BREAKING THE PATTERN AGAIN: ADDITIONS TO *MICRELEPHAS* DOGNIN, 1905 (LEPIDOPTERA; PYRALIDAE; CRAMBINAE), INCLUDING A NEW SPECIES AND A KEY

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Abstract. – Based on a phylogenetic analysis, a new species, here described, is placed in genus *Micrelephas* Dognin. *Micrelephas longicilia* Landry & Becker, sp. n. occurs from Guatemala south to Paraná, Brazil [HT from Bahia, Brazil]. It differs markedly from other described species of *Micrelephas* in the wider and relatively shorter forewings with a produced apex and with clear submedian and postmedian transverse lines. It is assigned to *Micrelephas* on the basis of several characters, including a previously recognized synapomorphy of the male genitalia, i.e. the presence of short fine spines on the gnathos dorsally toward apex. The males also share with several (or all) other species of *Micrelephas* a furrow containing long, presumably androconial scales on the upper surface of the hindwing along the basal half of M_1, a series of very long setae along the ventral edge of the valva, and a costal projection on the valva. *Catharylla interrupta* Zeller, 1866, comb. n. and *Argyria mesodonta* Zeller, 1877, comb. n. are transferred to *Micrelephas* Dognin, 1905. *Argyria mesozonalis* Hampson, 1919, syn. n. and *Argyria antonialis* Schaus, 1922, syn. n. are synonymized with *Micrelephas interruptus* (Zeller). A key to the ten species of *Micrelephas* is provided.

Sumário. – Basándose en un análisis filogenético, se describe una nueva especie en el género *Micrelephas* Dognin. *Micrelephas longicilia* Landry & Becker, sp. n. ocurre desde Guatemala a Paraná, Brasil [HT de Bahía, Brasil]. Difiere considerablemente de otras especies de *Micrelephas* en las alas más amplias y relativamente más cortas con el ápice producido y con líneas transversales submediana y postmediana bien contrastadas. Se asigna a *Micrelephas* sobre la base de varios carácters, entre ellos una synapomorfía de los órganos genitales masculinos, reconocida previamente, es decir la presencia de espinas finas y cortas al ápice del gnathos dorsalmente. Los machos también compartan con varias (o todas) otras especies de *Micrelephas* un surco que contiene, presumiblemente escamas androconiales en la superficie superior de las alas posteriores a lo largo de la mitad basal de la M_1, una serie de pelos muy largos en el borde ventral de la valva y una proyección costal en la valva. *Catharylla interrupta* Zeller, 1866, comb. n. y *Argyria mesodonta* Zeller, 1877, comb. n. son transferidas a *Micrelephas* Dognin, 1905. *Argyria mesozonalis* Hampson, 1919, syn. n. y *Argyria antonialis* Schaus, 1922, syn. n. son sinonimizadas con *Micrelephas interruptus* (Zeller). Se proporciona una clave para las diez especies de *Micrelephas*.

Key words: Moth, *Argyria*, *Catharylla*, new synonymy, new combinations, Neotropical, Cytochrome Oxidase I, phylogenetic analysis, parsimony

In Lepidoptera, the taxonomist is usually blessed in that the forewing shape and pattern of markings and colours provide some, usually good indications of phylogenetic affinities. However, at the generic level there are some cases when the forewing shape and pattern set us astray. One such case is genus *Micrelephas* Dognin, for which the habitus of the type species (*M. crassipalpis* Dognin) had set it apart by Dognin (1905), and it was kept in its own monobasic genus for almost 100 years (Błeszyński & Collins 1962, Munroe 1995). The association of *M. crassipalpis* with two species previously placed in *Argyria* (*M. pictellus* (Schaus) and *M. kadenii* (Zeller)), along with the descriptions of four new species, was due to Landry (2003). This was based on several character states such as the presence in the males of a furrow containing long, presumably androconial scales on the upper surface of the hindwing along the basal half of M_1 in all seven species except two, the presence again in males of a bundle of long filiform scales medially on the abdominal intersegmental membrane VIII-IX dorsally, except in *M. helenae* Landry, the presence of short, fine spines dorsally on the gnathos apically (a synapomorphy), the presence of a lightly sclerotized sheath surrounding a thickly sclerotized basal projection on the base of the valva's costa in males of several species, and the presence of extremely long setae on the ventral margin of the valva also in several species.

In trying to identify material of Crambinae collected in the Neotropics over the years, BL and VOB came across series of specimens of an unknown species in the field and in several collections. These turned out to represent a new species very similar to *Catharylla interrupta* Zeller, 1866 and *A. mesodonta* Zeller, 1877 in male and female genitalia. The new species is described and *Catharylla interrupta,* as well as *A. mesodonta*, are transferred to *Micrelephas* Dognin. These three share with *Micrelephas crassipalpis* several of the characters mentioned above, such as the apically spined gnathos, a synapomorphy, a furrow dorsally on the hindwing along M_1, and extremely long setae on the ventral margin of the male valve.

Another species with relatively long palpi and a white pattern with faint brownish orange submedian and postmedian transverse lines is *Argyria croceicinctella* (Walker, 1863), but the unique type is a female without abdomen. Hence, none of the putative characters that would associate it with some certainty to *Micrelephas* can be verified to ascertain its proper generic affiliation.

MATERIAL AND METHODS

Specimens studied are from the following collections: Natural History Museum, London, UK (BMNH), Carnegie Museum of Natural History, Pittsburgh, Pennsylvania, USA (CMNH), Canadian National Collections of Insects, Arachnids and Nematodes, Ottawa, Canada (CNC), Muséum d'histoire naturelle de Genève, Geneva, Switzerland (MHNG), Polish Academy of Science, Museum of the Institute of Zoology, Warsaw, Poland (MZPW), State Museum of Natural History Stuttgart, Stuttgart, Germany (SMNS), National Museum of Natural History, Washington, D.C., USA (USNM), Collection

of Vitor O. Becker, Camacan, Bahía, Brazil (VOB), Valencia University Collection, Valencia, Spain (VUCS), and Museum für Naturkunde der Humboldt-Universität zu Berlin, Germany (ZMHB). Additional data on three specimens of the new species came from the McGuire Center for Lepidoptera and Biodiversity (Florida Museum of Natural History), Gainesville, Florida, USA (MGCL). Some specimens will be deposited in the Museu de Zoologia da Universidade de São Paulo, Brazil (MZUSP).

Terminology follows Landry (2003) except use of 'phallus' instead of 'aedeagus', following Kristensen (2003).

Because the new species described here is very similar in genitalia to two species (*M. interruptus* and *M. mesodonta*) which were placed in *Argyria* before (e.g. Munroe 1995), presumably because of their satiny-white forewing colour, it was found advisable to perform a morphology-based phylogenetic analysis to determine where the three species treated here should be placed in the classification of Crambinae. The dataset used was that of Landry (1995) with some modifications. Firstly, six taxa were removed from the matrix (*Loxocrambus coloradellus* (Fernald), *Parapediasia hulstella* (Fernald), *P. teterrella* (Zincken), *P. torquatella* Landry, '*Crambus*' *dimidiatellus* Grote, *Almita portalia* Landry, *Aethiophysa extorris* (Warren)) mostly because it was deemed more practical to have only one species per genus and, in the last case, because *A. extorris* was discovered by Solis (2009) to belong to Glaphyriinae instead of Cybalomiinae and we elected to use only one representative per subfamily in the outgroup. Secondly, for obvious reasons, *Micrelephas longicilia* sp. n. and *M. pictellus* (Schaus) were added to the analysis, and *Catharylla* Zeller was also added as the only member of Argyriini not included by Landry (1995). Thus, the matrix includes 52 taxa, with 7 of them representing the outgroup. Six new characters were also added to the analysis:

44. Forewing ground colour generally brown (0), satiny white (1);
45. Costal arm of male valva absent (0), present (1);
46. Length of anterior apophyses over length of papillae anales (r): 0.8<r<2 (0); r<0.7 (1); r>2.1 (2);
47. Furrow of androconial scales on hindwing absent (0), present (1);
48. Very long setae on ventral edge of male valva absent (0), present (1);
49. Short fine spines dorsally on gnathos at apex absent (0), present (1).

The analysis was performed under maximum parsimony with PAUP* version 4.0b10 (Swofford 2011) with the following parameters: heuristic search with bootstrap method; number of bootstrap replicates = 1000; all characters of type 'unord' and with equal weight; 3 characters were parsimony-uninformative; starting tree(s) obtained via stepwise addition; addition sequence: random; number of replicates = 1000; number of trees held at each step during stepwise addition = 1; branch-swapping algorithm: tree-bisection-reconnection.

In a second analysis, the three uninformative characters of the first analysis (# 6, 31, 32) were removed as well as most Crambini taxa to retain only *Crambus* and *Euchromius* (34 taxa overall). The matrix is available upon request from BL.

In order to provide additional evidence regarding the differences and relationships of the three taxa treated here, we decided to try to obtain and analyze the Cytochrome Oxidase I barcode sequence. The sequencing work was made in the Museum für Tierkunde, Senckenberg Naturhistorische Sammlungen Dresden, Germany (SMTD). DNA was extracted from the abdomen of dried specimens or from thorax tissue of ethanol preserved material. PCR amplifications were performed using BIO-X-ACT Short DNA polymerase (Bioline) and the COI primer pairs HybLCO/HybNancy or LCO/K699 (see molecular methods of Wahlberg lab, URL: http://nymphalidae.utu.fi/Nymphalidae/Molecular.htm). PCR success was examined with 1% agarose gel electrophoresis, subsequent staining with GelRED and photodocumentation under UV light. Clean-up of successful samples with ExoSAP-IT (USB Corporation) was followed by the sequence PCR using the BigDye Terminator v3.1 Cycle Sequencing Kit (Applied Biosystems). After final sodium acetate-ethanol precipitation clean-up, the samples were sequenced on a 3130 Genetic Analyzer (Applied Biosystems). For PCR amplifications, ExoSAP-IT clean-up, and sequence PCR a Mastercycler ep gradient S (Eppendorf) was used.

The obtained COI barcode sequences were submitted to the European Nucleotide Archive (ENA) of the European Molecular Biology Laboratory (EMBL, www.embl.org). They were blasted in GenBank and BOLD for plausibility. Resulting close matches were subsequently included in a broader analysis of barcode sequences. For this analysis we extended the dataset with barcode sequences of additional *Micrelephas* species as well as representatives of Argyriini and other Crambinae. The Scopariinae *Eudonia truncicolella* (Stainton) was chosen as outgroup. These publicly available additional barcode data were taken from GenBank and the Barcode Of Life Database (BOLD) and are listed in Table 1.

