpho menelaus orinocensis*, lectotype ♂ (MNHN). Dorsal (above) and ventral surfaces.

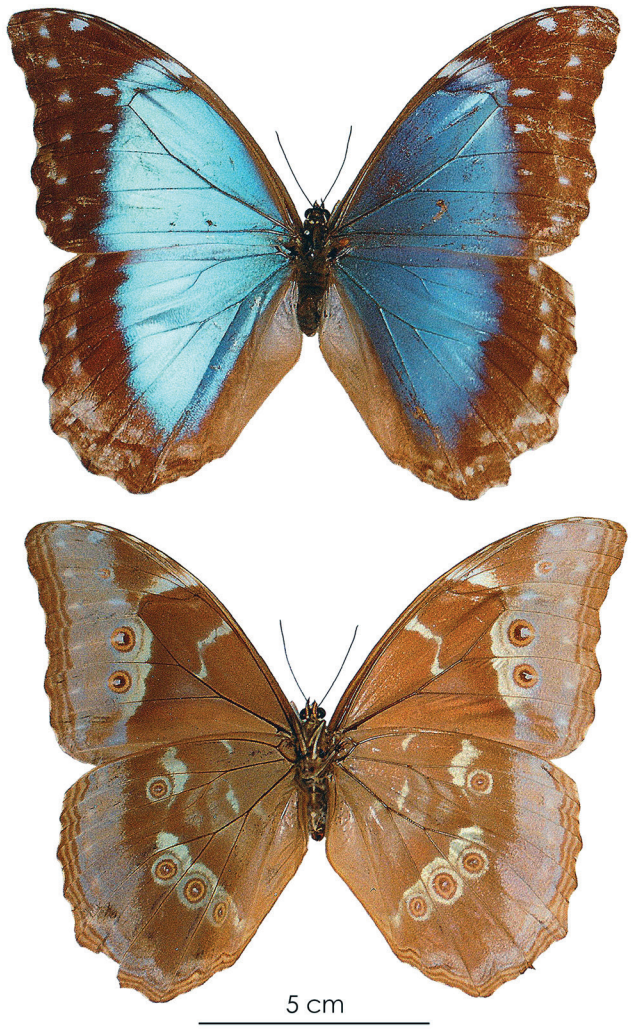

Fig. 5. *Morpho menelaus orinocensis*, paralectotype ♀ (MGCL). Dorsal (above) and ventral surfaces.

this respect, they are more similar to those of *M. m. neildi*, which however are larger on average (FWL: 77-83 mm), and the elongated postdiscal costal spot on the DFW is usually white (not blue); the two subspecies are also separated by a minimum distance of 700 km. *Morpho m. chantalae* males are only slightly smaller than those of *M. m. offenbachi* (FWL: 72-83 mm), but they differ from them by their narrower black margins. They are generally slightly larger, on average, than southern Venezuelan males of the most similar subspecies, *M. m. menelaus* (FWL: 63-70 mm), but the majority of specimens of both fall within the same size range, so this character is not of much significance; they differ, however, from southern Venezuelan specimens by their significantly darker venter, by their blue (not white) DFW postdiscal costal spot, often more prominent subapical pupillary white spot, and by the often more falcate FW outer margin.

Based on a small sample of females of *M. m. chantalae* (n = 6), four of these have a FWL of 74-76 mm, one measures 79 mm, and the last measures 83 mm; nonetheless, as with the males, these are smaller than those of *M. m. laurellae* and *M. m. neildi* (FWL from 84-93 mm). In *M. m. laurellae* and *M. m. neildi* females, the pale DFW postdiscal area is usually white without the extensive blue seen in *M. m. chantalae* females, and is usually separated from the discal cell by a wide bridge of dark scales across the discocellular veins that is absent in *M. m. chantalae*. In addition, the pale marginal interspaces are white in the latter two subspecies, but are touched with a yellowish tinge in *M. m. chantalae* (less visible in older specimens). All of the above characters also serve to distinguish females of *M. m. menelaus*, except that the size difference cannot be reasonably assessed due to the limited sample of nominate Venezuelan females available to us (n = 5; FWL 74-78 mm); however, the wing shape of *M. m. chantalae* is perhaps a little more falcate, and the entire ventral surface is much darker. Females of *M. m. offenbachi* differ from those of *M. m. chantalae* (and other Venezuelan subspecies) by their dark dorsal basal area with a deep blue-violet sheen.

