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Monographs

Half of the Diversity Undescribed: Integrative Taxonomy Reveals 32 New Species and a High Cryptic Diversity in the Scopariinae and Crambinae of the Philippines (Lepidoptera: Crambidae)

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Abstract

The Crambinae and Scopariinae (Lepidoptera: Crambidae) of the Philippines are revised here using DNA barcoding and morphology. In the Scopariinae, 20 species are reported from the Philippines, of which 14 are described as new: *Scoparia abo* **sp. n.**, *S. aenea* **sp. n.**, *S. bicornuta* **sp. n.**, *S. fulvida* ***sp. n.***, *S. ifugaoensis* **sp. n.**, *S. luzonensis* **sp. n.**, *S. masiita* **sp. n.**, *S. negrosensis* **sp. n.**, *S. tenuispina* **sp. n.**, *Eudonia penicula* **sp. n.**, *Micraglossa kianganensis* **sp. n.**, and *Micraglossa polisensis* **sp. n.** In the Crambinae, 42 species are found in the Philippines, with half of them described here as new: *Calamotropha anacantha* **sp. n.**, *Calamotropha philippinensis* **sp. n.**, *Catoptria philippinensis* **sp. n.**, *Culladia pseudoscoparia* **sp. n.**, *Gargela aculea* **sp. n.**, *Gargela acutibrachium* **sp. n.**, *Gargela bidentella* **sp. n.**, *Glaucocharis altissima* **sp. n.**, *Glaucocharis hamulus* **sp. n.**, *Glaucocharis kayumanggi* **sp. n.**, *Glaucocharis kabundukanis* **sp. n.**, *Glaucocharis negrosensis* **sp. n.**, *Glaucocharis uncusellus* **sp. n.**, *Glaucocharis sungay* **sp. n.**, *Metaeuchromius makintabus* **sp. n.**, *Metaeuchromius rizali* **sp. n.**, *Microchilo bundoki* **sp. n.**, *Microchilo cebuano* **sp. n.**, *Microchilo imminutela* **sp. n.**, and *Microchilo spinosus* **sp. n.** *Scoparia philippinensis* (Hampson, 1917) and *Metaeuchromius micralis* (Hampson, 1919) **comb. nov.** as well as female genitalia of *Calamotropha obliterans* (Walker, 1863) are redescribed, and first descriptions of male genitalia of *Glaucocharis clytia* (Błeszyński, 1966) and *Calamotropha unicolorellus* (Zeller, 1863) are provided. *Euchromius brunnealis* (Hampson, 1919) **syn.nov.** is synonymized with *Metaeuchromius micralis* **comb. nov.** *Culladia tonkinella* (Walker, 1865), *Eudonia barbipennis* (Hampson, 1897), *Gargela minuta* Song, Chen & Wu, 2009, *Gargela polyacantha* Li, 2019, *Gargela xanthocasis* (Meyrick, 1897), *Glaucocharis lathonia* (Błeszyński, 1966) and *Glaucocharis clytia* (Bleszynski, 1966) are reported here for the first time from the Philippines. DNA barcodes of 359 specimens indicate a perfect match with the Molecular Operational Taxonomy Unit ("MOTU") in 45 of the 66 morphospecies (68%), while nineteen of the morphospecies included one or more MOTUs, and three MOTUs were shared among more than one morphospecies. Forty MOTUs represented by females only suggest further unrecognized species in these groups. An apparent endemism rate of 95% is observed in mountain-dwelling Scopariinae, while the Crambinae show a lower endemism rate of roughly 50% presumably due to the occurrence of many lowland species. Further expeditions to undersampled islands and mountains will surely reveal additional species.

Introduction

With some 16,000 described species, the Pyraloidea represent the third most species-rich superfamily of Lepidoptera after Noctuoidea and Geometroidea (Nuss et al., 2003–2023). Crambinae and Scopariinae represent the 3rd and 5th subfamilies in rank of species diversity in the Crambidae and have been found to represent a monophyletic clade together with the two small subfamilies Erupinae and Heliothelinae (Léger et al., 2021; Regier et al., 2012). The subfamily Scopariinae encompasses 587 described species concentrated in the two species-rich genera *Eudonia* and *Scoparia* and show their highest diversity in temperate and tropical mountains (Nuss, 1999). A third genus from Eastern and South-East Asia, *Micraglossa*, shows a substantial amount of diversity within this region, with a large propor-

tion of undescribed species (Munroe, 1958). With 2085 described species, the Crambinae represent the third largest subfamily of pyraloid moths (Nuss et al., 2003–2023). The bulk of their diversity is found in the Holarctic region, but a few genera are distributed in tropical forests in South-East Asia (e.g., *Glaucocharis*, *Gargela, Microchilo*). Both subfamilies share the moss-feeding habit otherwise rare in Lepidoptera; *Eudonia*, *Scoparia,* and *Micraglossa* in Scopariinae as well as *Glaucocharis* in Crambinae are known to feed on moss. Other Crambinae feed predominantly on Poaceae, with few exceptions (Léger et al., 2019).

With over 7,000 islands, the Philippines archipelago represents one of the 25 biodiversity hotspots on Earth (Myers et al., 2000). Seventy to eighty percent of the species of mammals, amphibians, and reptiles are endemic to the archipelago (Ong et al., 2002). A similar rate of endemism is assumed for insects but remains limited due to the few groups that have been thoroughly studied (Ong et al., 2002). In Lepidoptera, an endemism of 30% is observed in butterflies (Treadaway & Schröder, 2012). The archipelago has a unique geological history, combining oceanic elements such as Luzon, the Visayas, and Mindanao, that have never been connected to other neighboring regions, with other geologically older elements such as Palawan and Mindoro that drifted from the Eurasian continental crust (Hall, 1998; Treadaway, 1998). The Pleistocene Ice age resulted in the lowering of the sea-level that revealed four major–partial or complete–land bridges connecting the Philippines to neighboring regions: the Palawan bridge that connected Palawan to Borneo, the Sulu archipelago land bridge connecting Borneo to Western Mindanao, the land bridge over the Sangir and Sarangani islands connecting Sulawesi to South Mindanao, and finally a bridge over Batanes that connected Taiwan to the North of Luzon (de Jong & Treadaway, 1993; Treadaway, 1998). Unfortunately, the region has experienced a severe clearing of its forest cover, especially in the lowlands, resulting in an estimated 7% of its primary vegetation currently remaining (Myers et al., 2000; Posa et al., 2008).

While its butterfly diversity is fairly well-known (Treadaway, 1995; Treadaway & Schröder, 2012), the Pyraloidea fauna remains largely unknown. One reason that could explain the poor knowledge of pyraloid moths in the Philippines is the scarcity of material found in museum collections (Diakonoff, 1968). The most significant collections of Microlepidoptera from the Philippines are those of Alfred Ernest Wileman at the Natural History Museum of London and those of Charles Fuller Baker at the Smithsonian in Washington. Nowadays, the Museum für Naturkunde, Berlin, Germany, completes the picture with a large amount of material collected on various islands of the Philippines during several expeditions led by Wolfram Mey in the late 1990s. This material has been used in group-specific studies, e.g., in the Scopariinae (Nuss, 1998), the Acentropinae (Speidel, 1998, 2003), and the Hoploscopinae (Léger et al., 2020). In the Scopariinae, only two species, *Eudonia homogenes* (Meyrick, 1894) and *Scoparia philippinensis* (Hampson, 1917), were known until the 1990s. The papers of Nuss (Nuss, 1998, 2002) presented revisional notes of the group for South-East Asia and described five new species from the Philippines: *Scoparia meyi* Nuss, 1998, *Scoparia monticola* Nuss, 1998, *Scoparia noacki* Nuss, 2002, *Scoparia spadix* Nuss, 1998, and *Micraglossa tagalica* Nuss, 1998. Nuss subsequently described a single species from the Philippines, *Scoparia noacki* (Nuss, 2002). In Crambinae, only sixteen species are reported from the Philippines: *Ancylolomia orchidea* Bleszynski, 1970, *A. westwoodi* Zeller, 1863, *Chilo auricilius* (Dudgeon, 1905)*, C. infuscatellus* (Snellen, 1890), *C. luteellus* (Motschulsky, 1866), *C. pulverata* (Wileman & South, 1917), *C. sacchariphagus* (Bojer, 1856), *C. suppressalis* (Walker, 1863), *Culladia hastiferalis* (Walker, 1866), *C. evae* Bleszynski, 1970, *C. suffusella* Hampson, 1896, *Calamotropha atkinsoni* Zeller, 1863, *C. obliterans* (Walker, 1863), *C. unicolorellus* (Zeller, 1863), *Eschata chrysargyria* (Walker, 1865), and *Euchromius micralis* (Hampson, 1919; Błeszynski, 1961; Bleszynski, 1970a, 1970b, 1970c; https://www.cabi.org/isc/datasheet/12855).

The 145 species described with Philippines as type locality (Nuss et al., 2003–2023) suggest a large proportion of endemics still awaiting description. Here, an integrative approach is used: the material was sorted using morphology first, and the mitochondrial cytochrome oxidase subunit I 5' region (DNA barcode COI-5P) was subsequently amplified and sequenced for a subsample of the morphospecies. Thirty-two species are newly described here, and seven species are reported from the Philippines for the first time. Discrepancy between the morphology and DNA barcodes suggest several cases of cryptic geographical lineages.

Material & Methods

Morphological investigations

The material from the Philippine islands stored at the Museum für Naturkunde was sorted into morphospecies based on the wing pattern, followed by examination of male and female genitalia. Images of the specimens were taken with a Sony 7R camera with MP-E 65 mm lens equipped with a Stackshot system operated by Capture 1 software (version 21) controlling a motorized platform; stacking was achieved using montages of 30-45 shots using Helicon Focus software (version 8.2.2). The genitalia were mounted following Robinson (1976). Photographs of genitalia were taken with a Nikon Eclipse 90i at the Senckenberg Museum für Tierkunde, Dresden. In some cases, genitalia were directly drawn from the original publications using Adobe Illustrator CS6. Measurements were undertaken using ImageJ (Schneider et al., 2012). Morphological characters were listed and scored in Mesquite (Maddison & Maddison, 2017).

Institution acronyms

The investigated material is stored in the following institutions, with the acronym in use between brackets: Museum für Naturkunde, Leibniz-Institut für Biodiversitäts- und Evolutionsforschung, Berlin (MfN); Senckenberg Mu-

seum für Tierkunde, Dresden (MTD); National History Museum, London (NHMUK); Philippines National Museum (PNM); State Museum of Natural History Stuttgart (SMNS).

Molecular data generation

For each morphospecies, at least one specimen from each locality was considered for DNA barcoding. Abdomens were removed and placed into a 96-well plate and placed for lysis overnight at 37°. The lysis product was pipetted onto a new plate and DNA was extracted from the 96-well plates on the QIAcube HT/QIAxtractor at the Museum für Naturkunde. Few additional samples were extracted using the NucleoSpin Tissue kit (Macherey-Nagel, Düren, Germany) following the manufacturer's protocol. Two protocols were followed for the PCR and sequencing. In the first Sanger-based protocol applied to the first four plates (MFNLEP-PYRALPHIL01, MFNLEP-PYRALPHIL07 to 09), the COI barcode was amplified in two parts referred to as COI fragment 1a and 1b using the pairs of primers LCO (GGTCAACAAATCATAAAGATATTGG) and K699 (WGGGGGGTAAACTGTTCATCC) for COI1a and primers COI_f220 (CCYGAYATAGCYTTYCCMCGAA) and Nadia (CCRAARAATCAAAATARRTGTTG) for COI1b. PCR-mix consisted of 17.8 µl ddH2O, 2.5 µl 10× Puffer, 1 µl Mg (25 mM), 0.5 µl dNTP Mix, 0.5 µl of each primer, 0.2 µl of Taq polymerase (New England Biolabs, Ipswich, USA), and 2 µl of the DNA sample, totalling a volume of 25 µl. PCR program was that of Léger et al. (2020). PCR product cleaning and sequencing were performed by MACROGEN (Netherlands). For the plates MFNLEP-PYRALPHIL10 and MFNLEP-PYRALPHIL11, the last 313bp of the COI barcode (referred to as "minibarcode") was amplified on plates using a combination of primers 5'-GGWACWGGWTGAACWGTWTAYCCYCC-3' and 5'-TANACYTCNGGRTGNCCRAARAAYCA-3' from Geller et al. (2013) bearing 13 bp tags at the 5' end. PCR reaction mix consisted of 7 µl Mastermix (CWBIO 2xTaq MasterMix, CW0682), 1 µl bovine serum albumin (1 mg/ml), 1 µl of each primer (10 µM) and 4 µl of the DNA voucher, totalling a volume of 14 µl. PCR program consisted of an initial denaturation step at 95 °C (5 min), followed by 35 cycles of denaturation at 94 °C (1 min), annealing at 45 °C (30 sec) and extension at 72 °C (1 min), succeeded by final extension of 72 °C (5 min). PCR amplification success was checked by analyzing a subset of the amplicons on gel. Pooling of the amplicons, library preparation and sequencing with the Oxford Nanopore Technology (ONT) MinION follow the methods described in Srivathsan et al. (2021).

Data analyses

Sequence processing was done with Geneious Prime 2021.1.1 (https://www.geneious.com). Primers were automatically trimmed and ambiguous bases were corrected using the "Find heterozygotes" plug-in with 80% peak similarity and peak detection height of 20%. Amplicons were assembled into the final consensus sequences after alignment against a reference COI sequence. Sequences were blasted on BOLD and removed from the final dataset if bringing incongruent results. Phylogenetic analyses were performed on RAxML (Stamatakis, 2006), with Rapid Bootstrap Search stopped after 400 replicates. P-distances were used here as advised in Srivathsan & Meier (2012). They were calculated with the dist.dna function of the R-package *ape* 5.6 (Paradis et al., 2019), and maximum intraspecific distances were retrieved using the maxInDist function of the R-package *spider* 1.5.0 (S. D. Brown et al., 2012). Haplotype networks were calculated under PopArt (http://popart.otago.ac.nz) using Median-joining networks (Bandelt et al., 1999). Additional sequences were retrieved from the Barcoding of Life Database (BOLD).

The distance-based method ASAP (Puillandre et al., 2021) was used in order to delineate Molecular Operational Taxonomic Units ("MOTU") in the dataset. A detrimental effect was observed when short, non-compliant DNA barcode sequences (< 487 bp) were included together with full-length DNA barcodes in the ASAP analysis. Similar behaviour was observed using the method ABGD (Puillandre et al., 2012) in an earlier work (Léger et al., 2020). Here, the algorithm would merge all clusters containing non-compliant DNA barcodes. Other DNA barcode compliant sequences were grouped into clusters matching estimates from morphology and ML analysis. The ASAP calculation was performed on the 313 bp COI1b fragment of the DNA barcode region. P-distances were used for the ASAP calculation. The match-ratio between morphospecies and MOTUs was calculated following the formula of Ahrens et al. (2016): match ratio = 2∗N match /(N MOTUs + N morph).

Distribution map and collecting intensity heatmap were generated with ggmap v. 3.0.1 (Kahle & Wickham, 2013).

Systematics and data treatment

An integrative workflow was followed; each molecular operational taxonomic unit (MOTU) was investigated for morphological diagnostic characters. Species with an unambiguous diagnosis and at least one male specimen available were subsequently considered for description. An exception was made for the genus *Microchilo* where two species were described from females because the separation from the other species on the wing pattern was straightforward. All the material investigated is reported on Supplementary Table S1 deposited on Dryad under the permanent link: https://doi.org/10.5061/dryad.b8gtht7mh. To save space, only the last six unique characters of the specimen identifiers are reported in the main text for the paratypes, the universal prefix "coll.mfn-berlin.de_u_" being omitted. Type specimens and genitalia slides of type specimens of South-East Asian species of Scopariinae were photographed during a stay at the Natural History Museum, London (NHMUK).

Results

Molecular work

Of the 491 specimens used for molecular work, 435 yielded partial or complete DNA barcode sequences (success rate =

88%). In 93 specimens, only partial DNA barcode was amplified and sequenced.

Species delimitation

The ASAP analysis of the COI1b fragment alignment included all but one morphospecies (*Scoparia aenea* **sp. n.**), for which the second COI fragment could not be sequenced. The best partitioning scheme yielded 76 subsets with a threshold distance of 0.047311 (asap-score = 2.00; P-val=6.60*e^{-03}). However, this partitioning merged several morphologically distinct species. The second-best partitioning model recognized 98 MOTUs with a threshold of 0.027199 (asap-score = 5.00; P-val=6.16*e^{-02}). This partition was hence adopted for further investigations. A perfect match between MOTU and morphospecies was observed in 38 of the 65 morphospecies (58%), while 19 were split in two or more MOTUs (29%). This translates into a match ratio of 0.47 as defined in Ahrens et al. (2016). In fifteen of the morphospecies, at least one MOTU was represented exclusively by female specimens which could not be separated morphologically from conspecific females. Three cases of shared MOTUs were observed: One MOTU was shared between *Scoparia noacki* Nuss, 2002 and *Scoparia bicornuta* **sp. n.**; one MOTU with *Glaucocharis kabundukanis* **sp. n.**, *G. hamulus* **sp. n.**, *Glaucocharis* cf. *clytia,* and one undescribed, distinct female of *Glaucocharis*; and one MOTU with *Glaucocharis kayumanggi* **sp. n.**, *G. negrosensis* **sp. n.**, and *G. sungay* **sp. n**.

Systematics

SCOPARIINAE Guenée, 1854

Type genus: *Scoparia* Haworth, 1811
= Eudoraeina Selys-Longchamps, 1844: 20

Scoparia Haworth, 1811

Scoparia Haworth, 1811. **Type species**: *Tinea pyralella* Denis & Schiffermüller, 1775.

= *Caradjaina* P. Leraut, 1986: 123–124. Type species: *Scoparia ambigualis kwangtungialis* Caradja, 1925. Léger et al., 2019, p. 761 (syn.)

= *Cholius* Guenée, 1845: 332. Type species: *Pyralis ochrealis* Denis & Schiffermüller, 1775. Léger et al., 2019, p. 761 (syn.)

= *Epileucia* Stephens, 1852: 5

= *Eudorea* J. Curtis, 1827: folio 170. Type species: *Tinea pyralella* Denis & Schiffermüller, 1775.

= *Eudoria* Chapman, 1912: 507

= *Eudoroea* Bruand, 1851: 26

= *Phegea* Gistel, 1848: ix

= *Scopea* Haworth, 1828: 590

= *Sineudonia* P. Leraut, 1986: 128. Type species: *Sineudonia brunnea* Leraut, 1986. W. Li et al., 2010, pp. 3–4, 12–13 (syn.)

= *Tetraprosopus* Butler, 1882: 97. Type species: *Tetraprosopus meyrickii* Butler, 1882. Munroe 1972: 29 (syn.)

= *Xeroscopa* Meyrick, 1884: 349. Type species: *Scoparia ejuncida* Knaggs, 1867. Meyrick 1899: 246 (syn.)

DIAGNOSIS

Descriptions of *Scoparia* are provided in Nuss (1999) and Li, Li & Nuss (2010). In male genitalia, the well-developed sacculus with a free distal process is apomorphic for the genus and separates it from other scopariine genera (Léger et al., 2019; W. Li et al., 2010). Male genitalia further show the following characters: uncus usually narrowly triangular or ovate; gnathos with slender projection; valva ovate; juxta usually ovate; phallus varying in length and diameter; and vesica of most species with one or several cornuti (W. Li et al., 2010; Nuss, 1998; pers. obs.). In female genitalia, the presence of an appendix bursae is apomorphic for *Eudonia* + *Scoparia* (Léger et al., 2019). From *Eudonia*, it is separated by anterior and posterior apophyses usually being shorter (1-3 X tergite VIII length), the shorter intersegmental membrane VIII-IX (usually less than 2 X tergite VIII length), and the conspicuously shorter colliculum and ductus bursae.

DISTRIBUTION

Distributed on all continents and many oceanic islands, except on Antarctica. The genus is lacking in tropical lowlands (Nuss et al., 2003–2023). At least fourteen species are found in the Philippines: *Scoparia abo* **sp. n.**, *Scoparia aenea* **sp. n.**, *Scoparia bicornuta* **sp. n.**, *Scoparia fulvida* **sp. n.**, *Scoparia ifugaoensis* **sp. n.**, *Scoparia luzonensis* **sp. n.**, *Scoparia masiita* **sp. n.**, *Scoparia meyi* Nuss, 1998, *Scoparia monticola* Nuss, 1998, *Scoparia negrosensis* **sp. n.**, *Scoparia noacki* Nuss, 2002, *Scoparia philippinensis* (Hampson, 1917), *Scoparia spadix* Nuss, 1998, and *Scoparia tenuispina* **sp. n.**

PHYLOGENETIC RELATIONSHIPS

Scoparia is sister to the species-rich genus *Eudonia* (Léger et al., 2019).

Scoparia meyi Nuss, 1998

Figs. 02, 58, 120.

Scoparia meyi Nuss, 1998, pp. 492–494, figs. 4, 13–16, 25.

MATERIAL

Holotype: ♂ (specimen identifier coll.mfn-berlin.de_u_9114be, genitalia on slide GU 750 prep. Nuss 1996). PHILIPPINES: Mindanao, Mt Agtuuganon, 1050 m, 28.v-7.vi.1996, leg. Mey.

Paratypes: 5 ♂ (specimen identifiers MTD11416, coll.mfn-berlin.de_u_9cf218, 3a5d91, 4dd260, faeb8a), 1 unsexed (detailed information in Table S1; https://doi.org/10.5061/dryad.b8gtht7mh).

Other specimens examined: 11 ♂, 4 ♀ (detailed information in Table S1; https://doi.org/10.5061/dryad.b8gtht7mh).

SIMILAR SPECIES

Scoparia tenuispina **sp. n.**

DIAGNOSIS

The predominantly white color of the forewing (Fig. 02) separates this species from the other *Scoparia* species of the Philippines except *Scoparia tenuispina* **sp. n.** The latter species has larger forewings lacking the antemedian discoidal and cubital black blotches observed in *S. meyi*. In male genitalia (Fig. 58), the absent or strongly reduced uncus is unique to this species. The slender, elongate juxta and the group of about 30 large cornuti (150 µm) constitute additional characters to identify this species. In female genitalia (Fig. 120), the antrum is funnel-shaped, the ductus bursae is very short and is sclerotized at corpus opening. In the corpus bursae, the numerous conspicuous spines increasing in length towards corpus opening are unique to this species.

DISTRIBUTION

PHILIPPINES: Luzon (Laguna, Mountain Province, Nueva Vizcaya), Mindanao (Davao oriental), Mindoro (Occidental Mindoro). Collected at altitudes between 815 and 1650 m.

DNA BARCODING

Specimens from Luzon, Mindoro, and Negros were recovered in a different MOTU than the one including specimens from Mindanao in the species delimitation analysis. A maximum intraspecific p-distance of 3.1% is found between samples MFNLEP-PYRALPHIL07-G01 from Luzon Nueva and MFNLEP-PYRALPHIL09-B04 from Mindanao Davao.

REMARKS

The species is newly recorded from Luzon and Mindoro.

Scoparia monticola Nuss, 1998

Figs. 03, 59, 121.

Scoparia monticola Nuss, 1998, pp. 486–467, figs. 1, 2, 9–10, 24.

Type locality: Philippines, Mindanao, Mt Agtuuganon, 1050 m.

MATERIAL

Holotype: ♂ (specimen identifier coll.mfn-berlin.de_u_1cbd79). PHILIPPINES: Mindanao, Mt Agtuuganon, 1050 m, 28.v-7.vi.1996, (W. Mey).

Paratypes: 7 ♂ (specimen identifiers coll.mfn-berlin.de_u_3b82f9, 93e28f, 3e27b1, 3c37a7, 65f297, 8160cf), 6 ♀ (specimen identifiers coll.mfn-berlin.de_u_41c7ec, 52c1ca, 854cb9, ed1647, 983640, e3a965), 1 unsexed (detailed information in Table S1; https://doi.org/10.5061/dryad.b8gtht7mh)

Other specimens examined: 7 ♂, 3 ♀, 4 unsexed (detailed information in Table S1; https://doi.org/10.5061/dryad.b8gtht7mh)

DIAGNOSIS

This species (Fig. 03) is best separated by examination of the genitalia. In male genitalia (Fig. 59), the single, large, straight cornutus on the vesica separates this species from other *Scoparia* of the Philippines. In female genitalia (Fig. 121), the colliculum lacks a sclerotized tube-like ring, the ductus bursae is very long, and the corpus bursae bears a narrow elongate signum.

DISTRIBUTION

CHINA: Jiangxi (W. Li & Liu, 2013); INDONESIA: Sumatra; PHILIPPINES: Luzon (Laguna, Mountain Province), Leyte, Mindanao (Davao oriental), Mindoro. Collected at altitudes between 650 and 1650 m.

DNA BARCODING

Specimens from Luzon differ from those of Mindanao by a p-distance of 1.6-2.4%. Within Luzon, a p-distance of 1.5% is observed between specimens from Mount Makiling and the specimen from the Cordillera mountain range. A maximum intraspecific p-distance of 3.6% is found between samples MFNLEP-PYRALPHIL09-G02 from Mindoro Oriental and PYRG590-11 from Sumatra.

REMARKS

The species is recorded here for the first time from the islands of Luzon, Leyte, and Mindoro.

Scoparia philippinensis (Hampson, 1917)

Figs. 04, 60, 122.

Microglossa [sic] *philippinensis* Hampson, 1917: 279–280.

Type locality: Philippines, Negros island.

Scoparia philippinensis Sasaki, 1998, p. 193

Scoparia philippinensis Nuss, 1998, pp. 488–489

MATERIAL

Lectotype: ♂ (genitalia on slide PyralidaeNHMUK Slide N° 3590). “Negros I.| 6000 ft. Philippines 1896 | Whitehead,” “1909-42” (NHMUK). Lectotype designated by M. Nuss.

Paralectotypes: 5 unsexed, same data (NHMUK). Nuss mentions that one of them is not conspecific (Nuss, 1998, p. 489).

Other specimens examined: 10 ♂, 24 ♀, 35 unsexed (detailed information in Table S1; https://doi.org/10.5061/dryad.b8gtht7mh).

DIAGNOSIS

In male genitalia (Fig. 60), the long uncus, the straight, tubular gnathos as well as the patch of minute cornuti on the vesica separate this species from its congeners. The female genitalia (Fig. 122) has a flattened ductus bursae, straight on basal half, with a short loop at midlength, distally wrinkled.

REDESCRIPTION

HABITUS (FIG. 04)

Forewing length 6-8 mm in males (n = 5), 6-9 mm in females (n = 17), ground color greyish white, basal area scattered with white and brown scales. Antemedian dark brown band running from basal ¼ of costa to middle of dorsum;

basal edge well-marked, wavy; distal edge fuzzy. Median area marked with white scales. Distal discoidal stigma dark brown. Postmedian and subterminal white lines forming an X. Margin greyish white. Fringes chequered white and grey. Hindwing dirty white.

MALE GENITALIA (FIG. 60)

Uncus ¾ X tegumen arm length, distal half ventrally densely setose, apex pointed. Gnathos projection about 2/3 of uncus length, straight, tubular, with apex pointing downwards. Valva dorsal margin convex, sclerotized, ventral process marked, apex rounded. Juxta base rounded, apex conspicuously indented. Vesica with a group of about 30 tiny cornuti.

FEMALE GENITALIA (FIG. 122)

Antrum forming a pouch covered with tiny sclerotized spicules. Colliculum about 4.5 X length of tergite VIII, flattened. Ductus bursae as long as colliculum, straight, with one tight loop shortly after colliculum junction, slightly enlarged in distal half before corpus opening. Corpus bursae globular, one half densely covered with spines, the other one reticulate, with one large sclerotized patch.

DISTRIBUTION

PHILIPPINES: Luzon (Benguet, Ifugao, Mountain Province), Mindanao (Davao Oriental), Mindoro (Oriental Mindoro), Negros. Collected at altitudes between 1300 and 2350 m.

DNA BARCODING

The species delimitation analysis recovered six different MOTUs within specimens of *S. philippinensis* from Luzon (Ifugao, Mountain Province), Negros (one MOTU each), as well as Mindanao and Mindoro (two MOTUs each). Three MOTUs were represented by females only. A maximum intraspecific p-distance of 9.3% is found between samples MFNLEP-PYRALPHIL07-A06 from Mindoro and MFNLEP1179 from Negros.

REMARKS

In Sasaki (1998), male genitalia of *S. philippinensis* is represented with a glabrous vesica. However, inspection of the genitalia slide from the holotype confirms the presence of the patch of minute cornuti on the vesica.

Scoparia luzonensis Léger, sp. n.

https://zoobank.org/9F5D3C71-24CE-4FDB-AB32-1FCD944FE442
Figs. 05, 61, 123.

MATERIAL

Holotype: ♂ (specimen identifier coll.mfn-berlin.de_u_be7bb, DNA voucher MFNLEP-PYRALPHIL01-E09, genitalia on slide TL979♂; BOLD sample ID PYPHI043-21, Genbank Accession Number PP196733). PHILIPPINES: Luzon, Ifugao, Mount Polis, 2000 m, 13/11/1997 (K. Ebert, W. Mey, M. Nuss). Deposited in MfN.

Paratypes: 19 ♂ (specimen identifiers MfN: coll.mfn-berlin.de_u_1f5a2a, f2427, ccf84f, 399d98, 2123f8, 48e851, 2664cd, 392215, 6db250, 70088d, be444f, d1b364, 45b21f, 49ebf8, e7bbc5; PNM: id.bioseasia.org_u_02359a, 023599; NHMUK: NHMUK013706263, NHMUK013706264), 8 ♀ (specimen identifiers MfN: coll.mfn-berlin.de_u_3b7485, 3de18e, 4ceba8, 777de6, b8659d, d4c409; PNM: id.bioseasia.org_u_0235a4, 0235a3) (detailed information in Table S1; https://doi.org/10.5061/dryad.b8gtht7mh).

Other material: 4 unsexed (detailed information in Table S1; https://doi.org/10.5061/dryad.b8gtht7mh).

DIAGNOSIS

Scoparia luzonensis **sp. n.** is best identified by examination of the genitalia: the long and slender uncus with narrow spatulate apex as well as the row of tiny cornuti on the vesica in male genitalia (Fig. 61) and the pouch at base of ductus bursae in female genitalia (Fig. 123) are unique to this species.

HABITUS (FIG. 05)

Forewing length 5.5-6.0 mm (males, n = 2), 5.5-6.5 mm (females, n = 6); relatively narrow, ground color black, markings white. Basal area sprinkled with white scales. Antemedian line white, running from costal 1/5 to dorsum 1/3, broadly arched. Median discoidal spot X-shaped, forming with cubital and dorsal markings with ill-defined white patch; distally with two marked blotches. Postmedian and subterminal lines meeting near costa, forming X-shaped pattern. Margin with 6-7 white spots. Fringe dirty white, with thin dark brown line medially. Hindwing dirty white.

MALE GENITALIA (FIG. 61)

Uncus 1.6 X tegumen arm length, narrowing in basal half, slender on distal half, laterally setose, apex spatulate. Gnathos projection ca ¾ X uncus length, dorso-apically with small teeth, apex tip pointing downwards. Valva dorsal margin convex, sclerotized; ventral process marked; apex rounded. Juxta with rounded base, apex conspicuously indented. Vesica with about 14 tiny cornuti displayed in a row, with a group of three cornuti apart.

FEMALE GENITALIA (FIG. 123)

Antrum membranous. Colliculum 3.5 X length of tergite VIII, lightly sclerotized. Ductus bursae 9-10 X length of tergite VIII, forming at base a membranous pouch, sinuate, narrow, enlarging towards corpus opening on distal ¼. Corpus bursae globular. Signum absent.

DISTRIBUTION

PHILIPPINES: Luzon (Ifugao, Laguna, Mountain Province), Mindoro. Collected at altitudes between 650 and 2100 m

DNA BARCODING

The specimen with identifier coll.mfn-berlin.de_u_2123f8 from Mount Banahaw differs from the other specimens of

North Luzon by 1.9-2.5%. This male specimen shows slight differences on the vesica: a subgroup of cornuti is observed in the specimen from the Laguna. A maximum intraspecific p-distance of 3.2% is found between samples MFNLEP-PYRALPHIL01-E09 from Luzon (Ifugao) and MFNLEP-PYRALPHIL01-H08 from Mindoro.

ETYMOLOGY

Referring to Luzon, where the species is predominantly encountered.

Scoparia abo Léger, sp. n.

https://zoobank.org/C2EA5E50-7EDC-40B9-8A3E-B62837FDC5C0
Figs. 06, 62.

MATERIAL

Holotype: ♂ (DNA voucher MFNLEP1178, genitalia on slide TL1487♂; BOLD sample ID PYPHI090-21, Genbank Accession Number PP196776). PHILIPPINES: Negros, Mt Talinis, shore of lake Nailig, 9.247706° N, 123.174851° E, 1580 m, 10-11.08.2012 (collector unknown). Deposited in SMNS.

SIMILAR SPECIES

Scoparia philippinensis (Hampson, 1917).

DIAGNOSIS

The grey forewing with the marked postmedian white X-shaped pattern is similar to that of *S. philippinensis*. In male genitalia, the two long, slender cornuti allow to separate this species from other *Scoparia* from the Philippines. No female specimen could confidently be assigned to this species.

HABITUS (FIG. 06)

Forewing length 6.5 mm (n = 1), ground color dark brown. Base white. Two antemedian white lines originating from costal 1/5, one running down to dorsum 1/5, the other one running down to dorsum 1/3. Large median transverse white patch. Postmedian line white, forming marked X-shaped pattern with median and subterminal markings. Subterminal area with marked patch near apex and tornus. Margin white. Fringes chequered white and light brown.

MALE GENITALIA (FIG. 62)

Uncus 3/4 X tegumen arm length, triangular, laterally setose, apex pointed. Gnathos projection about 4/3 of uncus length, slender, with tip pointing downwards. Valva dorsal margin slightly convex, ventral process marked, apex rounded. Vesica with two large cornuti of 430 µm.

FEMALE GENITALIA

Unknown.

DISTRIBUTION

PHILIPPINES: Mindanao (Davao Oriental: Mt Agtuuganon). Collected at an altitude of 1050 m.

DNA BARCODING

Three MOTUs for *Scoparia abo* were identified in the species delimitation analysis for Mindanao, Mindoro, and Negros. The MOTU from Mindoro, which includes specimens superficially resembling *S. abo* **sp. n.**, is represented by one single female. The maximum intraspecific p-distance of 7.6% is found between samples MFNLEP-PYRALPHIL07-C01 from Mindanao (Davao Oriental) and the two specimens from Negros.

ETYMOLOGY

From the Tagalog “abo,” ash, referring to the color of the forewings.

REMARKS

Female specimen with identifier coll.mfn-berlin.de_u_822d89 from Mindoro looks very similar in wing pattern. Examination of male specimens from this locality is needed in order to confirm whether this haplotype is conspecific or not.

Scoparia masiita Léger, sp. n.

https://zoobank.org/DF360063-8168-4821-97A0-367925843EA6
Figs. 07, 63, 124.

MATERIAL

Holotype: ♂ (specimen identifier coll.mfn-berlin.de_u_dfb222, DNA voucher MFNLEP-PYRALPHIL07-B05, genitalia on slide TL1039♂; BOLD sample ID PYPHI082-21, Genbank Accession Number PP196823). PHILIPPINES: Panay, Antique, San Reminigio, Aningalan, 09-10.04.1995 (W. Mey). Deposited in MfN.

Paratypes: 2 ♀ (specimen identifiers coll.mfn-berlin.de_u_c39589, cdeb6d) (detailed information in Table S1; https://doi.org/10.5061/dryad.b8gtht7mh).

DIAGNOSIS

Scoparia masiita **sp. n.** exhibits slender forewings devoid of any conspicuous markings (Fig. 07). In male genitalia (Fig. 63), the strongly protruding ventral process of the valva as well as the six cornuti of increasing length separates this species from its congeners. In female genitalia (Fig. 125), the pouch covered with sclerotized teeth at the base of ductus bursae is unique to this species.

HABITUS (FIG. 07)

Forewing length 5-7 mm (n = 3); ground color dark brown, markings dirty white. Antemedian area white, scattered with few brown scales. Median area with broad transverse band running from costal half to dorsal 3/4. Postmedian area with two white bands crossing in the middle, forming

a broad X-shaped pattern. Subterminal area with subtriangular patch medially. Margin dirty white, basal edge dentate. Fringe chequered dirty white and dark brown. Hindwing dirty white.

MALE GENITALIA (FIG. 63)

Uncus about 2/3 of tegumen arm length, triangular, laterally and apically setose, apex pointed. Gnathos projection about 5/6 of uncus length, slender, with tip pointing downwards. Valva dorsal margin conspicuously convex, ventral margin straight, with ventral process reaching valva apex posteriorly, valva apex conspicuously rounded. Juxta short, base rounded, apex broad, truncate. Phallus slightly curved. Vesica with six cornuti of increasing length from 50 to 200 µm.

FEMALE GENITALIA (FIG. 124)

Antrum elongate, membranous. Colliculum lightly sclerotized, flattened. Ductus bursae bent at base, forming a pouch covered with small sclerotized spines on basal 1/4, medially narrow, distally enlarging towards corpus opening. Corpus bursae small, globular, barely delimited from corpus. Signum forming one large sclerotized patch.

DISTRIBUTION

PHILIPPINES: Luzon (Benguet), Panay (Antique). Collected at altitudes between 800 and 2350 m.

DNA BARCODING

A maximum intraspecific p-distance of 0.7% is found between samples MFNLEP-PYRALPHIL01-A02 and MFNLEP-PYRALPHIL07-A01, both from Benguet, Luzon.

ETYMOLOGY

From the Ilonggo *masiit*, "spiny," referring to the six cornuti observed on the vesica as well as the spines found in the ductus pouch.

Scoparia tenuispina Léger, sp. n.

https://zoobank.org/48745E1F-0313-4724-9724-0D1A5A95E1C1
Figs. 08, 64.

MATERIAL

Holotype: ♂ (specimen identifier coll.mfn-berlin.de_u_8d160d, DNA voucher MFNLEP-PYRALPHIL07-G04, genitalia on slide TL1037♂; BOLD sample ID PYPHI138-21, Genbank Accession Number PP196823). PHILIPPINES: Mindanao, Mount Agtuuganon, 1050 m, 28.05-07.06.1996 (W. Mey). Deposited in MfN.

Paratypes: 2 ♂ (specimen identifiers coll.mfn-berlin.de_u_3d2f97, a471a9), 1 specimen with sex unknown (specimen identifier coll.mfn-berlin.de_u_9a94b7) (detailed information in Table S1; https://doi.org/10.5061/dryad.b8gtht7mh).

DIAGNOSIS

The short and large white forewings with dark brown markings (Fig. 08) separate this species from other Scopariinae from the Philippines. In male genitalia (Fig. 64), the duck-beak shaped apex of the uncus, the slender valva, and the thin tubular cornutus on the vesica easily separates this species from its congeners. No female specimen could confidently be assigned to this species.

HABITUS (FIG. 08)

Forewing length 5 mm (n = 2), rather large (width = 0.45 X length), white, sprinkled with dark brown scales, markings dark brown. Base dark brown. Antemedian line running from costal 1/4 to dorsal half, curved outwards, basally well-delimited. Median area with one costal subquadriangular and one discoidal X-shaped patch. Postmedian line white, edged with dark brown, running from costal 3/4 to 5/6 of dorsum, arch-shaped. Subterminal area dark brown, distally with three white patches on costal half; one large subquadriangular white spot between CuA1-CuA2. Marginal band white, well-marked, distally with 6-7 dark brown spots. Fringes dirty white. Hindwing white.

MALE GENITALIA (FIG. 65)

Uncus 5/4 X tegumen arm length, medially narrowed, apex broad, duck-beak shaped. Gnathos projection 4/5 X uncus length, slender, with apical tip pointing downwards. Valva slender, narrow on basal 1/4, dorsal margin slightly convex, apex rounded; ventral process marked, slightly protruding downwards. Juxta diamond-shaped, with base slightly indented. Phallus straight. Vesica with one thin tubular cornutus with rounded tip.

FEMALE GENITALIA

Unknown.

DISTRIBUTION

PHILIPPINES: Mindanao (Davao oriental: Mount Agtuuganon). Collected at an altitude of 1050 m.

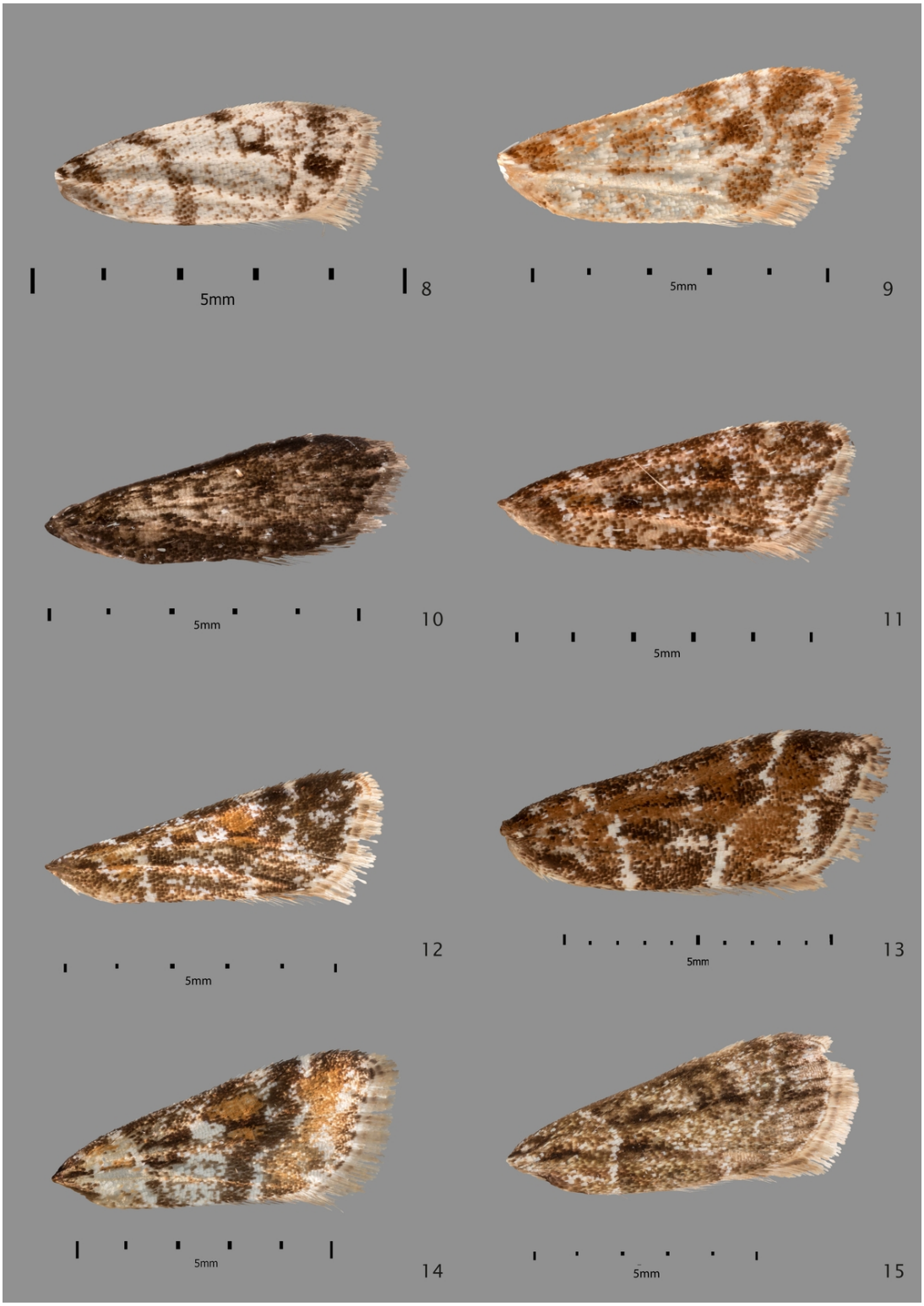
DNA BARCODING

The species delimitation analysis recovered three different MOTUs from Luzon (Camarines Sur, Mountain Province), Leyte and Mindanao (one MOTU each). Unfortunately, the MOTU from Luzon contains only one female, precluding direct comparison with the MOTU from Mindanao (three males). The abdomen of the specimen from Leyte was lost in the DNA extraction. Hence only specimens from Mindanao are confidently assigned to this species.