The sequences were compiled in an alignment file using PhyDE 0.9971 (Müller et al. 2008). The data were analyzed using distance- and phylogeny-based methods and compared with each other as well as with the morphological results. The distance-based analysis was done with PAUP* version 4.0b10 (Swofford 2011) using uncorrected p-distances (Srivathsan & Meier 2012). For the phylogenetic approach, we analyzed the dataset according to maximum parsimony (MP) and maximum likelihood (ML) criteria. For the MP analysis we used PAUP* version 4.0b10 (Swofford 2011) with settings as for the phylogenetic analysis of the morphology mentioned above, but with number of replicates = 10 of addition random sequence and a resampling of 329 nucleotides (~50% of characters) per bootstrap replicate. ML analysis was performed using raxmlGUI, version 1.3 (Silvestro & Michalak 2012) and under the GTR+G model with 1000 bootstrap replicates.

RESULTS

Morphology-based phylogenetic analysis

The resulting tree of the first analysis of the morphomatrix, a 50% majority-rule consensus tree, shows more than 50% support for nine groups, including Crambinae (62%), Argyriini (= *Argyria*, *Catharylla*, *Urola* and *Vaxi*, 59%), and *Micrelephas pictellus* + *longicilia* (58%). The resulting tree of the second

Fig. 1. Habitus of *Micrelephas* spp.: (A). *M. interruptus*, male, Ecuador, Zamora-Chinchipe, 3 km East Sabanilla, Rio Zamora, 1610 m (CMNH); (B) *M. interruptus*, holotype male of *A. antonialis* (USNM); (C) *M. interruptus*, holotype male of *A. mesozonalis* (Copyright by Trustees of the BMNH); (D) *M. mesodonta*, male, Ecuador, Loja, Estación Científica San Francisco, 2320 m (MHNG); (E) *M. mesodonta*, male, holotype of *A. mesodonta submesodonta* (MZPW); (F) *M. longicilia*, holotype male (VOB).

analysis also shows more than 50% support for nine groups, the same as in the first analysis except that Crambini, here made of *Crambus* and *Euchromius*, are supported at 69% and replace a deleted subgroup of Crambini. A detailed discussion of relevant characters and the distribution of their states in *Micrelephas* and other taxa is provided below, following the taxonomic treatments of the species.

COI analyses

The distance analysis resulted in a matrix of uncorrected p- (uncorr-p) values of sequence divergences. *Micrelephas longicilia* from Brazil shows an uncorr-p divergence of 6.38% to *M. mesodonta* and 6.37% to *M. interruptus*. However, the closest match is with four undetermined specimens (BioLep292 specimens 1-4) from Costa Rica which we obtained from a BLAST search on GenBank. The uncorr-p divergences of our *M. longicilia* specimen with these five specimens range from 4.86% to 4.87%. The uncorr-p divergences among these four specimens are 0–0.33%, indicating their highly probable conspecifity.

154 characters were parsimony-informative for the MP analysis. The molecular phylogenetic analyses of both MP and ML resulted in highly polytomous trees (not shown) with few supported clades:

1) The 'BioLep292 sp.' clade: 'BioLep292' specimens 1–4 (99.5% MP, 100% ML support);

2) *Micrelephas longicilia* + 'BioLep292' clade (51% MP, 55% ML support);

3) *Micrelephas mesodonta* + (*Micrelephas longicilia* + 'BioLep292' clade) (69% MP, 74% ML support).

The monophyly of *Micrelephas* is not supported based on the phylogenetic analyses of the short COI barcode fragment.

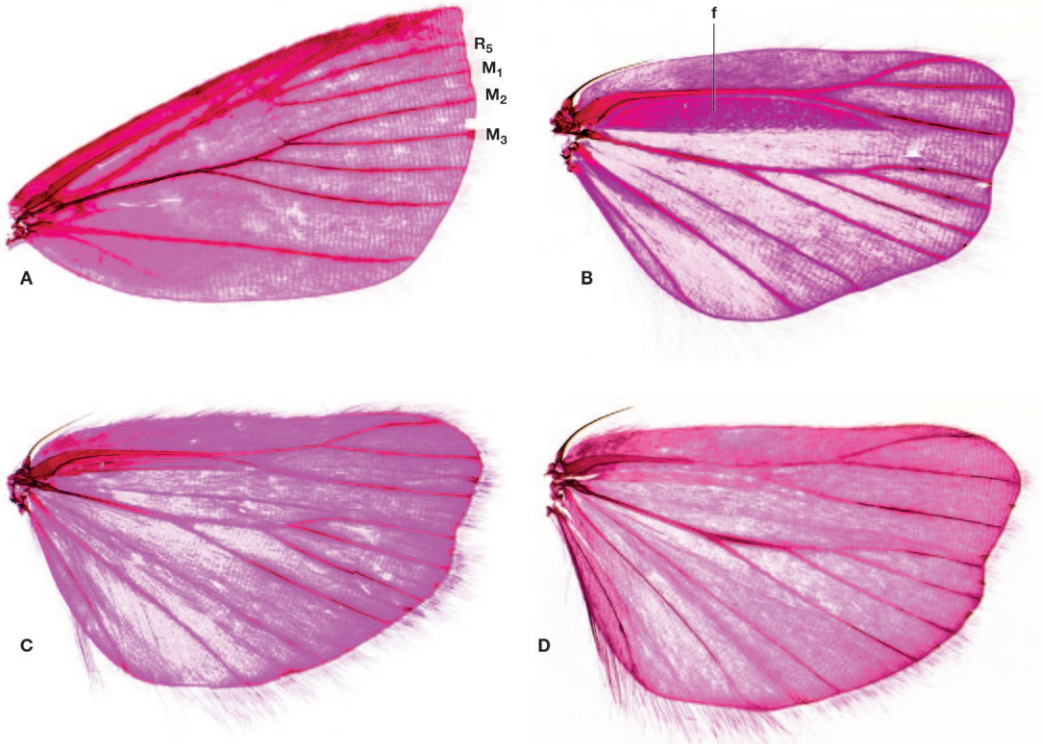

Fig. 2. Wing venation of *Micrelephas* species. (A) Forewing of *M. longicilia* (slide MHNG ENTO 6523); (B) Hindwing of *M. longicilia* (same slide); (C) Hindwing of *M. interruptus* (slide MHNG ENTO 6524); (D) Hindwing of *M. mesodonta* (slide BL 1789). f = furrow of androconial scales.

Taxonomy

***Micrelephas* Dognin, 1905**

Diagnosis

The only strictly diagnostic character for *Micrelephas* is the presence on the male gnathos of fine spinules dorsally on the arms along the edge and on the apical section.

Additions to redescription by Landry (2003)

Forewing terminal margin not produced in *M. mesodonta*. Forewing pattern in *M. interruptus* and *M. mesodonta* satiny white with orange brown to brown costal band and terminal fascia, without subterminal line; in *M. longicilia* pattern with distinct median and subterminal lines on mostly dirty white background. Hindwing Sc+R_1 and Rs connected at 3/5 to 2/3 wing length; M_1 connected to radial stem at 1/3 to 3/5 wing length, depending on size of furrow of androconial scales, the bigger the furrow, the longer the connection. Male abdominal intersegmental membrane VIII-IX without median tuft of long filiform scales as well in *M. interruptus*, *longicilia* and *mesodonta*. Male genitalia: Tegumen arms with connection of short to medium length. Valva with or without mediobasal setose hump; medioventrally at base sometimes with short bump adorned with short, thickly sclerotized, and closely-set scales; costa with or without short setae before projection(s); sheath at base of costal projection with or without spicules. Juxta sometimes with lateroanterior branches. Phallus dorsoapically sclerotized or not. Female genitalia: Segment VIII 0.75 to 1.7 X as long as wide. Anterior apophyses of short to medium length. Corpus bursae with or without signum.

***Micrelephas interruptus* (Zeller, 1866),** comb. n.

Figs. 1A-C, 2C, 4, 7B

Catharylla interrupta Zeller, 1866: 156, 157, pl. 1 fig. 15; type locality: Venezuela; Błeszyński & Collins (1962: 226); Munroe (1995a: 35); Landry (2013).

Argyria mesozonalis Hampson, 1919: 445; type locality: Peru, La Oroya; Błeszyński 1960: 101-103, unnumbered photo (misspelled *mezozonalis*); Błeszyński & Collins (1962: 214); Munroe (1995: 35); Landry (2013), **syn. n.**

Argyria antonialis Schaus, 1922: 133; type locality: Colombia, San Antonio; Błeszyński & Collins (1962: 214); Munroe (1995: 35); Landry (2013), **syn. n.**

Material examined: Holotype ♂ of *A. mesozonalis* (Fig. 1C): 1– 'Type | H.T.' [circular, red ringed]; 2– 'La Oroya | S.E. Peru | 31ooft [sic'] | Jan 06 | G. Ockenden'; 3– 'Platytes | mesozonalis | type ♂. Hmpsn.'; 4– '1908–159.'; 5– '161 | Błeszyński 195'; 6– 'Pyralidae | Brit. Mus. | Slide No. | 5645 ♂' (BMNH). Holotype ♂ of *A. antonialis* (Fig. 1B): 1– 'San Antonio | W.Colombia | Nov'07 | 5800ft | (M.G.Palmer)'; 2– 'Collection | WmSchaus'; 3– 'Type No. | 25538. | U.S.N.M.'; 4– 'Argyria | antonialis | type Schs'; 5– '♂ genitalia | Slide, 10May'32 | C.H. #39'; 6– 'Genitalia Slide | By 107,442 | USNM' (USNM). 1 ♂, **Ecuador**, Carchi, Maldonado, 2200 m, 9-11.i.1993 (V.O. Becker) (Col. Becker 105058, USNM); 1 ♂, Zamora-Chinchipe, 3 km East Sabanilla, Rio Zamora, 1610 m, 30.x.1987, wet forest (C. Young, R. Davidson, J. Rawlins) (CMNH); 1 ♂ (slide BL 1788), same data except 8 km NW Zamora, mouth Rio Sabanilla, 1420 m, 1.xi.1987 (CMNH); 1 ♂ (slide MHNG ENTO 6524), Loja, Estación Científica San Francisco, 3°58'S, 79°04'W, 2160 m, T1-5, 2.i.2000, attracted by light, 21h00-21h30 (G. Brehm) (MHNG); 1 ♀ (slide BL 1702), same data except 2155 m, 7.v.1999, 20h00-20h30 (MHNG); 1 ♂ (slide BL 1701), same data except 2250 m, T1-6, 8.xii.1999, 19h30-20h00 (MHNG); 1 ♂ (DNA Voucher 1489), same data except forest, 3°59.65'S, 79°04.10'W, 2670

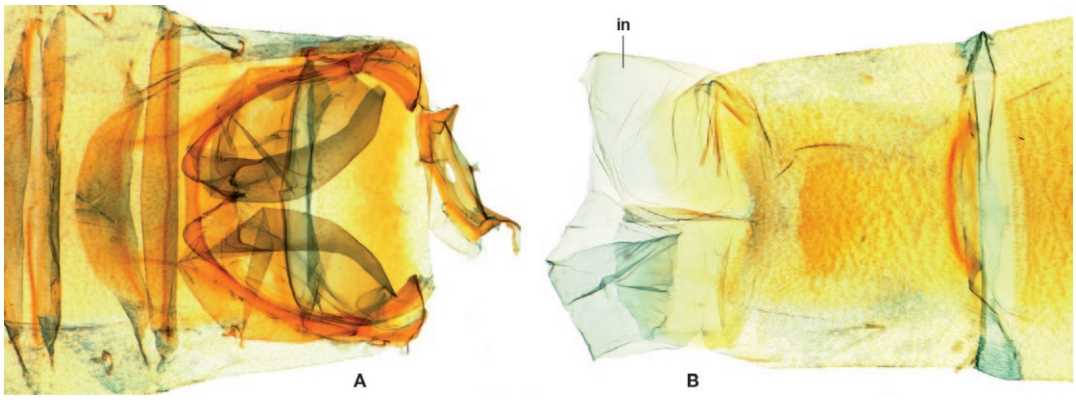

Fig. 3. *Micrelephas longicilia*. (A) Base of abdomen, male, ventral view (slide BL 1773); (B) Tip of abdomen, male, ventral view (same slide). in = intersegmental membrane VIII-IX.

