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A new species of *Mathania* Oberthür, 1890 from Peru (Lepidoptera, Pieridae)

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Abstract

A new species of the genus *Mathania* Oberthür, 1890, *M. hughesi* Lamas, Farfán & Cerdeña, **sp. n.** is described from the southwestern slopes of the Andes of Peru, associated with xerophytic environments, between 2300 and 3500 m elevation. This new species is distinguishable from its congeners by the following external character: a black band on forewing dorsal surface at the end of the discal cell, extending from the costal margin to the base of cell M_3-CuA_1. Adults and male and female genitalia are illustrated and compared to other species of *Mathania*. In addition, we report *Ligaria cuneifolia* (R. et P.) Tiegh. (Loranthaceae) as host plant of *M. hughesi.*

Key words: Andes, Anthocharidini, Arequipa, *Ligaria*, taxonomy

Introduction

The western slopes of the Andes from central to southern Peru are characterized by their xerophytic environment, with large expanses of desert, where vegetation is scarce or nonexistent (Rundel *et al*. 2007), this area is nevertheless traversed by several narrow river valleys where a moderately diverse fauna and flora is found, mainly between 1500 to 3000 m in elevation (Zeballos *et al.* 2001, Arakaki & Cano 2003, Montesinos *et al*. 2012, Farfán 2018).

Mathania Oberthür, 1890 (Pieridae: Anthocharidini), is a genus comprising four described species (Lamas 2004), to which we add a fifth one described herein. Klots (1933) listed some morphological characters putatively diagnostic of *Mathania*, which he treated as a subgenus of *Hesperocharis* Felder, 1862, including a very hairy palpus, a short spur extending into forewing discal cell, hindwing with a sharp tail at anal angle. Currently *Mathania* is treated as a genus in the *Hesperocharis* group, together with *Eroessa* Doubleday, 1847, *Cunizza* Grote, 1900, and *Hesperocharis* (Lamas 2004, Braby 2005, Braby *et al*. 2006, Wahlberg *et al.* 2014). A recent molecular analysis of pierid butterflies (Wahlberg *et al.* 2014) showed that *Mathania* comprise a valid genus, within a well-supported monophyletic group with the following relationship: *Cunizza* + (*Hesperocharis* + *Mathania*).

All the members of *Mathania* are distributed in South America, ranging from south of Ecuador to Chile and Argentina (Peña & Ugarte 1996, Braby & Nishida 2007) in a range of Andean habitats, from mid-elevation eastern wet forest to cool temperate rainforest and xerophytic scrubland of western slopes. Braby & Nishida (2007) provided a list of the known larval food plants of the *Hesperocharis* group, including two species of *Mathania* (*M. carrizoi* Giacomelli, 1914 and *M. leucothea* (Molina, 1782)), comprising two families of Santalales: Loranthaceae and Viscaceae.

Material and methods

Material examined. Specimens of *Mathania* were examined from the Museo de Zoología de la Universidad de Concepción, Concepción, Chile (MZUC), Museo de Historia Natural, Universidad Nacional Mayor de San Marcos,

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Lima, Peru (MUSM); Museo de Historia Natural, Universidad Nacional de San Agustín de Arequipa, Arequipa, Peru (MUSA); Colección de Entomología, Fundación e Instituto Miguel Lillo, Tucumán, Argentina (IFML); Museo Argentino de Ciencias Naturales Bernardino Rivadavia, Buenos Aires, Argentina (MACN); Nature Education Centre (former Zoological Museum), Jagiellonian University, Kraków, Poland (CEP-MZUJ); and personal collection of Pierre Boyer, Le Puy Sainte Réparade, France (PBF). Photographs of all type specimens of *Mathania* taxa (except *M. leucothea*) were examined at MUSM; images of those type specimens are also available in Warren *et al*. (2017).