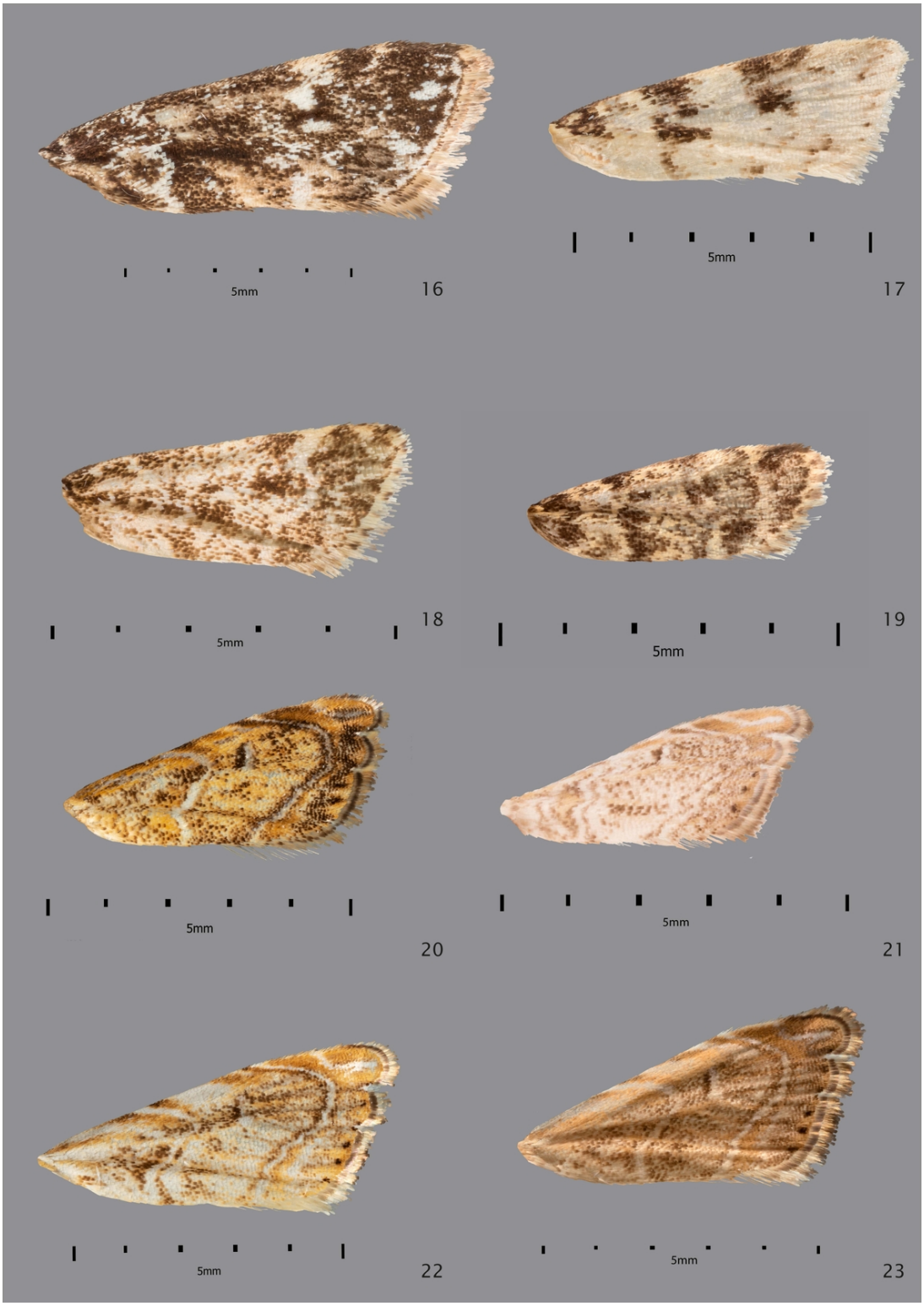
ETYMOLOGY

The name originates from the Latin *tenuis, e*: narrow, slender and *spina, ae*: spine, referring to the thin cornutus on the vesica.

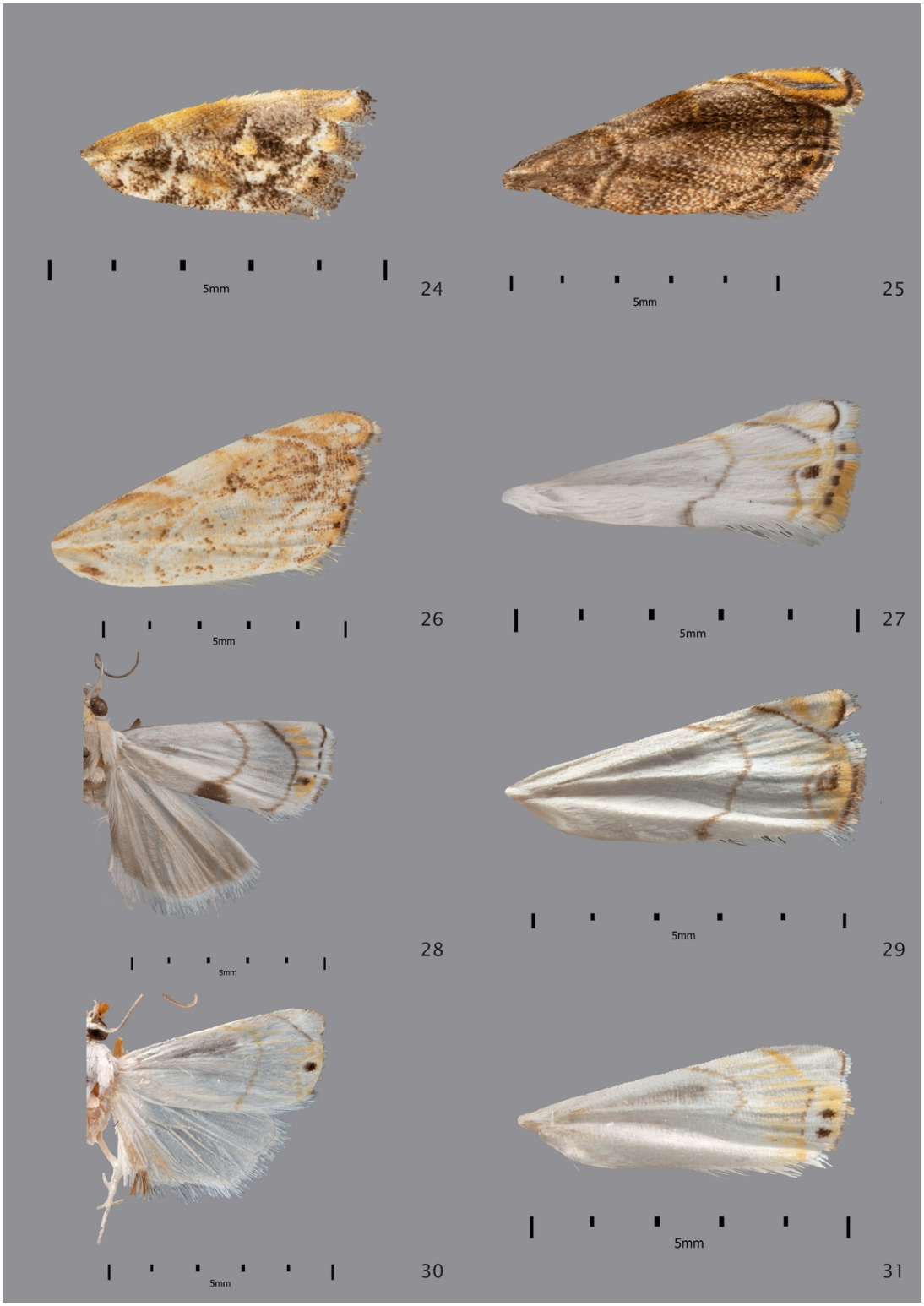
Figs 01-07. Wings of *Scoparia* species. 01*. Scoparia spadix* Nuss, 1998, ♂, holotype, specimen coll.mfn-berlin.de_u_dbcbce, right half. Fig. 02. *Scoparia meyi* Nuss, 1998, specimen coll.mfn-berlin.de_u_3a25b5, ♂, right wing. Fig. 03. *Scoparia monticola* Nuss, 1998, ♂, paratype, specimen coll.mfn-berlin.de_u_3c37a7, right wing. Fig. 04. *Scoparia philippinensis* (Hampson, 1917), ♀, specimen coll.mfn-berlin.de_u_2c9686, right wing. Fig. 05. *Scoparia luzonensis* **sp. n.**, ♀, paratype, specimen coll.mfn-berlin.de_u_9b56e6, right wing. Fig. 06. *Scoparia abo* **sp. n.**, specimen coll.mfn-berlin.de_u_f2eda9, right wing. Fig. 07. *Scoparia masiita* **sp. n.**, ♀, paratype, specimen coll.mfn-berlin.de_u_c39589, right wing.



Figs 08-15. Forewings of *Scoparia* and *Eudonia* species. Fig. 08. *Scoparia tenuispina* **sp. n.**, ♂, paratype, specimen coll.mfn-berlin.de_u_3d2f97, right wing. Fig. 09. *Scoparia fulvida* **sp. n.**, ♂, holotype, specimen coll.mfn-berlin.de_u_260fad, right wing. Fig. 10. *Scoparia noacki* Nuss, 2002, ♀, paratype, specimen MTD11431, left wing (mirrored). Fig. 11. *Scoparia bicornuta* **sp. n.**, ♀, specimen coll.mfn-berlin.de_u_f62195, right wing. Fig. 12. *Scoparia ifugaoensis* **sp. n.**, ♀, paratype, specimen coll.mfn-berlin.de_u_e117ac, left wing (mirrored). Fig. 13. *Scoparia negrosensis* **sp. n.**, ♀, holotype, specimen with DNA voucher MFNLEP1169, left wing (mirrored). Fig. 14. *Scoparia aenea* **sp. n.**, ♀, holotype, specimen coll.mfn-berlin.de_u_b5fc86, left wing (mirrored). Fig. 15. *Eudonia penicula* **sp. n.**, ♀, paratype, specimen coll.mfn-berlin.de_u_7946ab, right wing.



Figs 16-23. Forewings of *Eudonia*, *Micraglossa* and *Glaucocharis* species. Fig. 16. *Eudonia barbipennis* (Hampson, 1897), ♀, specimen coll.mfn-berlin.de_u_a5b998, left wing (mirrored). Fig. 17. *Micraglossa tagalica* Nuss, 1998, specimen coll.mfn-berlin.de_u_103d65, right wing. Fig. 18. *Micraglossa polisensis* **sp. n.**, ♂, holotype, specimen coll.mfn-berlin.de_u_c6cac, right wing. Fig. 19. *Micraglossa kianganensis* **sp. n.**, ♂, holotype, specimen MTD11400, right wing. Fig. 20. *Glaucocharis clytia* (Bleszynski, 1966), ♀, specimen coll.mfn-berlin.de_u_305595, right wing. Fig. 21. *Glaucocharis lathonia* (Bleszynski, 1966), ♀, specimen coll.mfn-berlin.de_u_bad563, right wing. Fig. 22. *Glaucocharis kabundukanis* **sp. n.**, specimen coll.mfn-berlin.de_u_9ba8f0, paratype, right wing. Fig. 23. *Glaucocharis altissima* **sp. n.**, specimen coll.mfn-berlin.de_u_57e7fa, ♂, paratype, right wing.



Figs 24-31. Wings of *Glaucocharis* and *Gargela* species. Fig. 24. *Glaucocharis uncusellus* **sp. n.**, ♀, paratype, specimen coll.mfn-berlin.de_u_343871, right wing. Fig. 25. *Glaucocharis kayumanggi* **sp. n.**, ♀, paratype, specimen coll.mfn-berlin.de_u_bd83a4, right wing, female. Fig. 26. *Glaucocharis kabundukanis* **sp. n.**, ♀, paratype, specimen coll.mfn-berlin.de_u_a83ca0, left wing (mirrored), male. Fig. 27. *Gargela minuta* Song, Chen & Wu, 2009, ♀, specimen coll.mfn-berlin.de_u_3b4d30, right wing. Fig. 28. *Gargela aculea* **sp. n.**, ♀, paratype, specimen coll.mfn-berlin.de_u_613e87, right half. Fig. 29. *Gargela acutibrachium* **sp. n.**, ♂, paratype, specimen coll.mfn-berlin.de_u_9c8b85, right wing. Fig. 30. *Gargela polyacantha* Li, 2019, ♂, specimen coll.mfn-berlin.de_u_97a0ae, left side (mirrored). Fig. 31. *Gargela xanthocasis* (Meyrick, 1897), ♂, specimen coll.mfn-berlin.de_u_fff00c, right wing.

Scoparia fulvida Léger, sp. n.

https://zoobank.org/BD66B868-DB40-48AC-8EF7-ED-BADEB025E9
Figs. 09, 65.

MATERIAL

Holotype: ♂ (specimen identifier coll.mfn-berlin.de_u_260fad, DNA extraction MFNLEP-PYRAL-PHIL07-E01, genitalia preparation TL1013♂ ; BOLD sample ID PYPHI112-21, Genbank Accession Number PP196798). PHILIPPINES: Mindanao, Mount Agtuuganon, 1050 m, 28.05-07.06.1996 (W. Mey). Deposited in MfN.

Paratype: 1 ♂ (specimen identifier coll.mfn-berlin.de_u_58d7a2) (detailed information in Table S1; https://doi.org/10.5061/dryad.b8gtht7mh).

DIAGNOSIS

Scoparia fulvida **sp. n.** displays a light tawny brown forewing ground color with broad white markings (Fig. 09). Examination of the male genitalia (Fig. 65) enables unambiguous identification: the small teeth on apical 1/3 of the gnathos and the dense row of cornuti on phallus are unique to this species. Females are not known.

HABITUS (FIG. 09)

Forewing length 6 mm (n = 1), ground color tawny brown, with white markings. Basal area tawny brown, with two antemedian transverse white bands crossing at midlength, forming X-shaped pattern. Median area basally brown, distally white, median markings absent. Postmedian and subterminal areas predominantly brown. Postmedian line white, well-marked, straight on costal ¼, arched outwards at midlength, incurved inwards near dorsum. Subterminal line white, bent inwardly, forming together with postmedian line a roughly defined X-shaped pattern. Margin with 6-7 marked brown spots. Fringes brownish. Hindwing dirty white, with apex pale brown.

MALE GENITALIA (FIG. 65)

Uncus 5/4 X tegumen arm length, latero-apically setose, apex pointed. Gnathos projection 3/5 X uncus length, roughly straight, apical 1/3 dorsally covered with minute teeth. Valva dorsal margin convex, sclerotized, ventral process marked, valva apex evenly rounded. Juxta base triangular; sclerotization spear-shaped, apex membranous. Vesica with one thick row of about 20 tiny cornuti tightly packed together, with size increasing from 8 to 50 µm.

FEMALE GENITALIA

Unknown.

DISTRIBUTION

PHILIPPINES: Mindanao (Davao oriental: Mount Agtuuganon). Collected at an altitude of 1050 m.

DNA BARCODING

The unique specimen with a DNA barcode branches as sister group to *Scoparia luzonensis* **sp. n.** in the RaxML analysis (BS = 83%).

ETYMOLOGY

The species name is derivated from *fulvidus*, *a*, *um*, "reddish brown," refering to the color of the forewing markings.

Scoparia noacki Nuss, 2002

Figs. 10, 66, 125.

Scoparia noacki Nuss, 2002, figs. 1-5. **Type locality**: Philippines, South Luzon, Los Baños, Mt. Makiling, 14°08' N 121°14' E, 815 m, submontane forest

MATERIAL

Holotype: ♂. PHILIPPINES: South Luzon, Los Baños, Mt. Makiling, 14°08' N 121°14' E, 815 m, submontane forest, at light, 30. Iii. 2000 (M. Nuss). Deposited in MTD.

Paratypes: 10 ♂, 14 ♀ (detailed information in Table S1; https://doi.org/10.5061/dryad.b8gtht7mh).

Other specimens examined: 5 ♂, 3 ♀ (detailed information in Table S1; https://doi.org/10.5061/dryad.b8gtht7mh).

SIMILAR SPECIES

Scoparia bicornuta **sp. n.**

DIAGNOSIS

The short (4.5-5 mm, n = 5), dull brown forewing (Fig. 10) separate *Scoparia noacki* from other *Scoparia* species in the Philippines. The male genitalia of *S. noacki* (Fig. 66) resemble that of *Scoparia ifugaoensis* **sp. n.** and *S. bicornuta* **sp. n.** From the latter, they can be separated by the presence of a single cornutus on the vesica. The female genitalia (Fig. 125) cannot be confidently separated from *Scoparia ifugaoensis* **sp. n.** and *S. bicornuta* **sp. n.** They have a rather short ductus bursae with a narrow loop medially and an egg-shaped corpus bursae with a faintly marked signum.

DISTRIBUTION

PHILIPPINES: Luzon (Laguna: Mount Makiling), Mindanao. Collected at altitudes between 815 and 1050 m.

DNA BARCODING

The species delimitation analysis recovered two MOTUs including *S. noacki*, one for Luzon (Laguna) and one for Mindanao. Examination of male and female genitalia revealed no differences between both populations. Furthermore, the MOTU from Luzon (Laguna) is shared with another closely related species, *S. bicornuta* **sp. n.** from Northern Luzon. The maximum intraspecific p-distance of 4.3% is found between samples from Luzon (Laguna) and those from Mindanao (Davao Oriental).

Scoparia bicornuta Léger, sp. n.

https://zoobank.org/A1CB240B-E577-4C8E-A4B0-B25502A2B202
Figs. 11, 67, 126.

MATERIAL

Holotype: ♂ (specimen identifier coll.mfn-berlin.de_u_932371, DNA voucher MFNLEP-PYRAL-PHIL01-F08, genitalia on slide TL973♂; BOLD sample ID PYPHI052-21, Genbank Accession Number PP196741): PHILIPPINES: Luzon, Mountain Province, Chatol, 2100 m (K. Ebert, W. Mey, M. Nuss). Deposited in MfN.

Paratypes: 1 ♂ (specimen identifier coll.mfn-berlin.de_u_ade9e9), 6 ♀ (specimen identifiers coll.mfn-berlin.de_u_8052f1, 6a8603, 3272b2, 1f46b8, 5c625, d684f0) (detailed information in Table S1; https://doi.org/10.5061/dryad.b8gtht7mh).

Other specimens examined: 1 ♂, 5 ♀, 3 unsexed (detailed information in Table S1; https://doi.org/10.5061/dryad.b8gtht7mh).

SIMILAR SPECIES

Scoparia noacki Nuss, 2002.

DIAGNOSIS

This species is similar to *Scoparia noacki*, with which it shares the same MOTU. It can be separated from *S. noacki* by examination of the habitus: *Scoparia bicornuta* **sp. n.** has greyish forewings with scattered white scales while *S. noacki* has dull brown forewings. In male genitalia, the vesica of *S. bicornuta* **sp. n.** bears two cornuti, while only one cornutus is found in *S. noacki* (7 male specimens examined). Female genitalia are identical to *Scoparia noacki*.

HABITUS (FIG. 11)

Forewing length 6 mm (n = 2), ground color brown, with white markings. Antemedian band speckled with copper scales, edged basally and distally with marked white lines. Median area with scattered white scales; median discoidal stigma dark brown, X-shaped, costally and dorsally abutted with copper scales. Postmedian and subterminal lines white, unevenly marked, together forming X shape. Margin with six marked white spots. Fringes brownish. Hindwing dirty white, with apex pale brown.

MALE GENITALIA (FIG. 67)

As in *S. noacki* except for the vesica that bears two cornuti.

FEMALE GENITALIA (FIG.126)

As in *S. noacki*.

DISTRIBUTION

PHILIPPINES: Luzon (Mountain Province). Collected at altitudes between 2000 and 2100 m.

DNA BARCODING

This species displays a divergence of 0.7-1.0% to *Scoparia noacki* and was recovered with the latter species a single MOTU in the species delimitation analysis.

ETYMOLOGY

From the Latin *bi-*, "two," and *cornutus, a, um*, "bearing horns," refering to the two diagnostic cornuti of the vesica in male genitalia.

Scoparia ifugaoensis Léger, sp. n.

https://zoobank.org/39C22D7E-8279-4E89-8CAD-62744326FF1F
Figs. 12, 68, 127.

MATERIAL

Holotype: ♂ (specimen identifier coll.mfn-berlin.de_u_68e35d, DNA voucher MFNLEP-PYRAL-PHIL07-B03, genitalia on slide TL1026♂; BOLD sample ID PYPHI080-21, Genbank Accession Number PP196766). PHILIPPINES: Luzon, Benguet, Mount Tabayoc, 2350 m, 22-25.11.1997 (K. Ebert, W. Mey, M. Nuss). Deposited in MfN.

Paratypes: 3 ♀ (specimen identifiers coll.mfn-berlin.de_u_e117ac, 543b12, 1bbabf) (detailed information in Table S1; https://doi.org/10.5061/dryad.b8gtht7mh).

SIMILAR SPECIES

Scoparia spadix Nuss, 1998.

DIAGNOSIS

Scoparia ifugaoensis **sp. n.** resembles *Scoparia spadix* but has darker forewings (Fig. 12), while *S. spadix* has scattered copper scales. The male genitalia (Fig. 68) are similar to those of *Scoparia aenea* **sp. n.**, but the three cornuti are of increasing size in *S. ifugaoensis*. The female genitalia (Fig. 127) are similar to those of *Scoparia noacki* (female of *S. spadix* is unknown) and cannot be separated from them with confidence.

HABITUS (FIG. 12)

Forewing length 6 mm (n = 1), ground color dark brown, with snow white and copper markings. Large antemedian band ocher, edged basally and distally with snow white lines. Median area dark brown scattered with snow white scales. Two distal discoidal copper patches, distally abutted with white markings. Postmedian and subterminal lines meeting at midlength, forming "X" shape, white. Margin with 6-7 white spots. Fringe dirty white. Hindwings dirty white.

MALE GENITALIA (FIG. 68)

As in *S. noacki* except for the vesica that bears two small-sized (50 µm) and one medium-sized (90 µm) cornuti.

FEMALE GENITALIA (FIG. 127)

As in *S. noacki*.

DISTRIBUTION

PHILIPPINES: Luzon (Benguet, Ifugao). Collected at altitudes between 2000 and 2350 m.

DNA BARCODING

A maximum intraspecific p-distance of 3.4% is found between specimens MFNLEP-PYRALPHIL07-B03 (Luzon: Benguet) and MFNLEP-PYRALPHIL07-F02 (Luzon: Ifugao). *Scoparia ifugaoensis* **sp. n.** is recovered as sister species to *Scoparia aenea* **sp. n.** in the RAxML tree (BS = 95).

Scoparia spadix Nuss, 1998

Figs. 01, 69.

Scoparia spadix Nuss, 1998, p. 490, figs. 3, 11–12. **Type locality**: Philippines: Mindanao, Mt Agtuuganon, 1050 m.

MATERIAL

Holotype: ♂ (specimen identifier coll.mfn-berlin.de_u_dbcbce, DNA voucher MFNLEP1084, genitalia on slide TL1272M). PHILIPPINES: Mindanao, Mt Agtuuganon, 1050 m, 28.v-7.vi.1996, leg. Mey. Deposited in MfN.

Paratypes: 2 ♂ (specimen identifiers coll.mfn-berlin.de_u_6a6cf9, ce35bd) (detailed information in Table S1; https://doi.org/10.5061/dryad.b8gtht7mh).

Other specimens examined: 7 ♂, 13 ♀ (detailed information in Table S1; https://doi.org/10.5061/dryad.b8gtht7mh).

SIMILAR SPECIES

Scoparia ifugaoensis **sp. n.**

DIAGNOSIS

Scoparia spadix can be separated from its congeners by the ocher antemedian and postmedian bands edged with white, contrasting with the dark brown ground color in the forewing (Fig. 01). *Scoparia spadix* shares with *S. aenea* **sp. n.** the antemedian and postmedian ocher bands but lacks the conspicuous white median diffuse patch observed in *S. aenea* **sp. n.** In male genitalia (Fig. 69), the short triangular uncus and the elongate gnathos curved downwards is also observed in *S. philippinensis*, *S. noacki*, and *S. ifugaoensis* **sp. n.** From these species, *S. spadix* can be recognized by the five elongate curved cornuti on the vesica. Females are unknown.

DISTRIBUTION

INDONESIA: Sumatra. PHILIPPINES: Leyte, Luzon (Mountain Province, Laguna), Mindoro, Mindanao (Davao Oriental). Collected at altitudes between 850 and 2100 m.

DNA BARCODING

The species delimitation analysis recovered five MOTUs for Leyte, Mindoro, and Mindanao. Unfortunately specimens from Leyte and Mindoro were only represented by females and can thus not be confidently identified as belonging to *S. spadix*.

REMARKS

Specimens from Mount Makiling (Laguna) and Mountain Province have a white median band on the forewing that is absent in specimens from Mindanao, the type locality. The male genitalia of specimens from Mt Makiling harbor a vesica with six long, slightly curved cornuti, while specimens from Mindanao show only five long, curvy cornuti (*S. spadix*). The single male specimen from North Luzon (Mountain Province) shows five cornuti of increasing size. Due to the low number of male specimens available from Luzon, I refrain from describing new species here.

Scoparia negrosensis Léger, sp. n.

https://zoobank.org/64E6C7EA-DD2B-4A77-8EB5-C5867E80E1D9
Figs. 13, 70, 128.

MATERIAL

Holotype: ♀ (DNA voucher MFNLEP1169, genitalia on slide TL1481♀; BOLD sample ID PYPHI390-23, Genbank Accession Number PP211050). PHILIPPINES: Negros, Mt Talinis, shore of lake Nailig, 9.247706°N, 123.174851°E, 1580 m, 10-11.08.2012 (collectors unknown). Deposited in SMNS

Paratype: 2 ♂, 2 ♀ (detailed information in Table S1; https://doi.org/10.5061/dryad.b8gtht7mh).

SIMILAR SPECIES

Scoparia aenea **sp. n.**, *Scoparia spadix.*

DIAGNOSIS

Scoparia negrosensis **sp. n.** is superficially similar to *S. aenea* **sp. n.** and *S. spadix* (Fig. 13). In male genitalia (Fig. 70), this species is separated from other species of the *spadix* group by the very long gnathos projection about 2.4 times the length of the uncus and the ten straight cornuti of increasing length on the vesica. Female genitalia (Fig. 128) are virtually identical to those of *Scoparia philippinensis*.

HABITUS (FIG. 13)

Forewing length 7 mm (n = 1); ground color dark brown, with snow white and brown markings. Antemedian line white, well-marked. Longitudinal suffusions of brown scales running along cell veins and 1A+2A. Postmedian and subterminal lines white, narrowing towards each other at midlength without meeting. Subterminal area broadly suffused with brown. Fringes dirty white, distally dark brown. Hindwings dirty white, distally speckled with brown scales.

MALE GENITALIA (FIG. 70)

As in *S. spadix* except for the following characters: gnathos projection 2.4 X uncus length; vesica with ten straight cornuti of increasing length.

FEMALE GENITALIA (FIG. 128)

As in *S. philippinensis*.

DISTRIBUTION

PHILIPPINES: Negros. Collected at altitudes between 1580 and 1820 m.

DNA BARCODING

All five specimens sequenced yielded identical DNA barcodes.

ETYMOLOGY

Derived from Negros island where the species is encountered.

Scoparia aenea Léger, sp. n.

https://zoobank.org/B682EF2F-0FA7-4E09-A783-CEA7C77D5CC8
Figs. 14, 71, 129.

MATERIAL

Holotype: ♀ (specimen identifier coll.mfn-berlin.de_u_b5fc86, DNA voucher MFNLEP-PYRALPHIL01-B03, TL937♀ ; BOLD sample ID PYPHI009-21). PHILIPPINES: Luzon, Benguet, Mount Tabayoc, 2300 m, 24/11/1997 (K. Ebert, W. Mey, M. Nuss). Deposited in MfN.

Paratype: 8 ♂ (specimen identifiers MfN: coll.mfn-berlin.de_u_b91b52, 769e53, 258b3c, cff08d, 6df9fc, 9fe285, cca059; PNM: id.bioseasia.org_u_02358b), 12 ♀ (specimen identifiers MfN: coll.mfn-berlin.de_u_db426, dabc97, 3bdf36, d35462, 4d7c43, b119ca, b8a016, f77651, 4d13e4, d455c5; PNM: id.bioseasia.org_u_02357c, 023579) (detailed information in Table S1; https://doi.org/10.5061/dryad.b8gtht7mh).

SIMILAR SPECIES

Scoparia ifugaoensis **sp. n.**

DIAGNOSIS

The conspicuous copper-colored subterminal area of the forewing (Fig. 14) separates *Scoparia aenea* **sp. n.** from congeneric species. *Scoparia aenea* **sp. n.** is distinctly larger than other species of the *spadix* group with copper markings. Male genitalia are similar to those of *S. ifugaoensis* **sp. n.**, but the three small thorn-shaped cornuti are of equal size in *S. aenea* **sp. n.**, while one cornutus is larger than the other two in *S. ifugaoensis* **sp. n.** The female genitalia are very similar to those of *S. ifugaoensis* **sp. n.**, but the corpus bursae is more markedly globular in *S. aenea* **sp. n.** which is rather egg-shaped in *S. ifugaoensis* **sp. n.**

HABITUS (FIG. 14)

Forewing length = 6.5-7.5 mm (n = 4); ground color dark brown, with snow white and copper markings. Antemedian band ocher, edged basally and distally with snow white lines. Median area dark brown, medially with large ill-defined white band originating at cell, running down to dorsum. Two distal discoidal copper patches, distally abutted with white mark. Postmedian and subterminal lines meeting at midlength, forming a "X" shape, white. Subterminal area copper-colored. Margin with 6-7 white spots. Fringe basally striped dirty white and grey, distally greyish. Hindwings dirty white.

MALE GENITALIA (FIG. 71)

Uncus roughly half of tegumen arm length, triangular, latero-apically setose, apex pointed. Gnathos projection 1.4 X uncus length, slightly curved downwards. Valva dorsal margin conspicuously convex, ventral process marked, valva apex broadly rounded. Juxta elliptical, apico-medially deeply notched. Vesica with three short spine-like cornuti of 82-96 µm.

FEMALE GENITALIA (FIG. 129)

Antrum spiculose. Colliculum short, sclerotized. Ductus bursae roughly ¾ X length of corpus bursae, slightly sinuate, medially enlarged, enlarging towards corpus opening on distal ¼. Corpus bursae roughly 1.2 of ductus bursae, large, globular, one half covered with spines, other half reticulate; broad lightly sclerotized signum.

DISTRIBUTION

PHILIPPINES: Luzon (Benguet, Ifugao). Collected at altitudes between 2000 and 2350 m.

DNA BARCODING

A maximum intraspecific p-distance of 0.7% is found between specimens MFNLEP-PYRALPHIL01-B03 from Luzon (Benguet) and MFNLEP-PYRALPHIL07-H12 from Luzon (Ifugao). *Scoparia aenea* **sp. n.** is recovered as sister species to *Scoparia ifugaoensis* **sp. n.** in the RaxML tree (BS = 95).

ETYMOLOGY

From the Latin *aeneus*, *a*, *um*, "copper-colored."

Scoparia spp.

MATERIAL

Scoparia cf. *spadix* (Fig. 130): 1 ♀ (specimen identifier coll.mfn-berlin.de_u_2667b0, DNA voucher MFNLEP-PYRALPHIL01-F07, genitalia on slide TL961F). PHILIPPINES: Mindoro, Mount Halcon, 1300 m, 15-17.01.1998 (W. Mey, V. Samarita).

Scoparia cf. *mindanaoensis* (Fig. 131): 1 ♀ (specimen identifier coll.mfn-berlin.de_u_822d89, DNA voucher MFNLEP-PYRALPHIL01-D01, genitalia on slide TL901F). PHILIPPINES: Mindoro, Mount Halcon, 1300 m, 15-17.01.1998 (W. Mey, V. Samarita).

Scoparia cf. *tenuispina* (Fig. 132): 1 ♀ (specimen identifier coll.mfn-berlin.de_u_dddbd5, DNA voucher MFNLEP-PYRALPHIL01-F06 F, genitalia on slide TL952F). PHILIPPINES: Luzon, Mountain Province, Barlig, 1650 m, 14-15.11.1997 (K. Ebert, W. Mey, M. Nuss).

REMARKS

These specimens could not be confidently associated to known species as they belong to a MOTU containing exclusively female specimens.

Eudonia Billberg, 1820

Eudonia Billberg, 1820. **Type species**: *Phalaena mercurella* Linnaeus, 1758.

= *Boiea** Zetterstedt, 1839: 995. Type species: *Phalaena mercurella* Linnaeus sensu Zetterstedt, 1839.

= *Borea* Stephens, 1852: 2

= *Dasyscopa* Meyrick, 1894: 464. Type species: *Dasyscopa homogenes* Meyrick, 1894. Léger et al., 2019, p. 769 (syn.)

= *Dipleurina* Chapman, 1912: 507. Type species: *Phalaena crataegella* Linnaeus sensu Hübner, 1796. Nuss, 1999, p. 59 (syn.)

= *Dipluerina* Sharp, 1913: 357

= *Dipleurinodes* P. Leraut, 1989: 14–16. Type species: *Dipleurinodes mineti* Leraut, 1989. Léger et al., 2019, p. 769 (syn.)

= *Eudipleurina* P. Leraut, 1989: 10–11. Type species: *Eudoria* (*Dipleurina*) *ankaratella* Marion, [1957]. Léger et al., 2019, p. 769 (syn.)

= *Malageudonia* P. Leraut, 1989: 20. Type species: *Witlesia malgassicella* Marion, 1956, by original designation. Nuss, 1999, pp. 21, 22–23, 59 (syn.)

= *Vietteina* P. Leraut, 1989: 36. Type species: *Vietteina ivelonensis* Leraut, 1989. Nuss, 1999, p. 59 (syn.)

= *Witlesia* Chapman, 1912: 507. Type species: *Eudorea pallida* Curtis, 1827. Munroe 1972: 47 (syn.)

= *Wittlesia* Chapman, 1912: 507, 518, pl. 40, 44

DIAGNOSIS

Descriptions of *Eudonia* are provided in Nuss (1999) and Li, Li & Nuss (2012). The presence of an appendix bursae in female genitalia is an apomorphy for *Eudonia* + *Scoparia* (Léger et al., 2019). The gnathos tip directed posterad or upwards as well as the absence of cornuti on vesica in male genitalia is apomorphic for *Eudonia* (Léger et al., 2019; Nuss, 1999). The following characters of male genitalia further characterize the genus: uncus broad and short; valva rather simple, lacking the free distal process of the sacculus. In female genitalia, the following characters are characteristic for *Eudonia*: anterior and posterior apophyses usually long (over 3 X tergite length); intersegmental membrane IX-X long (over 2 X tergite length), colliculum long, tubular, sclerotized; ductus bursae long, always membranous, corpus bursae with a signum, devoid of appendix bursae (Léger et al., 2019; W. Li et al., 2012).

DISTRIBUTION

Distributed on all continents and many oceanic islands, including subantarctic islands (W. Li et al., 2012; Nuss et al., 2003–2023). Two species are found in the Philippines: *Eudonia penicula* **sp. n.** and *Eudonia barbipennis* (Hampson, 1897).

PHYLOGENETIC RELATIONSHIPS

Eudonia is sister to *Scoparia* (Léger et al., 2019).

Eudonia penicula Léger, sp. n.

https://zoobank.org/5CF78E1F-F445-4109-B03A-7FAA260DD005
Figs. 15, 72, 133.

MATERIAL

Holotype: ♂ (specimen identifier coll.mfn-berlin.de_u_d58c00, DNA voucher MFNLEP-PYRAL-PHIL01-H07, genitalia on slide TL967♂; BOLD sample ID PYPHI378-23). PHILIPPINES: Mindoro: Occidental Mindoro, Mount Baco Pass, 1150 m, 14.01.1998 (W. Mey, V. Samarita). Deposited in MfN.

Paratypes: 1 ♂ (specimen identifier coll.mfn-berlin.de_u_29f992), 10 ♀ (specimen identifiers: MfN: coll.mfn-berlin.de_u_2899da, bb43cb, bef944, 7946ab, 426cd2, 495315, 99a7b7, c3967f, e754a7; PNM: id.bioseasia.org_u_023875) (detailed information in Table S1; https://doi.org/10.5061/dryad.b8gtht7mh).

SIMILAR SPECIES

Eudonia homogenes (Meyrick, 1894).

DIAGNOSIS

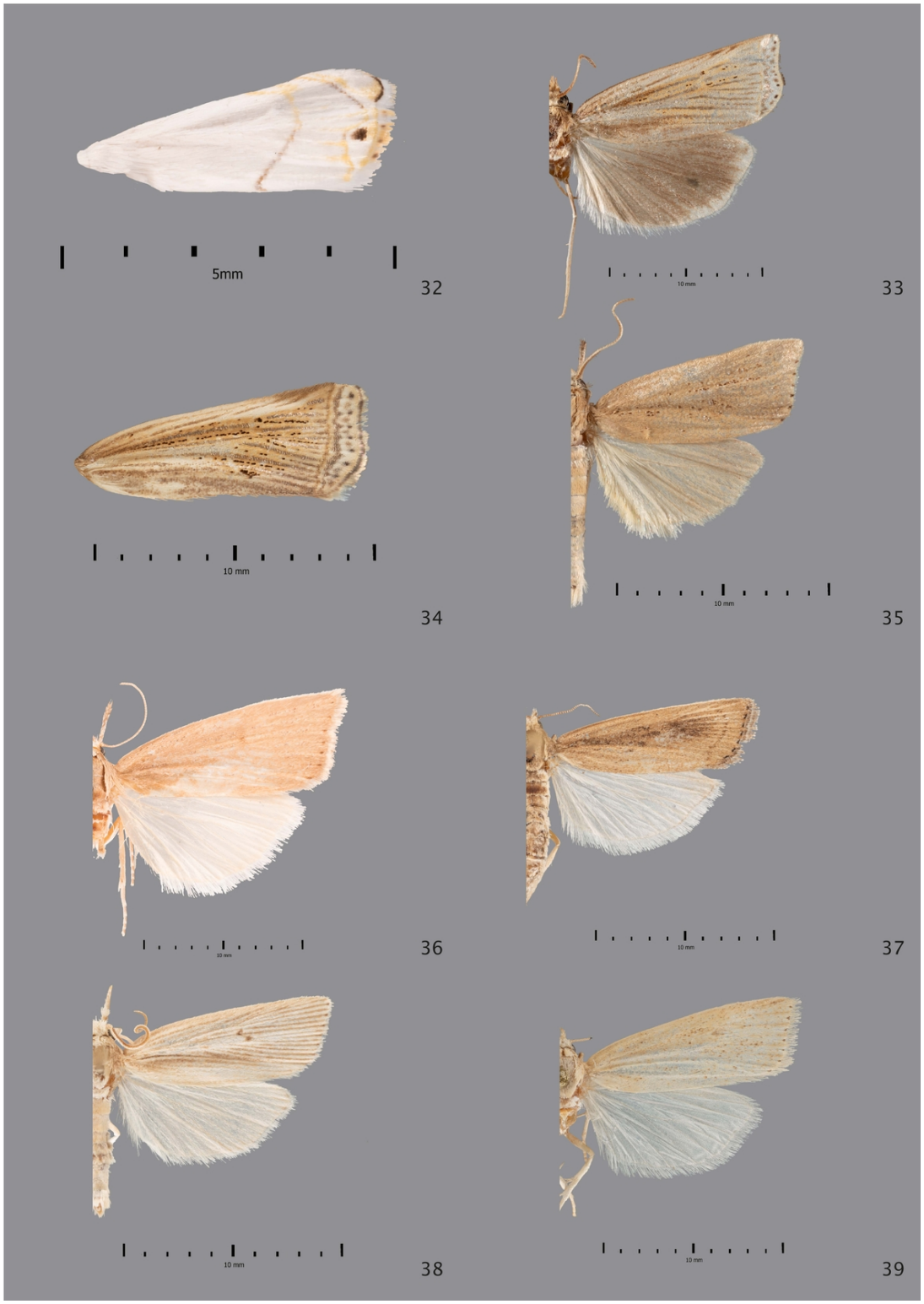
Eudonia penicula **sp. n.** resembles *Eudonia homogenes* (Meyrick, 1894), from which it can be confidently separated by examination of the genitalia. In the Philippines, this species is separated from *Eudonia barbipennis* (Hampson, 1897) by the distinctive proximal discoidal and cubital dark brown streaks on the forewing. In male genitalia, the thick setae on the innerside of the valva as well as the thick bristles on the apex of the juxta unambiguously separates this species from *E. homogenes*. In female genitalia, the antrum is covered with tiny sclerotized spicules as in *E. homogenes*, but it forms a pouch well delimited from the colliculum in *E. penicula* **sp. n.** and is cone-shaped, gradually enlarging torward opening in *E. homogenes*. Furthermore, the colliculum forms a sclerotized ring about 4/5 of the length of tergite VIII, while it is three to four times the length of tergite VIII and is only weakly sclerotized in *E. homogenes*.

HABITUS (FIG. 15)

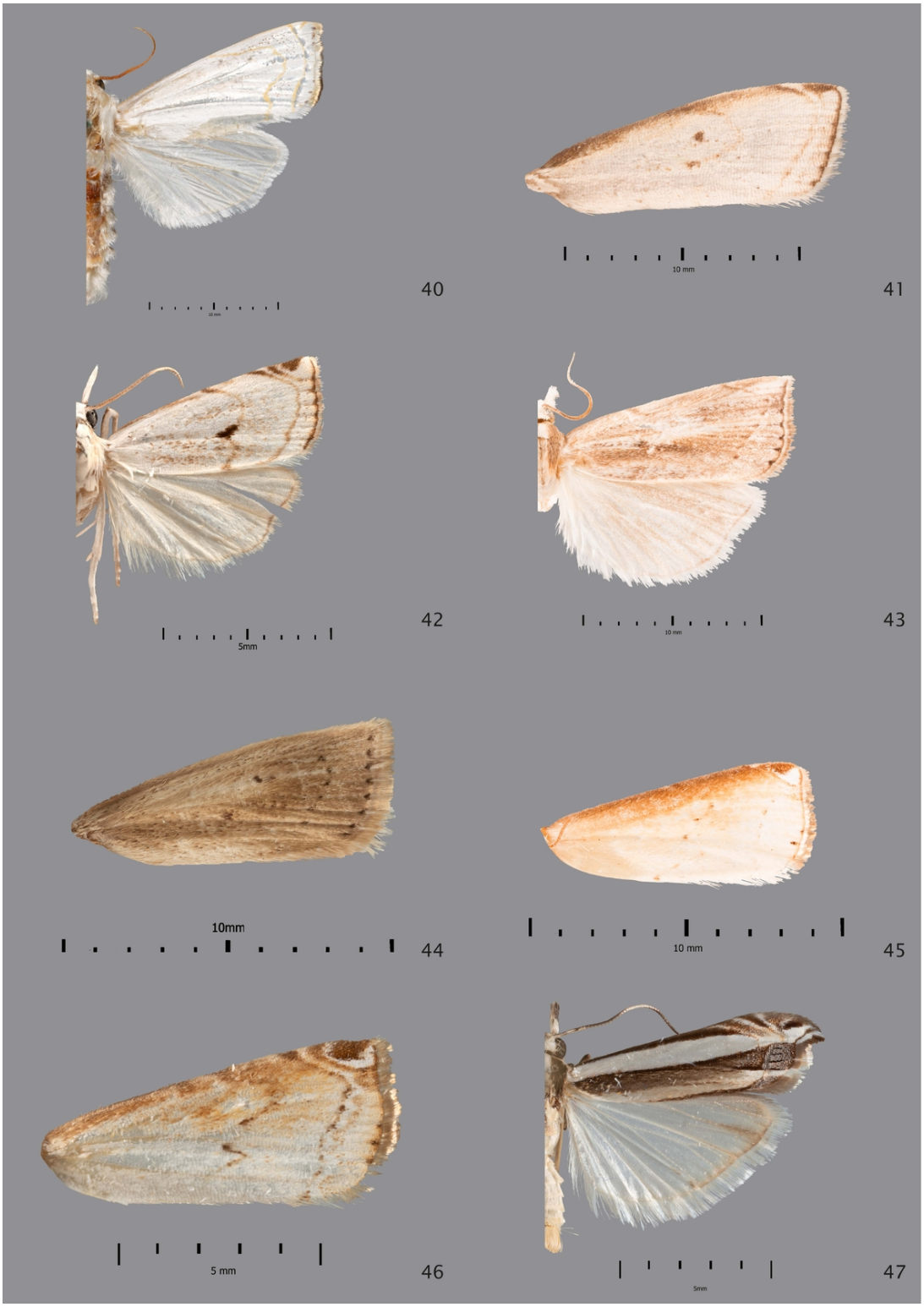
Forewing length 7.2-8.0 mm (n = 5), ground color grey. Basal area with marked dark brown dash. Antemedian line white, running from costal 1/4 to dorsal 1/3, arched outwards. Median area speckled with white scales; marked cubital, proximal discoidal, and distal discoidal thick dark brown ticks. Postmedian and subterminal lines thin, white, forming X-shaped pattern. Margin white. Fringe dirty white, medially with grey line. Hindwing grey.