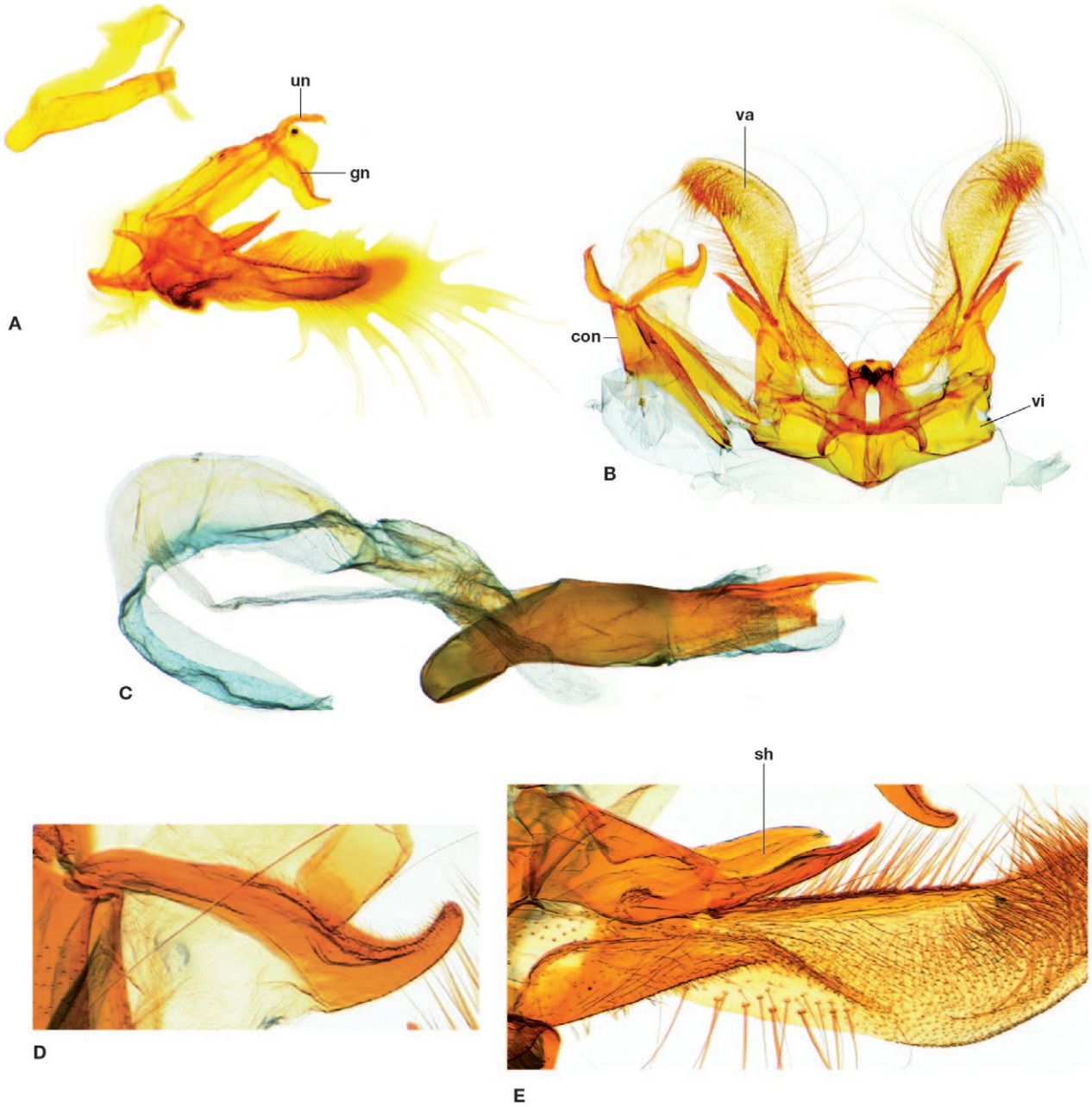

Fig. 4. Male genitalia of *Micrelephas interruptus*. (A) Lateral view (slide BL 1783, before mounting); (B) Without phallus, spread out (slide 1788); (C) Phallus, lateral view; (C) Phallus, lateral view; (D) Gnathos; (E) Base of valva (C-E, same slide). con = dorsal connection of tegumen; gn = gnathos; sh = sheath of costal projection of valva; un = uncus; va = valva; vi = vinculum.

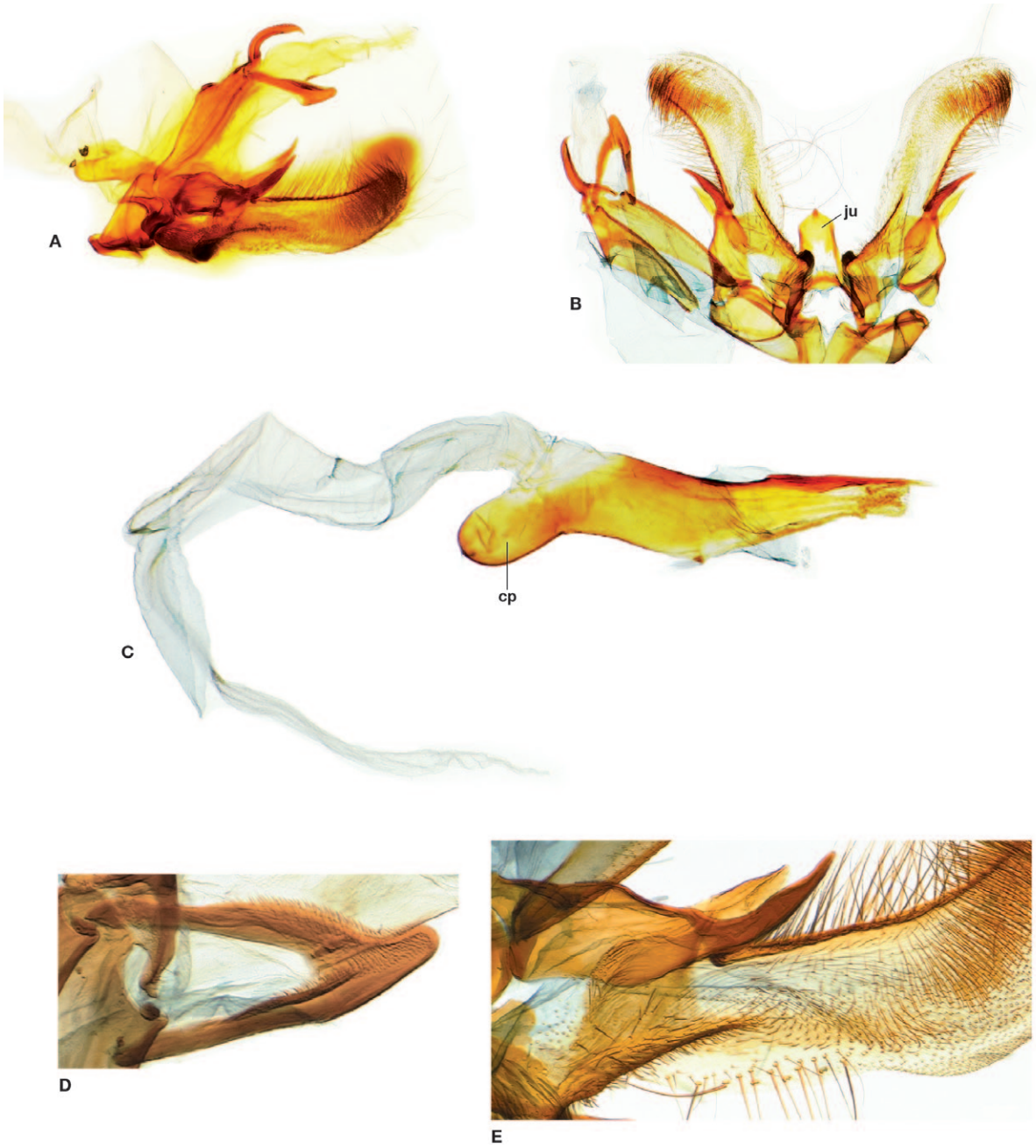

Fig. 5. *Micrelephas mesodonta*. (A) Lateral view (slide BL 1703, before mounting, with phallus in place); (B) Without phallus, spread out (slide 1703); (C) Phallus, lateral view; (D) Gnathos; (E) Base of valva (C-E, same slide). cp = coecum penis; ju = juxta.

m, T1-10 (17), 23.x.2000, LF V 20h30-21h00 (D. Süßenbach) ((SMNS) ; 45 ♂, 11 ♀, same locality and collectors (SMNS). 1 ♂ (Pyralidae Brit. Mus. Slide No. 15277), **Colombia**, Centr[al]. Cord[illera]. M[ou]nt[ains]., Tolima, X.3500 m (BMNH). 1 ♂ (slide BL 1783), [**Peru**] Huancabamba, Cerro de Pasco, 6400 ft. (E. Boettger) (BMNH); 1 ♀ (slide BL 1784), Carabaya, S[anto] Domingo, 6000 ft., End of wet seas[on]., iv.[19]02 (Ockenden) (BMNH); 1 ♀ (Pyralidae Brit. Mus. Slide No. 17710), same data except dry seas[on]., v.[19]02 (BMNH); 1 ♂, S. E. Peru, R[io]. Inambari, La Oroya, 3100 ft., wet season, xii.[19]05, (G. R. Ockenden) (BMNH).

Diagnosis: Within *Micrelephas* the satiny white forewing ground colour with orange brown to brown costal, terminal and median bands will separate this species from all others. The most similar species in terms of external characters is *Micrelephas mesodonta* (Zeller), treated below. The latter differs most notably in the absence of a complete median band. The male genitalia of the two species are very similar but differ in characters mentioned below in the Diagnosis for *M. mesodonta*. The female genitalia are very similar to those of the new species described below. Several species of *Argyria* look very similar to this species. One is *A. croceivittella* (Walker, 1863), but its labial palpi are distinctly short and it has a brown band on the forewing's inner margin after the median fascia Two others have either a distinct subterminal line on the forewing or a faint indication of a terminal line near the anal angle.