Morphological analysis. Male and female genitalia were removed from abdomens and soaked in 10% KOH solution for ten minutes. Subsequently, abdomens were preliminarily cleaned out of soft tissue in water in order to expose genital parts. Female abdomens were stained with chlorazol black in order to identify soft genital parts. Dissected genitalia were cleaned out of water by using ethanol 90% and 95% solutions**.** Wing venation and genitalic terminology follow Klots (1970) and Comstock & Needham (1898). Length measurements are in metric units and were made from photographs of specimens taken next to a scale and magnified on a computer screen. Photographs of adults were taken with a Nikon D610 digital camera through a Nikkor 105 mm f/2.8G AF-S VR Micro lens; photographs of genitalic structures were taken with SMZ25 Nikon stereomicroscope. Images were assembled and edited in Photoshop CS5.1.

The following abbreviations are also used:

DFW—Dorsal forewing
DHW—Dorsal hindwing
VFW—Ventral forewing
VHW—Ventral hindwing

Results

Mathania hughesi Lamas, Farfán & Cerdeña sp. n.

Mathania agasicles (Hewitson): Hughes, 1956: 250.
Hesperocharis (*Mathania*) *agasicles* ssp.: Lamas, 1977: 65.
Mathania [n. sp.]: Lamas, 2004: 108.
Mathania sp. n.: Farfán, 2018: 364.

Type locality. Peru, Arequipa, Quequeña, 16º33’S, 71º28’W, 2480 m.

Type material. HOLOTYPE ♂: PERU, AR[equipa], Quequeña, 2480m, 1633/7128 [16º33´S / 71º28´W], 28.iv.2012, G. Lamas [leg.]; deposited in MUSM.

PARATYPES (56♂, 11♀) (all from Peru): 1♂, 1♀, same data as holotype (MUSM); 4♂, 3♀, same data, J. Cerdeña leg. (MUSM); 2♂, AY[acucho], Río Chilques, 22 km SE Puquio, 14º43’S, 74º44’W, 3450 m, 16.ii.1995, G. Lamas leg. (MUSM); 1♂, same locality, 15.ii.1995 (MUSM); 1♂, AR[equipa], Sabandia, 2400 m, 06.v.1984, L. Velásquez leg. (MUSM); 1 ♂, AR[equipa], Mollebaya, 2500 m, 06.v.1984, L. Velásquez leg. (MUSM); 8♂, 1♀, Arequipa, Characato, 2350-2400 m, 10.xi.2017, T. Pyrcz leg. (CEP-MZUJ); 4♂, same data, 30.iv.2017 (CEP-MZUJ); 8♂, same data, 07.v.2017 (CEP-MZUJ); 5♂, same data, 29.x.2017 (CEP-MZUJ); 4♂, Arequipa, 1 Km NW Yura, 28.iv.2017, T. Pyrcz leg. (CEP-MZUJ); 3♂, 3♀, AR[equipa], Sogay, 2500 m, 20.v.2008, J. Farfán leg (MUSA); 1♂, 1♀, same data, 05.iii.2008 (MUSA); 3♂, AR[equipa], Cañón del Colca, 2650 m, 22.x.2008, J. Farfán leg. (MUSA); 2♂, AR[equipa], Yura, 2380 m, 18.vi.2008, J. Farfán leg. (MUSA); 3♂, AR[equipa], Yarabamba, 2400 m, 27.iv.2012, J. Farfán leg. (MUSA); 1♂, AR[equipa], Charcani, 3100m, 26-27.vi.2010, J. Farfán leg. (MUSA); 1♂, AR[equipa], Chachas, 3000 m, 27.vi.2013, J. Farfán leg. (MUSA); 1♀, AR[Arequipa], Sogay, 2500 m, 18.iii.2009, J. Farfán leg. (MUSA); 1♂, 1♀, TA[cna], Palca, 2900 m, 19.vii.2011, J. Farfán leg (MUSA); 1♂, TA[cna], Tarata, 3100 m, 11.xi.2011, J. Farfán leg. (MUSA).

Additional specimen, excluded from the type series: 1♂, PERU, AP[urímac], Tapairihua, Río Antabamba, 14º12’S, 73º06’W, 2600 m, 17.vi.2013, E. Huamaní leg. (MUSM). Although undoubtedly belonging to this species, the specimen appears slightly divergent and may represent a separate subspecies.