MALE GENITALIA (FIG. 72)

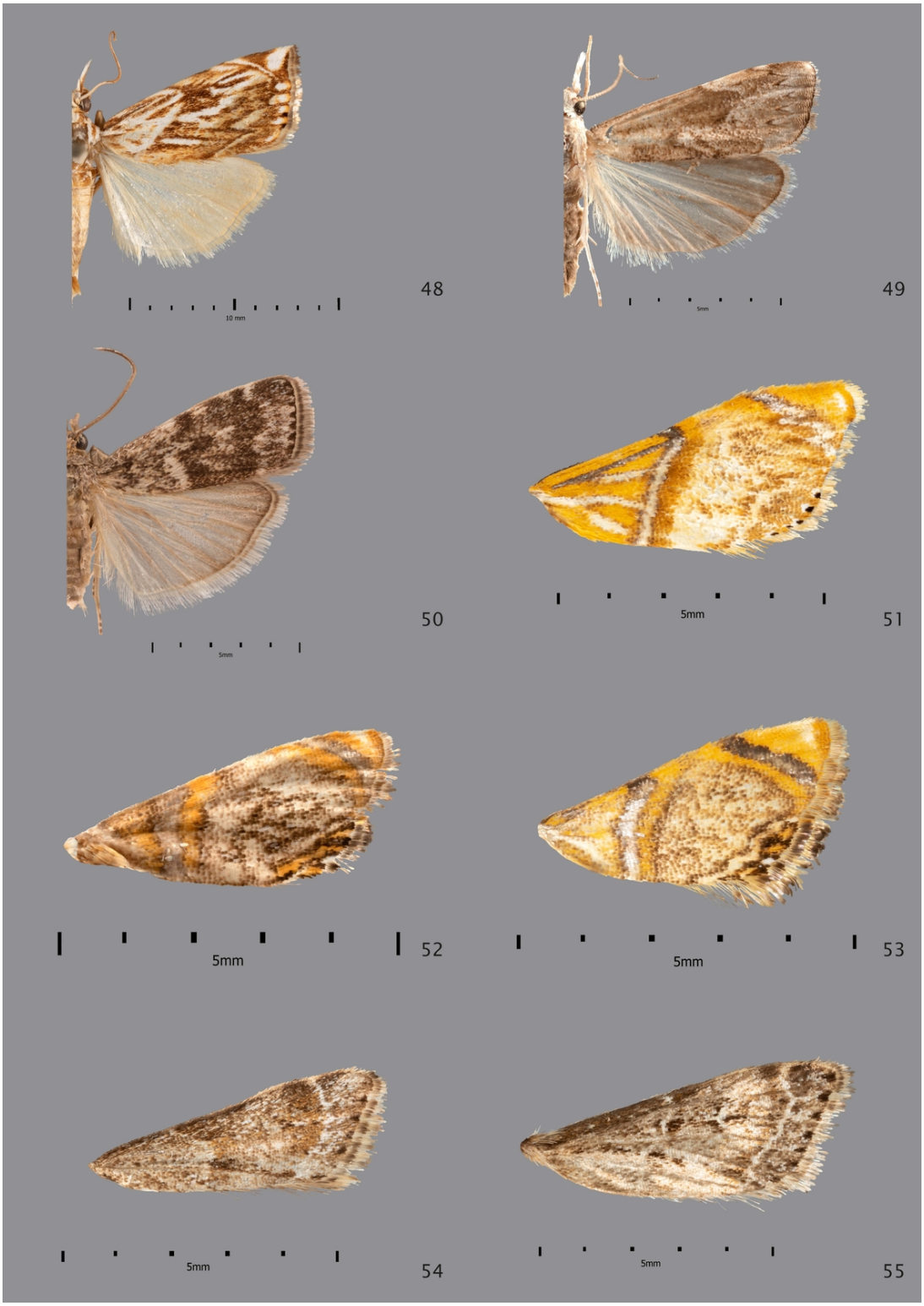
Uncus 3/4 X tegumen arm length, quadriangular, about twice as long as wide, densely setose; apex broad, truncate. Gnathos projection about 0.5 X uncus length, tubular,



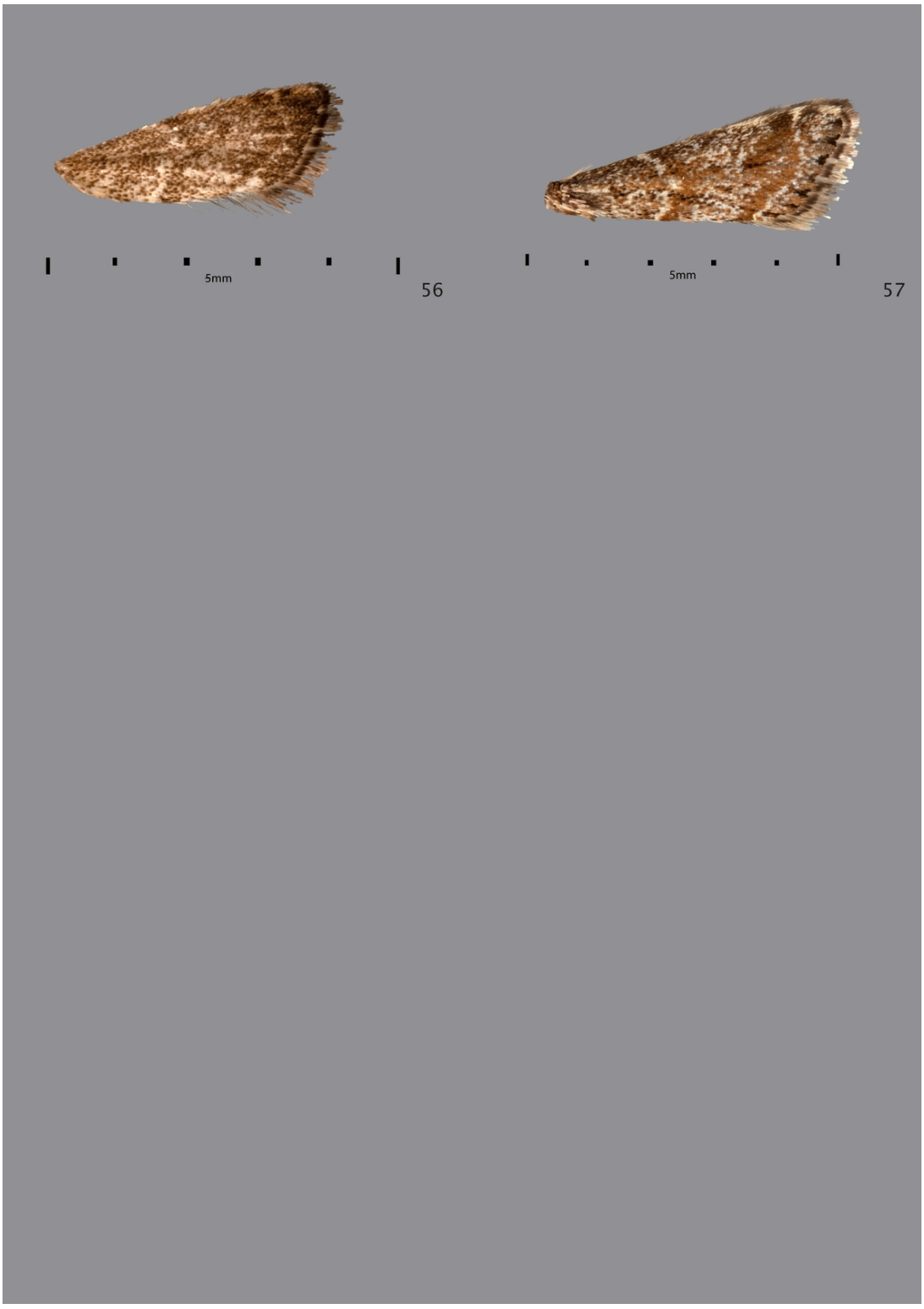
Figs 32-39. Wings of *Gargela*, *Ancylolomia* and *Chilo* species. Fig. 32. *Gargela bidentella* **sp. n.**, ♀, paratype, specimen coll.mfn-berlin.de_u_9859, right wing. Fig. 33. *Ancylolomia orchidea* Bleszynski, 1970, ♂, specimen coll.mfn-berlin.de_u_6873a4, right half. Fig. 34. *Ancylolomia westwoodi* Zeller, 1863, specimen coll.mfn-berlin.de_u_8a1d13, ♂, right wing. Fig. 35. *Chilo auricilius* Dudgeon, 1905, specimen coll.mfn-berlin.de_u_5678ae, left wing (mirrored). Fig. 36. *Chilo luteellus* (Motschulsky, 1866), ♂, specimen coll.mfn-berlin.de_u_31e49, left side (mirrored). Fig. 37. *Chilo infuscatellus* Snellen, 1890, ♀, specimen coll.mfn-berlin.de_u_3ba9f3, left side (mirrored). Fig. 38. *Chilo sacchariphagus* (Bojer, 1856), ♂, specimen coll.mfn-berlin.de_u_9cde85, right half. Fig. 39. *Chilo suppressalis* (Walker, 1863), ♀, specimen coll.mfn-berlin.de_u_c58f13, left wing (mirrored).



Figs 40-47. Wings of *Eschata*, *Calamotropha* and *Angustalius* species. Fig. 40. *Eschata* cf. *rififi* Bleszynski, 1965, ♂, specimen coll.mfn-berlin.de_u_bf466f, right half. Fig. 41. *Calamotropha obliterans* (Walker, 1863), ♂, specimen coll.mfn-berlin.de_u_7aa174, right wing. Fig. 42. *Calamotropha philippinensis* **sp. n.**, ♂, paratype, specimen coll.mfn-berlin.de_u_f30a8c, right half. Fig. 43. *Calamotropha anacantha* **sp. n.**, ♂, holotype, specimen coll.mfn-berlin.de_u_1609c7, right wing. Fig. 44. *Calamotropha unicolorellus* (Zeller, 1863), ♂, specimen coll.mfn-berlin.de_u_294fbd, right wing. Fig. 45. *Calamotropha* sp. 1 cf. *oculalis*, ♂, specimen coll.mfn-berlin.de_u_1e3488, right wing. Fig. 46. *Calamotropha* sp. 2 cf. *oculalis*, ♂, specimen coll.mfn-berlin.de_u_a7f185, right wing. Fig. 47. *Angustalius malacelloides* (Bleszynski, 1955), specimen coll.mfn-berlin.de_u_e7300e, right half.



Figs 48-55. Wings of *Catoptria*, *Culladia*, *Metaeuchromius* and *Microchilo* species. Fig. 48. *Catoptria philippinensis* **sp. n.**, ♂, paratype, specimen coll.mfn-berlin.de_u_78302c, right half. Fig. 49. *Culladia hastiferalis* (Walker, 1865), specimen coll.mfn-berlin.de_u_656531, right wing. Fig. 50. *Culladia pseudoscoparia* **sp. n.**, specimen coll.mfn-berlin.de_u_893233, right wing. Fig. 51. *Metaeuchromius micralis* **comb. nov.**, ♀, specimen coll.mfn-berlin.de_u_5b3516, right wing. Fig. 52. *Metaeuchromius rizali* **sp. n.**, specimen MTD11447, right wing. Fig. 53. *Metaeuchromius makintabus* **sp. n.**, specimen coll.mfn-berlin.de_u_868941, ♂, holotype, right wing. Fig. 54. *Microchilo bundoki* **sp. n.**, ♂, holotype, specimen coll.mfn-berlin.de_u_b4f995, right wing. Fig. 55. *Microchilo cebuano* **sp. n.**, ♀, paratype, specimen coll.mfn-berlin.de_u_c18ec0, left wing (mirrored).



Figs 56-57. Forewings of *Microchilo*. Fig. 56. *Microchilo spinosus* **sp. n.**, ♀, paratype, specimen coll.mfn-berlin.de_u_58c789, left wing (mirrored). Fig. 57. *Microchilo imminutela* **sp. n.**, specimen coll.mfn-berlin.de_u_7fbefe, right wing

curved upwards, dorsal edge dentate, tip rounded. Valva dorsal margin slightly convex, protruding distally into a pointed apex; ventral margin almost straight, curved upwards on distal 1/4; hump bearing patch of thick setae pointed inwards at midlength of innerside of valva. Juxta with base rounded, narrowing from basal 1/4 to 3/4, apex lightly sclerotized, covered with thick bristles. Phallus sclerotized, basal end conspicuously curved, apex with rows of short teeth.

FEMALE GENITALIA (FIG. 133)

Antrum forming broad pouch densely covered with tiny sclerotized spicules, forming a U-shaped indentation in ventral view. Colliculum 4/5 X length of tergite VIII, forming sclerotized ring. Ductus bursae ca 4 X length of corpus bursae, straight, narrow. Corpus bursae globular, with large rounded sclerotized patch.

DISTRIBUTION

PHILIPPINES: Luzon (Benguet, Ifugao, Mountain Province), Mindoro (Oriental Mindoro). Collected at altitudes between 1150 and 2300 m.

DNA BARCODING

The species delimitation analysis recovered two MOTUs, one for specimens from Luzon and Mindoro and one single specimen from Mindanao. The maximum intraspecific p-distance of 2.9% is found between specimens MFNLEP-PYRALPHIL01-D03 from Luzon Mountain and MFNLEP-PYRALPHIL09-E01 from Mindanao. Unfortunately, the abdomen of the Mindanao specimen was lost during the DNA extraction.

ETYMOLOGY

From the Latin *peniculus, i*: brush, referring to the brush-like appendices in male genitalia.

REMARKS

Nuss (1998) reports *Eudonia homogenes* from the Philippines. He probably refers to this species, which is externally similar to *E. homogenes*.

Eudonia barbipennis (Hampson, 1897)

Scoparia barbipennis Hampson, 1897: 238. **Type locality**: Malaysia, Malay Peninsula, Gunong Ijau

Dasyscopa barbipennis (Hampson, 1897): Nuss, 1998, p. 497

Eudonia barbipennis (Hampson, 1897): Léger et al., 2019, p. 769.

Figs. 16, 73, 134.

MATERIAL

Lectotype: ♂ (specimen identifier NHMUK013696725, genitalia on slide PyralidaeNHMUK Slide N° 3617). “Gunung Ijau, Mal[aysia]. Pen[insula]” (NHMUK). Lectotype designated by M. Nuss.

Other specimens examined: 5 ♂, 10 ♀ (detailed information in Table S1; https://doi.org/10.5061/dryad.b8gtht7mh).

DIAGNOSIS

The dark brown ground color of the forewing (Fig. 16) with the distal discoidal white patches and the postmedian white X separate *Eudonia barbipennis* (Hampson, 1897) from other *Eudonia* species encountered in South-East Asia. In male genitalia (Fig. 73), the uncus apex is duck-beak-shaped, while it is bifid in *E. barbipennis* **sp. n.**, and the gnathos forms a projection about ¼ of uncus length, while the gnathos projection is reduced to a bump in *E. barbipennis* **sp. n.** In female genitalia, the lightly sclerotized anterior half of the ductus bursae as well as the pouch at corpus opening covered with sclerotized spinules separates this species from *E. penicula* **sp. n.** Female genitalia of *E. barbipennis* **sp. n.** were not investigated.

REDESCRIPTION

HABITUS (FIG. 16)

Forewing length: 8.2-9.5 mm (n = 5); ground color dark brown, with snow white markings. Antemedian line wavy, white. Median area with two well marked distal discoidal rounded white patches. Postmedian line forming at costa and dorsum well-marked patches, forming with subterminal line a X shape. Subterminal line ill-defined, forming well-marked white spot between R5 and M1 and two smaller blotches between CuA1 and CuA2. Margin with white lunules. Fringe chequered dirty white and brown. Hindwing white; in males, presence of an androconial organ on the dorsum of the hindwing.

MALE GENITALIA (FIG. 73)

Uncus 4/5 X tegumen arm length, large, densely haired dorso-apically, apex duck-beak-shaped. Gnathos projection about ¼ of uncus length, slender, with apex rounded. Valva dorsal margin basally concave, medially conspicuously convex, apex pointed. Juxta broad, lanceolate, weakly sclerotized. Phallus slender, curvy, vesica without cornuti.

FEMALE GENITALIA (FIG. 134)

Antrum membranous, spinulose. Colliculum 6.8 X length of tergite VIII, narrow, lightly sclerotized. Ductus bursae 5.3 X length of tergite VIII, straight, narrow. Corpus bursae small, globular, membranous, with pouch-like projection at corpus opening bearing sclerotized spinules. One signum at corpus opening.

DISTRIBUTION

PHILIPPINES: Luzon (Benguet, Ifugao, Mountain Province). Collected at altitudes between 2000 and 2350 m.

DNA BARCODING

The species delimitation analysis recovered two MOTUs, one for the specimens from North Luzon and one for the specimens from Negros. A maximum intraspecific p-distance of 5.5% is found between specimens MFNLEP-

PYRALPHIL07-C06 from Luzon (Benguet) and MFNLEP1165 from Negros.

Micraglossa Warren, 1891

Micraglossa Warren, 1891. **Type species**: *Micraglossa scoparialis* Warren, 1891.

= *Microglossa* Hampson, 1907: 20

DIAGNOSIS

Descriptions of *Micraglossa* are provided in Nuss (1999) and Li et al. (2010). *Micraglossa* exhibits a typical scopariine pattern with the X-shaped postmedian and subterminal lines but can be separated from other related genera by the shiny golden-colored forewing markings. The absence of appendix bursae in female genitalia separates it from *Eudonia* and *Scoparia* (Léger et al., 2019). Male genitalia exhibit the following characters: uncus elongate, relatively narrow; gnathos usually slightly longer than uncus, with small apical tooth pointing downwards; valva with spine projection on innerside in some species, distal half of valva usually bent upwards; vesica with or without cornuti. Female genitalia exhibit the following characters: posterior and anterior apophyses shorter than in *Eudonia*; colliculum long, tubular, lightly sclerotized; ductus bursae long, membranous, sometimes with loops; corpus bursae globular, membranous, without appendix bursae, with ovate or streak-like signum (W. Li et al., 2010).

DISTRIBUTION

Oriental and Australasian regions. The distribution stretches from temperate China and Japan southwards to Australia (Nuss et al., 2003–2023). Three species are found in the Philippines: *Micraglossa tagalica* Nuss, 1998, *M. polisensis* **sp. n.**, *M. kianganensis* **sp. n.**

PHYLOGENETIC RELATIONSHIPS

Micraglossa is sister to the clade formed by *Eudonia* and *Scoparia* (Léger et al., 2019).

Micraglossa tagalica Nuss, 1998

Figs. 17, 74, 135.

Micraglossa tagalica Nuss, 1998, pp. 512–515, figs. 8, 21–22, 28. **Type locality**: Philippines, Mindanao, Mt Agtuguanon, 1050 m

MATERIAL

Holotype: ♂ (specimen identifier coll.mfn-berlin.de_u_6df1a8). PHILIPPINES: Mindanao, Mt. Agtuguanon, 1050 m, 28. V.–7. Vi. 1996 (W. Mey). Deposited in MfN.

Paratypes: 7 ♂ (specimen identifiers coll.mfn-berlin.de_u_be7bfe, b628af, 4c9b77, 40a24b, 4a853e, 6df1a8, b79f72), 13 ♀ (specimen identifiers coll.mfn-berlin.de_u_dd60b9, 2e4c39, 3e34c3, 5b97ef, 9fa4ce, a8ac63, bb595c, ca1c27, d47b3e, 28b40f, e52e8f, 39bccc, 7c77db), 5 specimens unsexed (specimen identifiers coll.mfn-berlin.de_u_c83896, 3e4e28, 90724b, b2c9f1, 999692) (detailed information in Table S1; https://doi.org/10.5061/dryad.b8gtht7mh).

Other material examined: 117 specimens (detailed information in Table S1; https://doi.org/10.5061/dryad.b8gtht7mh).

DIAGNOSIS

Micraglossa tagalica has a pale yellow forewing ground color with shiny gold iridescence, with dark brown markings. The prominence of the pale yellow ground color separates this species from other scopariine species in the Philippines. In male genitalia (Fig. 74), the vesica devoid of cornuti and the mesal part of the valva without a projection separate this species from other *Micraglossa* species from continental China (W. Li et al., 2010). From *Micraglossa polisensis* **sp. n.** and *M. kianganensis* **sp. n.**, *Micraglossa tagalica* can be separated by the combination of the following characters: the uncus has a narrow apex, the gnathos bears a marked subapical dorsal bump, the valva is distally enlarged, and the juxta apex is bifid. In female genitalia (Fig. 135), the two conspicuous loops of the ductus bursae and the elongate signum covered with small spines separate this species from other *Micraglossa* species (Nuss, 1998). Females of *Micraglossa polisensis* **sp. n.** and *M. kianganensis* **sp. n.** are unknown.

DISTRIBUTION

PHILIPPINES: Leyte, Luzon (Ifugao, Laguna, Mountain Province, Nueva Vizcaya), Mindanao (Davao Oriental), Mindoro (Oriental Mindoro), Negros. Collected at altitudes between 1050 and 2100 m.

DNA BARCODING

A p-distance of 1.1 to 2% is observed between the specimens from Luzon and Mindoro. A maximum intraspecific p-distance of 2.9% is found between specimens MFNLEP-PYRALPHIL01-D11 from Leyte and MFNLEP-PYRALPHIL01-H02 from Luzon (Laguna).

REMARKS

Nine more paratypes (three males, one female, and five unsexed) were found that were not listed in the original publication but were labelled as such.

Micraglossa polisensis Léger, sp. n.

https://zoobank.org/8281886e-f21c-4a8d-ab50-4340f966399a

Figs. 18, 75.

MATERIAL

Holotype: ♂ (specimen identifier coll.mfn-berlin.de_u_c6cac, DNA voucher MFNLEP-PYRALPHIL01-D10, genitalia on slide TL985♂; BOLD sample ID PYPHI035-21, Genbank Accession Number PP196727). PHILIPPINES: Luzon, Mountain Province, Chatol, 2100 m, 16-18.11.1997 (K. Ebert, W. Mey, M. Nuss). Deposited in MfN.

Paratypes: 2 ♂ (specimen identifiers coll.mfn-berlin.de_u_e1338d, 9e6b86) (detailed information in Table S1; https://doi.org/10.5061/dryad.b8gtht7mh).

DIAGNOSIS

In male genitalia (Fig. 75), the vesica devoid of cornuti and the mesal part of the valva without a projection separate this species from other *Micraglossa* species from continental China (W. Li et al., 2010). From other Philippines species, *Micraglossa polisensis* **sp. n.** can be recognized by the bulky uncus apex (in lateral view), the valva gently tapering towards apex, the semi-rounded apex of the valva, and the rounded juxta. Females are not known.

HABITUS (FIG. 18)

Forewing length 5.0-5.7 mm (n = 2); ground color cream and brown. Antemedian line white, wavy. Median area mixed with cream and brown scales; one distal discoidal thick brown patch. Postmedian line well marked, S-shaped, running straight down to discal cell, cream. Subterminal line cream, medially incurved inwards, nearly meeting postmedian line there. Fringe cream with black spots. Hindwing dirty white.

MALE GENITALIA (FIG. 75)

Uncus ca 9/10 X tegumen arm length, narrowed on distal half, laterally with scattered setae, apex spatulate in dorsal view. Gnathos projection about 9/10 X uncus length, with subapical dorsal tooth pointing upwards, small tip pointing downwards at apex. Valva tapering towards apex, dorsal margin sclerotized, slightly concave, apex semi-rounded. Juxta basally broadly rounded, distally membranous. Phallus straight, vesica without cornuti.

FEMALE GENITALIA

Not known.

DISTRIBUTION

PHILIPPINES: Luzon (Ifugao, Mountain Province). Collected at altitudes between 2000 and 2100 m.

DNA BARCODING

A maximum intraspecific p-distance of 0.2% is found between specimens MFNLEP-PYRALPHIL01-D10 from Mountain Province and MFNLEP-PYRALPHIL01-H01 from Ifugao on Luzon.

ETYMOLOGY

The name is derived from the type locality, Mount Polis, on Luzon island.

Micraglossa kianganensis Léger, sp. n.

https://zoobank.org/FD0D400C-4645-4C66-996C-9A6747AD034F
Figs. 19, 76.

MATERIAL

Holotype: ♂ (specimen identifier MTD11400, DNA barcode BC MTD 01473, genitalia on slide TL1296♂; BOLD sample ID PYRG626-11). PHILIPPINES: Luzon, Ifugao, Kiangan, 750 m, 10/11/1985 (J. Settele). Deposited in MTD.

DIAGNOSIS

In male genitalia (Fig. 76), the slender and wavy gnathos lacks the subapical dorsal conical projection observed on the other congeneric species from the Philippines. Females are not known.

HABITUS

Forewing length 4 mm, ground color cream and brown. Antemedian band wavy, edged with cream lines. Median area with a mix of cream and brown scales. Postmedian line well marked, S-shaped, running straight down to CuA1, meeting subterminal line at half length, then bent inwardly with 90° angle, running straight towards base, then bent downwards towards dorsum. Subterminal line fuzzy, cream, medially incurved inwards. Margin cream. Fringe cream with brown spots. Hindwing light copper-color.

MALE GENITALIA

Uncus about 1.4 X tegumen arm length, regularly bent downwards, slender, with scattered setae dorsally, apex ventrally with short tooth pointing downwards. Gnathos projection about 0.9 X uncus length, slender, evenly curved downwards, distal 1/4 straightened, tip pointed downwards. Valva dorsal margin sclerotized, strongly concave; ventral margin basally straight, conspicuously curved upwards on distal half; apex broadly rounded. Juxta tongue-shaped. Phallus straight, vesica without cornuti.

FEMALE GENITALIA

Not known.

DISTRIBUTION

PHILIPPINES: Luzon (Ifugao). Collected at an altitude of 750 m.

ETYMOLOGY

Name derived from Kiangan, the locality where the specimen was caught.

CRAMBINAE Latreille, 1810

Type genus: *Crambus* Fabricius, 1798
= Crambina Zeller, 1847: 745
= Tetrachila Hübner, 1818: 23, 28, 30, [34]

DIPTYCHOPHORINI Gaskin, 1972

Glaucocharis Meyrick, 1938

Glaucocharis Meyrick, 1938. **Type species**: *Glaucocharis stella* Meyrick, 1938

= *Pagmania* Amsel, 1961: 332. Type species: *Pagmania bilinealis* Amsel, 1961. Błeszyński, 1965, p. 51 (syn.)

= *Pareromene* Osthelder, 1941: 366. Type species: *Pareromene rebeli* Osthelder, 1941. Gaskin, 1985, p. 11 (syn.)

= *Ditomoptera* Hampson, 1893: 52, 179. Type species: *Ditomoptera minutalis* Hampson, 1893.

DIAGNOSIS

Forewing with conspicuous antemedian and postmedian lines, apex usually with apical streak, termen protruding outwards at apex, below apex with an indentation reaching tip of M1, often with a secondary indentation at tip of M3 (W. Li & Li, 2012b). Male genitalia with the following characteristics: uncus and gnathos elongate, narrow, of various shapes; valva long and narrow, with narrow cucullus, costal process sclerotized, elongate, narrow, pointed outwards or upwards. Female genitalia with short papillae anales coalesced dorsally; posterior and anterior apophyses over twice the tergite length; antrum usually tubular or funnel-shaped; ductus bursae long, narrow; corpus bursae rounded or ovate, signum present or absent (W. Li & Li, 2012b; pers. obs.).

DISTRIBUTION

Known from the Afrotropics, the Palearctic, Oriental, and Australasian regions. Nine species are reported here from the Philippines: *Glaucocharis lathonia* (Błeszyński, 1966), *Glaucocharis clytia* (Błeszyński, 1966), *Glaucocharis negrosensis* **sp. n.**, *Glaucocharis hamulus* **sp. n.**, *Glaucocharis kayumanggi* **sp. n.**, *Glaucocharis kabundukanis* **sp. n.**, *Glaucocharis altissima* **sp. n.**, *Glaucocharis uncusellus* **sp. n.**, *Glaucocharis sungay* **sp. n.**

PHYLOGENETIC RELATIONSHIPS

Glaucocharis belongs to the Diptychophorini, the most-basal tribe of Crambinae (Léger et al., 2019).

Glaucocharis clytia (Błeszyński, 1966)

Figs. 20, 77, 136.

Pareromene clytia Błeszyński, 1966: 459, fig. 20, pl. 40 fig. 3. **Type locality**: Indonesia, Sumatra, Fort de Kock.

Glaucocharis clytia (Błeszyński, 1966): Gaskin 1974: 192-194, figs. 5, 22.

MATERIAL

Material examined: 7 ♂, 6 ♀ (detailed information in Table S1; https://doi.org/10.5061/dryad.b8gtht7mh).

SIMILAR SPECIES

Glaucocharis hamulus **sp. n.**, *Glaucocharis kabundukanis* **sp. n.**, and *Glaucocharis* species of the *ajaxella* group.

DIAGNOSIS

Glaucocharis clytia (Fig. 20) is very similar in the forewing pattern to *G. kabundukanis* **sp. n.** and *G. hamulus* **sp. n.** In male genitalia (Fig. 77), the bifid costal projection unambiguously separates this species from other *Glaucocharis* species from the Philippines. The female genitalia (Fig. 136) share the cruciform-shaped signum on corpus bursae with *G. kabundukanis* **sp. n.** and species from the *ajaxella* species group from Papua, but the two sharp prongs of the antrum posterior margin projected posterad separate this species from other *Glaucocharis* species.

DESCRIPTION OF THE MALE GENITALIA (FIG. 77)

Uncus ca 7/10 X tegumen length, slender, apex pointed, with ventral and dorsal patches of setae. Gnathos 9/10 X uncus length, slender, straight, with small apical tip pointing upwards. Tegumen arms narrow, with subtriangular bump on posterior margin. Costal process with ventral arm ca 1.5 X valva length, dorsal arm much shorter, S-shaped. Valva triangular, dorsal and ventral margins straight, with 3-4 sclerotized bristles at its base, valva apex pointed. Juxta elongate, with apex conspicuously notched. Phallus slender, straight. Vesica with one short cornutus.

DISTRIBUTION

INDONESIA: Sumatra. MALAYSIA: Borneo. PHILIPPINES: Mindanao, Mindoro, Negros. Collected at altitudes between 750 and 1300 m.

DNA BARCODING

The highest intraspecific divergence observed is of 4.3% between MFNLEP030 from Negros and MFNLEP031 from Mindoro.

REMARKS

This is the first description of the male genitalia. This species is recorded here for the first time from the Philippines.

Glaucocharis lathonia (Błeszyński, 1966)

Figs. 21, 78, 137.

Pareromene lathonia Błeszyński, 1966: 459, figs. 12, 19, pl. 40 fig. 2. **Type locality**: Moluccas, W Obi, Obi Lake.

Glaucocharis lathonia (Błeszyński, 1966): Gaskin, 1985, p. 21, figs. 23, 89, 94.

MATERIAL

Material examined: 2 ♂, 17 ♀ (detailed information in Table S1; https://doi.org/10.5061/dryad.b8gtht7mh)

DIAGNOSIS

In the forewing (Fig. 21), the zigzag antemedian line as well as the notch at dorsal 1/3 of the postmedian line separates this species from other *Glaucocharis* species found in the Philippines. In male genitalia (Fig. 78), the costal process projecting posterad into a long, narrow spine reaching beyond valval apex separates this species from other *Glaucocharis* species. In female genitalia (Fig. 137), the elongatetongue-shaped ventral sclerotization of the antrum and the rounded pouch at midlength of ductus bursae separates this species from other *Glaucocharis* species.

DISTRIBUTION

INDONESIA: Papua. MALAYSIA: Borneo. PAPUA NEW GUINEA: D'Entrecasteaux Island. PHILIPPINES: Leyte, Luzon (Camarines Sur, Zambales), Mindanao, Negros. Collected at altitudes between 500 and 1050 m.

DNA BARCODING

The highest intraspecific divergence observed is of 4.6% between specimens MFNLEP-PYRALPHIL08-A02 (Luzon) and MFNLEP-PYRALPHIL10-D11 (Negros). Haplotype from Borneo differ by a p-dist of 1.3% from the specimen MFNLEP-PYRALPHIL08-A10 from the Bicol peninsula on Luzon.

REMARKS

This is the first record of this species for the Philippines.

Glaucocharis kabundukanis Léger, sp. n.

https://zoobank.org/4C5F057A-7C37-4C62-B66B-8ED03B82E080
Figs. 22, 79, 138.

MATERIAL

Holotype: ♂ (specimen identifier coll.mfn-berlin.de_u_efb910, DNA voucher MFNLEP-PYRALPHIL10-H08, genitalia slide TL1315♂; BOLD sample ID PYPHI423-23, Genbank Accession Number PP211079). PHILIPPINES: Luzon, Mountain Province, Chatol, 2100 m, 16-18.11.1997 (K. Ebert, W. Mey, M. Nuss). Deposited in MfN.

Paratypes: 3 ♂ (specimen identifiers MfN: coll.mfn-berlin.de_u_1b18f8, da9b2c; PNM: id.biosea-sia.org_u_0235cf), 8 ♀ (specimen identifiers MfN: coll.mfn-berlin.de_u_f61ae2, a83ca0, f5921b, 1a445f, 5452eb, 5beadc, c2e07a; NHMUK: NHMUK013706259) (detailed information in Table S1; https://doi.org/10.5061/dryad.b8gtht7mh).

Other material: 1 unsexed (detailed information in Table S1).

SIMILAR SPECIES

Glaucocharis altissima **sp. n.**, *G. hamulus* **sp. n.**, *G. lathonia,* and *Glaucocharis* species of the *ajaxella* group.

DIAGNOSIS

The forewing of *G. kabundukanis* **sp. n.** (Fig. 22) is very similar to that of *G. clytia*, and separation from this species is best done by an examination of the genitalia. In male genitalia (Fig. 79), the straight, sclerotized costal process of the valva with the apex pointed upwards, the slender juxta, and the row of cornuti on the vesica separate this species from other *Glaucocharis* species. The female genitalia (Fig. 138) share the cruciform-shaped signum on the corpus bursae with *G. clytia* and species of the *ajaxella* species group from Papua. Among them, it shares the lightly sclerotized subconical antrum as well as the bulbous projection with sclerotized spines at the base of the ductus bursae with *G. ajaxella* (Błeszyński, 1966) (Bleszynski, 1966; Gaskin, 1985). The broadly U-shaped indentation of the antrum margin enables unambiguous identification of the female of this species.

HABITUS (FIG. 22)

Forewing length 6.7 mm (n = 1); ground color pale yellow, medially suffused with brown scales. Antemedian line originating at 1/3 of costa, arched outwardly, then bent inwards towards dorsum, meeting dorsum at right angle, cream. Broad dark brown suffusion in cell. Postmedian stigma barely marked, dark brown. Postmedian line originating at costal 3/4, broadly arched outwards, meeting dorsum with an angle of 80°, cream. Subapical V-shaped streak cream. Subterminal area marked with cream suffusion. Margin with six black spots, the three near tornus being more conspicuously marked. Fringes metallic brown. Hindwing cream.

MALE GENITALIA (FIG. 79)

Uncus slender, slightly longer than tegumen arm. Gnathos projection ca 2/5 of uncus length, apex pointed upwards. Valva basally with three conspicuous bristles; ventral margin slightly concave medially, conspicuously rounded apically; costa strongly sclerotized, with a short, pointed projection at apex. Juxta elongate, slender, apex pointed. Saccus subtriangular, with rounded apex. Vesica with row of 7-8 cornuti of increasing length (30-80 µm).

FEMALE GENITALIA (FIG. 138)

Posterior apophyses 3.8 X length of tergite VIII. Anterior apophyses 3.2 X length of tergite VIII. Intersegmental membrane VIII-IX ca 2.4 X length of tergite VIII. Antrum forming a lightly sclerotized cone with posterior margin deeply incurved, U-shaped. Ductus bursae ca 1.5 X length of corpus bursae, roughly straight; ductus-antrum connection conspicuously narrowed, sclerotized; basal pouch broad, strongly sclerotized, covered with small spicules. Corpus bursae large, spherical, with one large cross-shaped signum.

DISTRIBUTION

PHILIPPINES: Luzon (Ifugao, Mountain Province). Collected at altitudes between 1650 and 2100 m.

DNA BARCODING

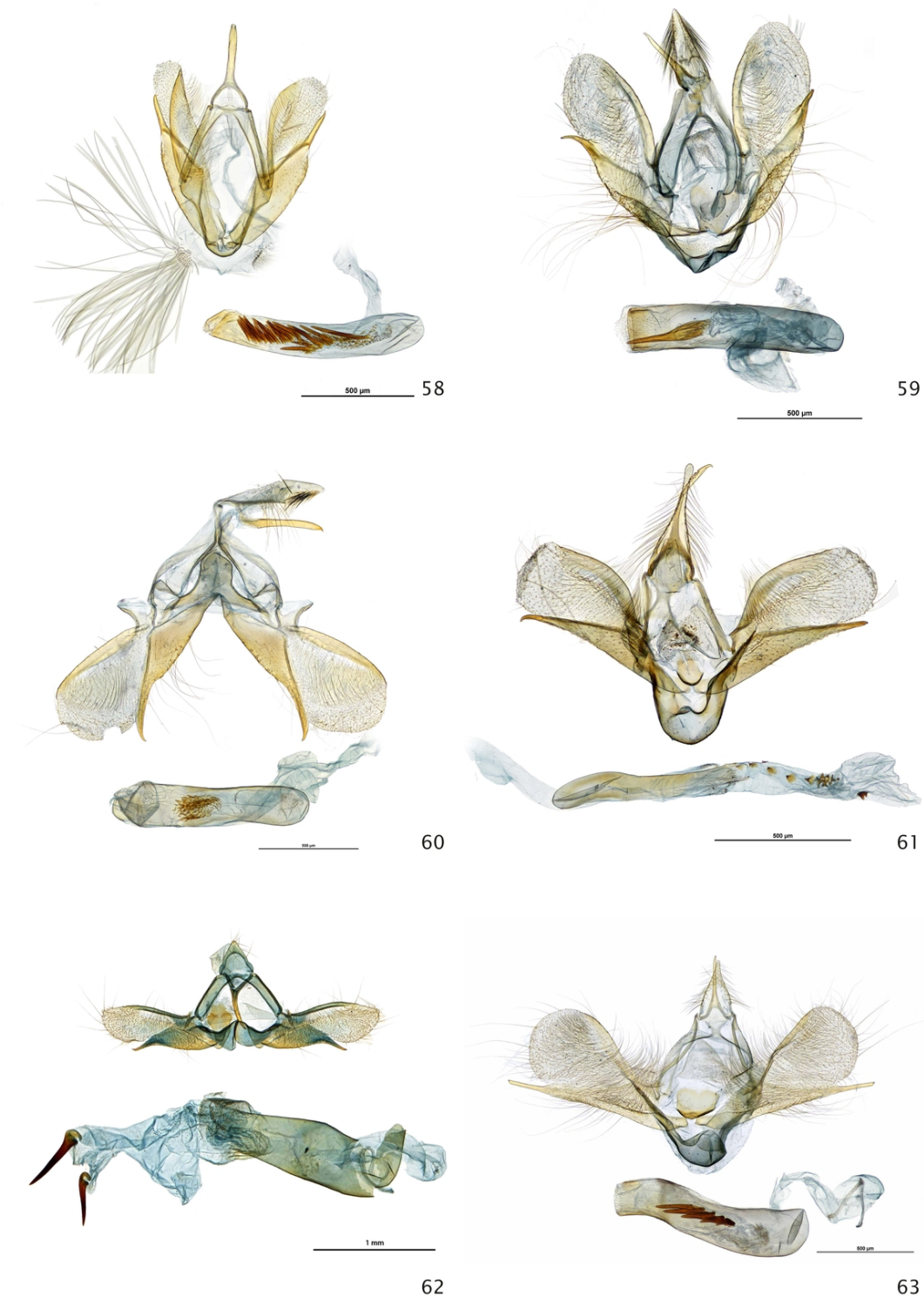
The highest intraspecific divergence observed is of 0.17%.

ETYMOLOGY

From the Filipino *kabundukanis*, "highlands, mountains," referring to the habitat of the species.

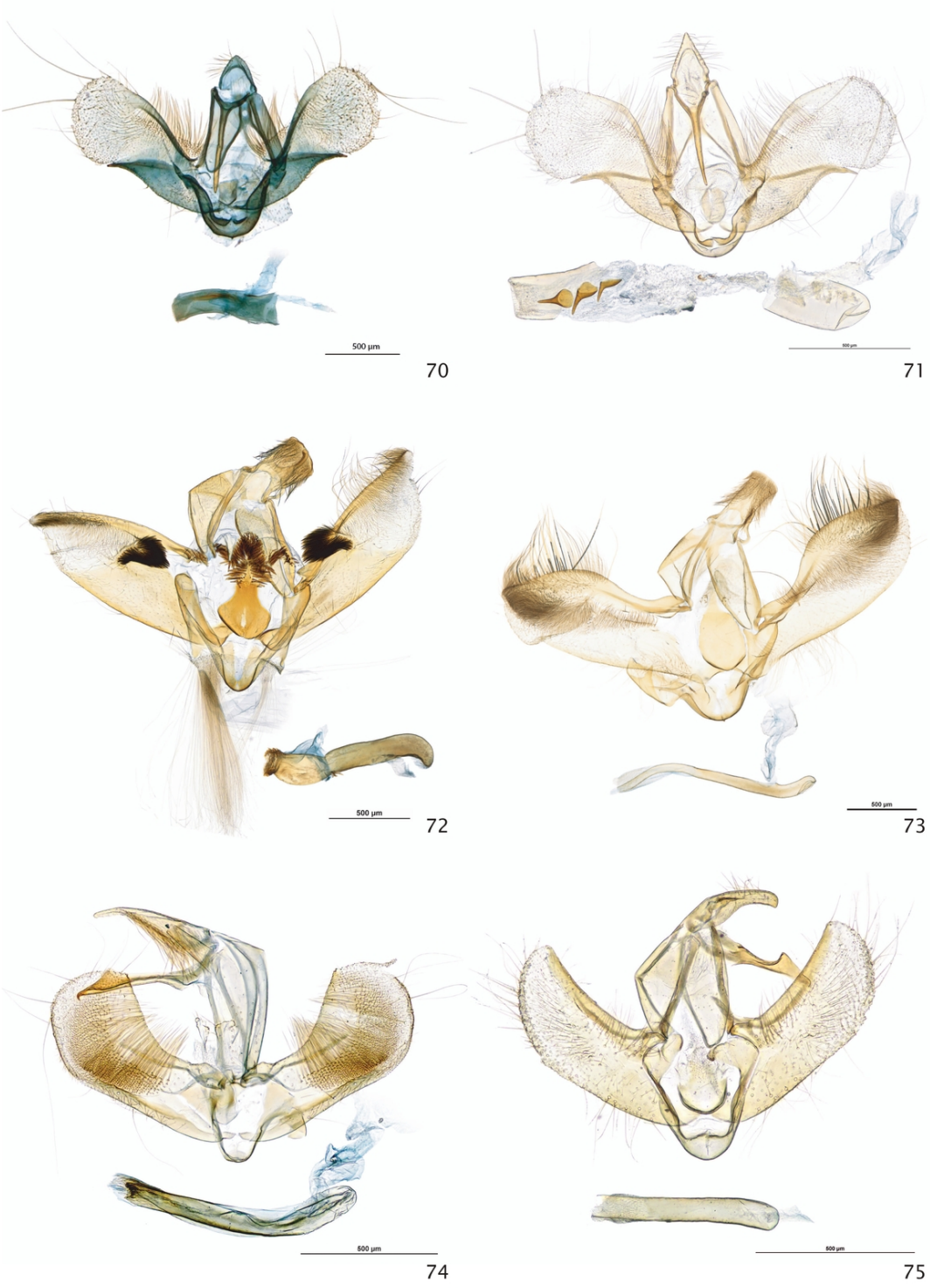
Glaucocharis altissima Léger, sp. n.

https://zoobank.org/7A8D592A-4A4B-48CC-853B-047FD5FDAE7F
Figs. 23, 80, 139.

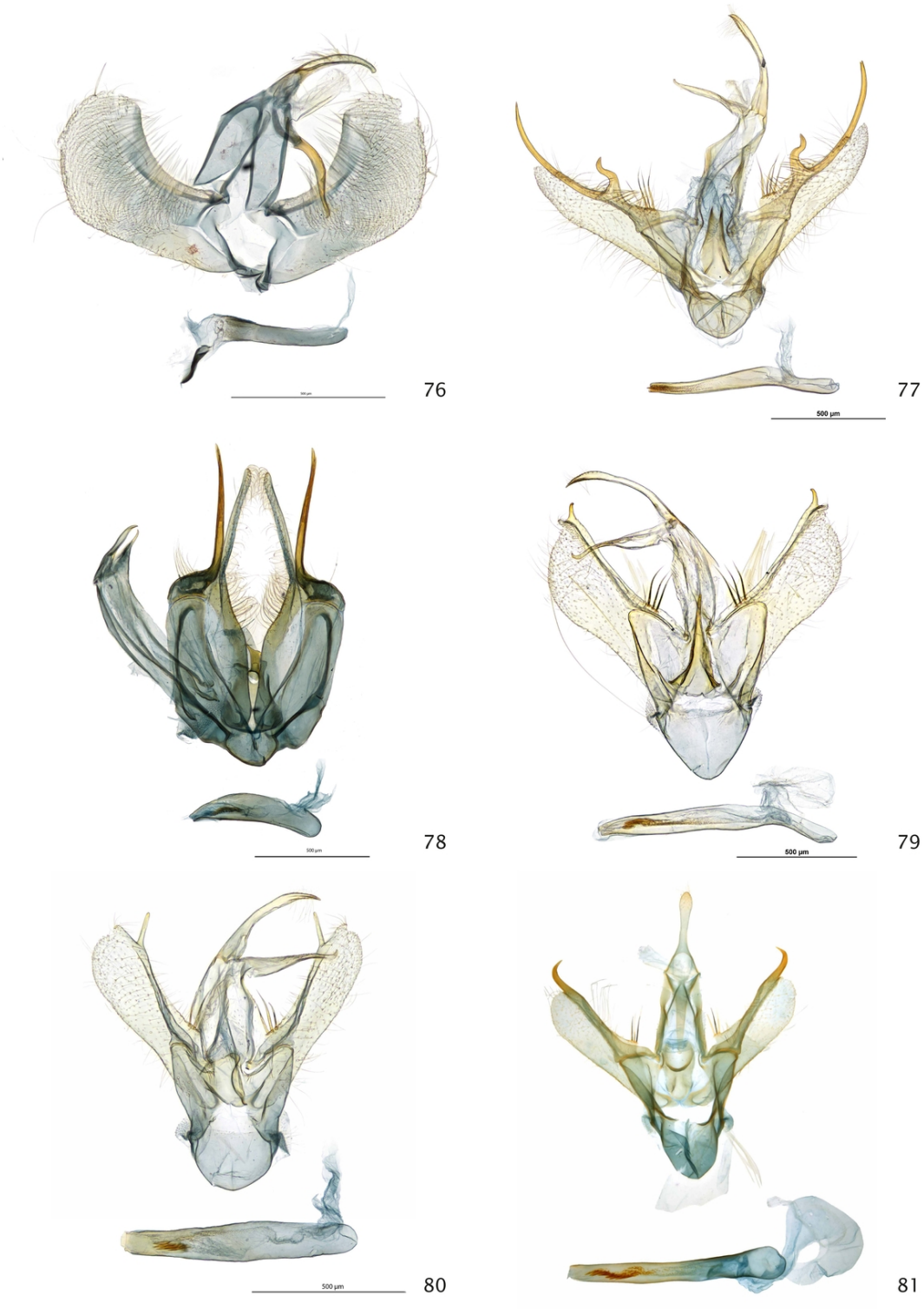


Figs 58-63. Male genitalia of *Scoparia* species. Fig. 58. *Scoparia meyi* Nuss, 1998, slide TL933♂. Fig. 59. *Scoparia monticola* Nuss, 1998, slide TL1043♂. Fig. 60. *Scoparia philippinensis* (Hampson, 1917), slide TL902♂. Fig. 61. *Scoparia luzonensis* **sp. n.**, paratype, slide TL941♂. Fig. 62. *Scoparia abo* **sp. n.**, slide TL1487♂. Fig. 63. *Scoparia masiita* **sp. n.**, holotype, slide TL1039♂.