Partial COI barcode of specimen MTD Lep1489 from Ecuador (302 base pairs):

TTAAKATTATTAATTCGAGCAGAATTAGGAAACCCTGGATCCTTAATTGGAGATGATCAAATTTATAATACTATTGTAACTGCCCA
TGCATTTATTATAATTTTTTTTATAGTTATACCTATTATAATTGGAGGATTTGGAAATTGATTAGTTCCTTTAATATTAGGAGCTCCT
GATATAGCTTTCCCACGAATAAATAATATAAGATTCTGATTGCTCCCCCCCTCATTAACTTTATTAATTTCAAGAAGAATTGTAGA
AAATGGAGCAGGAACTGGATGAACGGTTTACCCCCCCCTTTCATCTAATATTGCCCATGGTGGTAGATCTGTAGATTTAGCTATTT
TTTCTTTGCATTTAGCTGGAATTTCATCAATCTTAGGAGCTATTAATTTTATTACTACTATTATTAATATACGAATTAATGGATTATC
ATTTGATCAAATACCTTTATTTGTATGATCAGTAGGAATTACTGCTCTTCTTCTTCTTCTATCTTTACCAGTATTAGCTGGAGCTATC
ACTATACTTCTTACTGATCGAAATTTAAATACCTCTTTTTTCGATCCTGCCGGAGGTGGAGATCCAATTTTATACCAACATTTATTT

Additions to original descriptions and redescription of *M. mesozonalis* by Błeszyński (1960): Forewing length: 9-11 mm (males, n=9), 10-12 mm (females, n=3). Hindwing dorsally with furrow along male M_1 (Fig. 2C) short and narrow, about 1/5th width of cell, extending slightly beyond connection

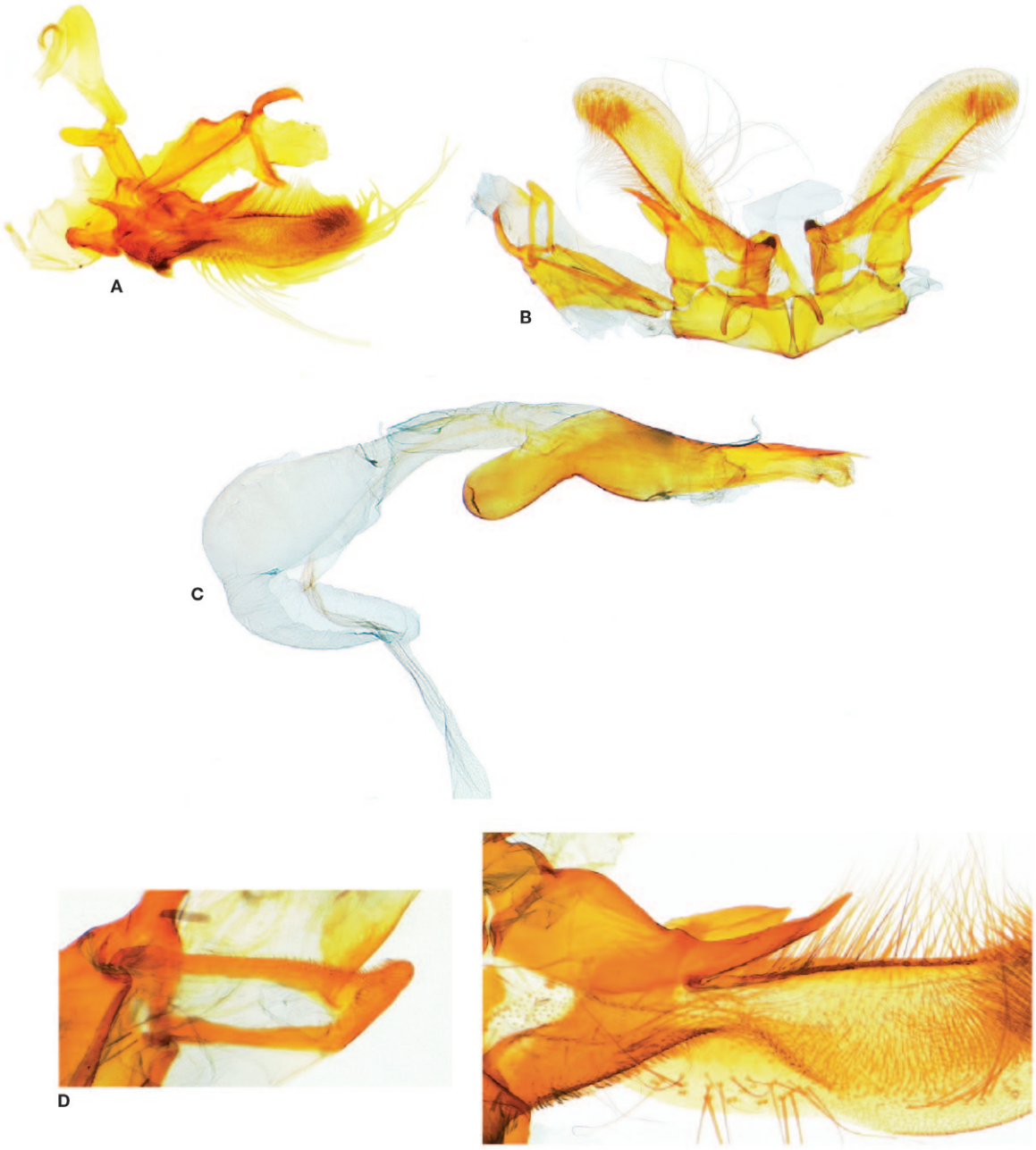

Fig. 6. *Micrelephas longicilia*. (A) Lateral view (slide BL 1785, before mounting, with phallus in place); (B) Without phallus, spread out (slide BL1773); (C) Phallus, lateral view; (D) Gnathos; (E) Base of valva (C-E, same slide).

between Rs and M_1 and shortly before middle of wing, with short scales set perpendicularly from longitudinal axis within furrow; connection between Rs and M_1 at about 2/5 wing length, and that between $Sc+R_1$ and Rs at about 2/3 wing length. **Female genitalia** (description from BL 1702 in lactic acid, before mounting) (Fig. 7B) (n=3): Papillae anales narrow, widening ventrally to twice dorsal width, coalesced dorsally, poorly sclerotized except for ventrally (but not dorsally) connected narrow sclerotized band along base of papillae, with abundant setation of mostly medium length. Posterior apophyses laterally flattened posteriorly, then circular, not distinctly enlarged subbasally, slightly converging, extended to middle of segment VIII, apically not knobbed and more thickly sclerotized. Segment VIII long, about 1.7 X as long as wide, excluding anterior apophyses, slightly narrowing toward apex, with setae of medium length mostly along apical 1/4, dorsally more strongly sclerotized at apex along wide band of about 1/4 of length of segment, with straight apical margin and broadly concave anterior margin, ventrally well sclerotized with apical margin forming broad V, with shallow depression medially at level of bases of anterior apophyses. Anterior apophyses of medium length, about 1/3 length of segment VIII, narrow, slightly projected dorsally. Ostium bursae medially situated, ventrally associated with tongue-shaped, sclerotized projection, about 2/5 length of segment VIII, slightly narrowing before apex. Ductus bursae narrow proximally, 3 X as wide upon connection with corpus bursae, long, without spicules but with pattern of hexagons in distal half. Ductus seminalis connected on ductus bursae at mid-length. Corpus bursae large, shaped like inverted stocky pear in dorsal view and slightly flattened in lateral view, slightly shorter than ductus bursae, with pattern of hexagons over whole surface, hexagons more thickly sclerotized to form large T-shaped signum with mouth-shaped depression as horizontal bar of T and slightly longer narrowing vertical branch, located posteriorly at base of connection with ductus bursae.

Remarks: *Catharylla interrupta* Zeller was described from two males, but neither could be located either in the BMNH, ZMHB, or St-Petersburg, where Zeller types are known to occur. Fortunately the description is accompanied by a drawing

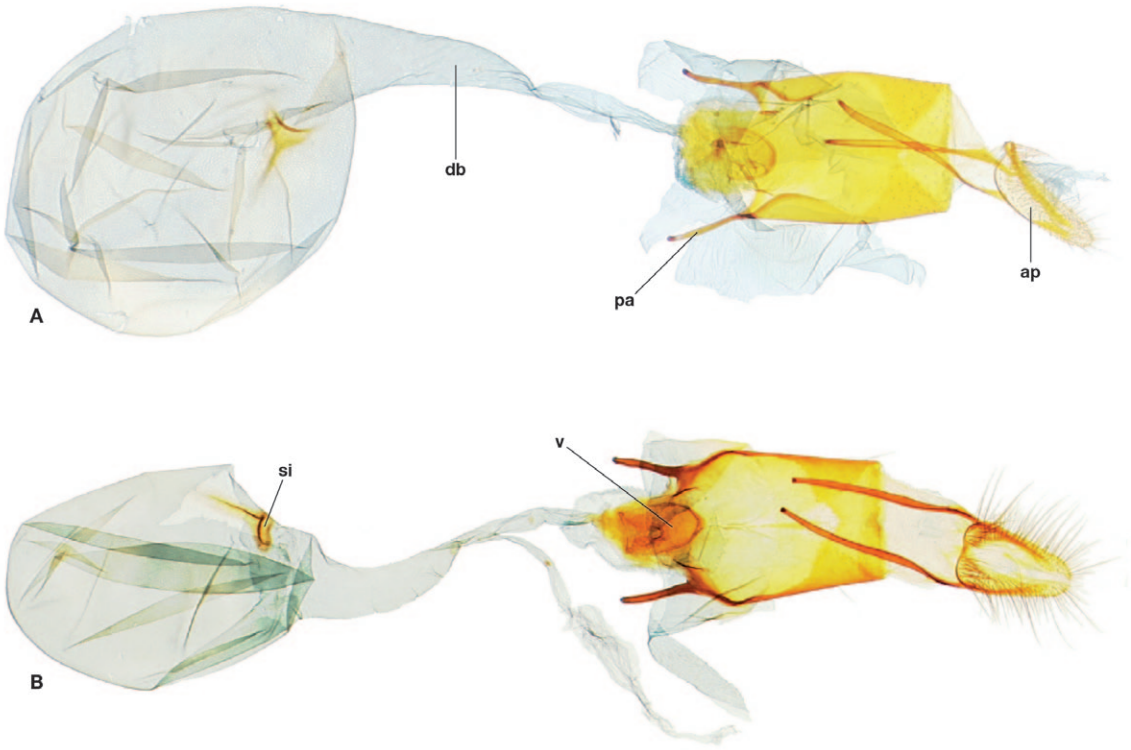

Fig. 7. Female genitalia of *Micrelephas* species in ventral view. (A) *M. longicilia* (slide MHNG ENTO 6277); (B) *M. interruptus* (slide BL 1702). ap = anal papillae; db = ductus bursae; pa = posterior apophyses; si = signum of corpus bursae; v = ventral plate of sterigma.