Distribution: This new subspecies is known primarily from the middle course of the Río Caripe in Monagas state in north-eastern Venezuela, a river which is also known locally as the Río Grande, Río Matura, and Río Caripito. The upper tributaries of this river valley system, which even flow through the town of Caripe, unite to flow eastwards past Caripito where the river enters the Río San Juan in the Orinoco Delta at almost sea level. Specimens of *M. m. chantalae* **ssp. nov.** have been recorded

Fig. 6. Color variations of the VHW ocelli in *Morpho menelaus chantalae* **ssp. nov.** A: ♂ holotype – B: ♂ paratype (MNHN) – C: ♀ paratype (MNHN) – D: ♀ paratype (MNHN).

Fig. 7. Habitat of *Morpho menelaus chantalae* **ssp. nov.**: view of the forested slopes above Matura in the middle Río Caripe valley.

Fig. 8. Habitat of *Morpho menelaus chantalae* **ssp. nov.**: view of the middle course of the Río Caripe near Matura.

from as low as 350 m in the river valley, upriver at a site known as Matura (450 m), and from slopes at up to 800 m elevation above the river in the area around Buenos Aires and Río Pajaral, about 15 km east-northeast of Caripe (see Figs. 7 and 8). The taxon is also known from stream valleys to the north-west and north of Monte Oscuro (Sucre state), to the south-east of Cumaná, based on reports (pers. comm.) from a local lepidopterist, Francisco Marval, to whom we give credit for the first known records of *M. m. chantalae*: sight observations of males were first made on 12th February 1999, followed by the capture of the only specimen known to date from Sucre state, on 19th August 2000 (a male). The approximate area in which various individuals of this species have been seen is within the coordinates 10°13' - 10°16' N and 64° 05' - 64° 08' W. Francisco later observed a single specimen to the south of Cumaná, along the Cancamure river near Periquito, north of Guaranache, on the 7th June 2016. Finally, we have examined a photo (Fig. 9) by Rosana Langerano (pers. comm.) of a larva, most likely in its 4th instar, of what is certainly *M. menelaus* near Los Altos de Sucre (Sucre state) in the extreme north-west of the Turimiquire range, at around 600 m elevation. It seems inconceivable that this could be anything other than a larva of *M. m. chantalae*. Thus, *M. m. chantalae* is in all probability resident in suitable habitat across the Turimiquire range in western Sucre state, northern Monagas, and north-eastern Anzoátegui.

Fig. 9. Late instar larva of *Morpho menelaus chantalae* **ssp. nov.** from near Los Altos de Sucre, Monagas (photo by Rosana Langerano).

Habitat and behavior: *Morpho m. chantalae* **ssp. nov.** has been reported from pristine and relatively intact lowland humid tropical forest, from at least 350 to 800 m elevation. However, it also ventures into secondary forest along road edges and river banks. The behavior of *M. m. chantalae* agrees with that reported for other Venezuelan subspecies of *M. menelaus* (see Neild, 2008: 221-222). Males appear on the wing as early as 08:00 on bright sunny days, and generally fly about 1 to 3 m above the ground or river. However, their numbers dwindle significantly by around 11:00 (or as much as an hour earlier if it is really sunny), and few if any are seen around midday or later. They can be easily attracted to metallic blue lures, even from a considerable distance away. The much rarer females fly high (at up to 10 m or so) and are most often observed around the middle hours of the day. Efforts to bait specimens of either sex with fermenting fruit have mostly proven unsuccessful, despite attempts on many occasions with various types of fruit; males rarely visited, and those that did tended to be very old, and

to prefer banana. No females came to any bait, but they have sometimes been found drinking from damp substrate beside water courses.