Figs 64-69. Male genitalia of *Scoparia* species. Fig. 64. *Scoparia tenuispina* **sp. n.**, holotype, slide TL1037♂. Fig. 65. *Scoparia fulvida* **sp. n.**, holotype, slide TL1013♂. Fig. 66. *Scoparia noacki* Nuss, 2002, slide GU Nuss 953♂. Fig. 67. *Scoparia bicornuta* **sp. n.**, paratype, slide TL1035♂. Fig. 68. *Scoparia ifugaoensis* **sp. n.**, holotype, slide TL1026♂. Fig. 69. *Scoparia spadix* Nuss, 1998, paratype, slide GU Nuss 753♂.



Figs 70-75. Male genitalia of *Scoparia*, *Eudonia* and *Micraglossa* species. Fig. 70. *Scoparia negrosensis* **sp. n.**, paratype, slide TL1483♂. Fig. 71. *Scoparia aenea* **sp. n.**, paratype, slide TL990♂. Fig. 72. *Eudonia penicula* **sp. n.**, holotype, slide TL967♂ (genitalia) and TL1156♂ (phallus). Fig. 73. *Eudonia barbipennis* (Hampson, 1897), slide TL907♂. Fig. 74. *Micraglossa tagalica* Nuss, 1998, slide TL987♂. Fig. 75. *Micraglossa polisensis* **sp. n.**, holotype, slide TL985♂.



Figs 76-81. Male genitalia of *Micraglossa* and *Glaucocharis* species. Fig. 76. *Micraglossa kianganensis* **sp. n.**, holotype, slide TL1296♂. Fig. 77. *Glaucocharis clytia* (Bleszynski, 1966), slide TL1073♂. Fig. 78. *Glaucocharis lathonia* (Bleszynski, 1966), slide TL1324♂. Fig. 79. *Glaucocharis kabundukanis* **sp. n.**, paratype, slide TL993♂. Fig. 80. *Glaucocharis altissima* **sp. n.**, paratype, slide TL1323♂. Fig. 81. *Glaucocharis hamulus* **sp. n.**, holotype, slide TL1333♂.

MATERIAL

Holotype: ♂ (specimen identifier coll.mfn-berlin.de_u_4cc0b0, DNA voucher MFNLEP-PYRAL-PHIL10-B09, genitalia on slide TL1317♂; BOLD sample ID PYPHI427-23; Genbank Accession Number PP211083). PHILIPPINES: Luzon, Ifugao, Mount Polis, 2000 m, 13.11.1997 (K. Ebert, W. Mey, M. Nuss). Deposited in MfN.

Paratypes: 8 ♂ (specimen identifiers MfN: coll.mfn-berlin.de_u_a89b8d, 8e4664, 3685bd, ad5a00, 68f213, 57e7fa; PNM: id.bioseasia.org_u_669810; NHMUK: NHMUK013706260), 10 ♀ (specimen identifiers MfN: coll.mfn-berlin.de_u_77cf5e, 3b0e51, 718784, 8ea3e2, 6f7452, 38d0fb, 5763dd, b48f8a, 44557e; PNM: id.bioseasia.org_u_0235b5) (detailed information in Table S1; https://doi.org/10.5061/dryad.b8gtht7mh).

SIMILAR SPECIES

Glaucocharis kabundukanis **sp. n.**, *G. hamulus* **sp. n.**

DIAGNOSIS

Glaucocharis altissima **sp. n.** is externally similar to *G. clytia* and *G. kabundukanis* **sp. n.** The forewing of *G. altissima* **sp. n.** (Fig. 23) shows an ochreous ground color speckled with brown scales, while it is white to yellow and speckled with dark brown scales in *G. clytia* and white to ochreous in *G. kabundukanis* **sp. n.** The male genitalia (Fig. 80) are similar to those of *Glaucocharis kabundukanis* **sp. n.**: The costa is projected apically into a slender arm about 1/4 of valva length, while the projection is conspicuously shorter in *G. kabundukanis* **sp. n.**; the juxta is deltoid with truncate apex, while it is slender and elongate in *G. kabundukanis* **sp. n.** In female genitalia (Fig. 139), the indentation of the antrum posterior margin is less deeply incurved than in *G. kabundukanis* **sp. n.**, and the basal pouch of the ductus bursae lacks the sclerotization found in *G. kabundukanis* **sp. n.**

HABITUS (FIG. 23)

Forewing length 6.5 mm (n = 1); ground color light ochreous, medially suffused with brown scales. Antemedian line originating at costal 1/3, arched outwardly, then bent inwards towards dorsum, meeting dorsum at right angles, cream. Basal and median area below costa uniformly suffused with brown scales. Postmedian stigma forming vertical dark brown dash edged distally with cream. Postmedian line originating at costal 3/4, broadly arched outwards, meeting dorsum with an angle of 55°, cream. Subapical V-shaped streak cream. Subterminal area cream, distally suffused with brown. Margin with six black spots, the three near tornus more conspicuously marked. Fringes copper. Hindwing cream.

MALE GENITALIA (FIG. 80)

Uncus ca 5/4 of tegumen arm length, slender, regularly curved downwards, apex pointed in lateral view. Gnathos ca 3/4 of uncus length, slender, triangular, apex tip pointed upwards. Tegumen arms slightly angled at distal 1/3. Valva basally with three conspicuous, sclerotized bristles; ventral margin straight; costa conspicuously sclerotized, apically projecting upwards into slender arm ca 1/4 the length of valva; valva apex pointed. Juxta deltoid with truncate apex. Vesica with row of six cornuti (45-70 µm).

FEMALE GENITALIA (FIG. 139)

Anterior apophyses 2.2 X length of tergite VIII. Posterior apophyses ca 2.2 X length of tergite VIII. Intersegmental membrane VIII-IX 1.8 X length of tergite VIII. Antrum forming a lightly sclerotized cone with posterior margin ventrally broadly incurved. Ductus bursae 1.5 X length of corpus bursae, roughly straight, larger distally; basal pouch ellipsoid, membranous, with patch of small spicules. Corpus bursae spherical, with one large cross-shaped signum.

DISTRIBUTION

PHILIPPINES: Luzon (Benguet, Ifugao). Collected at altitudes between 2000 and 2350 m.

DNA BARCODING

Two MOTUs were recovered in the species delimitation analysis for North Luzon and Mindoro. Unfortunately, the MOTU for Mindoro is exclusively represented by female specimens. A high haplotype diversity is recovered, with the 19 specimens sequenced showing 11 different haplotypes (see Fig. 179e).

ETYMOLOGY

From the Latin *altus, a, um*: high and the superlative *–issim*, referring to the high altitude at which the species is encountered.

Glaucocharis hamulus Léger, sp. n.

https://zoobank.org/267BDC50-66BD-4E93-A44C-9297A5F9B8C0

Fig. 81

MATERIAL

Holotype: ♂ (specimen identifier coll.mfn-berlin.de_u_91835d, DNA voucher MFNLEP-PYRAL-PHIL10-A11, genitalia on slide TL1333♂; BOLD sample ID PYPHI414-23, Genbank Accession Number PP211070). PHILIPPINES: Luzon, Benguet, Adunot river Unterlauf, 19-21.11.1997 (K. Ebert, W. Mey, M. Nuss). Deposited in MfN.

Paratype: ♂ (specimen identifier coll.mfn-berlin.de_u_2e31ce) (detailed information in Table S1; https://doi.org/10.5061/dryad.b8gtht7mh).

SIMILAR SPECIES

Glaucocharis kabundukanis **sp. n.**

DIAGNOSIS

The forewing of the male of *Glaucocharis hamulus* **sp. n.** (not shown) is externally identical to *G. kabundukanis* **sp. n.** and can be only reliably identified by examination of male genitalia. In male genitalia (Fig. 81), the apex of the costal arm is projected beyond the valva and is curved upwards

into a tip, and the juxta apex is deeply notched. Females are unknown.

HABITUS

As in *Glaucocharis kabundukanis* **sp. n.**

MALE GENITALIA (FIG. 81)

Uncus as long as tegumen arm length, slender, regularly curved downwards, apex spatulate, slightly pointing downwards. Gnathos projection about 5/6 of uncus length, slender, narrowing towards apex, apex tip pointed upwards. Tegumen arms slightly angled at distal 1/3. Valva basally with three conspicuous, sclerotized bristles; dorsal and ventral margin straight, valva apex rounded; costal process forming narrow arm, distally projecting beyond valva, apex bent upwards, forming pointed tip. Juxta basally rounded, apically broadly notched. Vesica with row of ca 15 cornuti.

FEMALE GENITALIA

Unknown.

DISTRIBUTION

PHILIPPINES: Luzon (Benguet), Negros. Collected at altitudes between 750 and 1400 m.

DNA BARCODING

The highest intraspecific divergence observed is of 1.9% between samples MFNLEP-PYRALPHIL10-A11 and MFNLEP-PYRALPHIL11-C03, both from Benguet (Luzon).

ETYMOLOGY

From the Latin *hamulus, i,* hook, refering to the hook-shaped apex of the costal process in male genitalia.

Glaucocharis uncusellus Léger, sp. n.

https://zoobank.org/F1890790-8270-44CF-B878-0A66E2F3920C
Figs. 24, 82, 140.

MATERIAL

Holotype: ♂ (specimen identifier coll.mfn-berlin.de_u_693863, DNA voucher MFNLEP999, genitalia on slide TL1310♂; BOLD sample ID PYPHI354-22, Genbank Accession Number PP197031). PHILIPPINES: Samar, Concord Cadacan, 150 m, 22-24.04.1997 (W. Mey, W. Speidel). Deposited in MfN

Paratypes: 1 ♂ (specimen identifier coll.mfn-berlin.de_u_5e4759), 1 ♀ (specimen identifier coll.mfn-berlin.de_u_343871) (see detailed information on Table S1; https://doi.org/10.5061/dryad.b8gtht7mh).

SIMILAR SPECIES

Glaucocharis melistoma (Meyrick, 1931); *Glaucocharis furculella* Wang & Sung, 1988; *Glaucocharis reniella* Wang & Sung, 1988; *Glaucocharis tridentata* Li & Li, 2012; *Glaucocharis unipunctalis* Sasaki, 2007.

DIAGNOSIS

The general dark brown pattern of the forewing (Fig. 24), the regularly arched antemedian line, and the b-shaped stigma separate this species from other *Glaucocharis* from the Philippines. With the above listed species, this species shares similar male genitalia (Fig. 82): The gnathos projection is spatulate, covered with a patch of hairs, the valva is distally narrowed, projecting upwards, and the costal process forms a thin basal arm projecting upwards. The short uncus and the S-shaped basal arm of the valva unambiguously separates this species from other *Glaucocharis* species. In female genitalia (Fig. 140), the membranous antrum, the tubular sclerotized colliculum, and the spherical corpus bursae with one single signum separates this species from other *Glaucocharis* species.

HABITUS (FIG. 24)

Forewing length 4 mm; ground color dark brown. Antemedian line evenly arched, cream. Broad ocher suffusion at costa in basal half, with a mix of cream and brown scales in distal half. Median area scattered with cream scales, cubital area with patch of ocher scales. Postmedian stigma forming b-shaped cream dash filled with ocher. Postmedian line barely marked at costa, zigzagging near margin on middle, then meeting dorsum at 4/5. Apical ocher blotch with cream streak. Margin ocher, interspersed with two dark brown spots. Hindwing dirty white.

MALE GENITALIA (FIG. 82)

Uncus ca half as long as tegumen arm, triangular, with apex rounded. Gnathos projection twice as long as uncus, slender, apex larger, spatula-shaped, with patch of sclerotized spines surrounded with hairs. Valva with costal arm projected upwards, bent at 2/5 outwards with 75° angle, then bent upwards at 4/5; valva subtriangular in basal 2/3, distal 1/3 projecting upwards into slender arm with rounded tip. Juxta basally rounded, distally forming two arms surrounding phallus. Phallus long, sclerotized, slender.

FEMALE GENITALIA (FIG. 140)

Papillae anales missing in the specimen investigated. Anterior apophyses ca 2.2 X length of tergite VIII. Antrum membranous. Colliculum ca half of ductus bursae length, tubular, lightly sclerotized. Ductus bursae long, narrowed medially, conspicuously enlarged on distal 1/4 at ductus seminalis connection. Corpus bursae globular, scobinate, with one rounded signum.

DISTRIBUTION

PHILIPPINES: Mindanao (Davao Oriental), Negros, Samar. Collected at altitudes between 150 and 1050 m.

DNA BARCODING

The two samples MFNLEP-PYRALPHIL07-C10 from Negros and MFNLEP999 from Samar shows identical DNA barcodes.

ETYMOLOGY

From "uncus" and the diminutive Latin suffix "–*ellus*", referring to the short-sized uncus in male genitalia.

Glaucocharis kayumanggi Léger, sp. n.

https://zoobank.org/E9FD5C3D-4BEB-4144-A5B3-D7A24900F20D
Figs. 25, 26, 83, 141.

MATERIAL

Holotype: ♂ (specimen identifier coll.mfn-berlin.de_u_bc1764, DNA voucher MFNLEP-PYRALPHIL10-D09, genitalia on slide TL1321♂; BOLD sample ID PYPHI422-23, Genbank Accession Number PP211078). PHILIPPINES: Luzon, Nueva Vizcaya, Bald Mountains, Santa Fe, 1150 m, 11-13.11.1997 (K. Ebert, W. Mey, M. Nuss). Deposited in MfN.

Paratypes: 12 ♀ (specimen identifiers MfN: coll.mfn-berlin.de_u_137c30, cc22c2, bd83a4, 7b7c16, 4c185f, 1453bc, 292a90, 89b6f7, 3f58c4; PNM: id.biosea-sia.org_u_0235c0, 0235c2; NHMUK: NHMUK013706262), 1 ♂ (specimen identifier coll.mfn-berlin.de_u_7c8ebe) (see detailed information on Table S1; https://doi.org/10.5061/dryad.b8gtht7mh).

SIMILAR SPECIES

Glaucocharis sungay **sp. n.**, *Glaucocharis negrosensis* **sp. n.**

DIAGNOSIS

Among the Philippines *Glaucocharis* species, *Glaucocharis kayumanggi* **sp. n.**, *G. sungay* **sp. n.**, and *G. negrosensis* **sp. n.** are easily distinguished by the general brown color of the forewing in female specimens, while other species exhibit a mix of white, fulvous, and brown scales. *Glaucocharis kayumanggi* **sp. n.** can only be confidently separated from *G. sungay* **sp. n.** and *G. negrosensis* **sp. n.** by examination of genitalia. In male genitalia (Fig. 83), this species shares with *G. sungay* **sp. n.** and *G. negrosensis* **sp. n.** the club-shaped gnathos apex, the ventro-basal hook-shaped process of the valva, and the long, narrow, sclerotized phallus. In *G. kayumanggi* **sp. n.**, the hook-like ventral process of the valva is thinner than in *G. sungay* **sp. n.** and longer than that of *G. negrosensis* **sp. n.**, almost reaching valval dorsal margin. The sacculus apex splits in two, with the dorsal arm extending beyond ventral process distally and ventrally forming a conspicuous lobe. In female genitalia (Fig. 141), the oblong corpus bursae with the star-like signum separates this species and *G. sungay* **sp. n.** from all *Glaucocharis* species (female of *G. negrosensis* **sp. n.** not known). The triangular indentation of the antrum ventral margin best separates this species from *G. sungay* **sp. n.**, where the antrum margin is evenly rounded.

HABITUS (FIGS. 25, 26)

Forewing length 5.4-6.4 mm (n = 6). Male forewing (Fig. 26) with pale yellow ground color, suffused with brown scales. Antemedian line originating at costal 1/3, arched outwardly, then bent inwards towards dorsum, meeting dorsum at right angles, cream. Distal discoidal stigma forming short transversal dark brown streak. Postmedian line originating at costal 3/4, broadly arched outwards, jagged at CuA2 vein, meeting dorsum with an angle of 80°, cream. Subapical V-shaped cream streak. Subterminal area speckled with dark brown. Margin with six black spots, the three near tornus more conspicuously marked. Fringes metallic brown. Hindwing white. Female forewing (Fig. 25) with metallic brown ground color. Antemedian line curved in costal half, then bent inwards towards dorsum, cream, distally edged with darker brown. Median area uniformly metallic brown, small fulvous blotch at costa. Distal discoidal stigma forming short transverse fulvous streak. Postmedian line conspicuously arched outwards towards margin, wavy, basally and distally edged with dark brown. Apex fuscous with thin metallic streak. Subterminal area brown to copper, with darker spots. Fringes metallic brown, white apically, cream at margin notch. Hindwing pale yellow, apex metallic brown.

MALE GENITALIA (FIG. 83)

Uncus about 4/5 of tegumen arm length, slender; lateral margin projecting downwards into a tooth at basal 1/4, uncus conspicuously narrowed at 3/4; apex duck-beak shaped. Gnathos arms joining at basal 1/4, gnathos projection as long as uncus, slender, apex club-shaped, covered with small teeth, densely haired. Valva with ventro-distal process hook-shaped, pointing upwards, strongly sclerotized; sacculus split in two: ventral arm slender with subtriangular apex; dorsal arm more strongly sclerotized, dorsal margin straight, ventral margin forming a conspicuous rounded bump, apex reaching beyond ventral hook-shaped projection, rounded, pointing downwards. Juxta with ventral keel-like projection at base; juxta plate enlarging in basal half, abruptly narrowed at midlength, distal projection narrow, apex tongue-shaped. Phallus long, thin, sclerotized, vesica devoid of cornuti.

FEMALE GENITALIA (FIG. 141)

Posterior apophyses ca 2.2 X length of tergite VIII. Intersegmental membrane VIII-IX ca 1.3 X length of tergite VIII. Anterior apophyses ca 2 X length of tergite VIII. Antrum funnel-shaped, ventral posterior margin V-shaped, strongly sclerotized. Antrum-colliculum junction marked, short, membranous. Colliculum narrow, ca 1/10 of ductus length, incurved, sclerotized. Ductus bursae long, roughly straight. Ductus seminalis branching at corpus opening. Corpus bursae oblong, roughly as long as ductus bursae, scobinate, with well-marked star-like signum near corpus opening.

DISTRIBUTION

PHILIPPINES: Luzon (Mountain Province, Nueva Vizcaya). Collected at altitudes between 1150 and 2100 m.

DNA BARCODING

The highest intraspecific divergence observed is 0.33% between MFNLEP-PYRALPHIL10-D09 (Luzon: Nueva Viz-

caya) and MFNLEP-PYRALPHIL08-C03 (Luzon: Mountain Province).

ETYMOLOGY

From the Tagalog *kayumanggi*, brown, refering to the brownish color of the forewings of the females.

Glaucocharis sungay Léger, sp. n.

https://zoobank.org/D68F24B4-38FF-47B5-91B9-287740C7EE0C
Figs. 84, 142.

MATERIAL

Material examined: Holotype: ♂ (specimen identifier coll.mfn-berlin.de_u_5bf419, DNA voucher MFNLEP-PYRALPHIL08-F09, genitalia on slide TL1204♂; BOLD sample ID PYPHI218-22, Genbank Accession Number PP196898). PHILIPPINES: Luzon, Albay, Amater, Mount Malinao, submontane forest, 400 m, 25-26.03.2000 (K. Ebert, W. Mey). Deposited in MfN.

Paratypes: 1 ♂ (specimen identifier coll.mfn-berlin.de_u_ab87f5), 2 ♀ (specimen identifiers coll.mfn-berlin.de_u_ae0f07, e19c94) (detailed information in Table S1; https://doi.org/10.5061/dryad.b8gtht7mh).

SIMILAR SPECIES

Glaucocharis kayumanggi **sp. n.**, *G. negrosensis* **sp. n.**

DIAGNOSIS

This species is externally identical to *Glaucocharis kayumanggi* **sp. n.** (see Fig. 25, Fig. 26) and *G. negrosensis* **sp. n.** and can only be reliably identified by examination of genitalia. In male genitalia (Fig. 84), the gnathos is broader than in G. *kayumanggi* **sp. n.** and bears small teeth dorsally on apical 1/4, the stout ventral hook-like process of the valva is larger than that in *G. kayumanggi* **sp. n.** and *G. negrosensis* **sp. n.**, and the sacculus does not extend distally beyond the ventral process. In female genitalia (Fig. 142), the evenly incurved margin of the antrum ventral margin best separates this species from *G. kayumanggi* **sp. n.**, where the antrum margin is indented.

HABITUS

As in *Glaucocharis kayumanggi* **sp. n.**

MALE GENITALIA (FIG. 84)

Uncus ca 2/3 of tegumen arm length, dorsally glabrous, ventral margin undulate, apex pointed. Gnathos projection about 5/3 of uncus length, distal half slightly larger, tongue-shaped, dorsally covered with tiny teeth, apex densely haired. Valva with strongly sclerotized cucullus, projecting distally into a thickly sclerotized hook pointing upwards; sacculus dorsal margin straight, apex conspicuously indented, with dorsal lobe narrower, projecting beyond ventral lobe. Juxta base notched, medially conspicuously widened, apically projected into two thin arms with pointed tip. Phallus slender, curved, sclerotized; vesica without cornuti.

FEMALE GENITALIA (FIG. 142)

Posterior apophyses ca 2.5 X length of tergite VIII. Intersegmental membrane VIII-IX 1.5-2 X length of tergite VIII. Anterior apophyses ca 2.1 X length of tergite VIII. Antrum narrow, tubular, strongly sclerotized, ventral margin evenly incurved. Antrum-colliculum junction marked, narrow, membranous. Colliculum short, ca 1/7 of ductus length, tubular, sclerotized. Ductus bursae long, curved twice in basal half, roughly straight on distal half. Ductus seminalis branching at distal 1/3 of ductus bursae. Corpus bursae oblong, slightly longer than ductus bursae, scobinate, with well-marked star-like signum near corpus opening.

DISTRIBUTION

PHILIPPINES: Luzon (Quezon, Albay), Mindoro. Collected at altitudes between 400 and 1300 m.

DNA BARCODING

The highest intraspecific divergence observed is of 1.15% between MFNLEP-PYRALPHIL07-F10 (Luzon) and MFNLEP-PYRALPHIL07-G10 (Mindoro).

ETYMOLOGY

From the Tagalog *sungay*, horn, referring to the hook-shaped projection in male genitalia. This name was proposed by Clister Pangantihon and Beatriz Christalle Seno.

Glaucocharis negrosensis Léger, sp. n.

https://zoobank.org/3325F05B-56BF-48E8-98C2-4526780D89BB
Fig. 85

MATERIAL

Holotype: ♂ (specimen identifier coll.mfn-berlin.de_u_c1f971, DNA voucher MFNLEP-PYRALPHIL08-G01, genitalia on slide TL1360♂; BOLD sample ID PYPHI221-22, Genbank Accession Number PP196901). PHILIPPINES: Negros, Negros Oriental, Patag, Lake Danao, 1400 m, 21.05.1996 (W. Mey). Deposited in MfN.

Paratype: 1 ♂ (specimen identifier coll.mfn-berlin.de_u_5145c8) (detailed information on Table S1; https://doi.org/10.5061/dryad.b8gtht7mh).

SIMILAR SPECIES

Glaucocharis kayumanggi **sp. n.**, *Glaucocharis sungay* **sp. n.**

DIAGNOSIS

The male of this species is externally identical to *Glaucocharis kayumanggi* **sp. n.** and *Glaucocharis negrosensis* **sp. n.** and can only be reliably identified by examination of genitalia. In male genitalia, *Glaucocharis negrosensis* **sp. n.** can be separated by the narrower, shorter ventro-basal process, the valval innermargin forming two conspicuous

lobes, the juxta basal arm projected ventrally, and the juxta plate evenly narrowing towards apex.

HABITUS

As in *G. kayumanggi* **sp. n.**

MALE GENITALIA (FIG. 87)

Uncus ca 4/5 of tegumen arm length, slender, bent downwards at basal 1/4, apex spatulate. Gnathos projection ca 1.1 X uncus length, slender, apex club-shaped, covered with small teeth, densely haired. Valva with cucullus process hook shaped, pointing upwards, strongly sclerotized; sacculus dorsal margin roughly straight, inner margin forming two conspicuous lobes, apex rounded. Juxta basally with stout arm projected ventro-anterad, curved downward; juxta plate basally rounded, narrowing towards apex; apex incurved. Phallus long, thin, sclerotized, vesica devoid of cornuti.

FEMALE GENITALIA

Not known.

DISTRIBUTION

PHILIPPINES: Negros. Collected at an altitude of 1400 m.

DNA BARCODING

The two specimens sequenced have identical DNA barcodes.

ETYMOLOGY

Derived from Negros island where the species is encountered.

Glaucocharis spp.

MATERIAL

Glaucocharis ♀ sp. 1 (not illustrated): ♀ (specimen identifier coll.mfn-berlin.de_u_3a3401, DNA voucher MFNLEP-PYRALPHIL07-E10, abdomen lost). PHILIPPINES: Luzon, Zambales Mountains, Coto, 110 m, 05-06.05.1999 (K. Ebert, W. Mey).

Glaucocharis ♀ sp. 2 (Fig. 143): 1 ♀ (specimen identifier coll.mfn-berlin.de_u_b8b597, DNA voucher MFNLEP-PYRALPHIL07-B11, genitalia on slide TL1079F). PHILIPPINES: Leyte, Lake Danao, 650 m, 14-17.04.1997 (W. Mey, W. Speidel).

Glaucocharis ♀ sp. 3 (Fig. 144): 1 ♀ (specimen identifier coll.mfn-berlin.de_u_86abe6, DNA voucher MFNLEP-PYRALPHIL07-F11, genitalia preparation TL1081F). PHILIPPINES: Mindoro, Occidental Mindoro, Mount Baco Pass, 1150 m, 14.01.1998 (W. Mey, V. Samarita).

Glaucocharis ♀ sp. 4 (not illustrated): 1 ♀ (specimen identifier coll.mfn-berlin.de_u_613241, DNA voucher MFNLEP-PYRALPHIL07-H11, genitalia on slide TL1083F). PHILIPPINES: Mindanao, Davao oriental, Mount Agtuguanon, 1050 m, 28.05-07.06.1996 (W. Mey).

Glaucocharis ♀ sp. 5 (not illustrated): 1 ♀ (specimen identifier coll.mfn-berlin.de_u_fcd9bf, DNA voucher MFNLEP-PYRALPHIL10-G10, genitalia on slide TL1331F). PHILIPPINES: Luzon, Laguna, Los Baños, Mount Makiling, 850 m, 16.03.2000 (K. Ebert, W. Mey).

Glaucocharis ♀ sp. 6 (not illustrated): 1 ♀ (specimen identifier coll.mfn-berlin.de_u_590635, DNA voucher MFNLEP-PYRALPHIL10-H10, genitalia preparation TL1332F), 1 ♀ (coll.mfn-berlin.de_u_359dc3, DNA voucher MFNLEP-PYRALPHIL08-A03, abdomen lost). PHILIPPINES: Luzon, Laguna, Los Baños, Mount Makiling, 850 m, 16.03.2000 (K. Ebert, W. Mey).

REMARKS

Six further species could be delimited using evidence from DNA barcoding, female genitalia, and habitus. However, I refrain from describing new species from unique female specimens here.

Roxita sp.

MATERIAL

1 ♂ (specimen identifier coll.mfn-berlin.de_u_a7fa3, DNA voucher MFNLEP-PYRALPHIL07-H07, genitalia on slide TL1057♂). PHILIPPINES: Leyte, Mount Balocaue, 719 m, 20-22.09.2011 (S. Naumann).

REMARKS

The unique male specimen of this species presumably belongs to a new species of *Roxita*. Unfortunately, much of the male genitalia was destroyed during the DNA extraction, so I decided not to formally describe this species but rather wait for additional material.

Gargela Walker, 1864

*Gargela** Walker, 1864: 815. **Type species**: *Gargela subpurella* Walker, 1864.

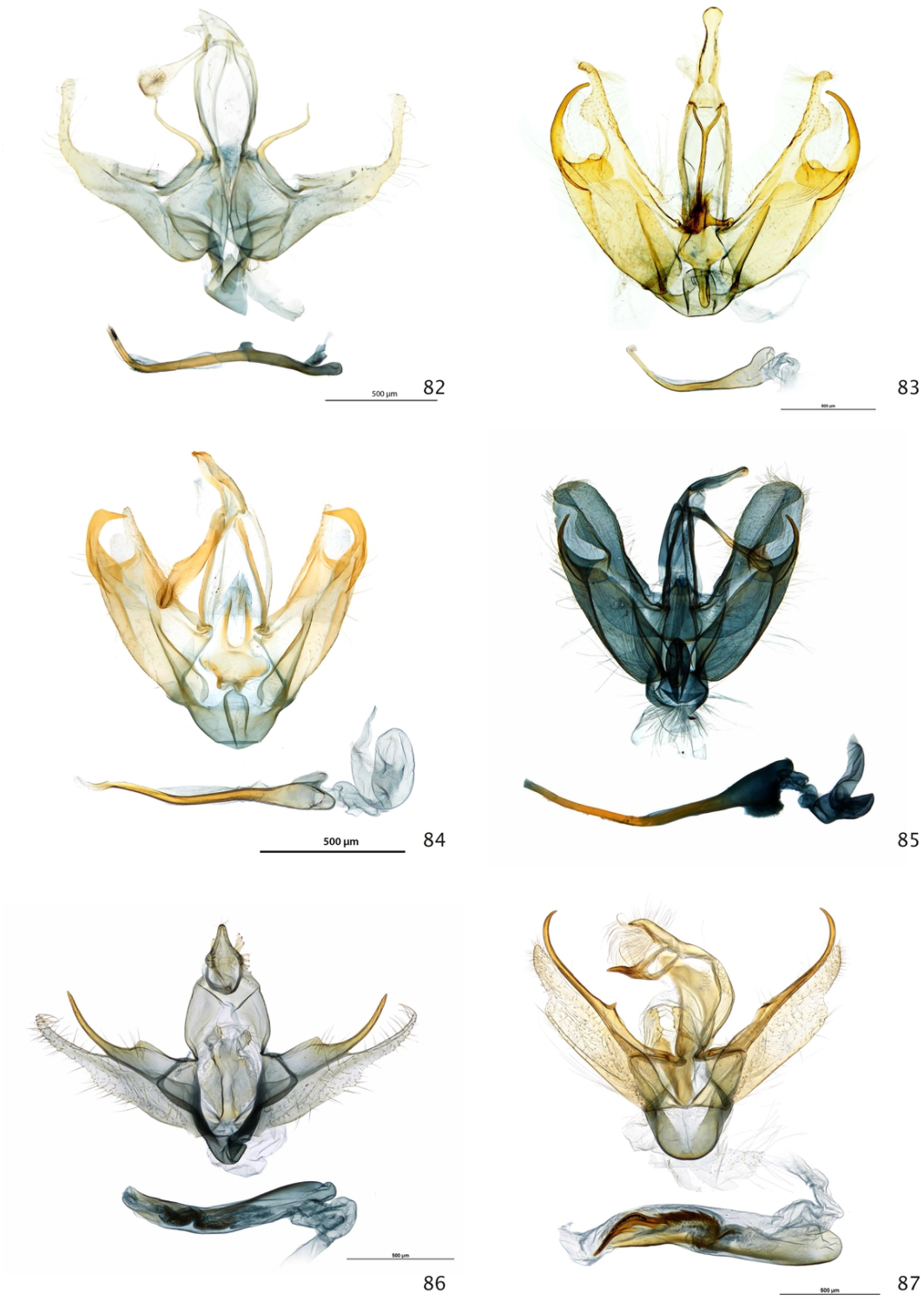
= *Mixophyla* Meyrick, 1887: 269. Type species: Crambus ermineus Moore, 1886

= *Angonia* Snellen, 1893: 54–56. Type species: *Angonia crambidalis* Snellen, 1893. Hampson 1896: 190 (syn.)

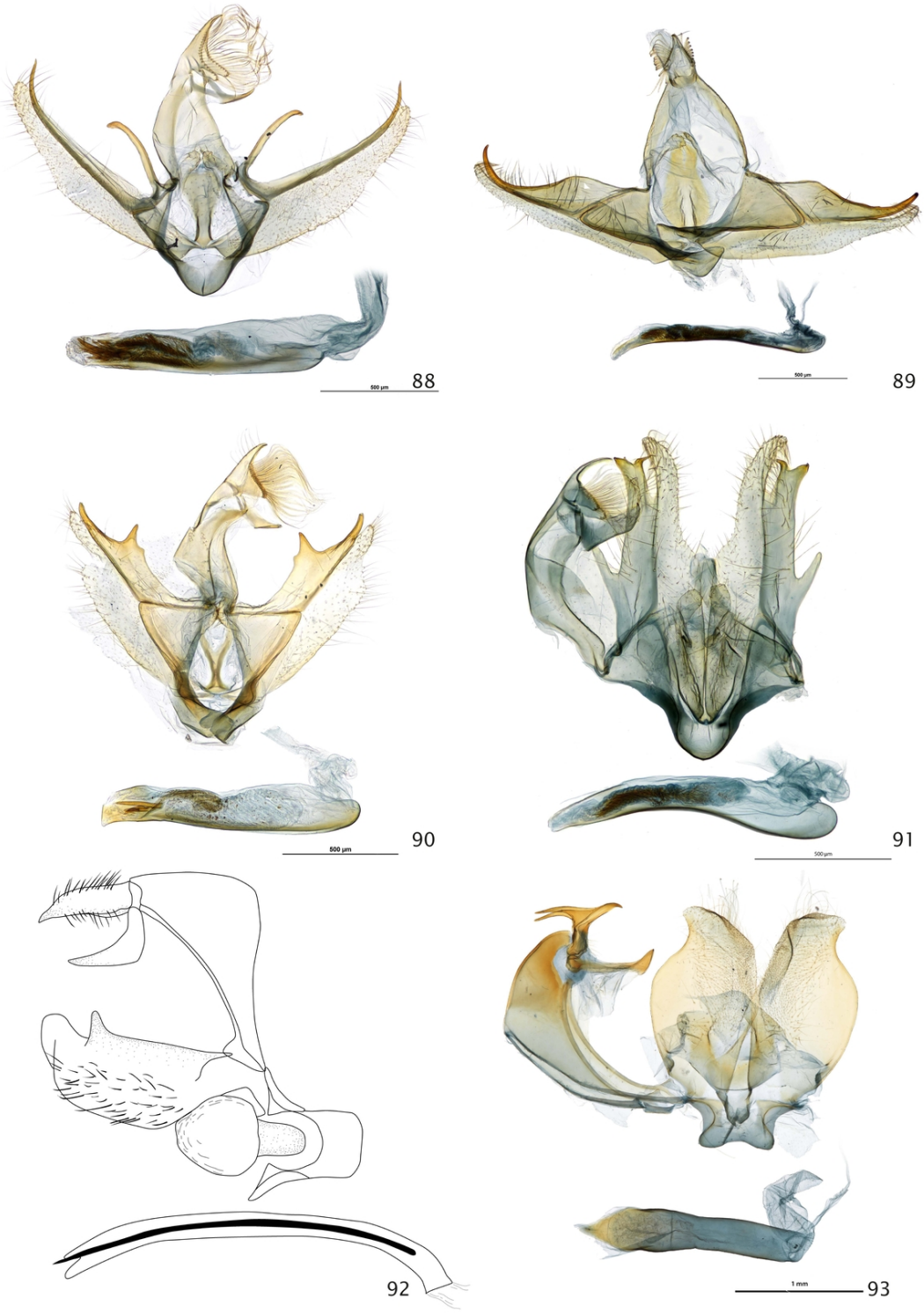
= *Mixophila** Hampson, 1896: 190

DIAGNOSIS

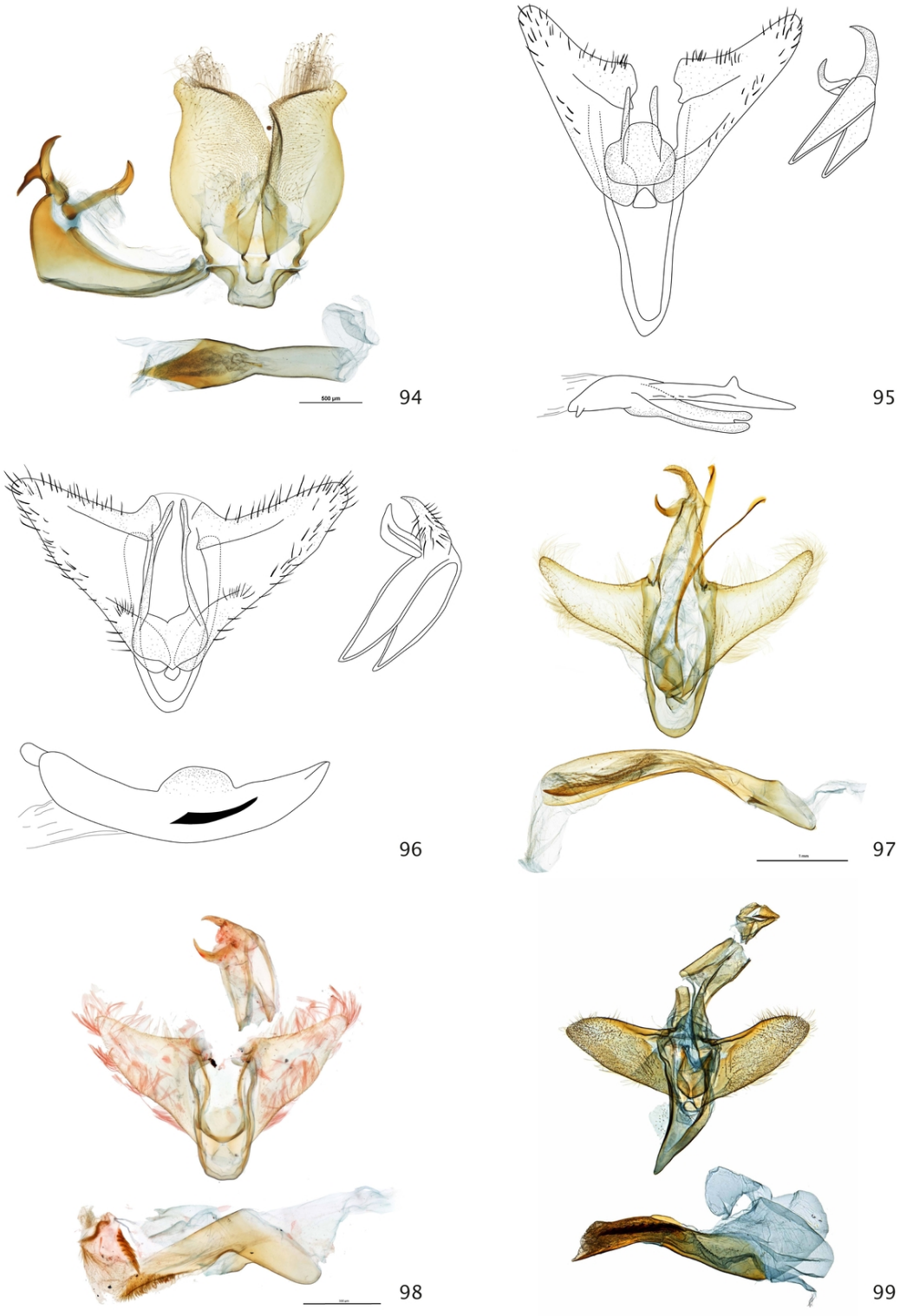
Forewing usually silvery white with curved median and postmedian lines (Song et al., 2009). In male genitalia, *Gargela* species show the following characters: uncus short, beak-shaped, with two characteristic ventral basal arms bearing a tuft of thick setae; gnathos short, beak-shaped; valva with costal arm narrow, sclerotized, elongate, with apex pointed upwards or posterad; and juxta distally with two lateral arms with scattered setae. In female genitalia, *Gargela* species show the following characters: papillae anales evenly rounded, posterior apophyses short, ductus bursae usually covered with spines in basal half, and corpus bursae with two signa.



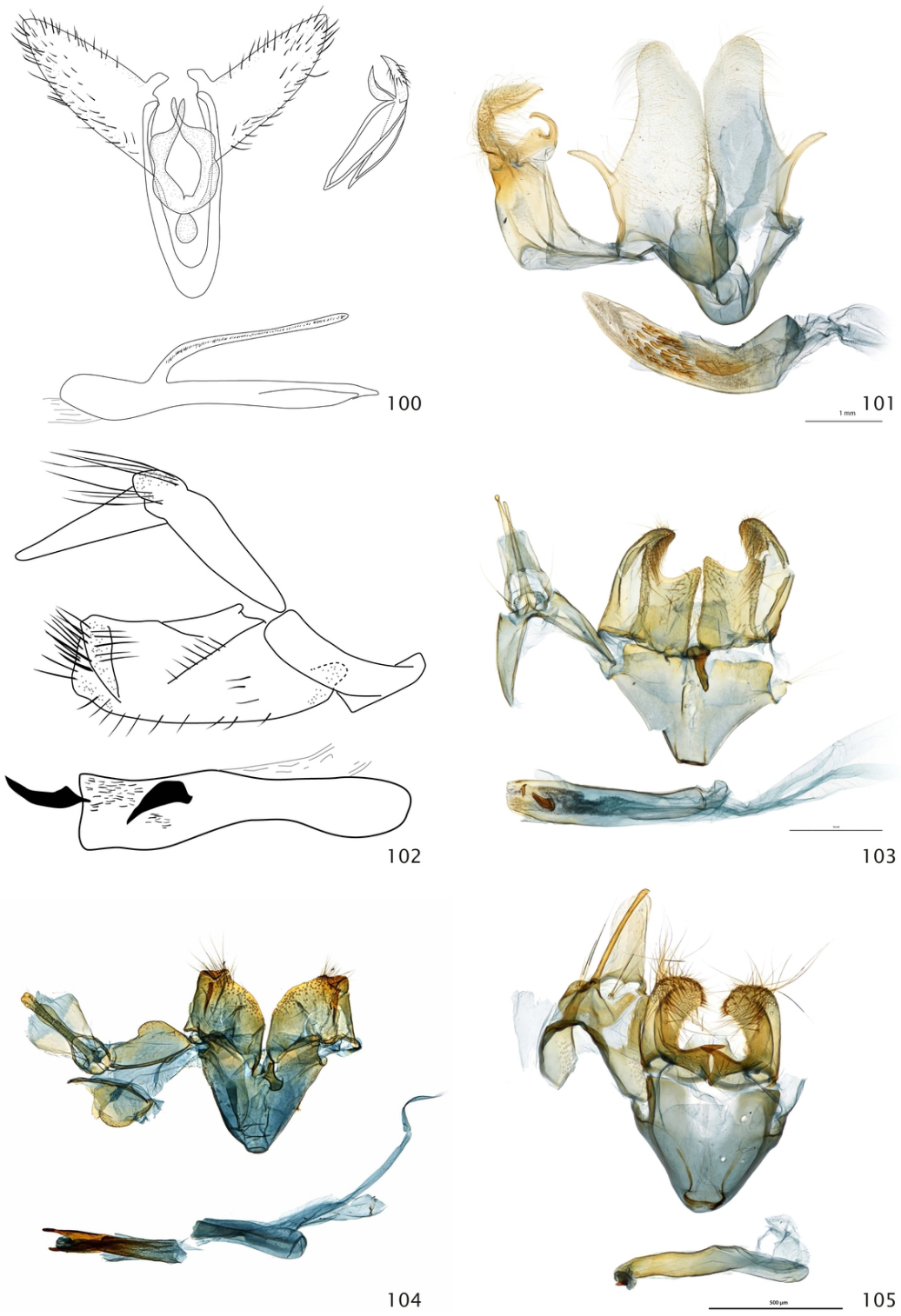
Figs 82-87. Male genitalia of *Glaucocharis* and *Gargela* species. Fig. 82. *Glaucocharis uncusellus* **sp. n.**, holotype, slide TL1310♂. Fig. 83. *Glaucocharis kayumanggi* **sp. n.**, holotype, slide TL1321♂. Fig. 84. *Glaucocharis sungay* **sp. n.**, holotype, slide TL1204♂. Fig. 85. *Glaucocharis negrosensis* **sp. n.**, holotype, slide TL1360♂. Fig. 86. *Gargela minuta* Song, Chen & Wu, 2009, TL1210M♂. Fig. 87. *Gargela aculea* **sp. n.**, holotype, slide TL1207♂.