of the forewing which allows determination and association with *A. mesozonalis* and *A. antonialis*. *Argyria mesozonalis* was described from "1 ♂ type". *Argyria antonialis* Schaus was described from an unspecified number of specimens, but presumably only one, of unspecified sex. The species is known to us from Colombia, Ecuador, Peru, and Venezuela. Moths are attracted to light and were collected between 945 to 2670 m from October to January, and April and May. In Ecuador, at the San Francisco Biological Station, province of Loja, Brehm et al. (2003) collected a large series of specimens between 1780 and 2670 m in January, May, October, November, and December, between 19h00 and 21h30. Brehm et al. (2003) mention their methodology as follows. "Moths were sampled manually using portable weak light-traps (2×15 W). Traps consisted of a white gauze cylinder (height 1.60 m, diameter 0.60 m) and were placed at the forest floor. We selected 22 sampling sites at 11 elevational levels between 1040 and 2677 m a.s.l. Sites were numbered from 1 to 11 (a+b) according to their elevational order. A detailed description of the sites and a discussion of the sampling methods was provided by Brehm (2002). Sampling occurred during three field periods (April–May 1999, October 1999–January 2000, and October–December 2000). Light-traps were run between 18:30 and 21:30 local time." Thus, the flight period and time recorded for *M. interruptus* at the San Francisco Biological Station only reflect the sampling methodology used. Błeszyński (1960: 102, pl. 14 fig., 1) mentioned that the male genitalia of *A. croceivittella* (Walker) (type locality: Brazil, Rio de Janeiro) are similar to those of *A. mesozonalis*. However, the genitalia shown by Błeszyński are clearly not those of *A. croceivittella*, but rather those of a specimen of *M. interruptus* or *M. mesodonta*. The holotype of *A. croceivittella* is a female without abdomen, but a male specimen (Brazil, Neu Bremen) dissected by Błeszyński (slide 6625) and identified by him as *A. croceivittella* (CMNH) seems correctly identified based on forewing and head pattern and is clearly not a *Micrelephas* because of its short labial palpi, just like those of *A. nummulalis* Hübner, the type species of the genus, and because its gnathos is decidedly bare of any spinules or setae. Only a fragment (301 base pairs) of the COI barcode was obtained due to sequence failure of the posterior barcode part.

***Micrelephas mesodonta* (Zeller, 1877),** comb. nov.
Figs. 1D-E, 2D, 5

Argyria mesodonta Zeller, 1877: 62–64; Błeszyński 1960: 98, 99, pl. 10 fig. 3, pl. 13 fig. 1; Błeszyński & Collins (1962: 214); Munroe (1995: 35); Landry (2013).
Argyria mesodonta submesodonta Błeszyński, 1960: 99–101, pl. 10 fig. 4, pl. 13 fig. 2; Błeszyński & Collins (1962: 214); Munroe (1995: 35); Landry (2013), **syn. n.**

Material examined: Lectotype ♂ of *mesodonta*: 1– 'Coll. | Staudinger'; 2– 'Origin.'; 3– 'Chanchamayo | Thamm'; 4– 'Argyria | mesodonta Z.'; 5– 'Typus'; 6– '8: Anhang' [=Appendix]; 7– 'Praep. Gen. Nr. 589 ♂'; 8– 'Lectotype | Argyria mesodonta | Zeller | Des. Błeszyński, 1960 | Labelled: B. Landry, 2012', ZMHB. Holotype ♂ of *submesodonta* (Fig. 1E): 1– '1903.4. | Bolivia | Stgr'; 2– 'Mus. Zool. Polonicum | Warsawa | 12/45'; 3– Argyria ♂ | submesodonta | Blesz. | Holotypus'; 4– Prep. 818 ♂ | Argyria | submesodonta | Błeszyński 1959 Holotypus; 5– '334 | det. Błeszyński 195', MZPW. Paralectotype ♂ of *mesodonta*: same labels as lectotype, but without last three (ZMHB). 1 ♂, **Ecuador**, Loja, Estación Científica San Francisco, 3°58'S, 79°04'W, 2240 m, T2-6, 1.i.2000, attracted at light, 20h-00-20h30 (G. Brehm) (SMNS); 1 ♂, same data except 2320 m, T2-7, 6.v.1999 (D. Süssenbach) (SMNS); 2 ♂ (one with genitalia on slide BL 1703; other: DNA voucher M. Nuss no 1490), same data except 2.xi.1999 (SMNS, MHNG); 1 ♂, same data except 03°59.52'S,

79°04.30'W, 2525 m, T1-8 (15), 16.xi.2000, 21h00-21h30 (SMNS); 1 ♂ (right wings on slide BL 1789), same data except 03°59.65'S, 79°04.10'W, 2670 m, T1-10 (17), 23.x.2000, 19h00-19h30 (SMNS); 1 ♂, same data except 2250 m, T1-6, 8.xii.1999, 21h00-21h30 (SMNS). 1 ♂ (genitalia on slide BL 1782), [**Peru**] Huancabamba, Cerro de Pasco, 6400 ft (E. Boettger) (BMNH).

Diagnosis: Among *Micrelephas* species this species cannot be confused with any other externally by virtue of its satiny white forewing with brown to orange brown markings consisting of a wide band along costa, culminating with a subapical triangle, a larger triangle abutting the costal band medially, a small dark brown spot on dorsum submedially, sometimes a smaller spot on dorsum subapically, and a terminal band with seven or eight black spots between veins. There is never a complete transverse, median line. The most similar species is *Micrelephas interruptus*, which always has a complete, inwardly oblique (from costa to dorsum) brown to orange brown median transverse line, but otherwise its markings are the same as those of *M. mesodonta*. The genitalia of the two species are very similar, but in *M. mesodonta* the uncus is slightly more evenly rounded dorsally, the gnathos is slightly thicker and strongly bent upward subapically, the tegumen is wider, and the subbasal projection of the valva's costa is slightly thicker. The female genitalia are unknown.

COI barcode of specimen MTD Lep1490 from Ecuador (609 base pairs):

TTAAKATTATTAATTCGAGCAGAATTAGGAAACCCTGGATCCTTAATTGGAGATGATCAAATTTATAATACTATTGTAACTGCCCA
TGCATTTATTATAATTTTTTTTATAGTTATACCTATTATAATTGGAGGATTTGGAAATTGATTAGTTCCTTTAATATTAGGAGCTCCT
GATATAGCTTTCCCACGAATAAATAATATAAGATTCTGATTGCTCCCCCCCTCATTAACTTTATTAATTTCAAGAAGAATTGTAGA
AAATGGAGCAGGAACTGGATGAACGGTTTACCCCCCCCTTTCATCTAATATTGCCCATGGTGGTAGATCTGTAGATTTAGCTATTT
TTTCTTTGCATTTAGCTGGAATTTCATCAATCTTAGGAGCTATTAATTTTATTACTACTATTATTAATATACGAATTAATGGATTATC
ATTTGATCAAATACCTTTATTTGTATGATCAGTAGGAATTACTGCTCTTCTTCTTCTATCTTTACCAGTATTAGCTGGAGCTATC
ACTATACTTCTTACTGATCGAAATTTAAATACCTCTTTTTTCGATCCTGCCGGAGGTGGAGATCCAATTTTATACCAACATTTATTT

Additions to original description and redescription by Błeszyński (1960): Forewing length: 10-11 mm. Hindwing dorsally with furrow along M_1 (Fig. 2D) narrow, about 1/5th width of cell, extending slightly beyond connection between Rs and M_1 and shortly before middle of wing, with short scales set perpendicularly from longitudinal axis within furrow; connection between Rs and M_1 at about 1/3 wing length, and that between Sc+ R_1 and Rs at about 3/5 wing length.

Remarks: The original description mentions two males. The two male syntypes have the same labels and Błeszyński didn't label any one of the two with a LT label, but he (1960) illustrated one (before it was dissected) with record of it being the LT in the legend, and BL labelled it accordingly. As far as known the species is distributed in Peru (type locality of *mesodonta* and Huancabamba), Bolivia (type locality of *submesodonta*) and Ecuador, between 1950 and 2670 m. The female is still unknown. In the DNA sequence K replaces an uncertainty between G or T, according to the IUPAC nucleotide ambiguity code.

Micrelephas longicilia Landry & Becker, sp. n.
Figs. 1F, 2A-B, 3, 6, 7A

Material examined: Holotype ♂ (Fig. 1F): 1– 'BRASIL :BA [Bahia], Camacan | Res[erva]. Serra Bonita | 15°23'S – 39°33'W | 800m, 25.iii.2011 | B. Landry, V. Becker'; 2– 'HOLOTYPE | Micrelephas | longicilia | Landry & Becker'. Deposited in VOB.