DISCUSSION

Considering the geographic distribution of *M. menelaus* populations in northern Venezuela, the species does not exist in the northern mountains of the Cordillera de la Costa and Cordillera del Interior, nor in the deciduous forests to their south, or in the hot and arid southern *llanos* which extend to the Orinoco river. The north-eastern subspecies *M. m. chantalae* **ssp. nov.**, from the mountainous Serranía de Turimiquire, is therefore separated from the Andean populations by a "*menelaus* desert" of over 700 km.

It is likely that the closest populations to *M. m. chantalae*, from a genetic point of view, are those of the Orinoco Delta. This raises the question of the relationship between *M. m. chantalae* and *M. m. orinocensis*. In this context, the fact that populations of *M. m. chantalae* have a darker ventral surface suggests that perhaps they did not originate from an expansion of the neighboring pale-ventered *M. m. orinocensis* population. However, some specimens of *M. m. chantalae* from the lower middle course of the Río Caripe are less dark ventrally and approach some *M. m. orinocensis* in coloration, individuals of which presumably ascend the river from the pure *M. m. orinocensis* population around Caripito, on the western margin of the Orinoco Delta (we have no data from between these two points). Thus, genetic flow between the two taxa is likely. This hypothesis is consistent with observations of other *Morpho* species in this area; previously, Blandin (2007a) and Neild (2008) noted that *M. deidamia guaraura* Le Cerf, 1925 and *M. achilles guaraunos* Le Moult, 1925, both described from the Orinoco Delta, exist in the foothills of the Paria Peninsula to the north of the Orinoco Delta, and specimens of these two species have also been found sympatrically with *M. m. chantalae* (unpublished data) in the topotypic Río Caripe valley, in the eastern Serranía de Turimiquire. Thus, there is probably no absolute ecological barrier between the delta and mountain forest ecosystems of the Turimiquire range. Blandin (2007a) and Neild (2008) also noted the presence of *M. helenor tucupita* Le Moult, 1925, in this same Serranía, along its borders with the north-western Delta. However, specimens very similar to *M. helenor corydon* Guenée, 1859 have also been found sympatrically with *M. m. chantalae* (unpublished data). The former common subspecies, ranging from the north-eastern Cordillera de Mérida, across the Cordillera de la Costa, and into the Península de Paria, is an extension of the trans-Andean *M. h. peleides* Kollar, 1850 (Blandin, 2007a).

Obviously, there is no unique biogeographical pattern for *Morpho* species in the Serranía de Turimiquire. To fully understand the history of their diversification, studies of the phylogeny and population genetics of local *Morpho* are necessary. Further, local geological history undoubtedly has contributed to diversification, especially the uprising of the coastal ranges, from *circa* 3.5 million years ago, and the subsequent eastward movement of the mouth of the Orinoco river (see Blandin & Purser, 2013, and references therein).

The discovery of *M. menelaus chantalae* highlights the biogeographical interest of north-eastern Venezuela, the *Morpho* fauna of which remains poorly known. To better understand the complex evolution of floras and faunas in this region, it is therefore vitally important to conserve the forest ecosystems from the mountains to the Orinoco Delta.

ACKNOWLEDGMENTS

The authors wish to acknowledge the generous contributions of the following individuals and institutions in the preparation of this paper: Quintín Arias sent photos of *M. m. orinocensis* in the MIZA collection (Museo del Instituto de Zoología Agrícola, Maracay, Venezuela); Mauro Costa (Caracas, Venezuela) translated the English abstract into Spanish; Alan Highton (Mérida, Venezuela) provided location and behavioral data for *M. m. orinocensis*; Rosana Langerano (Caracas, Venezuela) kindly shared her photo of the larva of *M. m. chantalae* and provided information about the location of its discovery; Francisco Marval (Cumaná, Venezuela) shared information regarding the first sightings of this new subspecies; and finally the comments of our two reviewers, Mauro Costa (Caracas, Venezuela) and Andrés Orellana (San Cristóbal, Venezuela), significantly improved the manuscript.

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