Diagnosis. *Mathania hughesi* **sp. n.** is easily distinguished from all the known congeneric species by having a black band at the distal end of the discal cell from costal margin to the base of cell M_3-CuA_1 on the forewing upperside (Fig. 1), absent in the other species. The male genitalia of *M. hughesi* **sp. n.** (Fig. 2a, b) is similar in shape to other species of *Mathania*. However, there are differences in the shape of the valvae that can allow its separation, a somewhat slender uncus, basally broader and distally narrower valva, rounded valval process and basally narrower vesica. Male genitalia in most species of *Mathania* have a robust uncus and tegumen, and elongate valvae with prominent structures on the inner side (Fig. 3).

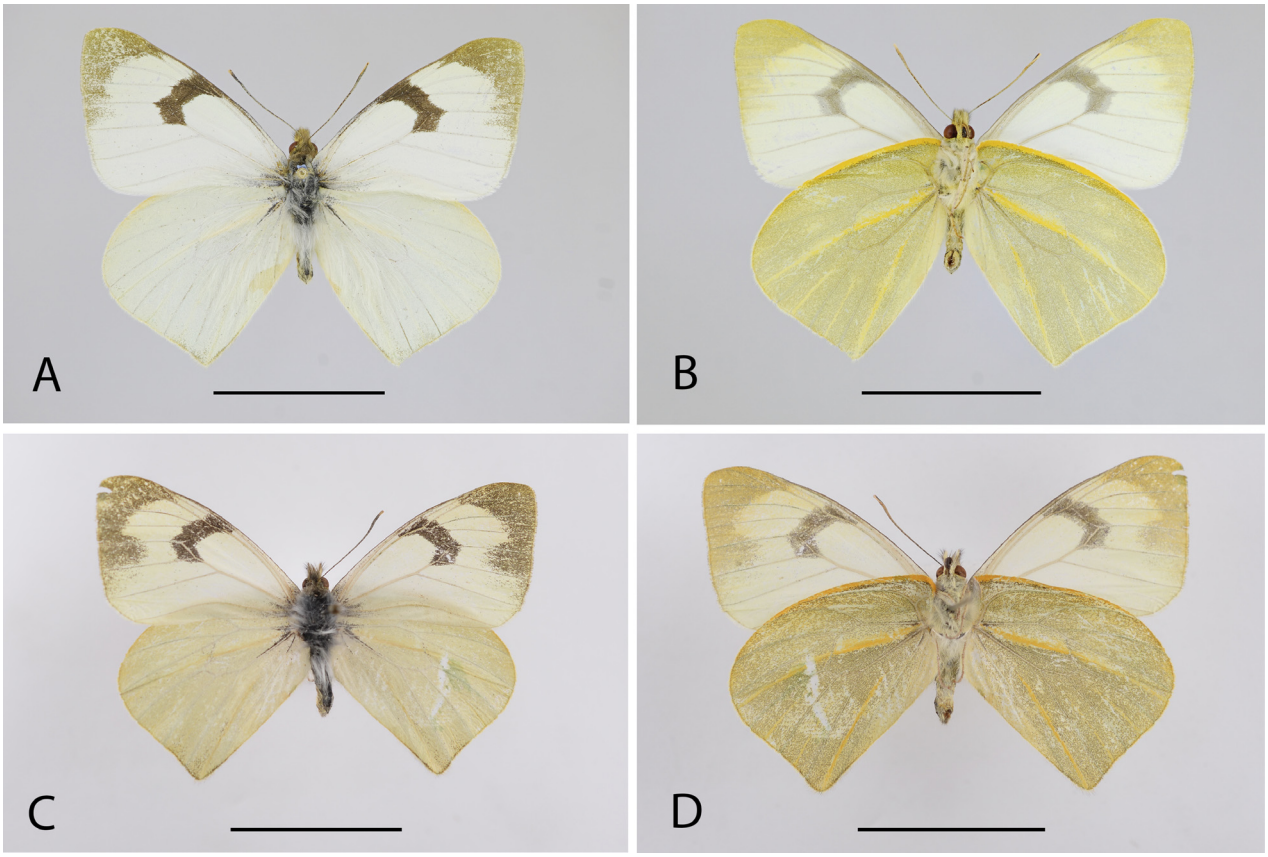

FIG. 1. Adults. A. *Mathania hughesi* sp. n. male, HOLOTYPE, dorsal view; B. *Mathania hughesi* sp. n. male, HOLOTYPE, ventral view; C. *Mathania hughesi* sp. n. female, PARATYPE, dorsal view; D. *Mathania hughesi* sp. n. female, PARATYPE, ventral view. Scale bar: 2 cm.