Paratypes: 25 ♂, 45 ♀. **Bolivia**: 3 ♂, 6 ♀, Cochabamba, Chapare, Alto Palmar [sometimes spelled 'Palmer'], 1100 m: ii.1962, Through F. H. Walz (1 ♀); 13-26.iii.1961, Through F. H. Walz (1 ♂, slide BL 1773, 1 ♀); 21.iii.1961 (1 ♀); iv.1959 (1 ♀, slide BL 1787); ix.1960, Through F. H. Walz (1 ♂, 1 ♀); x.1960 (1 ♂, 1 ♀); 1 ♀, Cochabamba, Chapare, El Limbo, 2000 m, iv.1954, F. Steinbach; 1 ♀, same data except xi.1962, Through F. H. Walz; 1 ♂ (slide BL 1785), 1 ♀, [La Paz Department] Coroico, 1800 m, 3-12.xii.1955, L. E. Pena (CNC, MHNG). **Brazil**: 1 ♂, Bahía, Camacã [sic], 400-700 m, 13-14. iv.1992, V.O. Becker (Col. Becker 84689, USNM); 1 ♂, Bahía, Camacan, 600 m, 15.xi.1995, V.O. Becker (Col. Becker 106228, USNM); 1 ♂, Bahía, Camacan, Res[erva]. Serra Bonita, 800 m, S 15° 23', W 39° 33', ii. 2007, V.O. Becker (Col. Becker 137097, USNM); 1 ♂, 1 ♀, same data except ii.2008, V.O. Becker (Col. Becker 139108, USNM); 1 ♀, same data except iii.2007, V.O. Becker (Col. Becker 137378, USNM); 1 ♂, same data except iii.2008, V.O. Becker (Col. Becker 139368, USNM); 1 ♀, same data except v.2008, V.O. Becker (Col. Becker 139976, USNM); 1 ♀, same data except vii.2007, V.O. Becker (Col. Becker 138272, USNM); 1 ♀, same data except ix.2009, V.O. Becker (Col. Becker 144942, USNM); 1 ♂, same data except xi.2011, V.O. Becker (Col. Becker 147524, USNM). 4 ♂, 8 ♀, same data except 23.iii.2011 (2 ♀), 25.iii.2011 (2 ♀, one on slide MHNG ENTO 6503), 26.iii.2011 (2 ♂, slides MHNG ENTO 6502 and 6523, 1 ♀ in ethanol MTD Lep 978), 27.iii.2011 (1 ♀), 30.iii.2011 (1 ♀), 2.iv.2011 (1 ♀), 3.iv.2011 (1 ♂), 5.iv.2011 (1 ♂, 1 ♀), B. Landry & V. Becker (MHNG); 1 ♂, 1 ♀, Paraná, Guaraqueçaba, 9.xii.1970, V.O. Becker (Col. Becker 9709, 9710, USNM); 1 ♂, 5 ♀, Paraná, Marumbi, 500 m, 21.xi.1970, V.O. Becker (Col. Becker 9697-9701, 9703, USNM); 1 ♂, Paraná, Marumbi, Morretes, 500 m, 17.xii.1969, Becker & Laroca (Col. Becker 15407, USNM); 4 ♀, same data except 21.xi.1970 (Col. Becker 9705-9708, USNM); 1 ♂, Paraná, Banhado, Quatro Barras, 800 m, 28.xi.1970, V.O. Becker (Col. Becker 9785, USNM); 1 ♀, same data except 12.iv.1970, V.O. Becker (Col. Becker 9788, USNM); 1 ♀, Paraná, Quatro Barras, 900 m, 31.i.1993, V.O. Becker (Col. Becker 86939, USNM); 1 ♂, Rio de Janeiro, Petropolis, 650 m, 10-20.x.1985, V.O. Becker (Col. Becker 64991, USNM); 1 ♀ (slide BL 1786), Rio de Janeiro, Kilometer 50, Estrada Contorno, Petropolis, 900 m, 28.xi.1971, E. G., I., & E. A. Munroe (CNC); 1 ♂, 1♀, São Paulo, Est. Biol. Boracela, nr. Salesopolis, 850 m, 11.iii.1972 (♀), 13.iii.1972 (♂), E. G., I., & E. A. Munroe (CNC); 1 ♀, São Paulo, Bertioga, 5 m, 15-17.v.1996, V. O. Becker (Col. Becker 99383); 1 ♀, São Paulo, Capão, Bonito Intervales, 900 m, 24°16'S 48°24'W, 5-7.xii.2001, V.O. Becker (Col. Becker 134268, USNM). **Costa Rica**: 1 ♂ (slide BL 1794), PA[Puntarenas], Alturas de Cotón, 1500 m, 15.ix.1999, V.O. Becker (Col. Becker 120224, USNM). **Ecuador**: 2 ♂ (one on slide BL 1772), Pichincha, Calacali, Yunguilla, F[in]ca El Cedral, 2242 m, N 00° 07' 0.15'', W 78° 34' 39.3'', 14-16.i.2010, P. Lincango (VUCS). **French Guyana**: 1 ♀ (slide MHNG ENTO 6277), R[ou]te de Kaw, @ pk 37, GPS: elev. 271 m, N 04°32.965', W 052°08.865', 6.iv.2008, M[ercury]V[apour]L[ight], B. Landry, C. Reuteler, D. Néron, J.-M. Bérenger, M. Pagès (MHNG). **Guatemala**: 2 ♀, B[aja]. Ver[apaz]., Purulhá, 1620 m, 20.vii.2000, V.O. Becker (Col. Becker 123384, USNM); 2 ♂ (one on slide BL 1793), Hue[huetenango], Ixcansan, 1630 m, 16°00' N, 91°29'W, 26.vii.2000, V.O. Becker (Col. Becker 124072, USNM); 2 ♀ (one on slide BL 1796), Izab[al], 30 km SE Morales, 700-1100 m, 14°50'N 88°40'W, 1-2.viii.2000, V.O. Becker (Col. Becker 125142, USNM). **Venezuela**: 1 ♀ (no abdomen), [no locality data] P. Anduze (USNM).

Material not examined: 1 sex unknown, Guatemala, Baja Verapaz, Quetzal Res., Los Ranchitos, 1680-1750 m, 10-15.vi.2007, J. B. Heppner; 1 ♀, Guatemala, Dept. Baja Verapaz, Biotopo Quetzal, Los Ranchitos, 1557 m, 4-8.ix.2007, J. Monzon, F. Camposeco, R. E.Woodruff, at light, MGCL slide female 01349; 1 ♀, same data except MGCL slide female 01348 (MGCL). 4 of sex unknown, BioLep292 (COI sequences used in analyses; for details see Tab. 1).

Diagnosis: This species is easily separated from the other known members of the genus by virtue of its forewing shape and pattern (Fig. 1F). *Micrelephas crassipalpis* Dognin is the only other species of the genus with mostly brown scaling on the forewing, but it has white markings postmedially, and its forewing length is 2.6 X its maximal width whereas in *M. longicilia* it is 2 X its maximal width. In addition, for example, *M. crassipalpis* has the labial palpus conspicuously dishevelled apically, the male has a brush of long hair-like scales in the furrow along hindwing M_1 dorsally, the male abdominal intersegmental membrane VIII-IX is set dorsally with a large crown of long and curved filiform scales on a ridge and the juxta has no anterolateral projections. In females of *M. longicilia* abdominal segment VIII and the anterior apophyses (Fig. 7B) are distinctly longer than in the other species of the genus, but the female of *M. crassipalpis* and *M. mesodonta* are unknown. The large signum of *M. longicilia* (Fig. 7B) is also diagnostic as four of the five species of *Micrelephas* for which the female is known have no signum while the other, *M. interruptus*, has a similar signum (Fig. 7A) although not as large, and its tongue-shaped projection ventrad from the ostium bursae is subapically narrowing before the rounded apex whereas that of *M. longisignata* is evenly rounded apically. The male genitalia of this species, *M. mesodonta*, and *M. interruptus* are almost identical.

COI barcode specimen MTD Lep978 from Brazil, Bahia, Camacan, Serra Bonita (657 base pairs):

ACTTTATATTTTATTTTTGGAATTTGAGCCGGAACAGTAGGAACATCTTTAAGATTATTAATTCGAGCAGAATTAGGAAATCCTGG
ATCTTTAATTGGTGATGATCAAATTTATAATACTATTGTAACAGCTCATGCATTTATTATAATTTTTTTTATAGTTATACCTATTATA
ATTGGAGGATTTGGAAATTGATTAGTTCCTTTAATATTAGGAGCCCCAGATATAGCTTTCCCACGAATAAATAATATAAGATTCTG
ATTATTACCTCCATCATTAACTTTATTAATTTCAAGTAGAATTGTAGAAAATGGAGCAGGAACTGGATGAACAGTGTACCCCCCAC
TATCATCTAATATTGCTCACGGTGGTAGCTCTGTAGATTTAGCTATTTTTCCCTACATTTAGCTGGAATTTCATCAATTTTAGGAG
CCATTAATTTTATTACAACTATTATTAATATACGAATTAATGGATTATCATTTGATCAAATACCTTTATTTGTATGATCTGKAGGTA
TCACTGCTCTTCTTCTTCTTTTATCTTTACCAGTTTTAGCTGGAGCTATTACTATATTACTTACTGATCGAAATTTAAATACCTCTTT
TTTTGACCCTGCAGGAGGAGGAGACCCAATTTTATACCAACATTTATTT

Description: MALE (n=12). (Fig. 1F). Head mostly white, with few dispersed dark brown scales on frons and medially below first layer of scales; with erect tuft behind chaetosemata, chestnut brown laterally, white medially; frons rounded, not produced. Antennal scape dirty white, with few darker, pale

brown scales, pedicel and first 2-3 flagellomeres coloured as scape, subsequent flagellomeres ringed pale whitish-brown and dark brown, flagellomeres only slightly laminate. Ocelli and chaetosemata present. Labial palpus about 2 X widest diameter of eye, not dishevelled apically, laterally dirty white, with brown to dark brown areas at base of first segment, base and apex of second, and on most of third except base; with white scales medially. Maxillary palpus scaling distally expanding, white; with white also laterally at middle, brown of various shades elsewhere. Haustellum scaling dirty white. Thorax mostly white with some mixed scales with apices brown. Foreleg coxa and femur dirty white; tibia and tarsomeres bronze brown, but blackish brown medially on tibia. Midleg femur dirty white with blackish brown at very base and apex; tibia slightly darker with dark greyish brown dorsally on basal 1/3 and ventrally at base of spines; first tarsomere pale chestnut brown; distal four tarsomeres ringed black and white laterally, medially pale chestnut brown. Hindleg as midleg but with slightly paler tibia. Forewing 2X its maximal width; length: 6.5–10.0 mm; outer margin rounded and apex slightly produced; forewing venation (Fig. 2A) as in *M. pictellus* (Landry 2003: fig. 9); hindwing venation (Fig. 2B) also as in *M. pictellus* except for shorter M_2 and M_3; connection between Rs and M_1 at about 5.5/10 wing length and that between $Sc+R_1$ and Rs at 2/3 wing length; furrow below stem of M_1 and Radius wide, basally making for more than half space between stem of Radius and Cubitus, narrowing distally, reaching slightly beyond connection of $Sc+R_1$ and Rs and 7/10 wing length, containing short, rounded scales, but no androconial hairs. Forewing dirty white with scattered brown scales, costa with greyish brown band, main markings brown as slightly oblique submedian band interrupted on radius but associated with inversely oblique darker bar in costal band, subterminal thinner band from 6/7 dorsal margin, slightly curved inwardly near middle and sharply curving back toward costa, and darkening, at R_5; costa following subterminal band with thin white dash, then with enlarging, apically emarginated chestnut brown triangle sometimes with white scales in middle, with few black scales at costa before apical white spot; apical margin banded chestnut brown with small black spots between vein endings; fringe shining greyish brown. Hindwing dirty cream, with few (4-5) small white marginal spots between veins; ventral surface with marginal white spots more numerous and conspicuous, also with subapical pale brown band from costa to median sector, and greyish brown scaling at anal angle; fringe concolorous with rest of wing, shining. Abdomen dorsally and ventrally light cream at base to pale bronze-cream toward apex.

Tympanal organs (n=) (Fig. 3A): Venulae secundae clearly marked; transverse ridge of medium width, straight or with anterior margin slightly concave; tympanic pockets very slightly projecting beyond or levelled with anterior margin of transverse ridge, narrowly rounded; praecinctorium dorsal margin sclerotized; tympanic crest medium-sized; tympanum at right angle with longitudinal plane; tympanic drum distinctly reaching beyond transverse ridge.

Intersegmental membrane VIII-IX (Fig. 3B) without specialized setae.