Figs 88-93. Male genitalia of *Gargela* and *Ancylolomia* species. Fig. 88. *Gargela acutibrachium* **sp. n.**, paratype, slide TL1205♂. Fig. 89. *Gargela polyacantha* Li, 2019, slide TL1206♂. Fig. 90. *Gargela xanthocasis* (Meyrick, 1897), slide TL1235♂. Fig. 91. *Gargela bidentella* **sp. n.**, holotype, slide TL1325♂. Fig. 92. *Ancylolomia chrysographellus* (Kollar & Redtenbacher, 1844), adapted from fig. 1, p. 29 of Bleszynski (1970b). Fig. 93. *Ancylolomia orchidea* Bleszynski, 1970, slide TL1221♂.



Figs 94-99. Male genitalia of *Ancylolomia* and *Chilo* species. Fig. 94. *Ancylolomia westwoodi* Zeller, 1863, slide TL1062♂. Fig. 95. *Chilo auricilius* Dudgeon, 1905, adapted from fig. 38, p. 136 of Bleszynski (1970c). Fig. 96. *Chilo infuscatellus* Snellen, 1890, adapted from fig. 27, p. 127 of Bleszynski (1970c). Fig. 97. *Chilo luteellus* (Motschulsky, 1866), slide TL1319♂. Fig. 98. *Chilo pulverata* (Wileman & South, 1917), slide NHMUK n° 7637. Fig. 99. *Chilo sacchariphagus* (Bojer, 1856), slide TL1378♂.



Figs. 100-105. Male genitalia of *Chilo*, *Eschata* and *Calamotropha* species. Fig. 100. *Chilo suppressalis* (Walker, 1863), adapted from fig. 120, p. 180 of Bleszynski (1970c). Fig. 101. *Eschata* cf. *miranda* Bleszynski, 1965, slide TL1215♂. Fig. 102. *Calamotropha atkinsoni* Zeller, 1863, adapted from fig. 129, plate LI of Bleszynski (1970b). Fig. 103. *Calamotropha obliterans* (Walker, 1863), slide TL1304♂. Fig. 104. *Calamotropha unicolorellus* (Zeller, 1863), slide TL1405♂. Fig. 105. *Calamotropha philippinensis* **sp. n.**, paratype, slide TL1211♂.

DISTRIBUTION

Known from the Oriental and Australasian (Papua) regions. Six species are reported from the Philippines: *Gargela minuta* Song et al., 2009, *Gargela valvaspinae* **sp. n.**, *Gargela acutibrachium* **sp. n.**, *Gargela polyacantha* Li, 2019, *Gargela xanthocasis* (Meyrick, 1897), *Gargela negrosensis* **sp. n.**

PHYLOGENETIC RELATIONSHIPS

Molecular phylogenies recovered *Gargela* as part of the Diptychophorini, sister to the three other Diptychophorini included in the study (*Diptychophora* Zeller, 1866, *Glaucocharis* Meyrick, 1938, *Microcausta* Hampson, 1895) (Léger et al., 2019).

Gargela minuta Song et al., 2009

Figs. 27, 86, 145.

Gargela minuta Song et al., 2009, p. 55, figs. 12, 24. **Type locality**: Taiwan, Lanyu Island, 270 m.

MATERIAL

7 ♂, 8 ♀, 2 unsexed (detailed information in Table S1; https://doi.org/10.5061/dryad.b8gtht7mh).

SIMILAR SPECIES

Gargela distigma Song et al., 2009, *Gargela polyacantha* Li, 2019, *Gargela bidentella* **sp. n.**

DIAGNOSIS

Among *Gargela* species of the Philippines, *Gargela minuta* can be separated on the forewing by the dark brown spots and the ocher coloration of the fringes (Fig. 27). *Gargela minuta* shows a nearly identical forewing pattern to *G. bidentella* **sp. n.,** but the fringe spots are more pronounced in *G. minuta* than *G. bidentella* **sp. n.** Both species are unambiguously separated by examination of male genitalia (Fig. 86); the bulky costal process with dorsal bump, the narrowed distal part of the valva, and the tiny cornuti of the vesica separates *G. minuta* from other *Gargela* species. This species has similar male genitalia as in *G. distigma*; however, in the latter species, the valva has a notched apex, and the vesica lacks the tiny cornuti. In female genitalia (Fig. 145), the following characters separate *G. minuta* from other *Gargela* species: the papillae anales are ventrally produced posterad, the posterior apophyses are bent upwards at basal 1/3, the basal half of ductus is covered with tiny spines, and the corpus bursae is pear-shaped with two thorn-shaped signa.

DISTRIBUTION

PHILIPPINES: Luzon (Nueva Vizcaya, Zambales, Laguna), Mindanao (Davao Oriental), Mindoro; Negros. TAIWAN. Collected at altitudes between 150 and 1150 m.

DNA BARCODING

The species delimitation analysis recovered two MOTUs, one for the specimens from Luzon (North Luzon, Zambales, Laguna) and Mindoro and one for the unique female specimen from Mindanao (Davao Oriental). The highest intraspecific divergence observed is of 3.97% between samples MFNLEP-PYRALPHIL07-A08 from Mindanao (Davao) and MFNLEP-PYRALPHIL09-F09 from Luzon (Laguna). Haplotype from the specimen from Taiwan (DNA voucher MFNLEP995) differs by 0.16% from the haplotype from Luzon and Mindoro (see Fig. 179h).

REMARKS

This is the first record of this species from the Philippines.

Gargela aculea Léger, sp. n.

https://zoobank.org/AC6452D7-B53A-4FBE-B7C0-A0CD01B85E79
Figs. 28, 87, 146.

MATERIAL

Holotype: ♂ (specimen identifier coll.mfn-berlin.de_u_d6f70c, DNA voucher MFNLEP-PYRALPHIL08-A06, genitalia on slide TL1207♂; BOLD sample ID PYPHI160-22, Genbank Accession Number PP196844). PHILIPPINES: Negros, Patag, 750 m, 20-25.05.1996 (W. Mey). Deposited in MfN.

Paratypes: 5 ♀ (coll.mfn-berlin.de_u_613e87, 386de0, fcb937, 4e1641, a5452e) (detailed information in Table S1; https://doi.org/10.5061/dryad.b8gtht7mh).

Other specimen examined: 1 ♀ (detailed information in table S1; https://doi.org/10.5061/dryad.b8gtht7mh).

SIMILAR SPECIES

Gargela hastatela Song et al., 2009; *G. hainana* Song et al., 2009; *G. renatusalis* (Walker, 1859).

DIAGNOSIS

In the forewing, the well-marked and evenly curved black median and subterminal lines as well as the conspicuous blotch formed by the median line at dorsum (Fig. 28) are unique among *Gargela* species of the Philippines. These characters are found elsewhere in *Gargela hastatela* Song et al., 2009, *G. hainana* Song et al., 2009, and *G. renatusalis* (Walker, 1859), all occurring in China. In male genitalia (Fig. 87), the dorsal spine of the costal process, the ventrally indented valva, and the three very long cornuti followed by the group of roughly 70 cornuti will separate this species from its congeners. In female genitalia, the evenly rounded posterior margin of the papillae anales, the sclerotized and wrinkled basal part of ductus bursae, and the globular corpus bursae with two lanceolate signa separate *Gargela aculea* **sp. n.** from other *Gargela* species.

HABITUS (FIG. 28)

Forewing length 5.0-6.4 mm (n = 6); ground color snow white. Median line thin, dark brown, broadly incurved outwards, ending at large dark brown patch at dorsum. Postmedian line thin, brown, starting at 7/10 of costa, broadly incurved outwards, ending on dorsum near tornus. Subter-

minal area with three marked cream yellow dashes at R4, R5, and M1, fourth dash faintly marked at M2; yellowish patch between M3 and CuA2, marked with dark brown between CuA1 and CuA2. Margin thinly marked with black from apex down to M3, with dashes between R5 and M3. Fringe white, with black distal blotches at R5, M1, M2, CuA1, and CuA2. Hindwing white, tornus bearing tuft of thin brown iridescent scales in males.

MALE GENITALIA (FIG. 87)

Uncus ca half of tegumen arm length, beak-shaped, ventrally covered with thick setae, dorso-apically setose, apex pointing downwards. Gnathos projection short, curved downwards, thinly dentate, apex pointed. Valva with broad sacculus, abruptly narrowed at distal 1/4, apex pointed; costal process fused to valva, forming a dorsal tooth at midlength, posteriorly projecting beyond valva, apex curved upwards. Juxta base narrow; apex forming two arms about half as long as total length, dentate and setose on its inner-side. Phallus straight, apex lightly sclerotized. Vesica covered with 60+ small cornuti, apically with three long and slender curved cornuti.

FEMALE GENITALIA (FIG. 146)

Papillae anales posterior margin regularly rounded. Posterior apophyses ca 2.7 X length of tergite VIII. Intersegmental membrane VIII-IX ca 1.4 X tergite length. Anterior apophyses ca 1.7 X tergite length. Antrum membranous, with ventral sclerotized tongue. Colliculum elongate, forming sclerotized circumvolutions. Ductus bursae curved in basal half, straight on distal half, enlarging towards corpus opening. Ductus seminalis branching at midlength of ductus bursae. Corpus bursae globular, reticulate, with two lanceolate signa, one at corpus opening, the other at middle of corpus.

DISTRIBUTION

PHILIPPINES: Leyte, Luzon (Quezon), Mindanao, Negros. Collected at altitudes between 650 and 2100 m.

DNA BARCODING

The species delimitation analysis revealed four different MOTUs for the populations of North Luzon (Mountain Province), Luzon (Quezon), Negros, and Mindanao + Leyte. Unfortunately, only the MOTU from Negros contained male specimens, precluding unambiguous assignment of these MOTUs to *G. aculea* **sp. n.** The highest intraspecific divergence observed is of 4.3% between samples MFNLEP-PYRALPHIL07-C07 from Luzon (Quezon) and MFNLEP-PYRALPHIL08-B06 from Leyte.

ETYMOLOGY

From the Latin *aculeus, i,* sting, refering to the small spine of the valva in male genitalia.

REMARKS

Specimen MFNLEP-PYRALPHIL08-C06 exhibits slight differences in female genitalia and could represent another closely related species. Future investigation of male specimens will clarify this case.

Gargela acutibrachium Léger, sp. n.

https://zoobank.org/DC8217B7-9C33-4BA3-A934-4481FEC32A76
Figs. 29, 88.

MATERIAL

Holotype: ♂ (specimen identifier coll.mfn-berlin.de_u_eca446, DNA voucher MFNLEP-PYRALPHIL09-G09, genitalia on slide TL1398♂; BOLD sample ID PYPHI301-22, Genbank Accession Number PP196980). PHILIPPINES: Luzon, Laguna, Mount Makiling, 850 m, 30-31.03.2000 (K. Ebert, W. Mey). Deposited in MfN.

Paratypes: 5 ♂ (coll.mfn-berlin.de_u_72eab6, 33a322, 9c8b85, 189117, d44f2d) (detailed information in table S1; https://doi.org/10.5061/dryad.b8gtht7mh).

SIMILAR SPECIES

Gargela grandispinata Li, 2019.

DIAGNOSIS

From the other *Gargela* species in the Philippines, this species can be separated by the copper color of the fringes towards termen on the forewing (Fig. 29). In male genitalia (Fig. 88), the arm-like costal process at base of valva separates this species from its congeners. Females are not known.

HABITUS (FIG. 29)

Forewing length 5.0-5.5 mm (n = 4); ground color snow white. Median line broadly arched towards margin. Postmedian line originating at 3/4 of costa, curved towards margin, then inwardly around subterminal spot, running downwards to termen; costally dark brown, dorsally ocher. Subterminal area broadly filled with ocher; conspicuous dark brown blotch between M3 and CuA1. Margin indented at R5-M1; apically dark brown, elsewhere ocher. Fringe white in apical half, copper in dorsal half. Hindwing white, tornus bearing tuft of thin brown iridescent scales in males.

MALE GENITALIA (FIG. 88)

Uncus about 9/10 of tegumen arm length, with conspicuous ventral triangular lobe at base, dorsally with thin setae, ventrally covered with thick setae, slightly bent downwards on distal 1/4, apex pointed. Gnathos projection about 1/3 of uncus length, slender, directed posterad. Costal process projecting into an arm about 1/3 of valva length. Costal arm fused to valva, elongate, distally curved upwards into a tip. Valva narrowing on distal half, dorsal margin straight, valva apex rounded. Juxta elongate, narrow at base, enlarging on distal half; distal part forming two incurved arms about 1/4 X juxta length, with rounded setose apex. Phallus straight, narrowing towards apex, slightly sclerotized. Vesica with one large cornutus (length = 200 µm) and two rows of densely packed cornuti.

FEMALE GENITALIA

Not known.

DISTRIBUTION

PHILIPPINES: Leyte, Luzon (Bicol), Mindanao (Davao Oriental). Collected at altitudes between 650 and 1050 m.

DNA BARCODING

The species delimitation analysis recovered three different MOTUs for the specimens of Leyte, Luzon (Laguna), and Mindanao (Davao Oriental). The highest intraspecific divergence observed is of 4.8% between samples MFNLEP-PYRALPHIL08-D06 from Leyte and MFNLEP-PYRALPHIL09-A09 from Luzon (Laguna).

ETYMOLOGY

From the Latin *acute*, sharp, and *brachium, ii,* the arm, refering to the conspicuous arm of male genitalia.

REMARKS

Examination of male genitalia from specimens of the different MOTUs revealed no major differences.

Gargela polyacantha Li, 2019

Figs. 30, 89, 147.

Gargela polyacantha W. Li in Yang et al., 2019, pp. 2200–2102, figs. 1, 2, 5, 6. **Type locality**: China, Yunnan Province, Xishuangbanna Dai Autonomous Prefecture, Mengla County, 21°29′N, 101°33′N

MATERIAL

1 ♂, 3 ♀ (detailed information in Table S1; https://doi.org/10.5061/dryad.b8gtht7mh).

SIMILAR SPECIES

Gargela minuta Song et al., 2009.

DIAGNOSIS

In *Gargela polyacantha*, the median line is regularly arched and predominantly ocher (Fig. 30), while it is S-shaped and dark brown in *Gargela minuta* and *G. acutibrachium* **sp. n.** In male genitalia (Fig. 89), the medial dorsal bump of the costal process is less pronounced than in *Gargela minuta*; the distal part is abutted to the valva, while it is separated from it in *Gargela minuta*. In female genitalia (Fig. 147), the basal half of ductus bursae is covered with dense tiny spines, and the corpus bursae is globular with two thorn-shaped signa (Yang et al., 2019).

DISTRIBUTION

CHINA: Guizhou, Yunnan. PHILIPPINES: Luzon (Batangas, Zambales). Collected at altitudes between 150 and 250 m.

DNA BARCODING

The highest intraspecific p-distance of 0.8% is found between specimens MFNLEP-PYRALPHIL09-D09 and MFNLEP-PYRALPHIL08-H05, both from Zambales mountains in Luzon.

REMARKS

This is the first record of this species from the Philippines.

Gargela xanthocasis (Meyrick, 1897)

Figs. 31, 90, 148.

Mixophyla xanthocasis Meyrick, 1897, Trans. Ent. Soc. Lond. 1897: 81, pl. A. 8. **Type locality**: Indonesia, Sangir Island. Hampson, 1897, Trans. ent. Soc. Lond. 1897: 135; Hampson, 1899, Jour. Bombay Nat. Hist. Soc.12: 700, fig.1: 8.

Gargela xanthocasis Inoue, 1982, Moths of Japan II: 332, pl.38: 68 (♂); Song et al., 2009, p. 42, figs. 1,13.

MATERIAL

1 ♂, 1 ♀ (detailed information in Table S1; https://doi.org/10.5061/dryad.b8gtht7mh).

SIMILAR SPECIES

Gargela distigma Song et al., 2009.

DIAGNOSIS

This species can be recognized by the two marginal spots of the forewing that are not found in other *Gargela* species of the Philippines. In male genitalia, the costal process is projected dorsally into a conspicuous tip abutted basally with a small bump, and the vesica bears three to five characteristic spines of decreasing length. In female genitalia (Fig. 148), the antrum exhibits a broad sclerotized plate; the enlarged basal 1/4 of ductus bursae is covered with scattered, long spines; the ductus bursae is regularly curved, enlarging towards corpus opening; and the corpus bursae is globular with two lanceolate signa abutting each other.

REDESCRIPTION

HABITUS (FIG. 31)

Forewing length 5 mm (n = 1); ground color snow white. Median line broadly arched towards margin. Postmedian area with vein ochreous. Subterminal line curved towards margin in costal half, then slightly bent inwardly by the two subterminal spots, ocher, medially dark brown. Subterminal area medially ocher with two conspicuous dark brown blotches at M3 and CuA1 cells. Margin slightly incurved at R5-M1; apically dark brown. Fringe white, medially copper. Hindwing white, tornus bearing tuft of thin brown iridescent scales in males.

MALE GENITALIA (FIG. 90)

Uncus about half of tegumen arm length, basally projected into two conspicuous ventral lobes, dorsally with scattered setae, ventrally covered with thick setae, apex slightly bent

downwards, pointed. Gnathos projection short, pointed posterad. Costal arm fused to valva, medially projecting into a dorsal conspicuous tip doubled by a small anterior bump; costa apex pointed, not extending beyond valva apex. Valva abruptly narrowed on distal 1/4, apex pointed. Juxta elongate, conspicuously narrowed at basal 1/4, from there enlarging into two incurved arms forming rounded setose apex. Phallus straight with lightly sclerotized apex. Vesica with five conspicuous cornuti with decreasing length as well as 200+ tiny spines.

FEMALE GENITALIA (FIG. 148)

Papillae anales posterior margin regularly rounded. Posterior apophyses ca 1.75 X length of tergite VIII. Intersegmental membrane VIII-IX ca 1/3 X length of tergite VIII. Anterior apophyses ca 4 X length of tergite VIII. Antrum forming broad orbicular sclerotization. Colliculum with sclerotized patches. Ductus bursae at base forming a pouch covered with small spines; ductus kinked at half length, enlarged in distal 1/4. Ductus seminalis branching at 1/4 of ductus length. Corpus bursae globular, reticulate, with two small oblong signa.

DISTRIBUTION

CHINA: South China; INDONESIA: Sulawesi Utara, New Guinea; JAPAN; PAKISTAN; PHILIPPINES: Luzon (Quezon, Camarines Sur); TAIWAN. Reported at between 100 and 1200 m (this study; Song et al., 2009).

DNA BARCODING

The highest intraspecific divergence observed is of 1.5% between samples MFNLEP-PYRALPHIL09-D05 from Luzon (Quezon) and MFNLEP-PYRALPHIL09-E05 from South Luzon (Camarines Sur: Mt Isarog).

REMARKS

This is the first record of this species from the Philippines. The specimen illustrated in Song et al. (2009) has three marginal spots on the forewing. However, the type specimen in the NHMUK only has two spots. Male genitalia strongly resemble those illustrated in Song et al. (2009). However, they count only three cornuti, while the specimen investigated here shows an additional two cornuti, much smaller. Distribution records from the literature are doubtful (Song et al., 2009).

Gargela bidentella Léger, sp. n.

https://zoobank.org/E927154D-E665-4992-BF07-6694A7084C50
Figs. 32, 91, 149.

MATERIAL

Holotype: ♂ (specimen identifier coll.mfn-berlin.de_u_dc6875, DNA voucher MFNLEP-PYRALPHIL08-E05, genitalia on slide TL1325♂; BOLD sample ID PYPHI202-22, Genbank Accession Number PP196883). PHILIPPINES: Negros, Negros Oriental, Patag, 750 m, 20-25.05.1996 (W. Mey). Deposited in MfN.

Paratypes: 2 ♀ (specimen identifiers coll.mfn-berlin.de_u_9859, 673744), same collecting data (detailed information on Table S1; https://doi.org/10.5061/dryad.b8gtht7mh).

SIMILAR SPECIES

Gargela minuta Song et al., 2009.

DIAGNOSIS

This species is very similar to *Gargela minuta* in forewing pattern (see diagnosis of *G. minuta*). In male genitalia (Fig. 91), the bifid apical projection of the costal process allows unambiguous segregation of the species from other *Gargela* species. In female genitalia (Fig. 149), this species shares the elongate corpus bursae with two thorn-shaped signa with *G. minuta*; however, the antrum lacks the ventral, lightly sclerotized depressions observed in *G. minuta*.

HABITUS (FIG. 32)

Forewing length 4.5 mm (n = 1); ground color snow white. Median line arched towards margin in costal 1/3, then running in a straight line down to termen. Subterminal line originating at 3/4 of costa, curved towards margin, then inwardly around subterminal spot, running downwards to termen; dark brown from R5 to M2, otherwise ochre. Subterminal area with conspicuous dark brown blotch at M3 cell. Margin slightly indented at R5-M1; apically dark brown, otherwise ochre. Fringe white, medially copper with four dark brown spots. Hindwing white, tornus bearing tuft of thin brown iridescent scales in males.

MALE GENITALIA (FIG. 91)

Uncus ca 1/3 of tegumen arm length, narrow, beak-shaped, ventrally covered with thick setae, dorso-apically setose, apex pointed. Gnathos projection as long as uncus, straight, apical 1/4 curved upwards, tip pointed. Valva ventrally narrowed at midlength, distal half slender, gently curved upwards; costal process fused to valva in basal 3/4; basal 1/3 with slender arm projecting dorso-posterad; distal 1/4 projecting upwards, apically bifid with one tooth pointing upwards and one hook-like projection pointing inwards. Juxta broad, distal 1/3 with conspicuous lateral lobes, apex forming two lobes setose. Vesica with ca 200 cornuti, apex with one isolated cornutus.

FEMALE GENITALIA (FIG. 149)

Papillae anales posterior margin regularly rounded. Posterior apophyses ca 1.75 X length of tergite VIII. Intersegmental membrane VIII-IX ca 1.75 X length of tergite VIII. Anterior apophyses ca 3.75 X length of tergite VIII. Antrum and colliculum lightly sclerotized, with longitudinal ridges. Basal half of ductus bursae covered with spines, kink at midlength, distal half membranous, straight. Corpus bursae egg-shaped, reticulate, with two thorn-shaped signa.

DISTRIBUTION

PHILIPPINES: Negros. Collected at an altitude of 750 m.

DNA BARCODING

The highest intraspecific divergence observed is 0.5% between specimen MFNLEP-PYRALPHIL08-H06 and MFNLEP-PYRALPHIL08-F05.

ETYMOLOGY

Apposition of the Latin *bi-*, "two," *dens, tis,* "dent," and the diminutive suffix –ella, referring to the two apical teeth of the costal process in male genitalia.

ANCYLOLOMIINI Ragonot, 1889

Ancylolomia Hübner, 1825

Ancylolomia Hübner, 1825 n: 363. **Type species**: *Tinea palpella* Denis & Schiffermüller, 1775

= *Acylolomia* Hampson, 1919 b: 143

= *Jartheza* Walker, 1863 b: 183. **Type species**: *Chilo chrysographellus* Kollar, [1844] 1848

= *Tollia* Amsel, 1949 b: 280. **Type species**: *Crambus pectinatellus* Zeller, 1847.

DIAGNOSIS

Ancylolomia was revised by Bleszynski (1970b); however, he did not provide a definition of the genus. A definition is provided by Bassi (2013). *Ancylolomia* can be recognized by the following characters of the forewing: ground color pale brown with longitudinal tawny stripes often with dark brown and silver shiny scales; subterminal line shiny silver, rather straight; submarginal row of brown to grey spots; in many species termen concave near M1-M2. Male genitalia have the following characters: uncus beak-shaped, relatively short, in some species with dorsal horns, apex pointing downwards; gnathos slightly longer than uncus, beak-shaped, apex pointing upwards; phallus with ductus ejaculatorius at anterior end of phallus (Landry, 1995; Léger et al., 2019; pers. obs.). Female genitalia with papillae anales not coalesced dorsally and ventrally; posterior and anterior apophyses very short; sterigma present; ductus bursae very short, often with small scattered sclerites, barely demarcated from corpus bursae in most species; corpus bursae elongate, without signa (Bassi, 2013; Bleszynski, 1970a; pers. obs.).

DISTRIBUTION

Known from the Afrotropical, Palearctic, Oriental, and Australasian regions. Three species are reported from the Philippines: *Ancylolomia chrysographellus* (Kollar & Redtenbacher, 1844), *Ancylolomia orchidea* Bleszynski, 1970, and *Ancylolomia westwoodi* Zeller, 1863.

PHYLOGENETIC RELATIONSHIPS

Ancylolomia belongs to the Ancylolomiini (Léger et al., 2019).

Ancylolomia chrysographellus (Kollar & Redtenbacher, 1844)

Figs. 92, 150.

Chilo chrysographellus (Kollar & Redtenbacher, 1844: 494). **Type locality**: India, Uttarakhand [Himalaya], Mussoorie [Massouri]

= *Ancylolomia basistriga* Moore, 1886: 382, pl. 184 fig. 1. Type locality: [Sri Lanka] Ceylon, Neuera Eliza. Bleszynski 1970 c: 28 (syn.)

= *bassistriga* Błeszyński & Collins, 1962: 207

= *Jartheza cassimella* Swinhoe, 1887: 461, pl. 41 figs. 4, 6. Type locality: India, Mhow. Bleszynski 1970 c: 30 (syn.)

= *Jartheza responsella* Walker, 1863 b: 184. Type locality: [India, Hindustan], North Hindostan

= *Jartheza xylinella* Walker, 1863 b: 184-185. Type locality: Nepal. Bleszynski 1970 c: 28 (syn.)

MATERIAL

No material was examined for this species.

DIAGNOSIS

The long and slender cornutus in male genitalia (Fig. 92) places this species in the *inornata* species group (Bleszynski, 1970). From the other *Ancylolomia* species, *A. chrysographellus* can be recognized by the dent-shaped costal process of the valva.

DISTRIBUTION

AFRICA; CHINA; INDIA; INDONESIA; JAPAN; KOREA; MYANMAR; PAKISTAN; PHILIPPINES; SAUDI ARABIA; SRI LANKA; TAIWAN (Khan et al., 1991).

REMARKS

No specimen was investigated for this species. Khan et al. (1991) list the Philippines in the distribution of *A. chrysographellus*.

Ancylolomia orchidea Bleszynski, 1970

Figs. 33, 93, 151.

Ancylolomia orchidea Bleszynski, 1970: 35, figs. 11, 15. **Type locality**: Philippines, Luzon, Benguet, Baguio, 5000'

MATERIAL

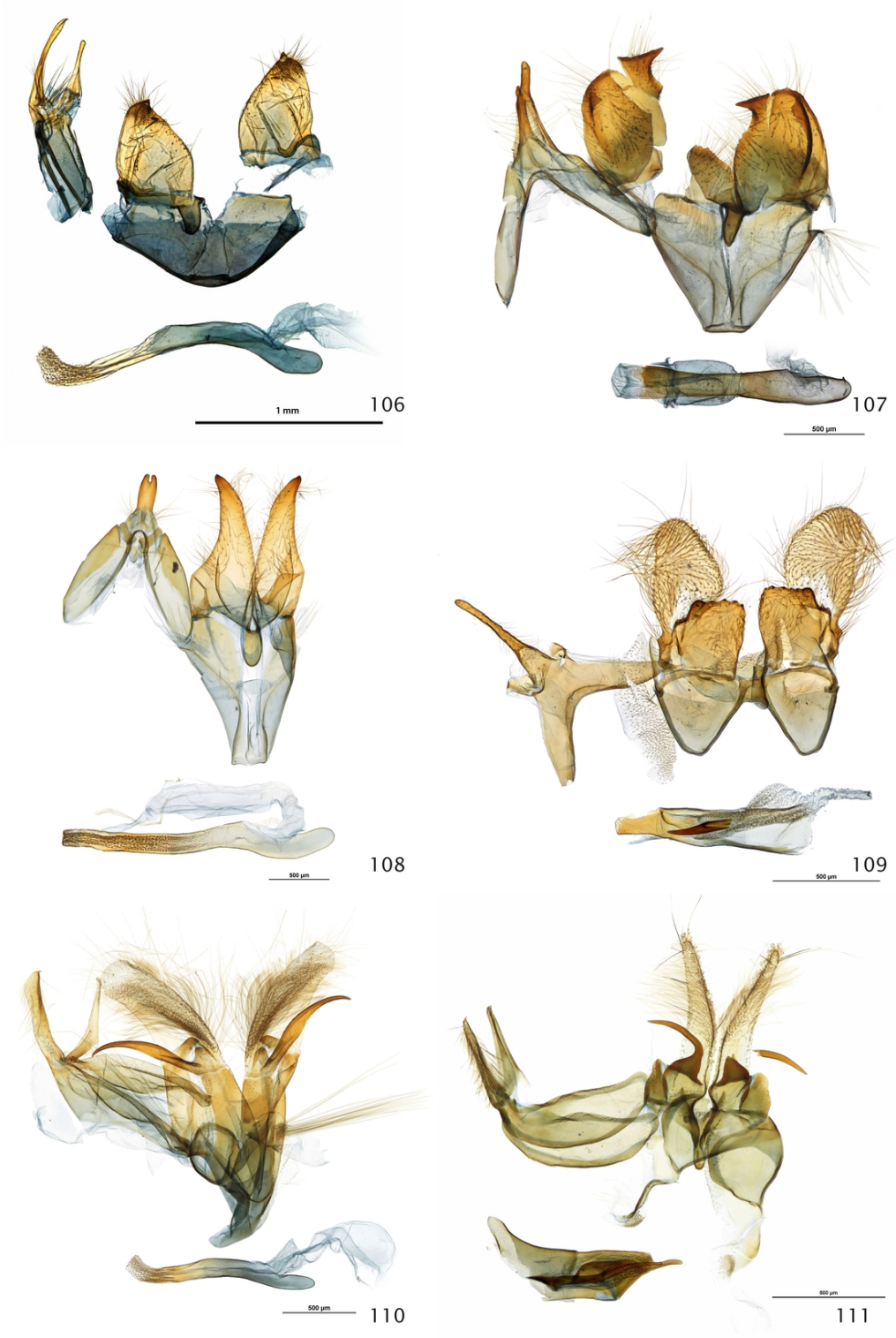
Specimen examined: 2 ♂ (detailed information in Table S1; https://doi.org/10.5061/dryad.b8gtht7mh).

SIMILAR SPECIES

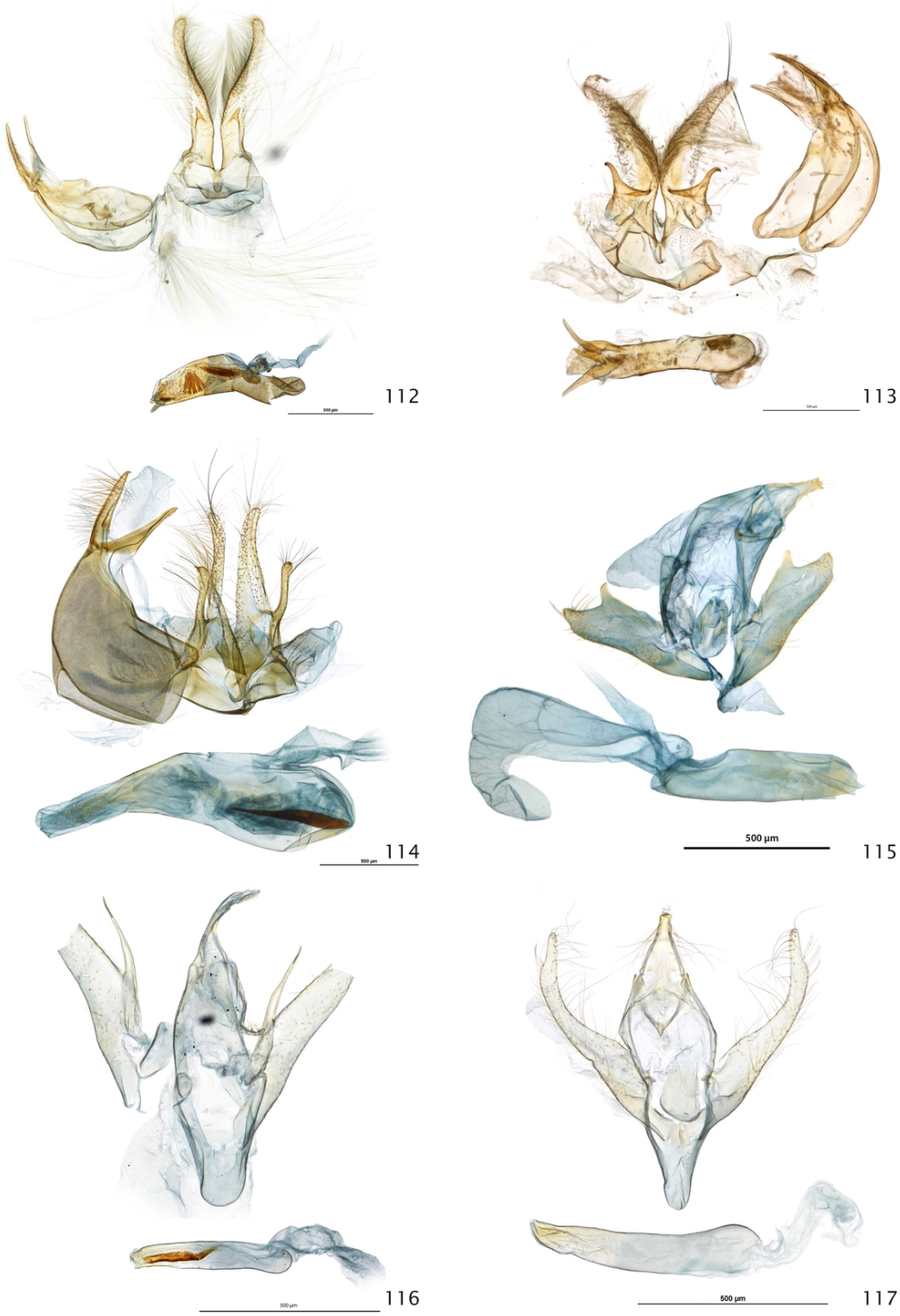
Ancylolomia westwoodi Zeller, 1863.

DIAGNOSIS

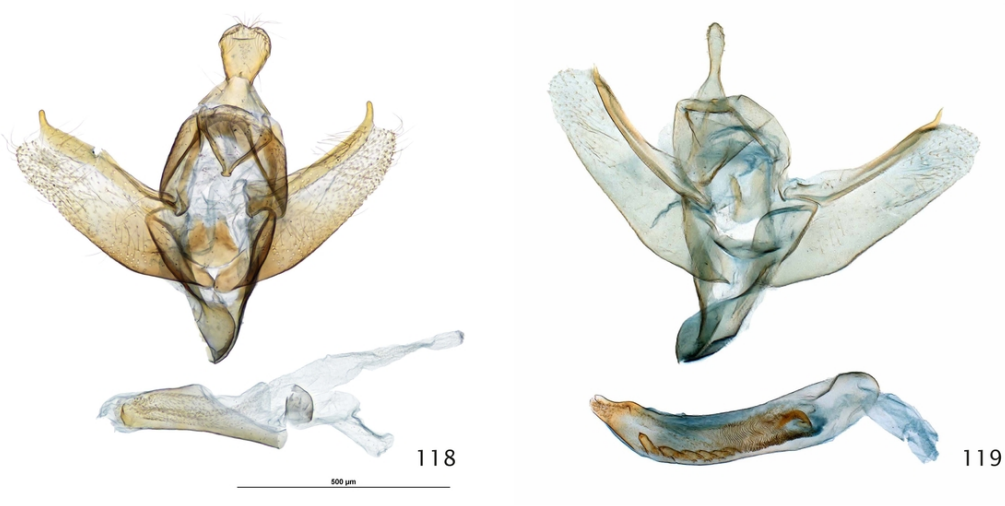
In male genitalia (Fig. 93), the following characters separate this species from the widespread *A. westwoodi*: the prominent thorn-like projections at midlength of uncus dorsum reach 2/3 of the uncus length and show no dorsal bump, while the projection is slightly less than half the uncus length and shows a marked dorsal bump in the form



Figs 106-111. Male genitalia of *Calamotropha*, *Angustalius*, *Catoptria* and *Culladia* species. Fig. 106. *Calamotropha anacantha* **sp. n.**, holotype, slide TL1064♂. Fig. 107. *Calamotropha* sp. 1 cf. *oculalis*, slide TL1070♂. Fig. 108. *Calamotropha* sp. 2 cf. *oculalis*, slide TL1213♂. Fig. 109. *Angustalius malacelloides* (Bleszynski, 1955), slide TL1223♂. Fig. 110. *Catoptria philippinensis* **sp. n.**, holotype, slide TL1066♂. Fig. 111. *Culladia hastiferalis* (Walker, 1865), slide TL1302♂.



Figs 112-117. Male genitalia of *Culladia* and *Metaeuchromius* species. Fig. 112. *Culladia tonkinella* Bleszynski, 1970, slide TL1305♂. Fig. 113. *Culladia suffusella* Hampson, 1896, slide NHMUK n° 18909. Fig. 114. *Culladia pseudoscoparia* **sp. n.**, holotype, slide TL916♂. Fig. 115. *Metaeuchromius micralis* (Hampson, 1919) **comb. nov.**, slide TL1354♂. Fig. 116. *Metaeuchromius rizali* **sp. n.**, holotype, slide TL1229♂. Fig. 117. *Metaeuchromius makintabus* **sp. n.**, holotype, slide TL1055♂.



Figs 118-119. Male genitalia of *Microchilo* species. Fig. 118. *Microchilo bundoki* **sp. n.**, paratype, slides TL957♂ (genitalia) and TL958♂ (phallus). Fig. 119. *Microchilo spinosus* **sp. n.**, paratype, slide TL1112♂.

of *A. westwoodi* found in the Philippines. Furthermore, the saccus anterior margin is conspicuously incurved, while it is straight or slightly rounded in *A. westwoodi* specimens from the Philippines. In female genitalia (Fig. 151), *A. orchidea* lacks the bag-shaped sclerites and the interspersed sclerotization on the antrum (Bleszynski, 1970b).

DISTRIBUTION

PHILIPPINES: Luzon (Cordillera central), Panay (Iloilo). Collected at altitudes between 400 and 2000 m.

DNA BARCODING

The species delimitation analysis recovered two MOTUs, one for the specimen from North Luzon and one for the specimen from Panay. A p-distance of 6.9% is observed between samples MFNLEP-PYRALPHIL07-F08 (Panay) and MFNLEP-PYRALPHIL08-D12 (Luzon, Ifugao).

Ancylolomia westwoodi Zeller, 1863

Figs. 34, 94, 152.

Ancylolomia westwoodi Zeller, 1863 b: 11. **Type locality**: Australia [Terra Vandiemenii]

= *Ancylolomia westwoodi bitubirosella* Amsel, 1959 d: 11, text-fig. 2, pl. 1 fig. 1, pl. 3 fig. 4. Type locality: Iran, Balochistan, Iranshar, 800 m

MATERIAL

2 ♂, 1 ♀ (detailed information in Table S1; https://doi.org/10.5061/dryad.b8gtht7mh).

SIMILAR SPECIES

Ancylolomia orchidea Bleszynski, 1970.

DIAGNOSIS

Characters of the male genitalia (Fig. 94) and female genitalia (Fig. 152) separate this species from *A. orchidea*. See diagnosis of *A. orchidea*.

DISTRIBUTION

AFGHANISTAN; AUSTRALIA; INDIA; INDONESIA: Java, Sumatra; MALAYSIA; PAKISTAN; PHILIPPINES: Luzon; SRI LANKA (Bleszynski, 1970b). Collected at an altitude of 250 m on the Philippines.

DNA BARCODING

The two specimens with sample numbers MFNLEP-PYRALPHIL07-E08 and MFNLEP-PYRALPHIL08-C12, both from Luzon, Zambales, diverge by p-dist=1.1% from each other. These two specimens show a divergence 7-9% with specimens of *A. westwoodi* on BOLD collected in Australia (see Fig. S2a), which is the type locality of the species.

REMARKS

Ancylolomia westwoodi is widespread all over the Oriental and Australasian regions (Bleszynski, 1970b) and probably represent a species complex rather than one single homogeneous species, as attested by analyses of the COI barcodes. This is the first record for the Philippines.

CHILOINI Heinemann, 1865

CHILO ZINCKEN, 1817

Chilo Zincken, 1817: 33. **Type species**: *Tinea phragmitella* Hübner, 1810

= *Borer** Guenée, 1862: 68-70. Type species: *Phalaena saccharalis* Fabricius sensu Guenée, 1862. Tams 1942: 67 (syn.)

= *Chilona* Sodoffsky, 1837: 94

= *Chilotraea* Kapur, 1950: 402, 403. Type species: *Chilo infuscatellus* Snellen, 1890. Błeszyński 1962 d: 1 (syn.)

= *Diphryx* Grote, 1881 d: 273. Type species: *Diphryx prolatella* Grote, 1881. Hampson 1896: 954 (syn.)

= *Hypiesta* Hampson, 1919 a: 538. Type species: *Hypiesta argyrogramma* Hampson, 1919. Błeszyński, 1965, p. 102 (syn.)

= *Nephalia* Turner, 1911: 113. Type species: *Nephalia crypsimetalla* Turner, 1911. Błeszyński 1966: 478 (syn.)

= *Silveria* Dyar, 1925: 10. Type species: *Silveria hexhex* Dyar, 1925.

DIAGNOSIS

Błeszyński provided a world revision for the genus (Bleszynski, 1970), and Landry provides a redescription of the genus (Landry, 1995). Species of *Chilo* have yellow to brown forewings with subterminal line, devoid of longitudinal lines, with many species having metallic scales, which are hypothesized as the apomorphy for the genus by Landry (Bleszynski, 1970c; Landry, 1995). Male genitalia have the following characters: uncus short and stout; gnathos as long as uncus; valva rather simple; vinculum conspicuously projected; pseudosaccus present; juxta usually with long arms, sometimes assymetrical (Bleszynski, 1970c). Female genitalia with papillae anales coalesced dorsally and ventrally; posterior apophyses roughly the length of tergite VIII; anterior apophyses 2-3 X tergite length; sterigma absent; antrum sclerotized; ductus bursae often with longitudinal sclerotized ridges; corpus bursae variable in shape, with or without cornuti.

DISTRIBUTION

Known from all continents except Antarctica (Bleszynski, 1970c; Nuss et al., 2003–2023). The genus shows its highest diversity in the Afrotropics (Bleszynski, 1970c). Some pest species show wide distributions. Seven species are reported from the Philippines: *Chilo auricilius* Dudgeon, 1905, *Chilo infuscatellus* Snellen, 1890, *Chilo luteellus* (Motschulsky, 1866), *Chilo pulverata* (Wileman & South, 1917), *Chilo polychrysus* (Meyrick, 1932), *Chilo sacchariphagus* (Bojer, 1856), and *Chilo suppressalis* (Walker, 1863).

PHYLOGENETIC RELATIONSHIPS

The genus *Chilo* is part of the Chiloini (Léger et al., 2019).

Chilo auricilius Dudgeon, 1905

Figs. 35, 95, 153.

Chilo auricilia Dudgeon, 1905: 405. **Type locality**: India, Burogah, N. Bihar.

= *Diatraea auricilia* (Dudgeon): Fletcher 1928: 58; Gupta 1940: 799.

= *Chilotraea auricilia* (Dudgeon): Kapur 1950: 408.

= *Chilo popescugorji* Błeszyński, 1963: 179, fig. 63, type locality: Taiwan, China; Bleszynski, 1970: 135 (syn.).

MATERIAL

7 ♀ (detailed information on Table S1; https://doi.org/10.5061/dryad.b8gtht7mh).

SIMILAR SPECIES

Chilo polychrysus (Meyrick, 1932).

DIAGNOSIS

Chilo auricilius, also known as the Gold-fringed Stemborer, is a widespread species in South-East Asia. It can be recognized by the silver suffusion as well as the thickly marked silver median line in males and females (Fig. 35). This species is highly similar to *Chilo polychrysus* in habitus, which led to erroneous reports from the Philippines (Barrion et al., 1990). Examination of male genitalia (Fig. 95) enables unambiguous identification of this species: pars basalis at base of valva absent (thorn-shaped pars basalis at base of valva in *C. polychrysus*); saccus narrow, conspicuously protruding anterad; juxta with two medium-length symmetrical arms not extending beyond basal-costal angle of valva, straight (two arms curved around the phallus in *C. polychrysus*); phallus with ventro-lateral arms roughly curved, reaching subapical part of phallus (strongly curved, reaching apex of phallus in *C. polychrysus*); phallus with subapical conical bump and small bulbose basal projection (both absent in *C. polychrysus*). In female genitalia (Fig. 153), the following characters distinguish this species from congeneric species: short ring-shaped sclerotized antrum; ductus bursae narrow, ca 1.5 X length of corpus bursae; corpus bursae progressively widening, pear-shaped, without signum. *Chilo polychrysus* exhibits a conspicuous C-shaped sclerotization at antrum, on each side of ductus opening, which enables unambiguous recognition of the species.

DISTRIBUTION

Most of South-East Asia (Sugar Research Australia). PHILIPPINES: Luzon (Batangas, Cagayan, Laguna, Quezon, Zambales), Panay (Iloilo), Mindanao (Davao Oriental, Misamis Oriental, Sirugao del Sur) (Litsinger et al., 2011). Collected at altitudes between 50 and 850 m on the Philippines.

DNA BARCODING

A maximum p-distance of 0.33% is observed between specimens MFNLEP-PYRALPHIL07-B08 from Mindanao (Surigao) and MFNLEP-PYRALPHIL07-H09 from Luzon (Quezon). Haplotype network reconstruction including all available BOLD sequences reveal that the Philippine haplotype is identical to a haplotype found elsewhere in Australia and India.