Description. **Male** (Figs. 1A, B): forewing length 22–26 mm (n=20). Head primarily black with brown eyes, hairy palpus with whitish brown hair-like scales, antenna dorsally brown and ventrally whitish brown. Body and abdomen black with white hair-like scales, abdomen ventrally light brown. Upperside of wings ground color white. DFW with black apex extending on outer margin to Cu_1 and a black band on distal end of discal cell from costal margin to base of cell M_3-CuA_1. DHW white. VFW white with apex greenish yellow extending through outer margin to Cu_1, and a dilute black band on distal end of discal cell, similar to that on dorsum. VHW greenish yellow, with yellow costal margin from base to apex, one longitudinal yellow line from wing base through discal cell to outer margin in cell M_2-M_3, and other longitudinal yellow lines in cells M_3-CuA_1, CuA_1-CuA_2 and CuA_2-A1. **Male Genitalia** (Fig. 2a,b,c): Saccus short and straight, tegumen well developed, uncus short with dorsolateral protuberances at base, valvae with weak dorsal concavity and prominent structures on the inner side (valval process), aedeagus curved downward as shown in Fig. 2c. **Female** (Fig. 1C, D): forewing length 24-25 mm (n=7), color and pattern very similar to that of male, but with slightly darker wings and with black outer wing margin broader at distal end of cell M_3-CuA_1 on DFW. **Female genitalia** (Fig.2d,e,f): Papillae anales hairy rounded in lateral view, with slightly elongated lobes in apical segment in dorsal view (Fig. 2e); posterior apophyses longer, ~ 2× length of anterior apophyses; ductus bursae cylindrical, membranous; corpus bursae membranous, subspherical with sclerotized elliptical dentate signum as shown in Fig. 2f, and with a larger accessory pouch; ductus seminalis inserted at the base of the ductus bursae.