Male genitalia (n= 3). (Fig. 6). Based on slides BL 1772 (Baixeras coll., Ecuador), BL 1773 (CNC, Bolivia), and MHNG ENTO 6502. Uncus narrow, with shaft slightly wider in basal half, not distinctly concave dorsally, apex pointed at about half right angle, with short setae dorsolaterally along shaft and at base of short arms laterally, without long setae. Gnathos well sclerotized, with narrow arms straight, joined at about 3/5, with fine spinules along dorsal edge of arms from about 1/3; apical plate slightly less than half length of arms, without distinct depression dorsoanteriorly, covered with short spinules

Table 1. Summary of the COI barcode data used in this study. Abbreviations: BOLD - Barcode Of Life Database; bp - base pairs; COI - Cytochrome Oxidase Subunit 1.

taxon	database: access no.	COI sequence length	origin of specimen
Eudonia truncicolella	GenBank: GU828709	657 bp	see Mutanen et al. 2010
Chilo suppressalis	GenBank: AB238203	657 bp	Ishiguro & Tsuchida (unpublished): Japan, Gifu
Crambus uliginosellus	GenBank: GU828691	657 bp	see Mutanen et al. 2010
Urola nivalis	GenBank: GU091472	657 bp	see Hebert et al. 2010
Argyria lacteella	BOLD: CNCLEP00026208	654 bp	USA, Florida, Putnam, Etoniah Creek St For., nr Florahome, 30m, 29°44'20'' N, 81°50'34'' W, leg. J.-F. Landry
Argyria auratellus	BOLD: CNCLEP00040415	654 bp	Canada, Manitoba Tall Grass Prairie Preserve, 290m, 49°04'34'' N, 96°44'31'' W, leg. J.-F. Landry & V. Nazari
Argyria rufisignella	BOLD: CNCLEP00025946	654 bp	USA, Florida, Lake Placid, Archbold Bio Stn, 125 m W Jay Cottage, 40m, 27°10'19''N, 81°20'56''W, leg. J.-F. Landry
Catharylla tenellus	BOLD: BC MTD 01709	657 bp	Brazil, Bahia, Porto Seguro, A. d'Ajuda, 20m, 16°27'S 39°03'W, leg. V. O. Becker
Micrelephas gaskini	BOLD: BC MTD 01229	657 bp	Colombia, Narino, western Cordillera western slope, Reserva Natural La Planada, 1850m, 1°15'00''N, 78°15'00''W, leg. J. Salazar
Micrelephas interruptus	ENA of EMBL	302 bp	Ecuador, Loja, Estación Científica San Francisco, forest, 2670 m, 3°59'39''S, 79°04'06''W, leg. D. Süßenbach (SMNS)
Micrelephas longicilia	ENA of EMBL	657 bp	Brazil, Bahia, Camacan, Reserva Serra Bonita, 800m
Micrelephas mesodonta	ENA of EMBL	609 bp	Ecuador, Loja, Estación Científica San Francisco, 2240 m, 3°58'S, 79°04'W, (SMNS)
Micrelephas pictellus	GenBank: Léger et al., accepted	632 bp	Brazil, Bahia, Camacan, Reserva Serra Bonita, 800m
cramBioLep01 BioLep292, specimen 1	GenBank: GU697927	657 bp	Costa Rica, 10°51'58'' N, 85°19'37'' W, leg. H. Cambronero & S. Rios
cramBioLep01 BioLep292, specimen 2	GenBank: GU697928	657 bp	Costa Rica, 10°51'58'' N, 85°19'37'' W, leg. H. Cambronero & S. Rios
cramBioLep01 BioLep292, specimen 3	GenBank: HM402420	657 bp	Costa Rica, 10°52'05'' N, 85°19'37'' W, leg. S. Rios
cramBioLep01 BioLep292, specimen 4	GenBank: HM402240	603 bp	Costa Rica, 10°52'05''N, 85°19'37''W, leg. F. Quesada & R. Franco

dorsally, with apex dorsally produced in narrow, blunt projection at right angle. Tegumen arms narrow at base, widening gently from base until connection at 2/3, ventral margin straight, dorsal margin diverging; dorsal connection wide, about 1/3 length of arms, slightly depressed dorsomedially. Valva at 1/6th ventromedially with short bump adorned with short and thickly sclerotized, closely set scales; costa at base with wide sclerotized section ending in narrow projection directed dorsomedially at about half right angle; partially enclosing, lateral sheath well-sclerotized, shorter than projection, with apex moderately pointed; cucullus of same medium width for whole length, directed upward at slightly less than half right angle, only slightly bent upward before apex, apically broadly rounded, with costa widened and flat beyond costal arms, narrowing until subapex, and bearing series of medium length setae, with 2-3 rows of very long setae on median surface just above ventral edge, interrupted near middle, with longest setae most ventrally situated. Juxta shaped like capital A with wide summit, with narrow median band set before middle and concave, with anterior branches equally narrow, about 1/3 length of whole structure, with terminal band wide, about 1/3 length of whole juxta, not distinctly curved downward except for short, median point at apex. Vinculum of same medium length except dorsolaterally, half as long and blunt, with short median crest. Phallus narrow, slightly shorter than cucullus of valva, forming right angle with coecum penis, then slightly bulging ventrally and slightly concave dorsally, with distal 1/3 straight, ending in sharp dorsal point, with rest of shaft apically unsclerotized in distal 1/5 and also laterally before that.

FEMALE (n=22). Forewing length: 8.0-10.0 mm; frenulum with 3 acanthae. **Female genitalia** (based on slides MHNG ENTO 6277 and BL 1786 in lactic acid) (n=4) (Fig. 7A): Papillae anales narrow, about twice as wide on ventral half, coalesced dorsally, poorly sclerotized except for ventrally (but not dorsally) connected narrow sclerotized band along base, with abundant setation of mostly medium length. Posterior apophyses laterally flattened posteriorly, then circular, not distinctly enlarged subbasally, slightly converging, extended to middle of segment VIII, apically not knobbed. Segment VIII long, about 1/5 longer than wide at mid length, excluding anterior apophyses, with setae of medium length mostly along apical 1/4, dorsally at apex more strongly sclerotized along wide band of about 1/3rd of length of segment, with almost straight apical margin and more deeply concave basal margin, ventrally well sclerotized with apical margin broadly concave, with shallow depression medially at level of bases of anterior apophyses. Anterior apophyses long, slightly less than half length of segment VIII, narrow, slightly curving mediodorsally. Ostium bursae medially situated, associated with tongue-shaped, sclerotized projection ventrally, apically equally broadly rounded. Ductus bursae narrow proximally, about 5 X larger upon connection with corpus bursae, long, with pattern of hexagons in distal half. Ductus seminalis connected on ductus bursae at mid-length. Corpus bursae large, circular (but exact shape not recorded before mounting), slightly shorter than ductus bursae, with pattern of hexagons over whole surface, with more thickly sclerotized hexagons forming large T-shaped signum located posteriorly at base of connection with ductus bursae, with horizontal bar of T forming smiling, big-lipped mouth-shaped depression, with vertical bar of T straight, shorter than horizontal bar, narrowing distally.

Distribution: From Guatemala to Brazil (Paraná State), and in Ecuador, Pichincha Province at 2242 m on the Pacific slope of the Andes.

Natural history: Unknown except that the adults come to light and that the species has been found in habitats between 5 (in Brazil, São Paulo) to 2242 m (in Ecuador).

Remarks: The new name refers to the long setae medially on the male valva along and above the ventral edge. There is an unusual discrepancy between the widely different forewing colour in this species and *M. interruptus*, and their almost identical genitalia. The available males of the Central American material available are darker overall than the females from this region and from specimens of both sexes collected further south. However, the dissected male from Bolivia is also darker.

Key to species of M*icrelephas* mostly based on adult external characters

Illustrations of species of *Micrelephas* not figured here can be found in Landry (2003).

1. Forewing mostly satiny white with brown to orange brown costal band and terminal fascia ……2
- Forewing not mostly satiny white, nor with brown to orange brown costal band and terminal fascia ……3
2. Forewing with complete median fascia (Fig. 1A) ..... *M. interruptus* (Zeller)
– Forewing without median fascia, but with median triangular spot touching costal band (Fig. 1D) ……..... *M. mesodonta* (Zeller)
3. Forewing mostly brown or dirty white speckled with brown scales, with (Fig. 1F) or without clear median and subterminal lines …….....4
– Forewing with white background, extensive dark brown (almost black) scaling, and orange to orange brown patch at apex ……..... 5
4. Forewing narrow, length 2.6 X maximal width, without clear median and subterminal lines, with satiny white spots before terminal line; labial palpi conspicuously dishevelled .....……*M. crassipalpis* Dognin
– Forewing wider, length 2 X maximal width, with clear, brown median and subterminal lines, without satiny white spots before terminal line; labial palpi not conspicuously dishevelled (Fig. 1F) …….. *M. longicilia* sp. n.
5. Forewing with orange scaling on inner margin from about 1/5 to 3/4 …… 6
– Forewing without orange scaling on inner margin from about 1/5 to 3/4 … 7
6. Forewing usually without connection between small dark patch anterior to subterminal line in median sector and larger dark area anterior to it, forewing length 10-12 mm; male genitalia with projection on costa of valva forming bifid plate pointing dorsally and ending in small flat spine laterally and flat cone medially, phallus with short lateral projections at base of coecum penis ……..……..…… *M. kadenii* (Zeller)
– Forewing with dark scales connecting small dark patch anterior to subterminal line in median sector and larger dark area anterior to it, forewing length 11.5-14 mm; male genitalia with projection on costa of valva directed dorsally, thick, broadly rounded, with medium-sized spine apically and short rounded projection medially, phallus without short lateral projections at base of coecum penis ……..... *M. pseudokadenii* Landry
7. Forewing with large patch of dark brown (almost black) scales on each side of postmedian line in median sector, forewing length 6.0-8.5 mm; widespread from Costa Rica south to Santa Catarina, Brazil ……..……..... *M. pictellus* (Schaus)
– Forewing without patch of dark brown (almost black) scales on each side of postmedian line in median sector, forewing length 9-15 mm; more localized ……..... 8
8. Forewing with large black patch in middle, before median line, followed by large steel blue patch on other side of median line, and usually by smaller black patch in cubital sector between postmedian line and terminal margin ……..... *M. chalybeus* Landry
– Forewing neither with large black patch in middle, before median line, or large steel blue patch on other side of median line, or black patch in cubital sector between postmedian line and terminal margin ……..... 9
9. Forewing usually with dark brown scaling at base, male forewing length 12-15 mm; hindwing mostly white, with some grey terminally in median sector; male valva with dorsocostal projection bifid; in Colombia and Ecuador ……..... *M. gaskini* Landry
– Forewing base white, male forewing length 9-11 mm; hindwing predominantly greyish brown; male valva without bifid projection on costa; in Costa Rica ……..... *M. helenae* Landry

DISCUSSION

Characters of interest for the taxonomic placement of the species treated here

On the head the length of the labial palpus was not used in the analysis of Landry (1995) or here because the values calculated do not fall into discrete classes. However, in *Micrelephas* species (Fig. 1) the labial palpi are generally long, whereas in *Argyria*, *Catharylla* and *Urola* the palpi are generally short. In *Vaxi* the palpi are slightly longer than in the other genera of Argyriini. Thus, the length of the labial palpi would support the placement of *Micrelephas longicilia* in this genus, and in Crambini, versus Argyriini.