REMARKS

This *Chilo* species is a pest of sugarcane in South-East Asia. It also feeds on rice, maize, and sorghum (Bleszynski, 1970c; Litsinger et al., 2011; Maes, 2022). In a survey of *Chilo* species on rice in the Philippines, *C. auricilius* accounted for 73% of the total number of specimens collected, while *C. polychrysus* was not recorded (Barrion et al., 1990). Broad distribution of *Chilo auricilius* over the Philippines is the result of rice culture expansion over the archipelago.

Chilo infuscatellus (Snellen, 1890)

Figs. 37, 96, 154.

Chilo infuscatellus Snellen 1890: 94. **Type locality:** Indonesia, Java

= *Argyria sticticraspis* Hampson 1919: 449; Gupta 1940: 788; Isaac & Rao 1941: 799; Isaac & Venkatraman 1941: 806 [syn. Kapur 1950].

= *Argyria coniorata* Hampson 1919: 449. Fletcher 1928 (syn.).

= *Diatraea calamina* Hampson 1919: 544; Kapur 1950 (syn.).

= *Diatraea auricilia* (Dudgeon): Fletcher & Ghosh 1920: 387.

= *Diatraea shariinensis* Eguchi 1933: 3; Kapur 1950 (syn.).

= *Chilo tadzhikiellus* Gerasimov 1949: 704; Błeszyński 1962: 111 (syn.).

MATERIAL

3 ♀ (detailed information on Table S1; https://doi.org/10.5061/dryad.b8gtht7mh).

DIAGNOSIS

Chilo infuscatellus, also known as the Yellow Top Borer, have narrow brownish forewings medially speckled with dark brown and snow white hindwings. This species can be separated from other *Chilo* species by the presence of a conspicuous cornutus on the vesica of the male genitalia (Fig. 96). In female genitalia (Fig. 154), the following characters distinguish this species from congeneric species: ostial pouch distincly incised; ductus bursae devoid of swellings and sclerotized markings; corpus bursae with one signum (Anon, 2019; Bleszynski, 1970c).

DISTRIBUTION

AFGHANISTAN; INDIA; INDONESIA, MYANMAR; PHILIPPINES: Luzon (Benguet; Zambales); TAIWAN; TAJIKISTAN; TIMOR (Bleszynski, 1970c). Collected at altitudes between 150 and 500 m on the Philippines.

DNA BARCODING

A maximum intraspecific p-distance of 0.3% is observed between MFNLEP-PYRALPHIL11-B01, MFNLEP-PYRAL-

PHIL11-A01, and MFNLEP-PYRALPHIL11-G01, all from Luzon (Zambales). The haplotypes of Luzon are most closely related to those found in Thailand (see Fig. S2e). A maximum intraspecific divergence of 7.1% is observed in specimen LSTEM114-18 from Java identified as *Chilo infuscatellus*.

REMARKS

Błeszyński (1970) investigated one female specimen from Klondyke on Luzon, Philippines.

Chilo luteellus (Motschulsky, 1866)

Figs. 36, 97, 155.

Schoenobius luteellus Motschulsky, 1866: 199. **Type locality**: Japan, Honshu, Kanagawa Pref., Kugenuma, Fujisawa

= *Chilo concolorellus* Christoph, 1885, in Romanoff: 149, pl. 8 figs. 15a, b; type locality: Turkmenistan, Askhabad.

= *Chilo gensanellus* Leech, 1889: 108, pl. 5 fig. 9; type locality: Korea, Gensan.

= *Chilo dubia* Bethune-Baker, 1894: 48, pl. 1 figs. 18, 19; type locality: Egypt, Alexandria.

= *Chilo boxanus* Hering, 1903: 111 ; type locality: China, Yangtse.

= *Chilo plumbosellus* Chrétien, 1910: 366 ; type locality: Algeria, Biskra.

= *Chilo molydellus* Zerny in Osthelder, 1935: 79 ; type locality: Syria, Amanus, Juksek Dagh.

= *Chilo pseudoplumbellus* Caradja, 1932: 117; type locality: China, Tianjin.

= *Chilo luteellus* (Motschulsky): Shibuya, 1928: 144.

MATERIAL

1 ♂, 2 ♀ (detailed information on Table S1; https://doi.org/10.5061/dryad.b8gtht7mh).

SIMILAR SPECIES

Chilo pulverosellus Ragonot, 1895.

DIAGNOSIS

Chilo luteellus (Fig. 36) is a rather large species (♂: 10 mm, ♀: 13-14 mm) and has somewhat broader forewings than other large *Chilo* species. Unambiguous identification succeeds by examination of the genitalia. In male genitalia (Fig. 97), the two elongate arms of the juxta and the absence of ventral arm on phallus separate this species and *C. pulverosellus* from other *Chilo* species. From *C. pulverosellus*, it is separated by the valva shape, which is more triangular than in *C. pulverosellus*, and the tips of the juxtal arms have a short tooth missing in *C. pulverosellus* (note that *C. pulverosellus* is not reported from the Philippines). In female genitalia (Fig. 155), the following characters distinguish this species from congeneric species: ductus bursae with basal half sclerotized, distally indented, abutted by two sclerotized lobes at ductus midlength; distinct swelling at midlength; ductus distal half wrinkled, with punctuate membrane; corpus bursae with light sclerotized ring at corpus opening; signum lacking (Anon 2019; Bleszynski, 1970c).

DISTRIBUTION

ALGERIA; CHINA; CROATIA; ISRAEL; ITALY; JAPAN; PHILIPPINES: Luzon (Laguna), Mindoro, Negros; ROMANIA; RUSSIA; SPAIN (Bleszynski, 1970c; Koren, 2021; Poltavsky & Artokhin, 2015). Collected at an altitude of 150 m on the Philippines. Bleszynski (1970c) reports the species from North Africa and Central Asia. He investigated one female specimen from the USNM collected on Mount Makiling (Laguna).

DNA BARCODING

A maximum intraspecific p-distance of 1.0 % is observed between specimens MFNLEP-PYRALPHIL07-C08 from Mindoro and MFNLEP-PYRALPHIL10-H09 from Negros. Three haplotypes were recovered in total from the Philippines. Of the three DNA barcodes available for this species, the haplotype from Shandong, China, is recovered as the closest neighbor, while the two other haplotype from Italy are more distantly related (Fig. S2f).

Chilo pulverata (Wileman & South, 1917)

Figs. 98, 156.

Diatraea pulverata Wileman & South, 1917. **Type locality**: Taiwan [Formosa], Kanshirei, 1000 ft.

= *Chilo izuensis* Okano, 1962a: 123, pl. 6, fig. 6; Bleszynski, 1970: 132 (syn.)

= *Chilo izouensis* Błeszyński, 1965a: 115

MATERIAL

No material was examined for this species.

DIAGNOSIS

This species can be separated from other *Chilo* species by examination of the male genitalia (Fig. 98): juxta symmetrical, with lateral arms arms not extending beyond basal-costal angle of valva; phallus with short ventral arm, subapical long patch of thorns and elongate patch of small cornuti. In female genitalia (Fig. 156), the two lamellate signa of the corpus bursae separate this species from other congeneric species of the Philippines (Anon, 2019; Bleszynski, 1970c).

DISTRIBUTION

CHINA; INDONESIA; JAPAN; PHILIPPINES: Luzon (Benguet); TAIWAN; TIMOR.

REMARKS

Błeszyński investigated two specimens (1 ♂, 1 ♀) of this species from Klondyke on Luzon, Philippines.

Chilo sacchariphagus (Bojer, 1856)

Figs. 38, 99, 157.

Proceras sacchariphagus Bojer, 1856; Błeszyński 1966: 477 (*Chilo*). **Type locality**: Mauritius

= *Argyria straminella* Caradja, 1926 c: 168; type locality: China, Tsingtan

= *Borer saccharellus** Guenée, 1862: 70–71; type locality: Réunion; Tams 1942 (syn.)

= *Chilo mauriciellus* Walker, 1863 b: 141–142; type locality: Mauritius

= *Chilo venosatus* Walker, 1863 b: 144; type locality: Malaysia, Borneo, Sarawak; Bleszynski 1970: 183 (syn.)

= *venosatum** Hua, 2005: 50

= *Diatraea striatalis* Snellen, 1890: 98, pl. 2 figs. 1–4; Hampson 1896: 953 (syn.)

= *Chilo sacchariphagus indicus* (Kapur, 1950: 414–415, pl. 6 figs. 3, 7, 13) (Proceras); type locality: India, Bihar, Pusa; Błeszyński 1966: 493 (*Chilo*)

= *Chilo sacchariphagus stramineella* (Caradja, 1926: 168) (*Argyria*); type locality: China, Tsingtau

MATERIAL

1 ♂, 2 ♀ (detailed information in Table S1; https://doi.org/10.5061/dryad.b8gtht7mh).

DIAGNOSIS

Chilo sacchariphagus, also known as the Spotted Borer or the Striped Stem Borer, is recognized by the striped forewings with a tiny dark brown cell spot in males, while female specimens are similar to those of *C. suppressalis*. This species can, however, be separated from other *Chilo* species by examination of the genitalia. In male genitalia (Fig. 99), the following characters separate this species: juxta plate short, broad, deeply notched, two arm projections conspicuously shorter as in other *Chilo* species; phallus with a row of 15-30 slender cornuti. In female genitalia (Fig. 157), the following characters separate this species: the antrum is well-marked, sclerotized; the ductus bursae has longitudinal ribs; and the corpus bursae is large, with one scobinate half (Anon, 2019; Bleszynski, 1970c). Bleszynski (1970c) discussed the differences in genitalia between the population from mainland China and Taiwan and that of the Philippines and Indonesia. He states that the "phallus in the specimens from Indonesia and Philippines is thinner and lacks the apical scobinations; in the ♀ genitalia the ductus bursae lacks the sclerite, but shows distinct longitudinal ribbing absent in the specimens from China and Formosa" (Bleszynski, 1970c).

DISTRIBUTION

EAST AFRICA; BANGLADESH; BRUNEI; CAMBODIA; CHINA; INDIA; INDONESIA (Borneo, Java, Bali, Sumatra, Celebes); IRAN; JAPAN; LAOS; MALAYSIA; PAKISTAN; PHILIPPINES: Luzon (Albay, Zambales); SINGAPORE; SRI LANKA; TAIWAN; THAILAND; VIETNAM (CABI Compendium 2019).

DNA BARCODING

The three specimens from the Philippines sequenced show identical DNA barcodes. Haplotype network reconstruction reveals that the Philippine haplotype is not shared with any other haplotypes retrieved from BOLD and GenBank and shows a p-distance of 2.4% to the closest conspecific specimen AGIMP002-12 from India. The highest distance observed is of 6.1% with specimen LSTEM508-18 from Java, Indonesia.

REMARKS

This species shows an extensive variation in genitalia, suggesting that it might indeed represent a species complex (Bleszynski, 1970c). Błeszyński investigated six specimens of this species from Benguet and Passay Rizal and two male specimens from Los Banos on Luzon, Philippines. This species is a major pest of sugar-cane in South-East Asia (Bleszynski, 1970c).

Chilo suppressalis (Walker, 1863)

Figs. 39, 100, 158.

Crambus suppressalis Walker, 1863. **Type locality**: [China, Kiangsu], Shanghai

= *Chilo oryzae* Fletcher, 1928: 59, pls 3, 4; type locality: India. Pusa; Kawada 1930: 145 (syn.)

= *Jartheza simplex* Butler, 1880: 690; type locality: Taiwan [Formosa]; Hampson, 1896: 957 (*Chilo*); Vinson, 1942: 40 (syn.)

= *suppresalis* Hampson, 1896: 957

MATERIAL

6 ♀ (detailed information in Table S1; https://doi.org/10.5061/dryad.b8gtht7mh).

DIAGNOSIS

Chilo suppressalis, also known as the Asiatic Rice Borer or Striped Rice Borer, is recognized by the cream/yellow forewing with a conspicuous black rounded discoidal spot in males, while females are similar to those of *C. sacchariphagus*. *Chilo suppressalis* can be separated from other *Chilo* species by the following characters of the male genitalia (Fig. 100): arms of juxta ca 2/3 of valva length, distinctly swollen at midlength; phallus with characteristic long, thin ventral arm (Bleszynski, 1970c). In female genitalia (Fig. 158), the following characters separate this species: ostial pouch small, slightly demarcated from ductus bursae; ductus bursae basally forming a twist, with sclerotized band; corpus bursae with elongate signum (Bleszynski, 1970c).

DISTRIBUTION

EAST AND SOUTH AFRICA; BANGLADESH; BRUNEI; CAMDOBIA; CHINA; INDIA; INDONESIA; IRAN; JAPAN; LAOS; MALAYSIA; PAKISTAN; PHILIPPINES: Luzon (Bataan, Batangas, Cagayan, Ifugao, Laguna, Nueva Ecija, Pangasinan, Mountain Province), Marinduque, Mindanao (Misamis Oriental, South Cotabato); SRI LANKA; TAIWAN; THAILAND; VIETNAM.

DNA BARCODING

A maximum intraspecific p-distance of 0.3% is observed between MFNLEP-PYRALPHIL11-A02 from Luzon (Ifugao) and the other three specimens from Luzon and Marinduque. Haplotype network reconstruction reveals that the Philippine haplotype is shared with specimens from China, South Korea, and Iran.

REMARKS

Chilo suppressalis is one of the most severe rice pest species and is present in the whole Oriental region, reaching temperate China and Japan to the North. It has been introduced to Europe and Hawaii (Maes, 2022). *Chilo suppressalis* together with *Scirpophaga incertulas* (Walker, 1863) are the most widespread rice pest species in the Philippines (Calora & Reyes, 1972). The observed decline of *Chilo suppressalis* in the past decades could be due to the introduction of narrow-stemmed rice (Litsinger et al., 2011).

Eschata Walker, 1856

Eschata Walker, 1856. **Type species**: *Eschata gelida* Walker, 1856

= *Chaerecla* Walker, 1865 b: 633. Type species: *Chaerecla chrysargyria* Walker, 1865. Hampson 1896: 961 (syn.)

= *Myeza* Walker, 1863 b: 190. Type species: *Myeza tonsalis* Walker, 1863

DIAGNOSIS

The Palaearctic fauna of *Eschata* was revised by Błeszyński (1965). Forewings are shiny snow white, generally with one postmedian and one subterminal line (pers. obs.). Male genitalia with the following characteristics: parrot-beak shaped uncus and beak-shaped gnathos; valva with costal arm; sacculus not marked; juxta notched or bifid as in other Chiloini (Léger et al., 2019; pers. obs.); vesica often with patch of short cornuti. Female genitalia are characterized as follows: papillae anales large, coalesced ventrally and dorsally; posterior apophyses roughly as long as length of tergite VIII; anterior apophyses roughly twice as long as length of tergite VIII; antrum membranous; posterior half of ductus sclerotized as in *Chilo* species; corpus bursae often with one signum.

DISTRIBUTION

Known from the Oriental region. One species, *Eschata* sp. cf. *rififi* Błeszyński, 1965, is reported here from the Philippines.

PHYLOGENETIC RELATIONSHIPS

Although the genus was not included in the molecular phylogeny of Léger et al. (2019), it can be confidently placed in the Chiloini based on the bifid juxta in male genitalia as well as the thick venulae secundae on the tympanal organs.

Eschata cf. miranda Błeszyński, 1965

Figs. 40, 101, 159.

Eschata miranda Błeszyński, 1965, in Amsel et al. (eds.): 99, pl. 40 fig. 501, 2, pl. 90 fig. 50. **Type locality**: Taiwan.

MATERIAL

2 ♂, 6 ♀ (detailed information in Table S1; https://doi.org/10.5061/dryad.b8gtht7mh).

DIAGNOSIS

Eschata sp. near *miranda* Błeszyński, 1965 shows similarities to *E. miranda* (type locality: India, Darjeeling) and *E. rococo* Błeszyński, 1970 (type locality: India, Khasis) in male genitalia (Fig. 101): uncus parrot-beak shaped, kinked downwards at half length; gnathos arm with posterior edge protruded upwards; valva slightly curved upwards, basally with narrow costal arm projecting postero-dorsally, juxta apex deeply notched; vesica with patch of short cornuti. However, the present species shows noticeable differences to *E. miranda* and *R. rococo*: The costal arm is dorsally concave (convex in the two other species), the juxta apical arms are narrower and slightly longer, and the vesica has a large, isolated cornutus not found in the two other species. The large, isolated cornutus of the vesica is also observed in *E. miranda* Błeszyński, 1965 (type locality: Taiwan); however, the short and bulky costal arm of the latter species separates it from the Philippine species.

DISTRIBUTION

PHILIPPINES: Luzon (Laguna, Zambales), Marinduque, Palawan. Collected at altitudes between 40 and 500 m.

DNA BARCODING

The highest intraspecific divergence observed is of 3.8% between specimens MFNLEP-PYRALPHIL08-D11 from Luzon (Zambales) and MFNLEP-PYRALPHIL08-G11 from Palawan. Both specimens from Palawan only yielded sequences for the COI1a fragment and were thus not included in the species delimitation analysis.

REMARKS

E. rococo is a possible synonym of *E. rififi*. Both species are only separated by minor details of the juxta in male genitalia.

CALAMOTROPHINI Gaskin, 1988

Calamotropha Zeller, 1863

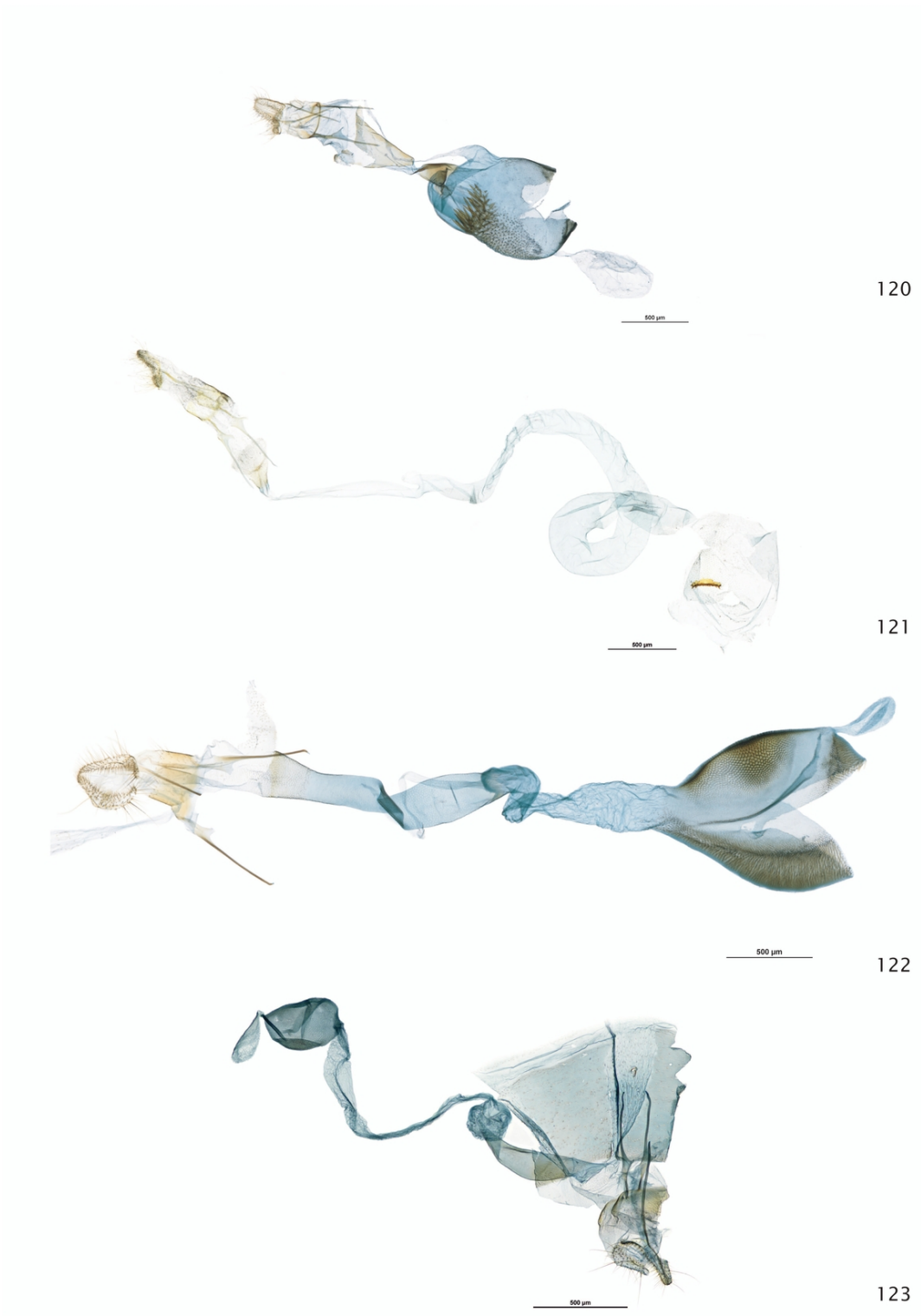
Calamotropha Zeller, 1863 b: 8, 9. **Type species**: *Tinea paludella* Hübner, [1824] 1796

= *Aurelianus* Błeszyński, 1962 d: 2. Type species: *Chilo discellus* Walker, 1863

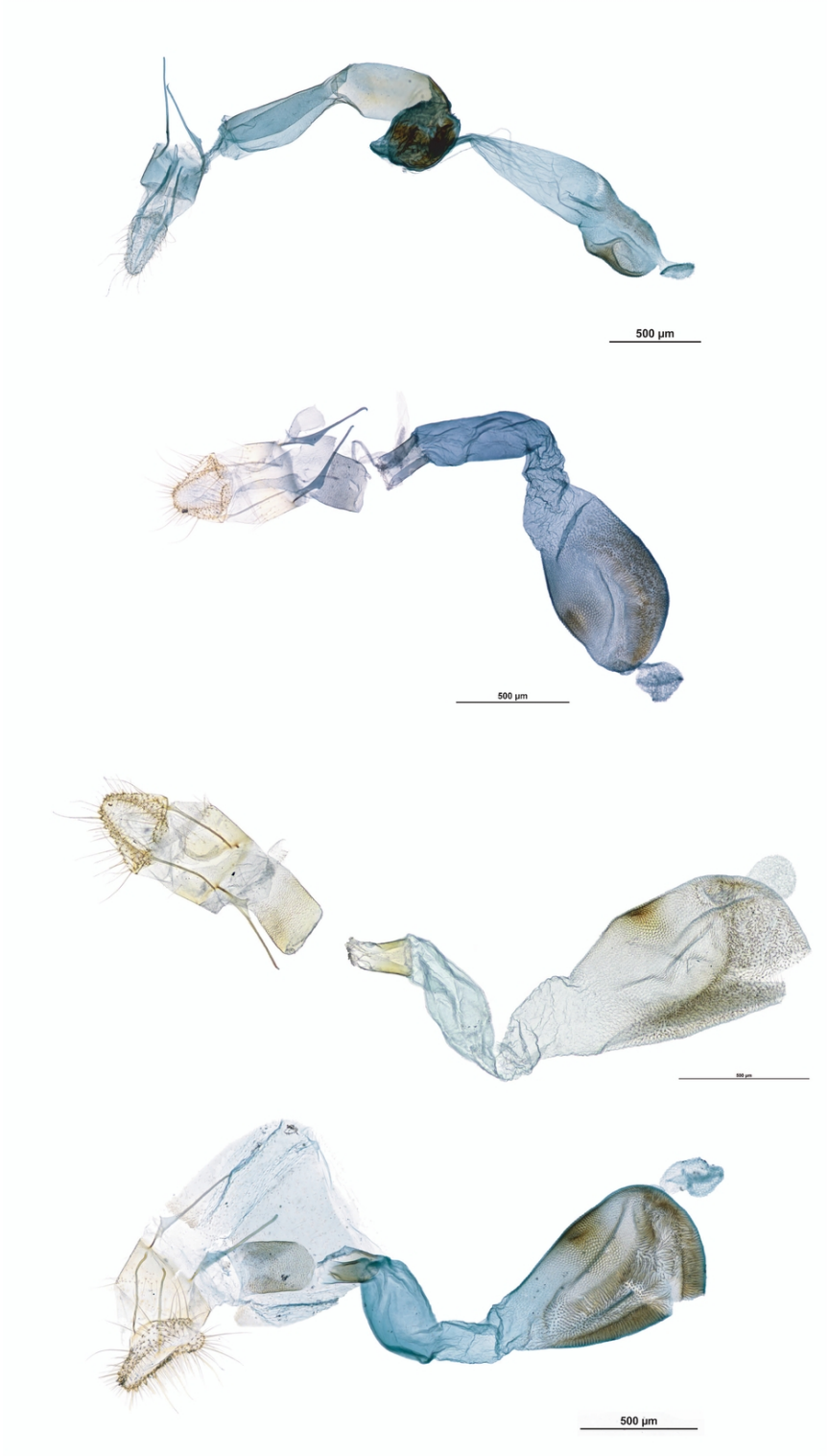
= *Myeza* Walker, 1863 b: 190. Type species: *Myeza tonsalis* Walker, 1863

DIAGNOSIS

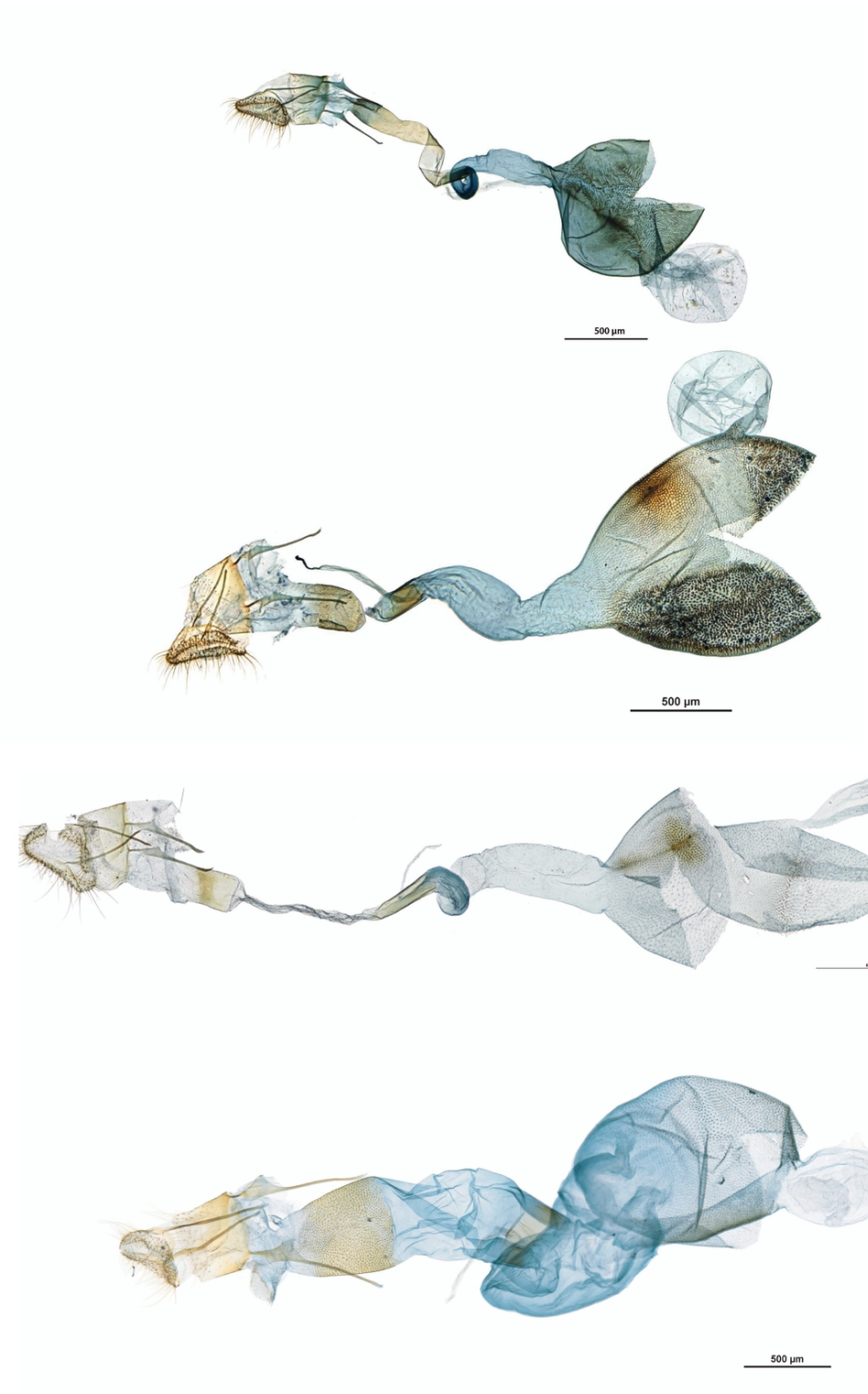
Calamotropha was revised by Błeszyński (1961) and the genus was redescribed by Landry (1995). The combination of forewing Rs4 vein stalked with Rs2+Rs3 and the open



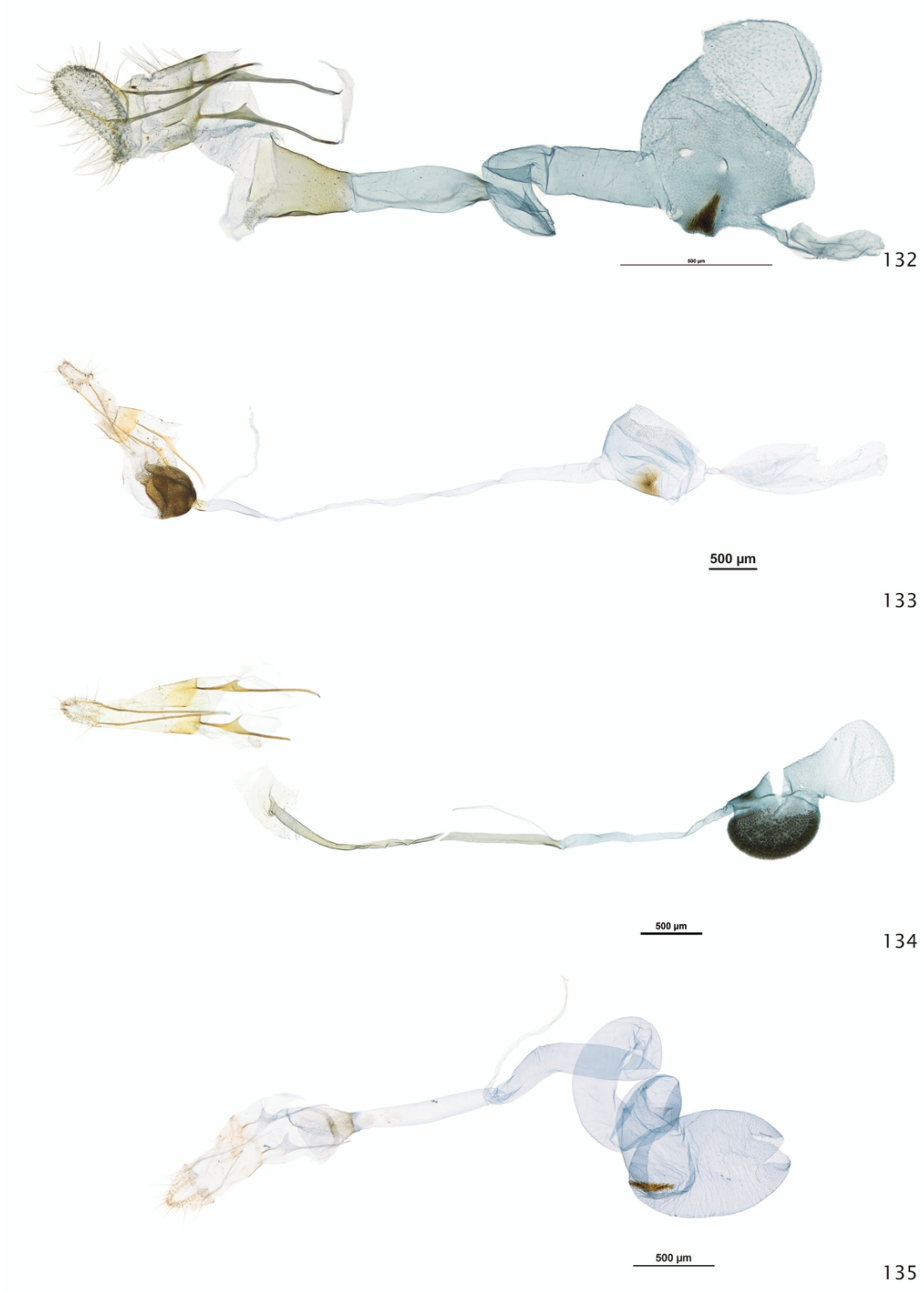
Figs 120-123. Female genitalia of *Scoparia* species. Fig. 120. *Scoparia meyi* Nuss, 1998, slide TL1042♀. Fig. 121. *Scoparia monticola* Nuss, 1998, slide TL955♀. Fig. 122. *Scoparia philippinensis* (Hampson, 1917), slide TL913♀. Fig. 123. *Scoparia luzonensis* **sp. n.**, paratype, slide TL938♀.



Figs 124-127. Female genitalia of *Scoparia* species. Fig. 124. *Scoparia masiita* **sp. n.**, paratype, slide TL1010♀. Fig. 125. *Scoparia noacki* Nuss, 2002, paratype, slide GU Nuss 955♀. Fig. 126. *Scoparia bicornuta* **sp. n.**, paratype, slide TL959♀. Fig. 127. *Scoparia ifugaoensis* **sp. n.**, paratype, slide TL1021♀.



Figs 128-131. Female genitalia of *Scoparia* species. Fig. 128. *Scoparia negrosensis* **sp. n.**, paratype, slide TL1482♀. Fig. 129. *Scoparia aenea* **sp. n.**, paratype, slide TL770♀. Fig. 130. *Scoparia* cf. *spadix*, slide TL961♀. Fig. 131. *Scoparia* cf. *abo*, slide TL901♀.



Figs 132-135. Female genitalia of *Scoparia*, *Eudonia* and *Micraglossa* species. Fig. 132. *Scoparia* cf. *tenuispina*, slide TL952♀. Fig. 133. *Eudonia penicula* **sp. n.**, paratype, slide TL915♀. Fig. 134. *Eudonia barbipennis* (Hampson, 1897), TL911♀. Fig. 135. *Micraglossa tagalica* Nuss, 1998, paratype, slide GU Nuss 756♀.

hindwing cell characterize the genus (Landry, 1995; Léger et al., 2019). Forewing white or brown, generally with a median and a subterminal fascia, margin with several small dots (W. Li & Li, 2012a; pers. obs.). Male genitalia with hairs at base of uncus; tegumen usually with short dorsal roof; valva relatively short; pseudosaccus present; vinculum subtriangular, conspicuously protruding anterad, saccus blunt (Landry, 1995; W. Li & Li, 2012a). Female genitalia with papillae anales coalesced dorsally and ventrally; posterior apophyses roughly as long as tergite VIII; anterior apophyses short or absent; antrum often sclerotized; ductus bursae usually slender; corpus bursae usually without signum.

DISTRIBUTION

Known from the Afrotropical, the Palearctic, Oriental, and Australasian regions (Błeszyński, 1961). Seven species are reported here from the Philippines, of which five can be confidently named: *Calamotropha anacantha* **sp. n.**, *Calamotropha atkinsoni* Zeller, 1863, *Calamotropha obliterans* (Walker, 1863), *Calamotropha philippinensis* **sp. n.**, *Calamotropha unicolorellus* (Zeller, 1863).

PHYLOGENETIC RELATIONSHIPS

Calamotropha is part of the Calamotrophini, also including *Pseudocatharylla* Błeszyński, 1961 and *Vaxi* Błeszyński, 1962 (Léger et al., 2019).

Calamotropha atkinsoni Zeller, 1863

Figs. 102, 160.

Calamotropha atkinsoni Zeller, 1863. **Type locality**: India, near Calcutta.

= *Calamotropha fuscicostella* Snellen, 1880: 247. Type locality: Indonesia, Sulawesi [Celebes], Bonthain; Makassar; Maros. Błeszyński, 1961 e: 196 (syn.)

= *Crambus holodryas* Meyrick, 1933: 444, 445. Type locality: [Thailand] Siam

= *Calamotropha atkinsoni malaica* Błeszyński, 1961 e: 196, 197, pl. 32 50, pl. 63 fig. 189. Type locality: Singapore

MATERIAL

No material was investigated for this species.

DIAGNOSIS

In male genitalia (Fig. 102), the very short, rounded uncus and the two conspicuous spine-like cornuti on the vesica unambiguously separate this species from other *Calamotropha* species (Błeszyński, 1961). In female genitalia (Fig. 160), the conspicuous sterigma covered by minute hair forms a chamber surrounding the antrum.

DISTRIBUTION

Ranging from India to the Philippines (Błeszyński, 1961).

REMARKS

Błeszyński (1961) reports this species from the Philippines.

Calamotropha obliterans (Walker, 1863)

Figs. 41, 103, 161.

Crambus obliterans Walker, 1863: 169, 170. **Type locality**: [Malaysia] Sarawak, Borneo.

= *Crambus candidifer* Walker, 1863: 170, 171

= *Crambus candifer* Hampson, 1896c: 934

= *Crambus condidifer* Błeszyński & Colling, 1962: 223

= *obliteranus* (Hua, 2005: 52) (*Crambus*)

Calamotropha obliterans Błeszyński, 1961, pp. 168, 169; pl. 24, fig. 20; pl. 47, fig. 111; pl. 66, fig. 204

MATERIAL

4 ♂, 1 unsexed (detailed information in Table S1; https://doi.org/10.5061/dryad.b8gtht7mh).

SIMILAR SPECIES

Calamotropha formosella Błeszyński, 1961, *C. okanoi* Błeszyński, 1961.

DIAGNOSIS

Calamotropha obliterans can be separated from other *Calamotropha* species by the following characters of the forewing: ground color cream, costa dark brown, median line on costal half evenly arched outwardly, forming a dot at midlength, then fading towards dorsum; median discoidal marked spot; subterminal line arched outwards near costa, cream, basally thinly edged with dark brown. Błeszyński (1961) states that the habitus of *C. obliterans* resembles that of *C. formosella* and *C. okanoi*. The genitalia enable unambiguous separation from these two species. In the male (Fig. 103), the valva apex is broadly notched ventrally (notch smaller in *C. okanoi*), the valva apex is pointed (rounded in *C. formosella*), and the vesica bears one medium and small cornuti (no cornuti in *C. formosella*, one single cornutus in *C. okanoi*). In female genitalia, the ventral, evenly curved plate of the antrum separates this species from other *Calamotropha* species.

REDESCRIPTION OF FEMALE GENITALIA (FIG. 161)

Posterior apophyses ca 5/4 of length of tergite VIII length, medially larger. Anterior apophyses ca 1.5 X tergite VIII length, narrowed on distal half. Antrum forming ventral evenly curved plate. Ductus bursae ca 1/4 of corpus length, straight. Corpus bursae not well demarcated from ductus bursae, elongate, membranous, devoid of signum.

DISTRIBUTION

MALAYSIA: Sabah, Sarawak; PHILIPPINES: Leyte, Luzon, Palawan, Samar. Collected at altitudes between 50 and 500 m.

DNA BARCODING

The species delimitation analysis recovered four different MOTUs within *C. obliterans* for the specimens from Leyte, Luzon (Zambales), Palawan, and Samar (one MOTU each). A maximum intraspecific p-distance of 6.7% is found between samples MFNLEP-PYRALPHIL09-C08 from Luzon

(Zambales) and MFNLEP-PYRALPHIL09-A08 from Palawan.

REMARKS

The species was described from a female from Sarawak by Walker. Błeszyński could not locate any male specimen from Borneo in the collections he visited (Błeszyński, 1961), so he investigated a male specimen from Palawan. He states that this male "seems to be conspecific with *Calamotropha obliterans* (Walk.)". The unique female investigated here does not match the drawing by Błeszyński (1961). The original slide is a poor-quality dissection where the corpus bursae and part of the ductus have presumably been lost.

Calamotropha unicolorellus (Zeller, 1863)

Chilo unicolorella Zeller, 1863. **Type locality**: Himalayas. Błeszyński, 1961 e: 215 (*Calamotropha*)
Figs. 44, 104, 162.

MATERIAL

1 ♂, 1 ♀ (detailed information in Table S1; https://doi.org/10.5061/dryad.b8gtht7mh).

SIMILAR SPECIES

Calamotropha shichito (Marumo, 1931); *Calamotropha pseudodielota* Błeszyński, 1961.

DIAGNOSIS

This species is separated form other *Calamotropha* species of the Philippines by the uniform brown color of the forewing with the dashed postmedian black line and the marked marginal black triangular spots. In male genitalia (Fig. 104), the basal lobe on the posterior margin of tegumen arms; the flat, spatula-shaped gnathos; and the two heavily sclerotized rods on the vesica are shared with *Calamotropha shichito* and *Calamotropha pseudodielota*. The valva of *C. unicolorellus* lacks the dorsal bump observed in *C. pseudodielota*, while the evenly curved ventral margin separates it from *C. shichito*, which has a rather straight ventral margin. The female genitalia (Fig. 162) has enlarged posterior apophyses with thinly dented margins also observed in *C. shichito* and *C. pseudodielota*. From *C. shichito*, it can be separated by the base of the ductus bursae after the antrum which is membranous and straight, while it is lightly sclerotized and kinked in *C. shichito* (Kim et al., 2023), as well as the posterior apophyses which run straight anterad, while anterior half is bent upwards in *C. shichito*. The antrum shows an anterior conical part and a posterior shorter, funnel-shaped part.

DESCRIPTION OF THE MALE GENITALIA (FIG. 104)

Uncus about 7/6 of tegumen arm length, narrow, straight, apex blunt. Gnathos projection about half the length of uncus, apex broad, spatula-shaped. Tegumen arms with posterior margin forming rounded bump on basal half. Valva ventral margin evenly curved upwards; dorsal margin straight; subdorsal ridge projection on innerside of valva; apex truncated, subapically with patch of thick setae. Vinculum large, triangular, with protruding saccus. Vesica bearing two apical heavily sclerotized rods.

DISTRIBUTION

INDIA; MALAYSIA: Sarawak; PHILIPPINES: Mindanao (Surigao del Sur), Samar; SRI LANKA. Collected at altitudes between 50 and 200 m.

REMARKS

Female genitalia match that of the specimen GS-1334 from Manilla, Philippines, illustrated in Błeszyński (1961: Fig. 209). Błeszyński (1961) notes that "it is possible that the females of *C. unicolorella* (ZELL.) belong to the species here described [*C. pseudodielota*]. However, the two differ in the coloration of head and vertex, in any case all the species of the *C. dielota* MEYR.-group are nearly indistinguishable on their facies. Too little material is avai[l]abe for my study to clarify this question."

Calamotropha philippinensis Léger, sp. n.

https://zoobank.org/0180F47A-9F83-487B-854C-3662F18D97F6
Figs. 42, 105, 163.

MATERIAL

Holotype: ♂ (specimen identifier coll.mfn-berlin.de_u_78b13f, DNA voucher MFNLEP-PYRALPHIL07-D07, TL1054♂; BOLD sample ID PYPHI106-21, Genbank Accession Number PP196792). PHILIPPINES: Negros, Patag, 750 m, 20-25.05.1996 (W. Mey). Deposited in MfN.

Paratypes: 7 ♂ (coll.mfn-berlin.de_u_f30a8c, d6a5f0, 1ddbb9, df0153, e40908, 14d6d4, db2f1b), 1 ♀ (specimen identifier coll.mfn-berlin.de_u_36446d) (detailed information in Table S1; https://doi.org/10.5061/dryad.b8gtht7mh).

SIMILAR SPECIES

Calamotropha brevistrigellus (Caradja, 1930), *Calamotropha formosella* Błeszyński, 1961, *Calamotropha latella* (Snellen, 1890), *Calamotropha melanosticta* (Hampson, 1896).

DIAGNOSIS

The white forewing with marked median and subterminal dark brown lines and the characteristic discal dark brown spot (Fig. 42) separate *Calamotropha philippinensis* **sp. n.** from other *Calamotropha* species of the Philippines. *Calamotropha philippinensis* **sp. n.** is externally similar to *C. brevistrigellus* (Caradja, 1932) and *C. melanosticta* (Hampson, 1896) but can be confidently separated by the ventral hook-like projection of the valva in male genitalia. Male genitalia (Fig. 105) share the ventral notch of the valva and the single cornutus of the vesica with *C. formosella*, but the ventral projection is narrow and sclerotized in *C. philippinensis* **sp. n.** The female genitalia (Fig. 163) are rather simple, with short posterior apophyses; a narrow, sclerotized ring at the

antrum; a long, straight ductus bursae; and a glabrous, ovoid corpus bursae.

HABITUS (FIG. 42)

Forewing length 4.5-6.7 mm (n = 6); ground color white, sprinkled with brown scales. Median line brown, broadly arched outwards down to CuA2, there forming a characteristic dark brown spot, then arched outwards in dorsal area. Subterminal line brown, broadly arched outwards. Subterminal dash-like brown spot at costa, running parallel to subterminal line. Subapical costal blotch brown, triangular. Margin brown. Fringes copper. Hindwing dirty white, with slightly marked brown margin on costal half.

MALE GENITALIA (FIG. 105)

Uncus with W-shaped base, extending into long, narrow projection, with blunt apex; uncus lateral arms connecting to gnathos arms. Gnathos forming broad spatula-shaped projection about 4/5 of uncus projection length. Tegumen arms stout, dorso-medially membranous. Valva short, stout, inwardly curved, densely covered with thick setae on distal half; ventral margin basally with conspicuous thorn-shaped projection pointing inwards; apex broadly rounded. Vinculum large, triangular, with protruding saccus. Vesica with one very short, spine-like cornutus.