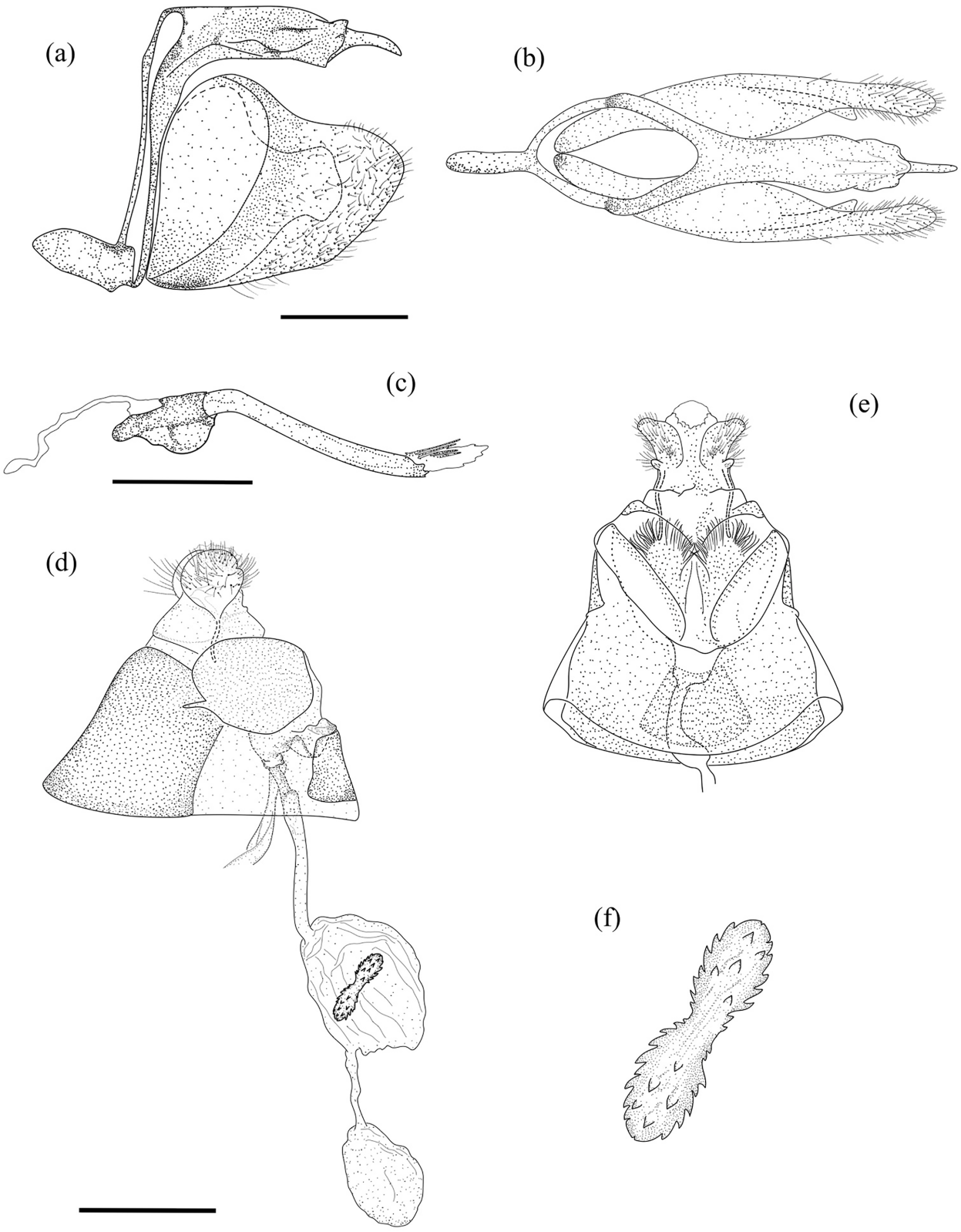

FIG. 2. *Mathania hughesi* sp. n. genital morphology: (a) male genitalia in lateral view, aedeagus removed; (b) dorsal view; (c) aedeagus in lateral view; (d) female genitalia in lateral view; (e) ventral view ; (f) detail of female signum. Scale bars: 1 mm.

Etymology. This new species is dedicated to Robert ("Robin") A. Hughes (1934-1991), in recognition of his valuable observations on the butterflies of the Department of Arequipa and southern Peru, being the first to report this species from the surroundings of Arequipa in the 1950s. Sadly, Hughes` personal collection of Lepidoptera was lost in the late 1960s in Arequipa (Hughes, *in litt*. to GL)