The Crambinae are generally recognized by relatively elongate forewings. This was quantified by Landry (1995) (Character 8) and the numbers obtained could only be divided into two discrete categories with difficulty. The apomorphic condition, in which the forewing length over the maximal width is less than 2.0 was found to occur only in the Diptychophorini. *Micrelephas longicilia*, with a ratio of around 1.9, also falls into this category and was thus given a score of 1 in the matrix analysed here.

The apomorphic condition of Character 9, the forewing outer margin produced at M_1-M_2 is restricted to *Prionapteryx* and *Pseudoschoenobius*. In *Micrelephas*, including *M. longicilia* (Fig. 1), but especially in *M. crassipalpis* Dognin, the forewing outer margin is produced slightly below, at M_2 and M_3. But this character, which would bring support to *M. longicilia* in *Micrelephas*, was not incorporated in the present phylogenetic analyses.

The free forewing vein R_5 (Character 11, Fig. 11A) in the outgroup taxa, most Crambinae except most Crambini, *Micrelephas*, *Euchromius*, *Argyria*, and *Urola* is considered plesiomorphic. The condition in which R_5 is attached to the stem of R_3 + R_4 is found in most Crambini, *Calamotropha*, *Catharylla*, and *Vaxi*. Thus the distribution of this character is somewhat contradicting support for the placement of *Micrelephas* in Crambini, and *Vaxi* in Argyriini.

The predominantly satiny white colouration of the forewing (Character 44) (Fig. 1A–E) brings support to Argyriini, as all their species share this character state. The presence of this character in *Micrelephas interruptus* (Zeller) and *M. mesodonta* (Zeller) (not included in the analysis, but treated above) therefore must be regarded as convergent evolution. Among Crambinae this character is also present in one Holarctic species of *Crambus*, in some Palaearctic *Calamotropha*, in the African *Pseudocatharylla*, Asian *Gargela*, some Neotropical Diptychophorini, and others. Thus, it is somewhat labile and is found exceptionally in some genera.

The hind wing cell (Character 15) may be closed by cross-veins (plesiomorphic state) or open (Fig. 2B–D). The latter apomorphic condition is observed in most Crambini, including *Micrelephas*, all Argyriini, and some other Crambinae. The distribution of this character is not informative with regard to *Micrelephas*, but supports a hypothesis of close relationship between Crambini and Argyriini.

The presence of a furrow containing long and hair-like androconial scales (Character 47) is found only in *Micrelephas* (Figs. 2B–D), inclusive of *M. longicilia*, but this character state is absent in *Micrelephas helenae* Landry and *M. chalybeus* Landry (Landry 2003), and reduced in *M. mesodonta*.

The tympanal organs were not investigated in detail as the characters treated (Characters 19–21) share the same character-state distribution in Argyriini, Crambini, and *Micrelephas*.

The male abdominal intersegmental membrane VIII-IX is adorned with coremata in most Crambinae, and most *Micrelephas* species, except *M. helenae*, *interruptus*, *longicilia* and *mesodonta*, have a bundle of long, filiform scales, sometimes S-shaped, dorsomedially (see Landry 2003). This character and its multiple variations was not analysed by Landry (1995) because of the insufficient number of taxa for which it was investigated.

In male genitalia the dorsal connection of the tegumen varies in length (Character 22), partly in relation to the width of the tegumen arms. Thus, narrow arms form a short connection and hence a short protective hood over the ventral parts of the genitalia. The plesiomorphic condition, where the hood is as wide, or wider than the arms, is found in most Crambinae, while a short hood is found in Argyriini, among others, and most *Micrelephas*, except the three treated here (Figs. 4–6A, B). This condition therefore weakens the support of *M. longicilia* as belonging in *Micrelephas*, but also contradicts a special affinity with Argyriini.

The direction of the apex of the male gnathos is an important character (# 27) in Crambinae as the apomorphic trait, a straight or apically downturned gnathos brings essential support to tribe Crambini (Landry 1995). This condition is also found in *Micrelephas* (Landry 2003 and present Figs. 4–6A, B). In some species of the genus, especially *M. interruptus* (Fig. 4), a slight bent upward may be observed subapically, at about 4/5 of length. This bent is not believed to be homologous to the plesiomorphic condition of Character 27, but perhaps is due to the widening of the gnathos arms apically, to counterbalance the extra weight.

The presence of short, fine spinules dorsally along the gnathos arms and at its apex (Figs. 4–6 D) (Character 49) is an exclusive synapomorphy supporting the cohesion of *Micrelephas* including *M. longicilia*. Interestingly, the apex (only) of the gnathos in some *Argyria* species (but not in *A. lacteella* (Fabricius)) and in *Urola nivalis* (Drury) are either adorned with tiny, triangular projections, or appear rugose. Whether these conditions are homologous to the small, fine spinules found on *Micrelephas* species remains to be investigated further.

The presence of very long setae along the edge of the valva (Character 48), especially at base and toward apex (Figs. 4–6A, B) represents a unique character found so far only in *Micrelephas*, including the three species treated here, and *M. pseudokadenii* Landry most conspicuously (see Landry 2003, fig. 33). This character-state, however, doesn't bring support to the pairing of *M. pictellus* and *M. longicilia* in the current analyses because it is not present in the former species. The longer setae found on the valva of some Argyriini are not situated along the ventral edge as in *Micrelephas*.

The shape of the valva was not investigated phylogenetically, although variation occurs. Neither was the costal projection(s)

of the valva, a common feature in Crambinae. In several species of *Micrelephas*, including the three treated here (Figs. 4–6E), there is a lightly sclerotized sheath that is exclusive to *Micrelephas* as far as known.

The pseudosaccus (Character 28) in the male genitalia represents the ventral point of attachment of a muscle, the sternal extensor of the valvae. This separate structure is an innovation occurring in the Crambini and several other genera of Crambinae, but not in Argyriini, Haimbachiini, and Prionapterygini (Landry 1995). It doesn't occur either in *Micrelephas* where the tegumen forms a low, longitudinal crest mediocephalad, possibly replacing the pseudosaccus. The absence of pseudosaccus in *Micrelephas* is consistent with the placement of the three species treated here in *Micrelephas*, but it doesn't support the genus as belonging to Crambini. However, in the current state of knowledge on the phylogeny of Crambinae one can only state that this structure was lost several times during the evolution of the group (Landry 1995).

In the female genitalia the corpus bursae of many Lepidoptera bears one or more signa (Character 38). The absence of signum or the presence of one signum was considered the plesiomorphic sate in Landry's (1995) analysis of Crambinae. There is no signum in the Argyriini as well as in four of the six *Micrelephas* species for which the female is known as shown by Landry (2003). In contrast, the two species treated here for which the female is known have one signum. This is a labile character that varies within several genera.

The papillae anales of the female may be dorsally coalesced or not (Character 41). The latter, apomorphic condition was found by Landry (1995) to represent a synapomorphy for the Crambini. In *Micrelephas*, both conditions are believed to occur as shown in *M. pictellus* and *M. longicilia*, the latter having the plesiomorphic condition. This character was not recorded precisely in Landry (2003) and the only other *Micrelephas* female (*M. gaskini* Landry) available for comparison has the dorsal papillae coalesced.

The anterior apophyses vary in length throughout the Crambinae and the extant of this variation could not be quantified clearly enough to be analysed phylogenetically by Landry (1995: 47). However, Landry (1995) concluded on this topic that a reduction in the length of the anterior apophyses was seemingly derived in the Crambiformes. The *Micrelephas* species treated by Landry (2003) all have very short anterior apophyses as do the Crambini and the Argyriini. In contrast, the species treated here have distinctly longer anterior apophyses (Fig. 7). Thus, this character would contradict the assignment of *M. longicilia* and *M. interruptus* to either Argyriini or Crambini as presently defined, and to *Micrelephas*.

CONCLUSIONS

The morphology-based phylogenetic analysis supports the placement of *M. longicilia* in *Micrelephas*, even though the support (58%) is not great. The 59% support for tribe Argyriini, exclusive of the two *Micrelephas* species analyzed offers additional credence to the exclusion of *Micrelephas* from this tribe. The placement of *M. longicilia* in *Micrelephas* is supported by several characters unique to the genus such as the gnathos dorsally with spinules (Character 49), the furrow of androconial scales on the hindwing (Character 47), and the long setae on the ventral edge of the valva (Character 48). Other characters, not included in the phylogenetic analysis, such as the presence of a more or less strongly sclerotized sheath at the base of the costal projection of the valva, and the slightly produced outer margin of the forewing at M_2-M_3 also bring support of *M. longicilia* in *Micrelephas*. However, the relatively short forewing (Character 8), the short dorsal connection of the tegumen (Character 22), and the presence of one signum on the female bursa (Character 38) contradict the placement of *M. longicilia* in *Micrelephas*, as do the absence of a bundle of long, filiform scales, sometimes S-shaped, dorsomedially on the male intersegmental membrane VIII-IX, but this is absent also in *M. helenae* Landry and reduced in two more species. Characters 8 and 22 also contradict placement of *M. longicilia* in the Crambini, as do the absence of a pseudosaccus in the male (Character 28), the coalesced anal papillae of the female (Character 41), the free vein R_5 in the forewing (Character 11), and the relatively long anterior apophyses of the female. In contrast, the straight apex of the gnathos (Character 27) and the long labial palpi point to an affinity with the Crambini. These contradictions are reflected in the result of the first phylogenetic analysis, which shows less than 50% support for tribe Crambini sensu Landry (1995). Perhaps these contradictions mean that *Micrelephas* is the most basal member of the Crambini. A broad phylogenetic analysis of Crambinae using molecular characters is currently under way by a student with BL and M. Nuss (SMTD) to try to answer this question and many more.

Wilson (2010) found that the COI barcode fragment is useful for phylogenetic analyses at genus and species level. However, in this study the COI barcode fails in providing good genetic support for the monophyly of *Micrelephas* and the placement of *longicilia* in this genus. This might be due to the observed large COI barcode sequence divergences between the congeneric species investigated in our study.

Apart from this, the COI barcode data enabled the recognition of several undetermined specimens (the 'BioLep292' clade) presumably conspecific with *M. longicilia* among the barcode data available in GenBank. The geographical distance between these GenBank specimens from Costa Rica and our barcoded *M. longicilia* specimen from Brazil might be responsible for the high uncorr-p sequence divergences found in this comparison. At the moment, morphological proof of the conspecifity of the GenBank specimens is still pending because they were not examined morphologically except for their habitus on photographs. They are from Costa Rica (See Table 1) as is one male specimen dissected and designated paratype. No discernible external or internal morphological differences were found between this dissected Costa Rican specimen, other Central American specimens, and specimens from South America. Similar findings of surprisingly high intraspecific barcode divergences of up to 5.05% between conspecific specimens of distant geographical origin have been made by Léger et al. (accepted) in the crambine genus *Catharylla* Zeller. These findings show how much still needs to be done and that we are just at the beginning of understanding both the species diversity and the molecular diversity of this group.

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