FEMALE GENITALIA (FIG. 163)

Posterior apophyses ca 4/5 of length of tergite VIII, narrowed on distal half. Anterior apophyses slightly larger than posterior apophyses, narrowed on distal half. Antrum forming sclerotized ring, ventrally notched. Ductus basal 1/4 wrinkled; distal 3/4 narrow, straight. Ductus seminalis branching at midlength of ductus bursae. Corpus bursae ovoid, roughly as long as ductus bursae; membrane reticulate, devoid of signum.

DNA BARCODING

A maximum intraspecific p-distance of 5.4% is observed between samples MFNLEP-PYRALPHIL07-A09 from Luzon (Quezon) and MFNLEP-PYRALPHIL09-F08 from Mindoro.

DISTRIBUTION

PHILIPPINES: Leyte, Luzon (Albay), Mindoro, Negros, Palawan. Collected at altitudes between 650 and 750 m.

REMARKS

Differences are observed in male genitalia between TL1054♂ (specimen of Negros) and the type specimen TL1211♂ (specimen from Leyte): Saccus is rather rounded in TL1054♂ (triangular in TL1211♂), cornutus is reduced to a dot-shaped sclerotized bump (spine-like in TL1211♂), and valva dorsal margin forms a dorsal bump (not observed in TL1211♂). These specimens differ in DNA barcodes by 0.3%.

Calamotropha anacantha Léger, sp. n.

https://zoobank.org/2AAA12CE-207D-4311-A5EB-0FF4658D6D1E
Figs. 43, 106, 166.

MATERIAL

Holotype: 1 ♂ (specimen identifier coll.mfn-berlin.de_u_1609c7, DNA voucher MFNLEP-PYRALPHIL07-G08, genitalia on slide TL1064♂; BOLD sample ID PYPHI142-21, Genbank Accession Number PP196827). PHILIPPINES: Luzon, Isabela, Sierra Madre, 22 km NW of Dinapique, logged primary forest, 700 m, 04.09.2006 (J. H. Lourens).

Paratypes: 2 ♀ (specimen identifiers coll.mfn-berlin.de_u_b5fe44, 280927) (detailed information in Table S1; https://doi.org/10.5061/dryad.b8gtht7mh).

SIMILAR SPECIES

Calamotropha tonsalis (Walker, 1863), *C. albistrigellus* (Hampson, 1896).

DIAGNOSIS

This species is conspicuously larger than other *Calamotropha* species found in the Philippines (♂ = 13 mm, ♀ = 15-17 mm). The forewings (Fig. 43) are brownish and reminiscent of *Chilo* or *Ancylolomia* species at first glance. However, the forewing of this species is broader and bears a conspicuous, postmedian, broken, brown line bent outwardly up to M1 vein, there angled at 100° and running towards dorsum. This species is externally undistinguishable from *Calamotropha tonsalis* found in Borneo and can be only confidently identified by examination of genitalic features. In male genitalia (Fig. 106), the vesica lacks the large cornutus found in *C. tonsalis*, and the gnathos is slightly shorter than the uncus, while it is as long as the uncus in *C. tonsalis*. Female genitalia (Fig. 166) are very similar, but the straight posterior apophyses with dorsal bump possibly separate this species from *C. tonsalis*. This species also resembles *C. albistrigellus* (type locality: Bonin island), but the apex of the valva is notched in the latter, and the gnathos is as long as the uncus.

HABITUS (FIG. 43)

Forewing length 13 mm (♂, n = 1), 15-17 mm (♀, n = 2); ground color cream to light brown, speckled with darker scales. Antemedian cell spot faintly marked, dark brown. Broad, dark brown fascia on cubital area running from base up to postmedian area. Two postmedian faintly marked dark brown dots. Postmedian line dark brown, dashed, directed outwards up to M1 vein, there angled at 100°, running downwards to dorsum. Thin dark brown margin with five small triangular spots at veins towards tornus. Hindwing cream, suffused with light brown.

MALE GENITALIA (FIG. 106)

Uncus ca 5/6 of tegumen arm length, narrow, slightly curved downwards, glabrous, apex rounded. Gnathos arms

laterally bearing tuft of sclerotized setae; gnathos projection ca 5/6 of uncus length, narrow, glabrous, slightly curved upwards, with rounded apex. Tegumen arms short, stout. Valva short, stout; ventral margin straight in basal half, bent upwards on distal half; dorsal margin slightly convex; apex with patch of setae, ending in a short tooth. Pseudosaccus present. Phallus slender, slightly arched. Vesica covered with tiny spines.

FEMALE GENITALIA (FIG. 166)

Posterior apophyses ca 1.5 X length of tergite VIII, basally broad, at midlength with a dorsal bump. Anterior apophyses ca half of length of tergite VIII, with dorsal bump at base. Antrum forming a strongly sclerotized ring. Colliculum broad, marked with sclerotized, longitudinal lines. Ductus bursae at base with a small membranous pouch, straight, about twice the length of corpus bursae. Corpus bursae ovoid, reticulate devoid of signum.

DISTRIBUTION

PHILIPPINES: Luzon (Isabela), Marinduque. Collected at altitudes between 400 and 700 m.

DNA BARCODING

Two MOTUs were recovered in the species delimitation analysis, one for the two specimens from Eastern Luzon and one for the female specimen from Marinduque. A p-distance of 2.6% is found between MFNLEP-PYRALPHIL08-B12 (Luzon, Isabela) and MFNLEP-PYRALPHIL08-A11 (Marinduque).

ETYMOLOGY

From the Greek *a-, an-*, without, and *acantha*, spine, referring to the absence of thorn on the corpus bursae of female genitalia.

Calamotropha sp. 1 cf. *oculalis*

Figs. 45, 107.

MATERIAL

1 ♂ (specimen identifier coll.mfn-berlin.de_u_1e3488, DNA voucher MFNLEP-PYRALPHIL07-G09, genitalia on slide TL1070♂; BOLD sample ID PYPHI143-21). PHILIPPINES: Mindoro, Oriental Mindoro, Mount Halcon, 1300 m, 15-17.01.1998 (W. Mey, W. Speidel).

SIMILAR SPECIES

Calamotropha indica (Błeszyński, 1961), *C. melli* (Caradja, 1933), *C. oculalis* (Snellen, 1893), *Calamotropha* sp. 2 cf. *oculalis*.

DIAGNOSIS

This species (Fig. 45) is externally very similar to the four species listed above. *Calamotropha oculalis* is only known from female specimens, hence making comparison with the one male specimen available difficult. In male genitalia (Fig. 107), this species shares the shape of the uncus and gnathos with *C. indica* and *C. melli*; however, the conspicuous, ventral, spine-like projections of the valva apex separates this species confidently from the two others.

DISTRIBUTION

PHILIPPINES: Mindoro. Collected at an altitude of 1300 m.

REMARKS

One of the two species presented here is most probably *Calamotropha oculalis* (Snellen, 1893). Błeszyński (1961) examined a female specimen of *Calamotropha oculalis* from the Philippines (Luzon, Benguet, Irisan) with "genitalia strikingly similar to those of the holotype".

Calamotropha sp. 2 cf. *oculalis*

Figs. 46, 108.

MATERIAL

1 ♂ (coll.mfn-berlin.de_u_a7f185, DNA voucher MFNLEP-PYRALPHIL08-B11, genitalia on slide TL1213♂; BOLD sample ID PYPHI176-22, Genbank Accession Number PP196860). PHILIPPINES: Palawan, Barangay Maranlantan, Lake Danao, 85 m, 18.12.2007 (J.H. Lourens).

SIMILAR SPECIES

C. indica, *Calamotropha* sp. 1 cf. *oculalis*, *C. melli*, *C. oculalis*.

DIAGNOSIS

This species (Fig. 46) is externally very similar to the four species mentioned above. The deeply indented uncus and the unconnected gnathos arms (Fig. 108) unambiguously separate this species from *C. indica*, *C.* sp. 1 cf. *oculalis*, and *C. melli*. As mentioned above, the male of *Calamotropha oculalis* being unknown, additional material is required in order to draw conclusions on the identity of this species.

DISTRIBUTION

PHILIPPINES: Palawan. Collected at an altitude of 85 m.

REMARKS

See *Calamotropha* sp. 1 cf. *oculalis*.

CRAMBINI Latreille, 1810

Angustalius Marion, 1954

Angustalius Marion, 1954. **Type species:** *Angustalius ditaeniellus* Marion, 1954.

= *Bleszynskia** Lattin, 1961: 115. Błeszyński, 1965 a: 229 (syn.)

= *Crambopsis** Lattin, 1952: 90-91

DIAGNOSIS

The genus *Angustalius* has a conspicuously produced apex on the forewing. The wing pattern is similar to that of the Holarctic genus *Crambus*, with a broad white fascia running across the discoidal cell. Male genitalia exhibit the follow-

ing characters: uncus slender, elongate, bent downwards, apex pointing downwards; gnathos very short, without distal projection; valva with sclerotized costa, without projection; sacculus sclerotized, separated from valva; vesica usually with one cornutus. Female genitalia exhibit the following characters: papillae anales somewhat subrectangular; anterior and posterior apophyses strongly reduced or absent; ostium simple, sclerotized; ductus bursae short; corpus bursae with two signa (Błeszyński, 1965).

DISTRIBUTION

Occuring in the Afrotropical, Oriental, and Australasian regions. Six species are reported in the genus worldwide, of which only *Angustalius malacelloides* (Błeszyński, 1955) is found in the Philippines.

PHYLOGENETIC RELATIONSHIPS

Angustalius belongs to the so-called "*Crambus* group" and is sister to the Afrotropical genus *Conocramboides* (Bleszynski, 1970a; Léger et al., 2019).

Angustalius malacelloides (Błeszyński, 1955)

Figs. 47, 109, 165.

Crambopsis malacelloides Błeszyński, 1955 a: 229, figs. 3, 6. **Type locality**: Australia, Tasmania

Bleszynskia malacelloides Błeszyński, 1965, pp. 230–231, l. 54 fig. 144 (*Angustalius*)

Angustalius malacelloides Hua, 2005: 47 (*Bleszynskia*)

MATERIAL

3 ♂, 4 ♀ (detailed information in Table S1; https://doi.org/10.5061/dryad.b8gtht7mh).

SIMILAR SPECIES

Angustalius malacellus (Duponchel, 1836).

DIAGNOSIS

This species is a commonly encountered Crambinae in South-East Asia. Accurate identification to separate it from *A. malacellus* is only possible by examination of male genitalia (Fig. 109): The gnathos is longer, the posterior margin of the sacculus is denticulate and lacks the ventral protrusion as in *A. malacellus*, the vinculum is proximally rounded, while it is pointed in *A. malacellus,* and the cornutus on the vesica is smaller than in *A. malacellus* (Błeszyński, 1965). Błeszyński (1965) could not find the specific differences in female genitalia between *A. malacellus* (Duponchel, 1836) and *A. malacelloides* (Błeszyński, 1955). A possible character separating *A. malacelloides* (Fig. 165) from *A. malacellus* is the lack of the broadened pouch of the ductus bursae in *A. malacelloides*.

DNA BARCODING

A maximum intraspecific p-distance of 0.6% is observed between sample MFNLEP-PYRALPHIL08-G12 from Luzon (Zambales) and the two samples from Borneo. The specimen MFNLEP-PYRALPHIL08-F12 (Panay) and MFNLEP-PYRALPHIL08-G12 (Luzon, Zambales) both represent a unique haplotype, while specimens MFNLEP-PYRALPHIL08-E12 (Panay) and MFNLEP-PYRALPHIL07-D08 (Luzon) share the haplotype with specimens from Borneo, Papua New Guinea, and New South Wales, Australia (see Fig. 179a).

DISTRIBUTION

AUSTRALIA; CHINA; INDIA; MALAYSIA; PHILIPPINES: Luzon (Benguet, Zambales), Panay; NEW ZEALAND. In the Philippines, the specimens were collected at altitudes between 250 and 900 m, with one single specimen encountered at 2350 m.

Catoptria Hübner, 1825

Catoptria Hübner, 1825. **Type species**: *Catoptria speculalis* Hübner, [1825] 1816, by subsequent designation by Błeszyński, 1956, Z. wien. ent. Ges. 41: 213

= *Exoria* Hübner, 1825 n: 367 (but printed as 467). Type species: *Tinea combinella* [Denis & Schiffermüller], 1775, by subsequent designation by Shibuya, 1928, J. Fac. Agric. Hokkaido imp. Univ. 22: 45. Błeszyński 1963 a: 97 (syn.)

= *Tetrachila* Hübner, 1806 f: [2]

DIAGNOSIS

Moths of the genus *Catoptria* usually have tawny to brown forewings with a broad white fascia running from the base to the subterminal area, in some species disrupted by median and postmedian lines (Błeszyński, 1965; pers. obs.). The male genitalia exhibit the following characters: uncus well-developed, slender, with apex pointing downwards; gnathos roughly as long as uncus, slender, apex usually pointing downwards, often with subapical dorsal tip; valva with costal arm; sacculus often with free, sclerotized projection; phallus often with subapical or apical spines and with cornuti (Błeszyński, 1965; pers. obs.). The female genitalia show the following characters: papillae anales not coalesced dorsally and ventrally; anterior apophyses reduced; ostium pouch strongly sclerotized; ductus bursae with basal half strongly sclerotized, often curved; corpus bursae with one signum (Błeszyński, 1965; pers. obs.).

DISTRIBUTION

Found in the Holarctic region. Eighty-eight species are currently reported from the genus.

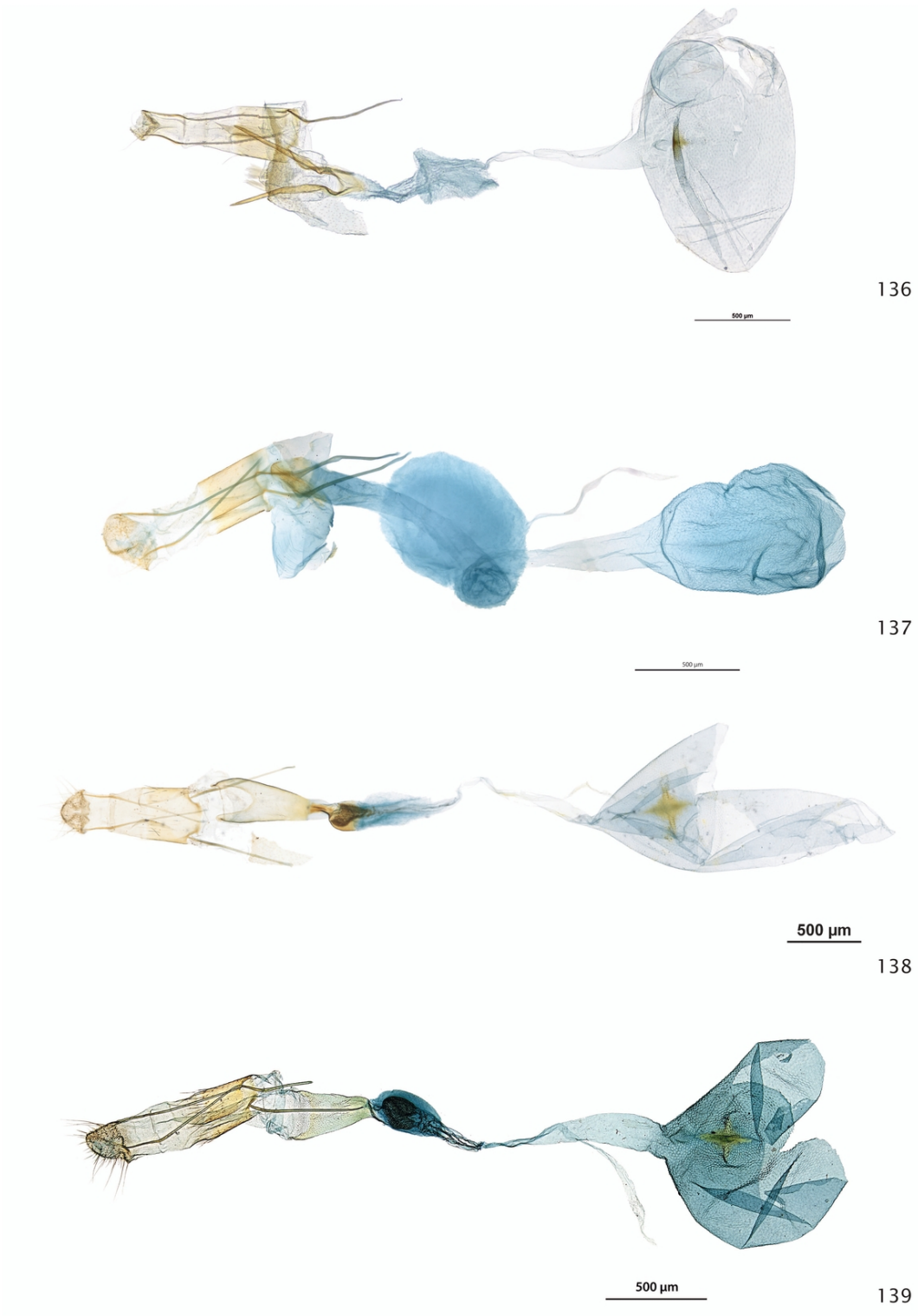
PHYLOGENETIC RELATIONSHIPS

Catoptria is sister to the Holarctic genus *Agriphila* (Léger et al., 2019).

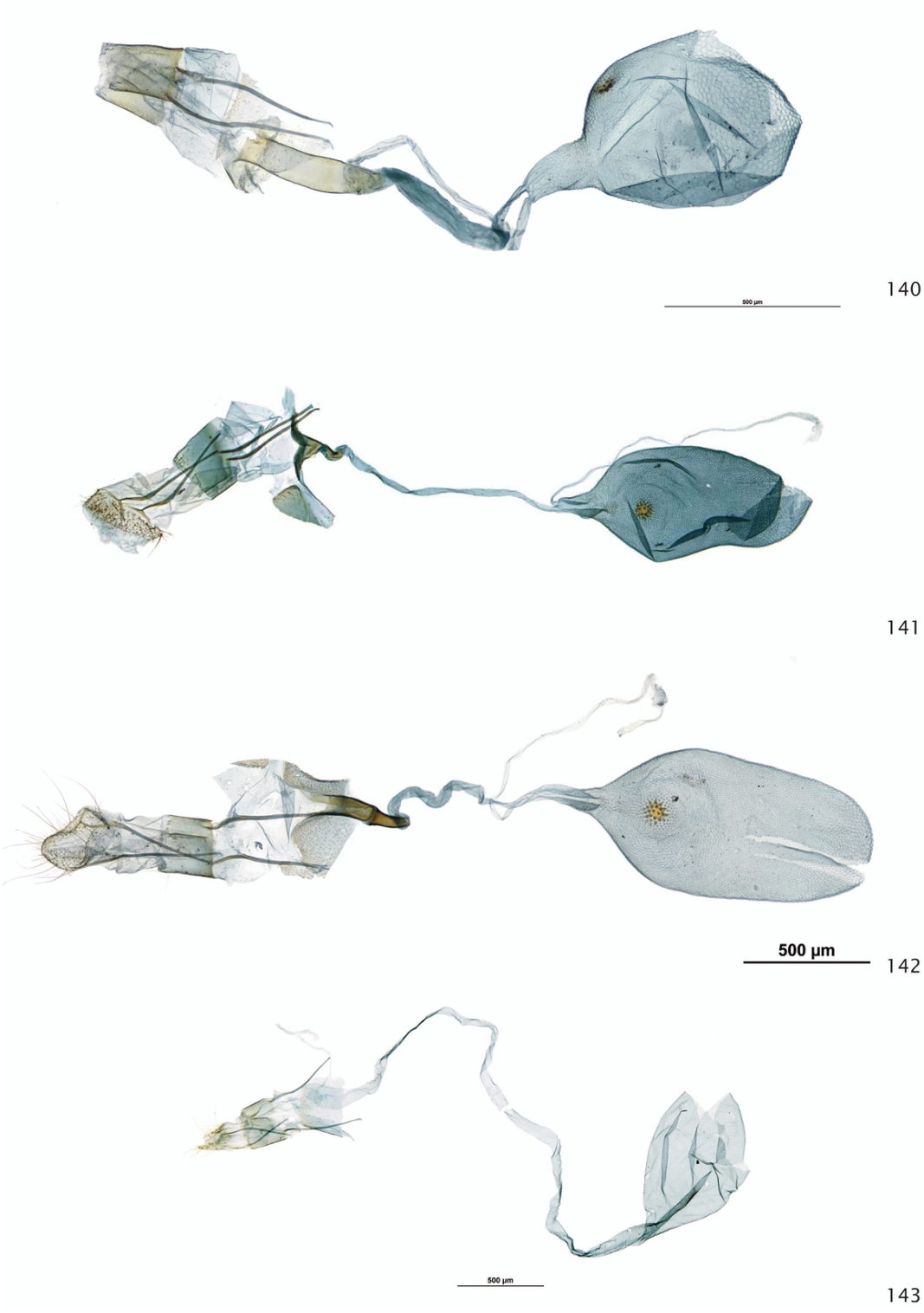
Catoptria philippinensis Léger, sp. n.

https://zoobank.org/A6AADF26-E9E0-452E-9AEA-0BA9F26307C7

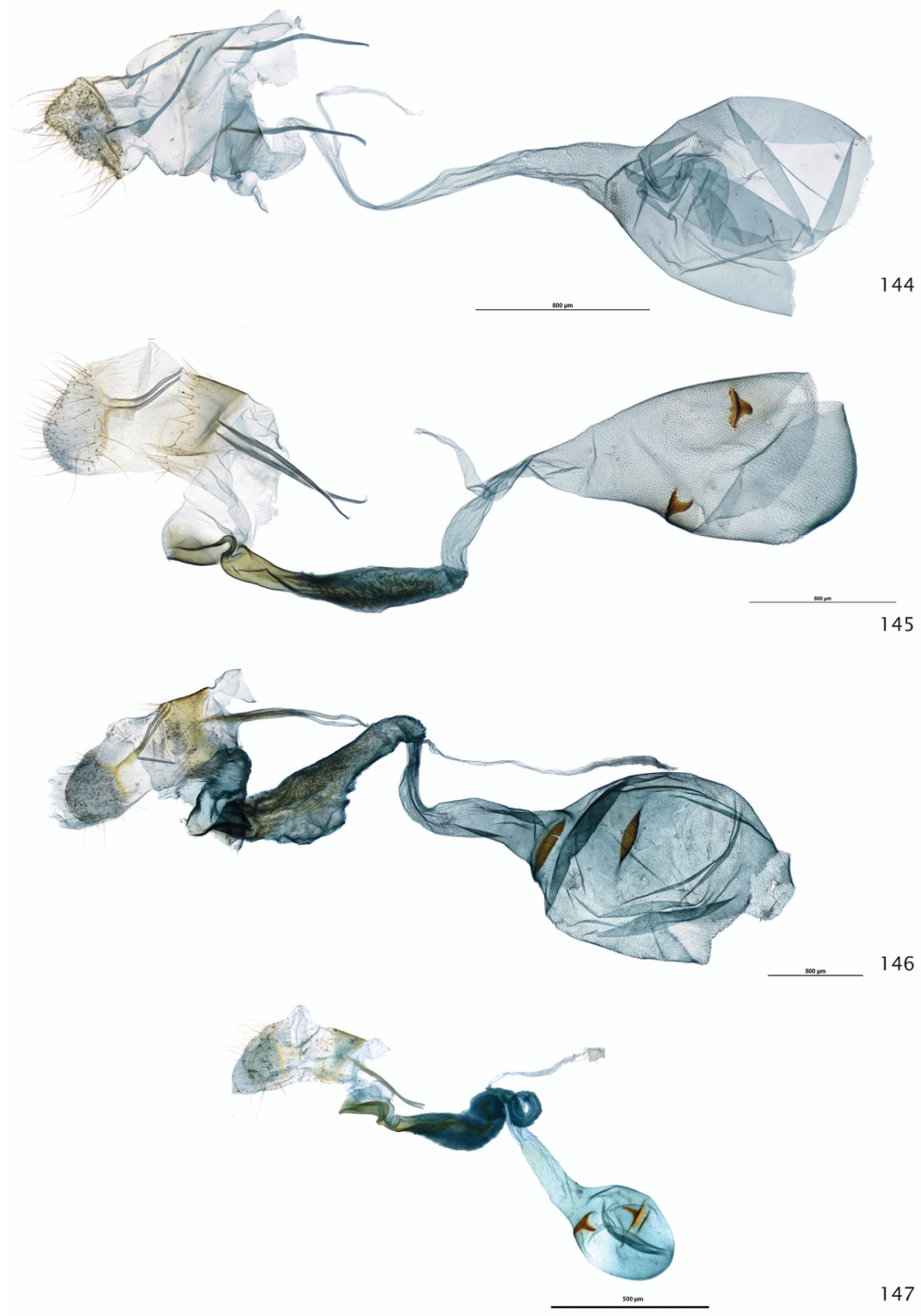
Figs. 48, 110, 166.



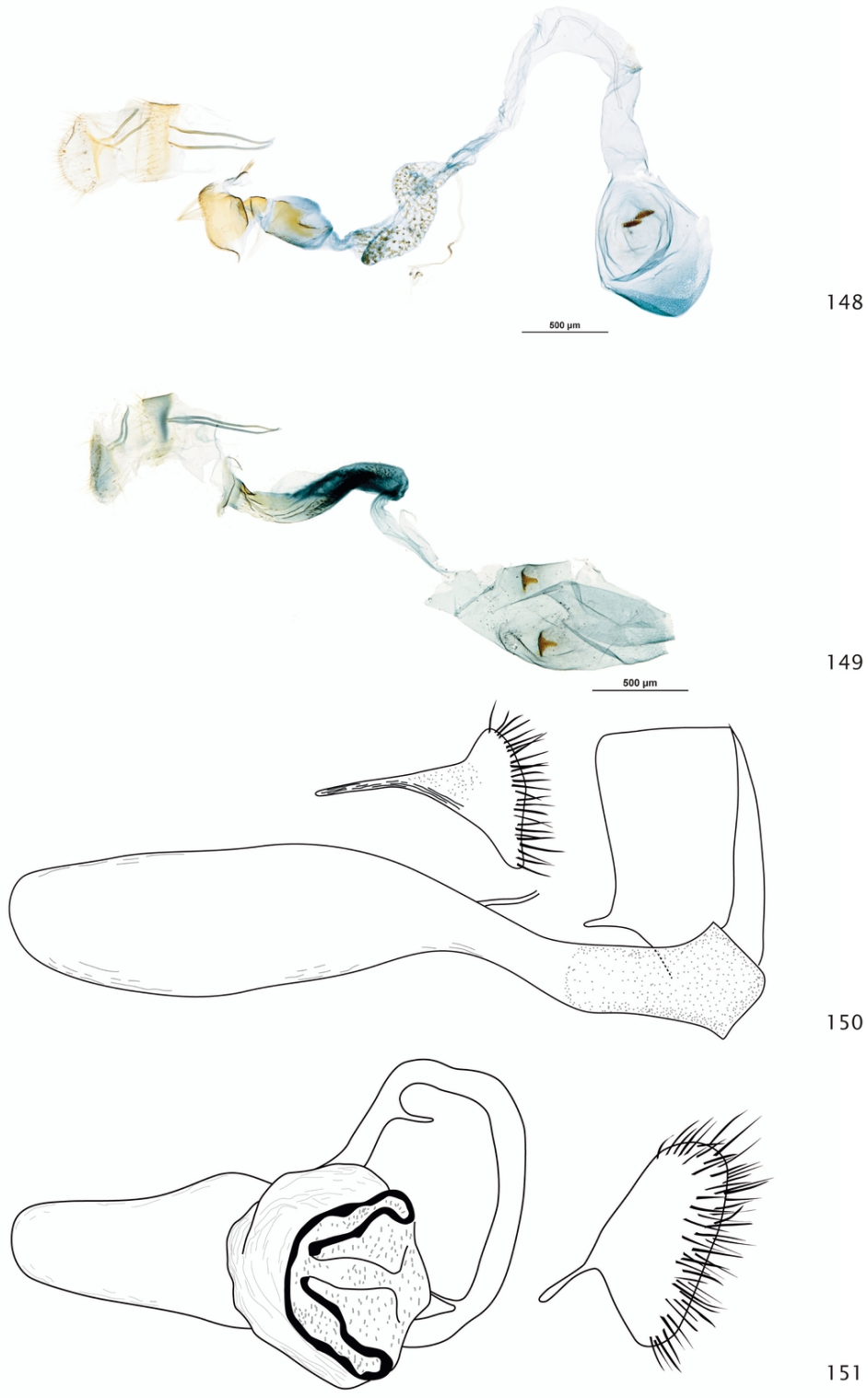
Figs 136-139. Female genitalia of *Glaucocharis* species. Fig. 136. *Glaucocharis clytia* (Bleszynski, 1966), slide TL994♀. Fig. 137. *Glaucocharis lathonia* (Bleszynski, 1966), slide TL1329♀. Fig. 138. *Glaucocharis kabundukanis* **sp. n.**, paratype, slide TL774♀. Fig. 139. *Glaucocharis altissima* **sp. n.**, paratype, slide TL1313♀.



Figs 140-143. Female genitalia of *Glaucocharis* species. Fig. 140. *Glaucocharis uncusellus* **sp. n.**, paratype, slide TL1074♀. Fig. 141. *Glaucocharis kayumanggi* **sp. n.**, paratype, slide TL1363♀. Fig. 142. *Glaucocharis sungay* **sp. n.**, paratype, slide TL1076♀. Fig. 143. *Glaucocharis* sp., slide TL1079♀.



Figs 144-147. Female genitalia of *Glaucocharis* and *Gargela* species. Fig. 144. *Glaucocharis* sp., slide TL1081♀. Fig. 145. *Gargela minuta* Song, Chen & Wu, 2009, TL1058♀. Fig. 146. *Gargela aculea* **sp. n.**, paratype, slide TL1049♀. Fig. 147. *Gargela polyacantha* Li, 2019, slide TL1371♀.



Figs 148-151. Female genitalia of *Gargela* and *Ancylolomia* species. Fig. 148. *Gargela xanthocasis* (Meyrick, 1897), slide TL1236♀. Fig. 149. *Gargela bidentella* **sp. n.**, paratype, slide TL1327♀. Fig. 150. *Ancylolomia chrysographellus* (Kollar & Redtenbacher, 1844), adapted from fig. 5, p. 31 of Bleszynski (1970b). Fig. 151. *Ancylolomia orchidea* Bleszynski, 1970, adapted from fig. 15, p. 34 of Bleszynski (1970b).

MATERIAL

Holotype: ♂ (specimen identifier coll.mfn-berlin.de_u_b2c391, DNA voucher MFNLEP-PYRAL-PHIL07-A09, genitalia on slide TL1066♂; BOLD sample ID PYPHI074-21, Genbank Accession Number PP196760). PHILIPPINES: Luzon, Mt Banahaw, Kinabuhayan, 17-19.03.2000, leg. Mey & V. Richter.

Paratypes: 9 ♂ (specimen identifiers coll.mfn-berlin.de_u_b95e98, e491f8, 2050dc, 1b2cf2, 78302c, c83b5d, 3b633b, 841b24, 4cf534), 1 ♀ (specimen identifier coll.mfn-berlin.de_u_d8bd7e) (detailed information in Table S1; https://doi.org/10.5061/dryad.b8gtht7mh).

DIAGNOSIS

The arched, white antemedian line, the conspicuously arched postmedian line with indentation at dorsal 1/3, and the two conspicuous black marginal dots separate this species from other *Catoptria* species. In male genitalia, the costa is sclerotized, albeit without projection, and the sacculus forms a hook-shaped projection directed upwards. In female genitalia (Fig. 166), the papillae anales are not coalesced; the ostium is conspicuously sclerotized, with a U-shaped aperture; the ductus bursae is slender and membranous; and the corpus bursae is membranous, without signum.

HABITUS (FIG. 48)

Forewing length 7.5-9.5 mm (n = 5); ground color tawny to brown. Antemedian line white, starting at 1/5 of dorsum, forming a wide arch, meeting costa at basal 1/3. Median area suffused with dark brown. Marked white stripes along discoidal veins and 1A + 2A. Postmedian line originating at costal 2/3, conspicuously arched outwards, indented outwards at CuA2, then meeting dorsum at 3/5. Subterminal area with five white spots, interspersed with two black dots at CuA1 and CuA2. Apex with one large, marked blotch, white. Fringes dirty white to copper. Hindwings cream colored.

MALE GENITALIA (FIG. 110)

Uncus elongate, slender; apex pointing downwards. Gnathos projection slender, apex rounded, pointing upwards. Sacculus forming one quadrangular sclerite in basal half; second sclerite at valva midlength subtriangular, dorsally projected upwards into a slender curved sclerotized arm about 2/5 of valva length, extending beyond cucullus, with apex pointed. Costal sclerite up to valva midlength, devoid of dorsal projection, distally projected ventrally into subtriangular tip reaching sacculus. Valva curved upwards in distal half, apex broadly rounded. Juxta evenly rounded, with sclerotized edges. Saccus forming acute triangle, with anterior tip pointing upwards. Phallus slender, slightly curved, apex covered with tiny teeth.

FEMALE GENITALIA (FIG. 166)

Posterior apophysis about 5/3 of length of tergite VIII, enlarged at 1/6. Anterior apophysis reduced to bump. Ostial lobe forming broad spatulate plate and two tubular chambers; posterior margin broadly U-shaped. Antrum forming membranous pouch surrounding ostial lobe. Ductus bursae narrow, of medium length, membranous. Corpus bursae membranous, half as long as ductus bursae, corpus width ca 5/3 X length of corpus bursae, ovoid, devoid of signum.

DISTRIBUTION

Philippines: Luzon (Laguna, Mountain Province, Quezon), Mindoro. Collected at altitudes between 1150 and 1650 m.

DNA BARCODING

Two MOTUs were recovered in the species delimitation analysis, one from the unique specimen sampled from Luzon and another one from the two specimens from Mindoro. A maximum p-distance of 5.4% is observed between these two clusters.

REMARKS

This species is provisionally placed here in *Catoptria*. In female genitalia, some characters are not consistent with such placement: The ductus bursae is not sclerotized (anterior half sclerotized in most *Catoptria* species), and the corpus bursae lacks a signum (one signum is present in most *Catoptria* species). According to Błeszyński (1965), the southernmost occuring *Catoptria* species was *C. pandora* Błeszyński, 1965, known from Yunnan province in China. This species extends the known distribution of the genus well into the Oriental region.

Culladia Moore, 1886

Culladia Moore, 1886: 382. **Type species**: *Araxes admigratella* Walker, 1863

= *Araxes** Walker, 1863 b: 192. Type species: *Araxes admigratella* Walker, 1863

= *Crambidion* Mabille, 1900: 748. Type species: *Crambidion achroellum* Mabille, 1900. Viette 1990: 85 (syn.)

= *Nirmaladia* Rose, 1983: 172, 175, figs. 1–7. Type species: *Culladia dentilinaelis* Hampson, 1919. M. Shaffer, Nielsen & Horak 1996: 183 (syn.)

DIAGNOSIS

The genus *Culladia* was revised by Bleszynski (1970a). Species of *Culladia* exhibit small, greyish wings. Vein R5 is very short or missing as observed in a few small Crambini genera (Bleszynski, 1970a; Léger et al., 2019). In male genitalia, the bifid sclerotized apex of the phallus is a potential apomorphy for the genus. Male genitalia exhibit the following characters: uncus and gnathos slender, with apex pointing downwards; valva slender, with costal arm at base, ventral process absent; pseudosaccus present; juxta short, with deep notch; vesica with one or more cornuti, with characteristic bifid sclerotized apex (Bleszynski, 1970a; pers. obs.). Female genitalia exhibit the following characters: papillae anales not coalesced dorsally and ventrally; posterior apophyses 1-2 X length of tergite VIII; anterior apophyses very short; antrum often with pair of sclerites; membranous pouch branching near antrum found in several

species; corpus bursae usually with long, scobinate signum (Bleszynski, 1970a; pers. obs.)

DISTRIBUTION

Occuring in the Afrotropical, Oriental, and Australasian regions. Five species are reported from the Philippines: *Culladia evae* Bleszynski, 1970, *C. hastiferalis* (Walker, 1865), *C. pseudoscoparia* **sp. n.**, *C. suffusella* Bleszynski, *C. tonkinella* Bleszynski, 1970.

PHYLOGENETIC RELATIONSHIPS

Culladia is sister to the Holarctic genus *Pediasia* Hübner, 1825 (Bleszynski, 1970a; Léger et al., 2019).

Culladia hastiferalis (Walker, 1865)

Figs. 49, 111, 167.

Scopula hastiferalis Walker, 1965: 1473. **Type locality**: Borneo, Sarawak.

Culladia admigratella Swinhoe (not Walker), 1900: 416.

Culladia hastiferalis (Walker): Bleszynski, 1970: 52, figs. 9, 15.

MATERIAL

8 ♂, 9 ♀, 43 unsexed specimens (detailed information in Table S1; https://doi.org/10.5061/dryad.b8gtht7mh).

DIAGNOSIS

Identification of this species requires examination of genitalic characters. In male genitalia (Fig. 111), the hook-like basal process, the bifid apex of the juxta, and the two oblong cornuti on the vesica separate *Culladia hastiferalis* from other *Culladia* species. In female genitalia (Fig. 167), the atrium bursae with two rounded, minutely spined swellings; the lengthy subostial projection; and the crest of sclerotized spines in corpus bursae separates this species from other *Culladia* species.

DISTRIBUTION

INDONESIA: Sumatra, Java, Moluccas, Papua; MALAYSIA: Sabah; PHILIPPINES: Leyte, Luzon (Antique, Bataan, Batangas, Benguet, Camarines Sur, Quezon), Mindanao (Davao Oriental), Mindoro, Palawan, Panay, Negros; TAIWAN (Bleszynski, 1970a). This species is recorded on all examined islands in the Philippines and is recorded from 120 m to 1050 m in the Philippines and up to 1570 m on Borneo (see Table S1).

DNA BARCODING

The maximum intraspecific p-distance of 0.7% is found between samples MFNLEP-PYRALPHIL07-D09 from Mindanao (Davao) and MFNLEP-PYRALPHIL08-H12 from Negros. A p-distance of 3.1-4.3% is observed between specimens from Luzon and those from Australia retrieved from BOLD.

Culladia evae Bleszynski, 1970

Fig. 168.

Culladia evae Bleszynski, 1970: 55, fig. 20. **Type locality**: Luzon, Manil[l]a.

MATERIAL

No material of this species was examined.

DIAGNOSIS

This species is similar in habitus to other *Culladia* species but can be differentiated by the antrum pouch; the broad, medium-sized, wrinkled ductus bursae; and the corpus bursae devoid of signum in the female genitalia (Fig. 168).

DISTRIBUTION

CHINA: Hainan; INDONESIA: Java, Papua; PALAU; PHILIPPINES: Luzon (Laguna, Rizal).

REMARKS

This species is described from female specimens only. Błeszyński examined specimens from Rizal, Montalban (1 ♀), Mount Makiling (1 ♀), and Los Banos (3 ♀).

Culladia suffusella Hampson, 1896

Figs. 113, 169.

Culladia suffusella Hampson, 1896, Proc. zool. Soc. Lond. 1895 (4): 925. **Type locality**: India, Nilgiris.

Culladia suffusella Bleszynski, 1970: 55, 56, fig. 21, 25.

MATERIAL

No material of this species was examined.

DIAGNOSIS

This species is similar in habitus to other *Culladia* species. In male genitalia (Fig. 113), the bifid basal process of the valva, the two apical horns of the vesica, and the small single cornutus separate this species from other *Culladia* species. In female genitalia (Fig. 169), the small sclerotization on antrum, the short subostial projection, and the corpus bursae barely delimited from the ductus separate this species from other *Culladia* species.

DISTRIBUTION

INDIA; PHILIPPINES: Luzon (Benguet).

REMARKS

Błeszyński examined 20 male and female specimens from Benguet, Luzon, and stored in the NHMUK.

Culladia tonkinella Bleszynski, 1970

Figs. 112, 170.

Culladia tonkinella Bleszynski, 1970: 53, 54, figs. 17, 19. **Type locality**: Hoa Binh [Vietnam].

MATERIAL

2 ♂ (detailed information in Table S1; https://doi.org/10.5061/dryad.b8gtht7mh).

DIAGNOSIS

This species is best separated by examination of genitalia. In male genitalia, the slender valva with the short, finger-shaped basal process and the two patches of 4-5 cornuti on the vesica unambiguously separates this species from its congeners. In female genitalia, the pouch-like projection is devoid of sclerotization, and the corpus bursae bears a longitudinal signum.

DISTRIBUTION

INDONESIA: Java, Sumatra; PHILIPPINES: Mindoro, Panay; VIETNAM. Collected at altitudes between 150 and 400 m on the Philippines.

REMARKS

This is the first record of this species from the Philippines.

Culladia pseudoscoparia Léger, sp. n.

https://zoobank.org/1AA6EF61-001C-4424-95D6-242F26B7F834
Figs. 50, 114, 171.

MATERIAL

Holotype: ♂ (specimen identifier coll.mfn-berlin.de_u_810de4, DNA voucher MFNLEP-PYRALPHIL01-E03, genitalia on slide TL916♂; BOLD sample ID PYPHI038-21, Genbank Accession Number PP196730). PHILIPPINES: Luzon, Zambales, Zambales Mountains, Pili, 150 m, 05-07.11.1998 (W. Mey, W. Speidel). Deposited in MfN.

Paratype: 3 ♂ (specimen identifiers coll.mfn-berlin.de_u_2c5838, ace978, 8e5a61), 2 ♀ (specimen identifiers coll.mfn-berlin.de_u_d9a2c0, 62cddb) (detailed information in Table S1; https://doi.org/10.5061/dryad.b8gtht7mh).

Other specimens: 32 unsexed (detailed information in Table S1; https://doi.org/10.5061/dryad.b8gtht7mh).

DIAGNOSIS

This peculiar looking *Culladia* species is unambiguously separated from other *Culladia* species by the larger and broader forewing mixed with brown and white scales and the brown marginal lunules, while the zigzag postmedian brown line found in other species is absent. In male genitalia (Fig. 114), the large tegumen arms, the setose costal projection of the valva, as well as the long cornutus on vesica unambiguously separate this species from other *Culladia* species. In female genitalia (Fig. 171), the non-coalesced papillae anales, the very long ductus bursae, as well as the presence of an appendix bursae on the corpus bursae unambiguously separate this species from other Crambinae species.

HABITUS

Forewing length 8 mm (n = 1); greyish brown, scattered with cream scales. Antemedian line cream, forming a jag pointing outwards in cell. Median area lighter, with one costal, one cubital, and one dorsal dark brown patch. Postmedian line broken, cream, starting at 4/5 of costa, well marked near costa, broadly arched outwards down to CuA1, then slightly arched outwards in dorsal area, meeting the dorsum near tornus. Subterminal area broadly marked with white suffusion, more pronounced towards margin. Margin with seven dark quadriangular spots. Fringe basally cream, distally bronze.

MALE GENITALIA (FIG. 114)

Uncus elongate, slender, densely setose; apex with small tooth pointing downwards. Gnathos projection about as long as uncus, apex with small tooth pointing downwards. Tegumen arm large, covered with minute points, tegumen roof ca 4/5 of tegumen arm length. Valva elongate, slender, slightly curved upwards on distal 1/4, apex rounded. Costal process slightly S-shaped, covered with setae, tip pointing upwards. Juxta short, rounded, deeply indented. Phallus stout, apically narrowed, apex forming two narrow, spatulate, weakly sclerotized projections. One straight, large, elongate cornutus of 660 µm.

FEMALE GENITALIA (FIG. 171)

Papillae anales not connected dorsally and ventrally, slightly concave. Antrum membranous. Ductus bursae covered with minute spicules, straight, narrow in basal half, broadly incurved on distal half, slightly broader, conspicuously bent before corpus opening. Corpus bursae membranous, globular, with a small globular appendix bursae. Signum absent.

DISTRIBUTION

PHILIPPINES: Luzon (Mountain Province, Ifugao, Zambales). Collected at altitudes between 150 and 2100 m.

DNA BARCODING

An intraspecific divergence of 2.9 % is observed between specimens MFNLEP-PYRALPHIL01-F03, MFNLEP-PYRALPHIL01-C06, and MFNLEP-PYRALPHIL01-B10 all from Zambales, Luzon.

ETYMOLOGY

From the Greek *pseudes*, false, and the genus *Scoparia* Haworth, referring to the resemblance in habitus and female genitalia with specimens of *Scoparia*.

REMARKS

This species is tentatively placed in *Culladia* here. According to Graziano Bassi (pers. comm.), the “male genitalia [is] similar to *Pediasia*, but the bilobed apex of phallus and ductus ejaculatorius branching off close to antrum bursae are diagnostic. It is somewhat similar to *C. dentilinealis* Hmps and somewhat “heretical” with respect to typical *Culladia*

in female genitalia, but surely close to it, as male genitalia show".

Culladia sp.

Fig. 172.

MATERIAL

1 ♀ (specimen voucher coll.mfn-berlin.de_u_6acee3, DNA voucher MFNLEP-PYRALPHIL10-A12, genitalia on slide TL1320F). PHILIPPINES: Luzon, Zambales, Zambales Mountains, Coto, 250 m, 06-07.05.1999 (K. Ebert, W. Mey).

REMARKS

This species of *Culladia* could not be assigned to any of the known species. Its female genitalia (Fig. 172) are different from all *Culladia* species (Bleszynski, 1970a).