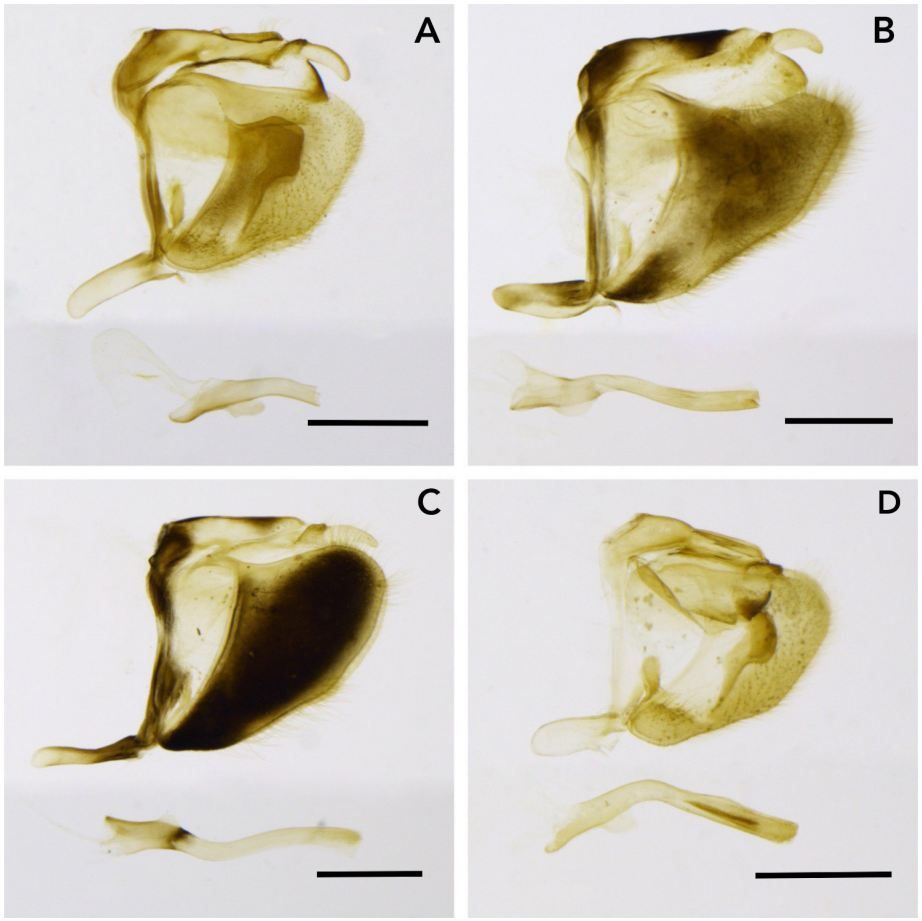

FIG. 3. Male genitalia (in lateral view). A. *M. leucothea*, locality Valparaiso, Chile, PBF collection. B. *M. carrizoi*, locality Purmamarca, Argentina, PBF collection. C. *M. agasicles,* locality Gualaceo, Ecuador, PBF collection. D. *M. aureomaculata,* locality Molinopampa, Peru, PBF collection. Scale bar: 1 mm.

Distribution. *Mathania hughesi* **sp. n.** is known from the western slope of the Andes in Peru, from the Department of Ayacucho in the north, south to the Department of Tacna, between 2300 and 3500 m elevation (Fig. 4).

Host plant. *Ligaria cuneifolia* (R.et P.) Tiegh. (Loranthaceae).

Bionomics. Adults are frequently found in xerophytic-shrub habitats above 2000 m, close to rivers or brooks where the host plant is located, the adults fly around the canopy of trees supporting the hemiparasitic host plant *Ligaria cuneifolia*, which in Arequipa grows on *Schinus molle* L. (Anacardiaceae), rarely adults fly at ground level. Oviposition behavior of *M. hughesi* is very similar to that described by Courtney (1986) for *M. leucothea* in Chile: «... Egg-laying is brief when it occurs: the wings fully closed (always open during "testing" contacts), the abdomen bent under, and one to several eggs rapidly deposited. …». Larvae of *M. hughesi* were found feeding close to the shoot tips on the underside of leaves of *L. cuneifolia*,; the larvae are solitary, cryptic and difficult to find on the host plant. The immature stages (Bravo *et al*. unpublished data) are similar to those of *M. leucothea* (Braby & Nishida 2007). *Mathania hughesi* around Arequipa appears to be univoltine, with abundant adults flying between June and August, and very few individuals between December and April. The latter period swith when immatures were found (March), which suggests that *M. hughesi* take advantage of rainy season of the southwestern slopes of the Andes (November to March) for development its, presumably due to food availability, because several dried plants of *L. cuneifolia* were observed during dry season.

Remarks

M. hughesi was recorded for the first time to Arequipa by R. Hughes (1956) as an undescribed subspecies of «*Mathania agasicles* (Hewitson)» from the locality of Yura [16°14′ S / 71°41′ W] in May 1952; he mentioned: «…

It differs from typical *agasicles* in that it has a square patch of dark scales on the costal margin of the forewings as well as having dark apices. Commonly found in the Yura Valley, where they were much attracted by the foliage of the pepper-trees …»; as mentioned below, the host plant *Ligaria cuneifolia* grows on the pepper-tree *Schinus molle* L., it was common to observe adults attracted to its foliage.

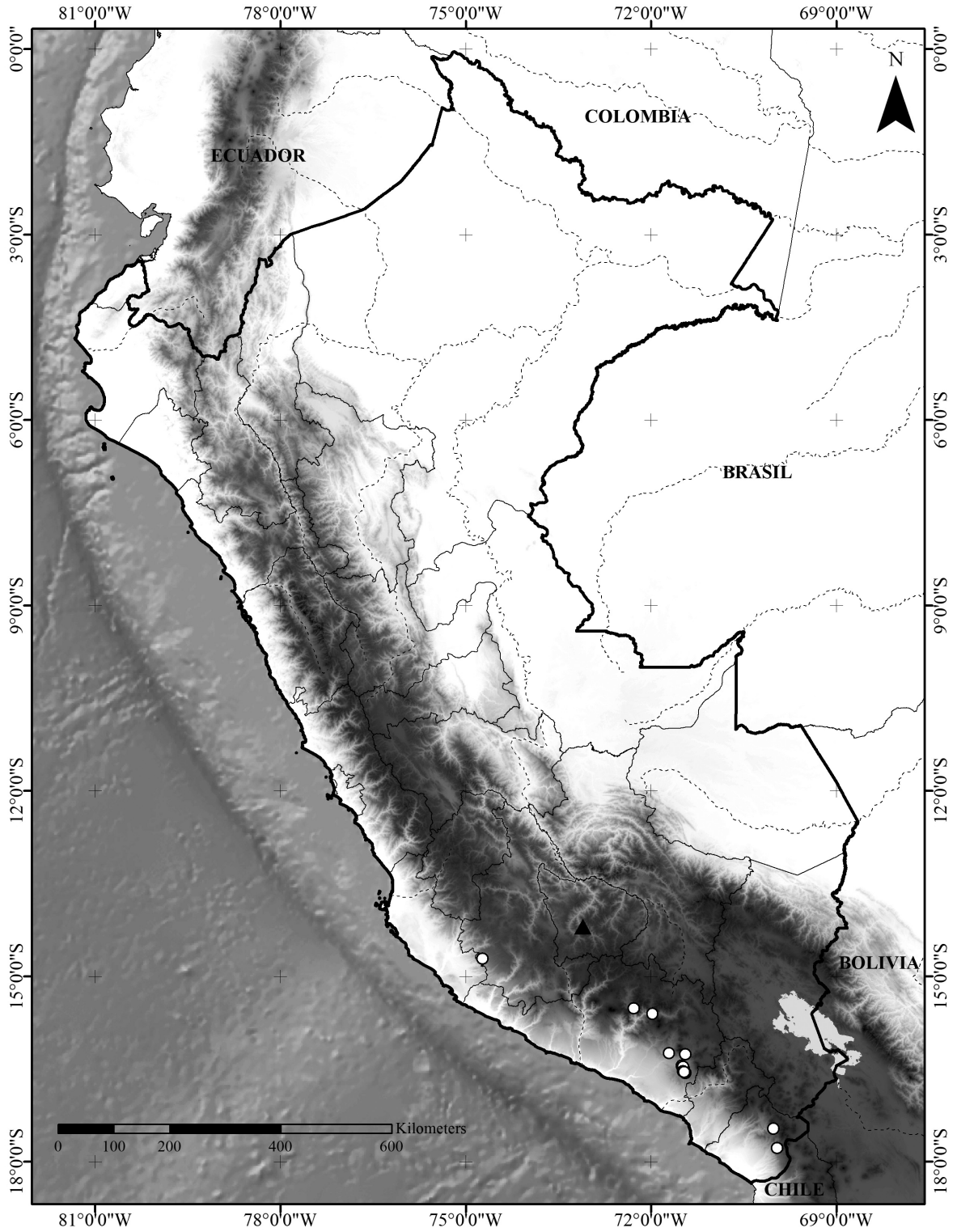

FIG. 4. Distribution map of *Mathania hughesi* **sp. n.** Triangle represents locality of specimen excluded from the type series.

Based on available information, *M. agasicles*, *M. aureomaculata* and *M. carrizoi* are typically, forest species distributed on the eastern slopes of the Andes, while *M. leucothea* and *M. hughesi* are restricted to open vegetation (xerophytic scrubland) on the western slopes of the Andes, the first species occurs in north central Chile and the lat-

ter occurs in southern Peru both in similar habitats; the known geographic range of taxa in *Mathania* suggests they followed allopatric speciation.

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