No tribal assignment

Metaeuchromius Błeszyński, 1960

Metaeuchromius Błeszyński, 1960 d: 217. **Type species**: *Eromene yuennanensis* Caradja, 1884

= *Pseudeuchromius* BłeszyńskiBłeszyński, 1965: 90. Type species: *Eromene lata* Staudinger, 1870

DIAGNOSIS

A redescription of the genus is provided by Schouten (1997). Forewing ground color white to cream, speckled with brown; antemedian area white to amber yellow, median straight or oblique ochreous band; subterminal line present; termen with characteristic row of terminal dots (W. C. Li et al., 2009; pers.obs.). Several species have abdominal scent organs on male sternite III (Schouten, 1997). Male genitalia with the following characteristics: uncus with pointed tip; gnathos projection usually short, hook-shaped, in some species with small dorsal teeth; valva narrow, with pointed apex, costal process usually developed into a spine, sacculus without process; saccus conspicuously protruding anterad; vesica with or without cornuti (W. C. Li et al., 2009; Schouten, 1997; pers. obs.). Female genitalia with the following characteristics: papillae anales coalesced or free dorsally and ventrally; anterior and posterior apophyses 1-2 X length of tergite VIII; antrum membranous or sclerotized, without projections; ductus bursae of variable length, with or without sclerotization, in some species with pouch-shaped enlargement; corpus bursae globular or pear-shaped, with or without signum (W. C. Li et al., 2009; Schouten, 1997; pers. obs.).

DISTRIBUTION

Known so far from the Palearctic (from Turkey to China), extending its distribution into the Oriental region in India (*Metaeuchromius euzonella* from Assam, India). Two species are newly described from the Philippines, and one is moved to the genus *Metaeuchromius*: *Metaeuchromius micralis* (Hampson, 1919), *Metaeuchromius rizali* **sp. n.,** and *Metaeuchromius makintabus* **sp. n.** Further presumably undescribed species are known from Java.

PHYLOGENETIC RELATIONSHIPS

Phylogenetic placement of *Metaeuchromius* is currently unclear. This genus was not included in the molecular phylogeny of the Crambinae (Léger et al., 2019). The closed hindwing cell suggests that the genus is not part of the open-cell clade comprising the Argyriini, the Haimbachiini, the Calamotrophini, the Euchromiusini, and the Crambini and is possibly closely related to the genus *Miyakea* Marumo, 1933 as suggested by Schouten (Landry et al., 2020; Léger et al., 2019; Schouten, 1997).

Metaeuchromius micralis (Hampson, 1919) comb nov.

Figs. 51, 115, 173.

Ommatopteryx micralis Hampson, 1919 a: 535. **Type locality**: Philippines, Luzon, Benguet Prov., Irizan

= *Euchromius brunnealis* **syn. nov** (Hampson, 1919). Type locality: Philippines, Negros island

MATERIAL

Material examined: 33 ♂, 27 ♀, 7 unsexed (detailed information in Table S1; https://doi.org/10.5061/dryad.b8gtht7mh).

SIMILAR SPECIES

Metaeuchromius fulvusalis Song & Chen, 2002, *M. rizali* **sp. n.**, *M. makintabus* **sp. n.**

DIAGNOSIS

This species (Fig. 51) is very similar to *Metaeuchromius fulvusalis* from mainland China. In male genitalia (Fig. 115), the valva spine is less prominent than in *M. fulvusalis*, and the narrow colliculum of the female genitalia (Fig. 173) is absent in *M. fulvusalis*. In the Philippines, this species can be separated from *M. rizali* **sp. n.** and *M. makintabus* **sp. n.** by the subapical zigzag silver line on the forewing. In male genitalia, the short costal process of the valva as well as the vesical devoid of cornuti unambiguously separate this species from other *Metaeuchromius* species. In female genitalia, the narrow sclerotized colliculum, the short ductus bursae, and the presence of one rounded signum on corpus bursae best separate this species from *M. makintabus* **sp. n.** (female of *M. rizali* **sp. n.** is not known). DNA barcodes suggest that this species might indeed represent a complex of cryptic species.

REDESCRIPTION

HABITUS (FIG. 51)

Forewing length 4.5-6.5 mm (n = 16); ground color cream suffused with tawny scales. Basal area amber yellow, with one slender shiny silver streak along costal cell vein; three white streaks following lower cell vein and anal veins. Medial line oblique, running inwardly from costa to dorsum, white, shiny silver near costa, marked basally and distally

with amber to tawny yellow. Subapical line starting at costal 3/4, zizagging outwardly to vein M1, shiny silver. Apex with subapical white lunule. Termen with five black points surrounded by white. Fringe amber yellow to copper. Hindwing dirty white, with faint patch of marginal brown scales at CuA2. Fringe dirty white, apically copper.

MALE GENITALIA (FIG. 115)

Uncus ca half of tegumen arm length, slightly bent downwards, apical 1/3 with few setae, apex thorn-shaped. Gnathos projection about 1/5 of uncus length, dorsally covered with tiny teeth, tip pointed. Valva elongate, setose; costal arm projected into a tip pointed upwards inwardly; ventral margin straight, apically curved upwards; apex pointed, with patch of 3-5 long, thick bristles. Juxta elliptical. Saccus rounded. Vesica covered with minute spines.

FEMALE GENITALIA (FIG. 173)

Papillae anales not coalesced dorsally and ventrally. Posterior apophyses about 7/4 of length of tergite VIII. Anterior apophyses about 9/5 of tergite length. Antrum membranous. Colliculum narrow, tubular, sclerotized. Ductus bursae about as long as corpus bursae, basal half narrow, enlarging towards corpus bursae on distal half. Corpus bursae with opening barely marked; ovoid, with one conspicuous signum.

DNA BARCODING

An unsuspected high divergence is observed among specimens of *Metaeuchromius micralis*. The species delimitation analysis recovered five different island-specific clusters for Luzon, Mindanao, Mindoro, Leyte + Samar, and Negros (Fig. 179c). The highest intraspecific p-distance of 7.3% is observed between samples MFNLEP-PYRALPHIL07-D11 from Leyte and MFNLEP-PYRALPHIL10-E11 from Negros.

DISTRIBUTION

PHILIPPINES: Leyte, Luzon, Mindanao, Mindoro, Negros. Collected at altitudes between 150 and 2300 m.

REMARKS

The type of "*Euchromius*" *brunnealis* (Hampson, 1919) could not be located at the NHMUK (D. Lees, personal communication). According to the original description, it matches the characters observed here in *Metaeuchromius micralis*: The forewing is "red-brown with a cupreous gloss and mixed with some whitish especially before and beyond the inwardly oblique rather ill-defined narrow red-brown medial band" and bears at the apex "an oblique ill-defined whitish band" similar to that of *Metaeuchromius micralis*, while the band is silver colored, straight in *M. makintabus* **sp. n.** or regularly arched in *M. rizali* **sp. n.** This species shows a strong divergence in DNA barcodes among island populations. No striking differences were found in male genitalia; however, forewing pattern and size show some island-specific variation. This species might represent a species complex whose investigation requires additional evidence such as nuclear markers and morphometric analyses.

Metaeuchromius rizali Léger, sp. n.

https://zoobank.org/F4F5BDD9-BCFD-45A4-B381-334DB4DCA854
Figs. 52, 116.

MATERIAL

Holotype: ♂ (specimen identifier MTD11449, DNA voucher MFNLEP-PYRALPHIL09-E07, TL1229♂; BOLD sample ID PYPHI282-22, Genbank Accession Number PP196961). PHILIPPINES: Luzon, Quezon, Lucena, Quezon National Park, 175 m, 20.03.2000 (M. Nuss). Deposited in MTD.

Paratypes: 3 unsexed (specimen identifiers coll.mfn-berlin.de_u_bc7445, MTD11448, MTD11447) (detailed information in Table S1; https://doi.org/10.5061/dryad.b8gtht7mh).

SIMILAR SPECIES

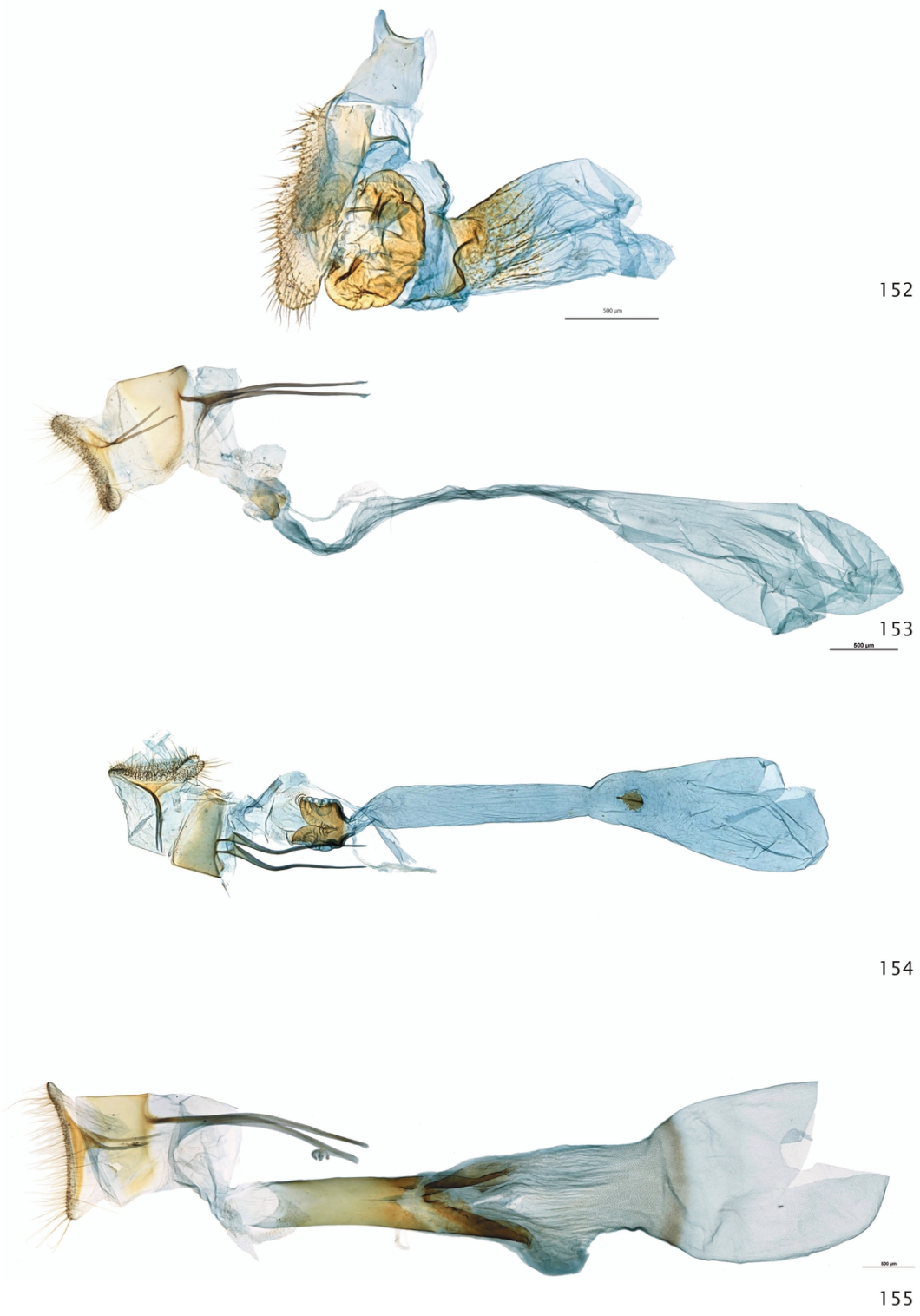
Metaeuchromius makintabus **sp. n.**, *Peniculimius fructus* Schouten, 1994.

DIAGNOSIS

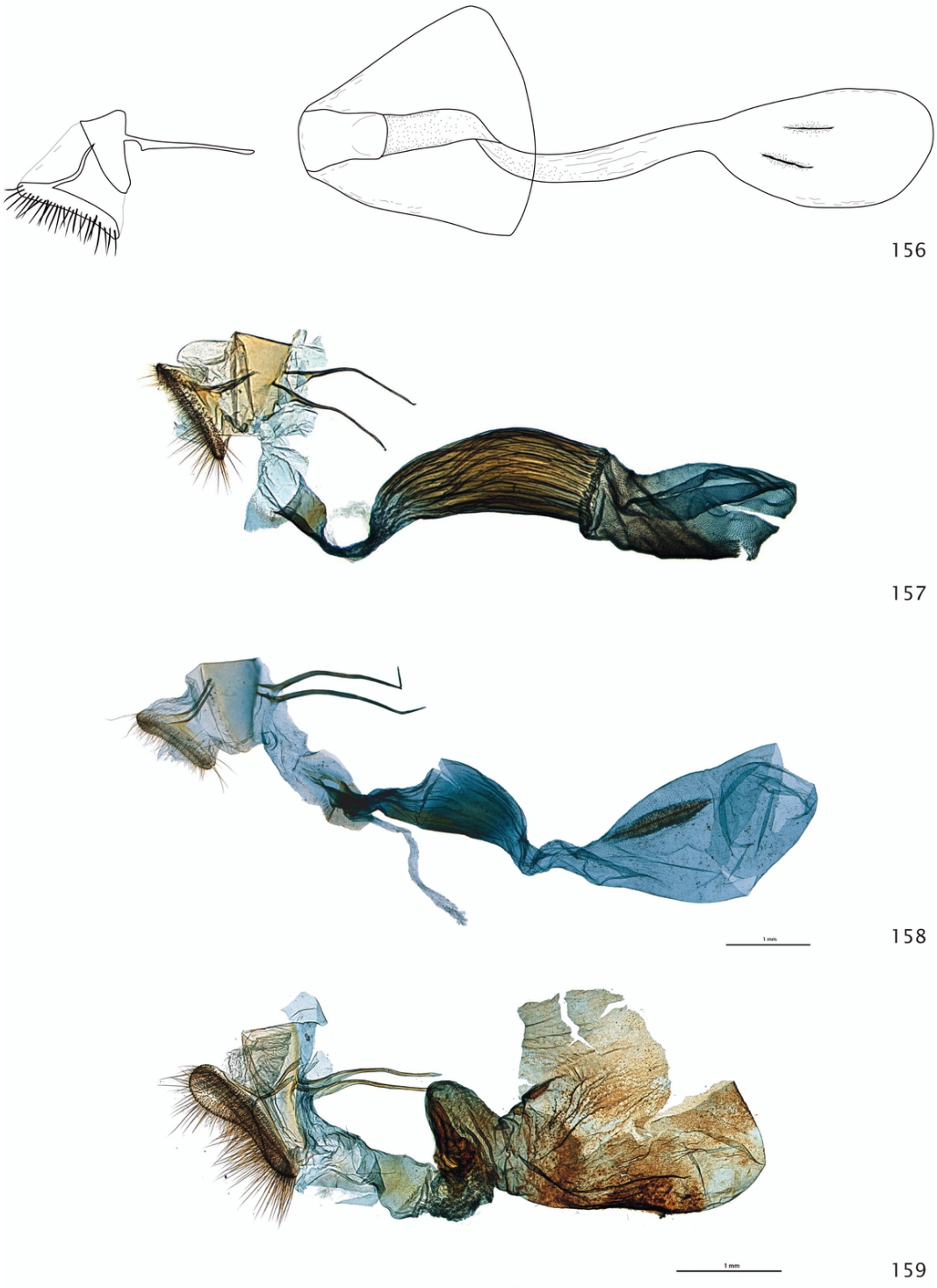
From *Metaeuchromius micralis*, *Metaeuchromius rizali* **sp. n.** and *M. makintabus* **sp. n.** are separated by the thicker, conspicuously silver, and rather straight antemedian and subapical bands (Fig. 52). The termen black dots are not as well delimited as in *M. micralis*, and the fringes are copper. *Metaeuchromius rizali* **sp. n.** is very similar to *M. makintabus* **sp. n.** in the forewing pattern, but the following characters help to separate them: The antemedian and subapical amber yellow area are not connected at costa (meeting at costa in *M. makintabus* **sp. n.**), the subapical silver band is slightly curved (straight in *M. makintabus* **sp. n.**), and the subtermen line runs straight (zigzagging in *M. makintabus* **sp. n.**). It is separated from *Peniculimius fructus* Schouten, 1994 by the amber color of the basal area (mix of grey and white scales in *P. fructus*) and the broader, silver color of the antemedian and subapical bands (narrow and whitish in *P. fructus*). In male genitalia (Fig. 116), the conspicuous costal process of the valva as well as the presence of a cornutus on the vesica separate this species from its congeners. Female specimens are not known.

HABITUS (FIG. 52)

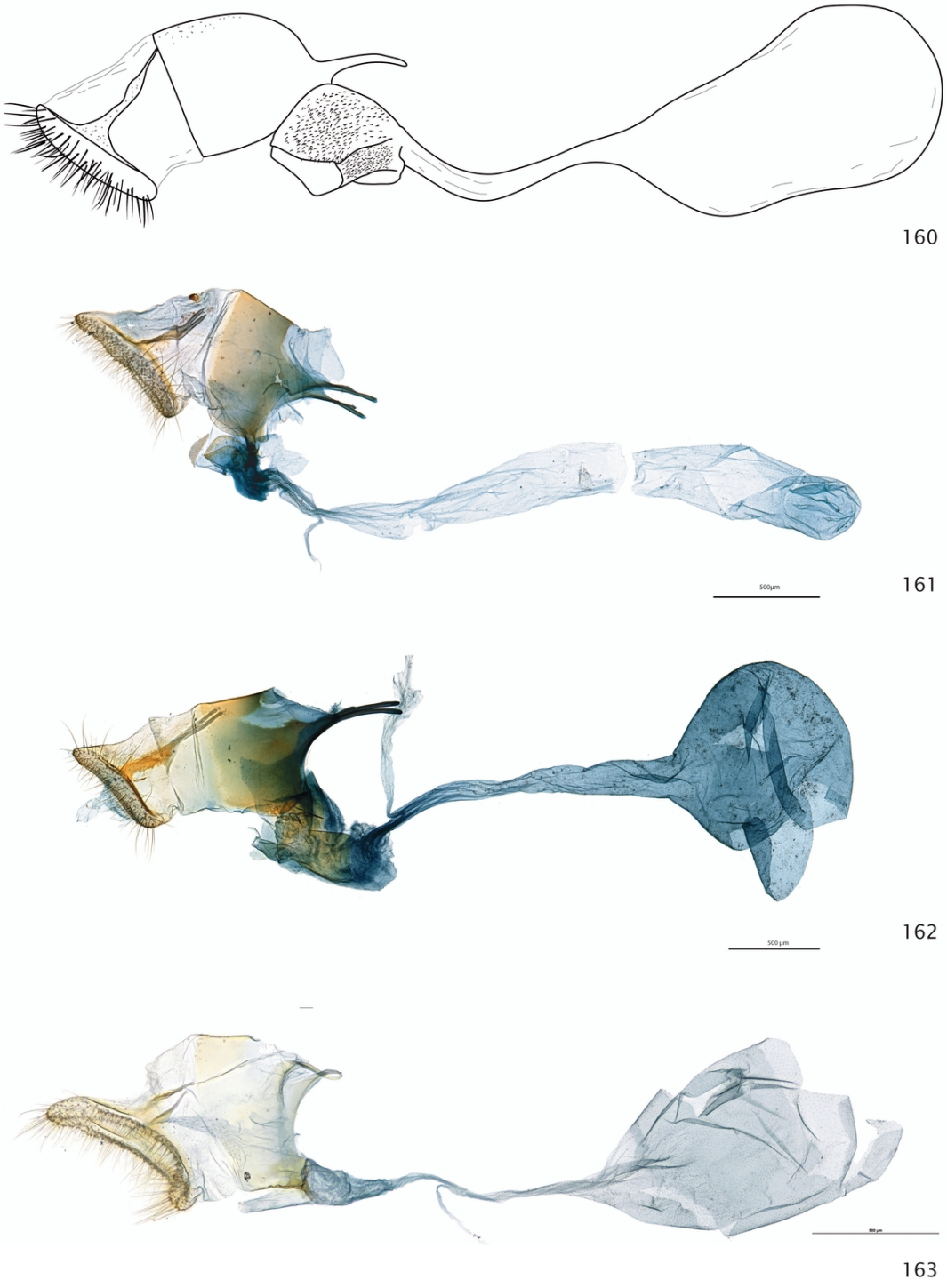
Forewing length 4.8 mm (n = 1), ground color cream suffused with amber yellow scales, markings amber yellow. Antemedian area amber yellow. Antemedian band slightly bent inwards on costal half, then running straight to dorsum, shiny silver, edged distally with broad amber yellow band. Subapical band starting at costal 3/4, running towards M1 vein on margin, slightly arched, shiny silver. Apical area amber yellow. Termen with patch of dark brown and amber yellow scales. Fringes dirty white, shiny silver at termen. Hindwing dirty white, with faint patch of marginal brown scales at CuA2. Fringe dirty white, copper at termen.



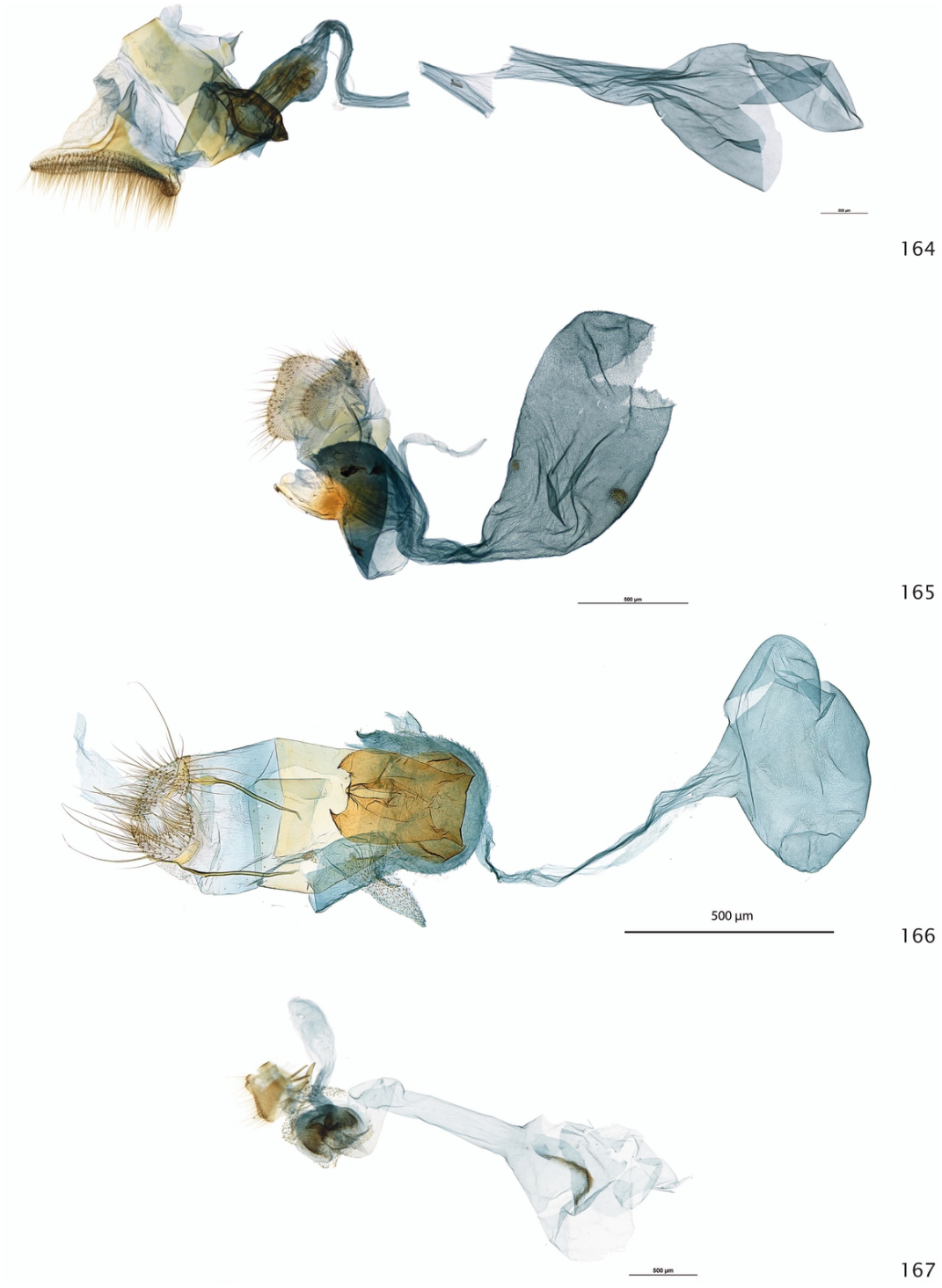
Figs 152-155. Female genitalia of *Ancylolomia* and *Chilo* species. Fig. 152. *Ancylolomia westwoodi* Zeller, 1863, slide TL1220♀. Fig. 153. *Chilo auricilius* Dudgeon, 1905, slide TL1059♀. Fig. 154. *Chilo infuscatellus* Snellen, 1890, slide TL1372♀. Fig. 155. *Chilo luteellus* (Motschulsky, 1866), slide TL1060♀.



Figs 156-159. Female genitalia of *Chilo* and *Eschata* species. Fig. 156. *Chilo pulverata* (Wileman & South, 1917), adapted from fig. 34, p. 133 of Bleszynski (1970c). Fig. 157. *Chilo sacchariphagus* (Bojer, 1856), slide TL1373♀. Fig. 158. *Chilo suppressalis* (Walker, 1863), slide TL1380♀. Fig. 159. *Eschata* cf. *miranda*, slide TL1115♀.



Figs 160-163. Female genitalia of *Calamotropha* species. Fig. 160. *Calamotropha atkinsoni* Zeller, 1863, adapted from fig. 189, plate LXIII of Bleszynski (1970b). Fig. 161. *Calamotropha obliterans* (Walker, 1863), slide TL1383♀. Fig. 162. *Calamotropha unicolorellus* (Zeller, 1863), slide TL1381♀. Fig. 163. *Calamotropha philippinensis* **sp. n.**, paratype, slide TL1225♀.



Figs 164-167. Female genitalia of *Calamotropha*, *Angustalius*, *Catoptria* and *Culladia* species. Fig. 164. *Calamotropha anacantha* **sp. n.**, paratype, slide TL1212♀. Fig. 165. *Angustalius malacelloides* (Bleszynski, 1955), slide TL1222♀. Fig. 166. *Catoptria philippinensis* **sp. n.**, paratype, slide TL1108♀. Fig. 167. *Culladia hastiferalis* (Walker, 1865), slide TL1068♀.

MALE GENITALIA (FIG. 116)

Uncus elongate, regularly bent downwards. Gnathos projection very short, covered with small spines. Costal process slender, strongly sclerotized, diverging from valva on distal half, tip pointed. Valva elongate, straight, apex missing on genitalia slide. Juxta base broadly rounded, apex lightly sclerotized. Vesica with one straight, thick, elongate cornutus.

FEMALE GENITALIA

Not known.

DISTRIBUTION

PHILIPPINES: Luzon (Quezon). Collected at an altitude of 175 m.

DNA BARCODING

An intraspecific divergence of 0.2% is observed between the two specimens from the same locality.

ETYMOLOGY

Dedicated to José Rizal, a Filipino figure in the history of independence of the Philippines.

REMARKS

A manuscript name "*Transeromene shafferi*" was appended by Schouten in 1992 to a specimen from Sabah, Borneo (Malaysia), that seems conspecific. This name has never been published and is hence not valid (Schouten, pers. comm.). Three abdomens were unfortunately lost during the pipetting process of the DNA extraction.

Metaeuchromius makintabus Léger, sp. n.

https://zoobank.org/9A48ACC8-1FF8-457C-A3E8-4600D98D67B6
Figs. 53, 117, 174.

MATERIAL

Holotype: ♂ (specimen identifier coll.mfn-berlin.de_u_868941, DNA voucher MFNLEP-PYRALPHIL07-E07, TL1055♂; BOLD sample ID PYPHI117-21, Genbank Accession Number PP196803). PHILIPPINES: Mindoro, Occidental Mindoro, Mount Baco Pass, 1150 m, 14.01.1998 (W. Mey, V. Samarita). Deposited in MfN.

Paratypes: 2 ♂ (specimen identifiers coll.mfn-berlin.de_u_41e331, 787e37), 1 ♀ (specimen identifier coll.mfn-berlin.de_u_2dafcc) (detailed information in Table S1; https://doi.org/10.5061/dryad.b8gtht7mh)

Other specimens examined: 1 ♂, 1 unsexed (detailed information in Table S1; https://doi.org/10.5061/dryad.b8gtht7mh).

SIMILAR SPECIES

Metaeuchromius rizali **sp. n.**

DIAGNOSIS

See diagnosis of *Metaeuchromius rizali* **sp. n.** for separation from *M. micralis* and *M. rizali* **sp. n.** based on wing pattern. In male genitalia (Fig. 117), the narrow valva, without costal arm, apical spine, and thick apical setae; the short gnathos projection; and the vesica lacking cornuti allows separation of this species from other *Metaeuchromius* species. In female genitalia (Fig. 174), the long ductus bursae and the globular corpus bursae without signa enable separation of this species from *M. micralis*.

HABITUS (FIG. 53)

Forewing length 4.5 mm (n = 1), ground color cream suffused with brown scales, markings amber yellow. Antemedian area amber yellow, with small silver blotch at base of costa. Antemedian band inwardly oblique on costal half, then running straight to dorsum, shiny silver, edged distally with broad amber yellow band. Subapical band starting at 3/4 of costa, running straight to M1 vein, shiny silver. Apical area yellow amber. Faintly marked cream line running in zigzag from CuA1 on margin to 2/3 of dorsum. Termen with dark brown patch with white and amber blotches. Fringes light brown, shiny silver at termen. Hindwing dirty white, with faint patch of marginal brown scales at CuA2. Fringe dirty white, apically copper.

MALE GENITALIA (FIG. 117)

Uncus about 3/5 X tegumen arm length, triangular, with few setae dorso-apically, apex blunt. Gnathos projection very short, pointed, covered with tiny spines. Valva elongate, gently narrowing from basal 1/3 to 2/3, distal 1/3 slender, curved upward; apex narrow, rounded. Juxta base broadly rounded, apex lightly sclerotized. Phallus straight, narrowing towards apex, apex lightly sclerotized; vesica without cornuti.

FEMALE GENITALIA (FIG. 174)

Papillae anales not connected ventrally and dorsally, slightly concave. Antrum and colliculum membranous. Ductus bursae straight, ca 5 X corpus length, distally with scattered spicules. Corpus bursae globular, reticulate, without signum.

DISTRIBUTION

PHILIPPINES: Mindoro, Leyte. Collected at altitudes between 650 and 1150 m.

DNA BARCODING

The species delimitation analysis recovered four different MOTUs from Mindoro, Negros (one MOTU each), as well as Leyte (two MOTUs). Three MOTUs are represented by male specimens with identical genitalia, while genitalia for one MOTU from Leyte were lost during the DNA extraction and thus not investigated. An intraspecific p-distance of 7.3% is found between specimens MFNLEP-PYRALPHIL10-E11 from Negros and MFNLEP-PYRALPHIL07-D11 from Leyte.

ETYMOLOGY

From the Filipino *makintab*, shiny, referring to the shiny antemedian and subterminal bands of the forewing.

Microchilo Okano, 1962

Microchilo Okano, 1962 a: 129. Type species: *Microchilo inouei* Okano, 1962

DIAGNOSIS

Species of *Microchilo* exhibit short greyish forewings. Okano (1962) provides a diagnostical description of the genus. Forewing very small (4-8 mm), greyish white, brown or grey; antemedian and postmedian lines present. Male genitalia with the following characters: uncus wide at base, medially narrowed, apex rounded; gnathos with very short, pointed projection; tegumen arms relatively short; valva narrow, costa sclerotized, produced at apex into a spine pointed upwards or outwards; saccus conspicuously protruding anterad; vesica with or without cornuti (Okano, 1962; pers. obs.). Female genitalia have the following characters: papillae anales minute, connected dorsally, free ventrally; posterior and anterior apophyses very long; intersegmental membrane VIII-IX roughly 2 X length of tergite VIII; antrum membranous or sclerotized, tubular; ductus bursae rather short, in some species covered with minute spines, often straight; corpus bursae often with short, streak-like signum (Okano, 1962; pers. obs.).

DISTRIBUTION

Distributed in Eastern Palearctic (Japan, continental China) and Oriental regions. Four species are newly described here for the Philippines: *Microchilo bundoki* **sp. n.**, *Microchilo cebuano* **sp. n.**, *Microchilo spinosus* **sp. n.**, *Microchilo imminutela* **sp. n.**

PHYLOGENETIC RELATIONSHIPS

Microchilo has been placed by Gaskin in the Diptychophorini (Gaskin, 1971), but molecular analyses suggest the genus belongs to the "narrow-winged clade," sister to the Diptychophorini (Léger et al., 2019).

Microchilo bundoki Léger, sp. n.

https://zoobank.org/936E5278-10E2-4051-B894-85BE14F1D64D
Figs. 54, 118, 175.

MATERIAL

Holotype: ♂ (specimen identifier coll.mfn-berlin.de_u_2cfadf, DNA voucher MFNLEP-PYRAL-PHIL01-C07, genitalia on slide TL958♂; BOLD sample ID PYPHI024-21, Genbank Accession Number PP196718). PHILIPPINES: Mindoro, Mount Halcon, 1300 m, 15-17.01.1998 (W. Mey, V. Samarita).

Paratypes: 9 ♂ (specimen identifiers MfN: coll.mfn-berlin.de_u_d9003e, f05b70, ef4378, 315da2, b4f995, e64d77, 22c8c5, daec43; PNM: id.bioseasia.org_u_023570), 6 ♀ (specimen identifiers MfN: coll.mfn-berlin.de_u_994d22, 28a23a, a5554b, 3786e7, 76e66b; PNM: id.bioseasia.org_u_02358a) (detailed information in Table S1; https://doi.org/10.5061/dryad.b8gtht7mh).

Other specimens examined: 6 unsexed (detailed information in Table S1; https://doi.org/10.5061/dryad.b8gtht7mh).

SIMILAR SPECIES

Microchilo elgrecoi Błeszyński, 1966, *M. inexpectellus* Błeszyński, 1965, *M. kawabei* Inoue, 1989.

DIAGNOSIS

This species (Fig. 54) is somewhat larger than *Microchilo spinosus* **sp. n.** and *Microchilo imminutela* **sp. n.** and smaller than *M. cebuano* **sp. n.** The shape of the antemedian line separates *M. bundoki* **sp. n.** from *M. cebuano* **sp. n.** and *M. spinosus* **sp. n.** The wing pattern of *M. bundoki* **sp. n.** is identical to *M. imminutela* **sp. n.**; however, *M. bundoki* **sp. n.** has slightly longer forewing (5-6 mm) than *M. imminutela* **sp. n.** (3.5 mm). In male genitalia (Fig. 119), this species is separated from *M. kawabei* and *M. inexpectellus* by the costal tip of the valva pointing upwards in *M. bundoki* **sp. n.**, while it points posterad in *M. kawabei* and *M. inexpectellus*. Male genitalia are very similar to those of *Microchilo elgrecoi* but are separated from the latter by the absence of cornutus on the vesical of the phallus (one cornutus in *M. elgrecoi*). From *Microchilo spinosus* **sp. n.**, it is separated by the broad, bulky uncus (narrow in *M. spinosus* **sp. n.**) and the absence of cornuti on the vesica (seven cornuti in *M. spinosus* **sp. n.**). The male of *M. imminutela* **sp. n.** is not known. In female genitalia (Fig. 176), the lightly sclerotized tubular colliculum and the lightly sclerotized lanceolate signum on the corpus bursae separate this species from other Philippines species. The lightly sclerotized lanceolate signum on the corpus bursae of *M. bundoki* **sp. n.** is shared with *M. elgrecoi*; however, the latter species has two longitudinal ribs in place of the tubular colliculum.

HABITUS (FIG. 54)

Forewing length 5.0-6.3 mm (n = 5); greyish, scattered with brown scales. Antemedian line strongly bent outwards in costal half, then running straight downwards to dorsum, thin, white. Median area dark brown, with tawny longitudinal band on its middle. Postmedian line white, regularly arched. Subterminal area suffused with white scales. Margin with dark brown dots at veins. Fringes chequered dirty white and greyish brown. Hindwing greyish brown.

MALE GENITALIA (FIG. 118)

Uncus 7/10 X tegumen length, narrowed at basal 1/3, apex rounded, spoon-shaped. Gnathos arms projecting at connection into a short double tip. Valva ventral margin slightly convex, apex rounded; costa of valva straight, strongly sclerotized, distally projecting into a small tip pointing upwards. Juxta short, with base rounded, apex slightly incurved. Phallus stout, straight. Vesica devoid of cornuti, covered with tiny spines of ca 20 µm.

FEMALE GENITALIA (FIG. 176)

Papillae anales small, triangular in lateral view, ventrally not fused. Intersegmental membrane roughly as long as length of tergite VIII. Posterior apophyses ca 2.6 X length of tergite VIII. Intersegmental membrane VIII-IX about 2/3 X length of tergite VIII. Anterior apophyses 2.3 X length of tergite VIII. Colliculum cylindrical, lightly sclerotized, covered with minute spicules. Ductus bursae straight, narrow, roughly as long as corpus bursae. Corpus bursae ovoid, with one lanceolate signum, lightly sclerotized.

DISTRIBUTION

PHILIPPINES: Luzon, Mindoro. Collected at altitudes between 1150 and 2350 m.

DNA BARCODING

The highest intraspecific p-distance of 2.3 % is found between samples MFNLEP-PYRALPHIL01-C05 from Luzon (Nueva Vizcaya) and MFNLEP-PYRALPHIL01-C07 from Mindoro.

ETYMOLOGY

From the Tagalog "bundok" for mountain, refering to the exclusively montane distribution of the species.

REMARKS

The manuscript name "*Microchilo luzonella*" Gaskin & Shaffer was appended to a series of specimens in the NHMUK. However, this name has not been published anywhere and is hence not valid.

Microchilo cebuano Léger, sp. n.

https://zoobank.org/7E79EB3B-2339-48A2-9D74-F0D533B48848
Figs. 55, 176.

MATERIAL

Holotype: ♀ (specimen identifier coll.mfn-berlin.de_u_7773b7, DNA voucher MFNLEP-PYRALPHIL01-H05, dissection on slide TL918♀; BOLD sample ID PYPHI401-23). PHILIPPINES: Mindanao, Mount Agtuganon, 1050 m, 28.05-07.06.1996 (W. Mey).

Paratypes: 3 ♀ (specimen identifiers coll.mfn-berlin.de_u_88af49, b1bcea, c18ec0) (detailed information in Table S1; https://doi.org/10.5061/dryad.b8gtht7mh).

DIAGNOSIS

The larger forewing (length = 7.5 mm) as well as the median discoidal Y-shaped stigma (Fig. 55) separate this species from the three other *Microchilo* species of the Philippines. In female genitalia (Fig. 176), the tubular sclerotized colliculum, the minute spicules on basal half of corpus bursae, and the lightly sclerotized rounded signum separates this species from the other Philippine species. Male genitalia unknown.

HABITUS (FIG. 55)

Forewing length 7.5 mm (n = 1); ground color greyish brown. Antemedian line thin, white, running inwardly towards dorsum. Median area marked with dark brown and tawny brown scales. Median marked Y-shaped discoidal patch. Postmedian line thin, white, running outwards down to M1 vein, then bent inwards towards dorsum. Subterminal area suffused with white scales. Margin with seven well-marked dark brown spots. Fringes chequered grey and cream. Hindwing greyish brown.

MALE GENITALIA

Unknown.

FEMALE GENITALIA (FIG. 176)

Papillae anales small, triangular in lateral view. Posterior apophyses ca 7/3 X length of tergite VIII. Anterior apophyses ca 2 X length of tergite VIII. Intersegmental membrane ca 1.5 X length of tergite VIII. Colliculum ca half of ductus bursae length, conical, lightly sclerotized, wrinkled. Ductus bursae short, straight, wrinkled. Corpus bursae ca 3 X ductus length, pear-shaped, basal half covered with small spines, distal half scobinate, with one large lightly sclerotized signum.

DISTRIBUTION

PHILIPPINES: Negros, Mindanao. Collected at altitudes between 1050 and 1450 m.

DNA BARCODING

The specimen from Negros and Mindanao were recovered in two different MOTUs in the species delimitation analysis, separated by a p-distance of 4.5%.

ETYMOLOGY

Refers to the Cebuano language spoken on Negros and Mindanao where the species is encountered.

Microchilo spinosus Léger, sp. n.

https://zoobank.org/36A61366-0180-4B00-8141-EF92C413498E
Figs. 56, 119, 177.

MATERIAL

Holotype: ♂ (specimen identifier coll.mfn-berlin.de_u_8028c5, DNA voucher MFNLEP-PYRALPHIL08-H07, TL1761♂; BOLD sample ID PYPHI237-22, Genbank Accession Number PP196916). PHILIPPINES: Mindanao, Mount Agtuuganon, 1050 m, 28.05-07.06.1996 (W. Mey). Deposited in MfN.

Paratypes: 12 ♂ (specimen identifiers coll.mfn-berlin.de_u_f6c89a, 9af9bd, d9d04d, 12a546, eca519, ee4ce6, 8302d6, b49b3c, 89de2c, da36cd, 32369b), 8 ♀ (specimen identifiers MfN: coll.mfn-berlin.de_u_bc4c7f, e3f73d, fd8d7a, 8c0402, 58c789, ea0468, 54345b; PNM:

id.bioseasia.org_u_023561, 023563) (detailed information in Table S1; https://doi.org/10.5061/dryad.b8gtht7mh).

SIMILAR SPECIES

Microchilo imminutela **sp. n.**

DIAGNOSIS

This species is much smaller and is similar in size to *Microchilo imminutela* **sp. n.** In the forewing, *Microchilo spinosus* **sp. n.** lacks the marginal black spots observed in other species. The examination of the genitalia enables unambiguous identification: Male genitalia have a narrow spatulate uncus apex and a phallus with a group of six cornuti (males of *M. cebuano* **sp. n.** and *M. imminutela* **sp. n.** unknown). In female genitalia (Fig. 177), the ring of sclerotized spines at corpus bursae opening separates this species from its congeners.

HABITUS (FIG. 56)

Forewing length 3.7-4.2 mm (n = 9), ground color brown, sparkled with cream scales. Antemedian line arched outwards, shortly indented inwards in cubital area, cream, edged distally with dark brown band. Postmedian line regularly arched outwards, cream. Subterminal area dark brown. Fringes dark brown. Hindwing greyish brown.

MALE GENITALIA (FIG. 119)

Uncus elongate, medially narrowed, apex duck-beak shaped, setose. Gnathos arms joining onto a small triangular tip covered with tiny spines. Valva ventral margin slightly convex at base, then straight, dorsal margin straight, sclerotized, projecting into a small tip distally, valva apex rounded. Juxta broad, apex deeply indented. Vesica with a group of six short, dentate cornuti and one larger, separate, curved cornutus; apex slightly sclerotized.

FEMALE GENITALIA (FIG. 177)

Papillae anales small, triangular in lateral view. Posterior apophyses ca 2 X length of tergite VIII. Anterior apophyses ca 1.9 X length of tergite VIII. Colliculum membranous. Ductus bursae very short, broad, covered with sclerotized spines near corpus opening, extending into a ring of spines at corpus opening. Corpus bursae ovoid. Signum C-shaped with dentate margin. Ductus seminalis branched directly from corpus bursae.

DISTRIBUTION

MALAYSIA: Borneo (Sabah). PHILIPPINES: Luzon (Albay, Camarines Sur), Mindoro, Negros, Mindanao (Davao Oriental). Collected at altitudes between 150 and 1050 m.

DNA BARCODING

The highest intraspecific p-distance observed is of 0.6% between sample MFNLEP-PYRALPHIL08-H09 and samples MFNLEP-PYRALPHIL08-A08 and MFNLEP-PYRALPHIL09-C07, all from Mount Agtuuganon on Mindanao.

ETYMOLOGY

From the Latin *spinosus, a, um*, spiny, referring to the cornuti observed on the vesica in male genitalia.

REMARKS

Specimen with DNA extraction number MFNLEP1000 from Borneo belongs to the same haplotype found in the Philippines. This suggests recent exchanges between populations of Borneo and the Philippines islands.

Microchilo imminutela Léger, sp. n.

https://zoobank.org/
D79AD250-2DDF-46F9-A03F-0F73C277F25D
Figs. 57, 178.

MATERIAL

Holotype: ♀ (specimen identifier coll.mfn-berlin.de_u_b9e672, DNA voucher MFNLEP-PYRALPHIL08-B08, genitalia on slide TL1308♀; BOLD sample ID PYPHI173-22, Genbank Accession Number PP196857). PHILIPPINES: Luzon, Zambales Mountains, Coto, 110 m, 05-06.05.1999 (K. Ebert, W. Mey). Deposited in MfN.

Paratypes: 3 ♀ (specimen identifiers coll.mfn-berlin.de_u_6cdafb, bd9f4f, f47423) (detailed information in Table S1; https://doi.org/10.5061/dryad.b8gtht7mh).

Other specimens examined: 1 ♀ (detailed information in Table S1; https://doi.org/10.5061/dryad.b8gtht7mh).

DIAGNOSIS

This species is externally similar to *Microchilo bundoki* **sp. n.** and is best separated from the latter by examination of the female genitalia (male specimens are unknown). In female genitalia (Fig. 178), the transverse row of sclerotized spines at midlength of the corpus bursae opening separates this species from its congeners.

HABITUS (FIG. 57)

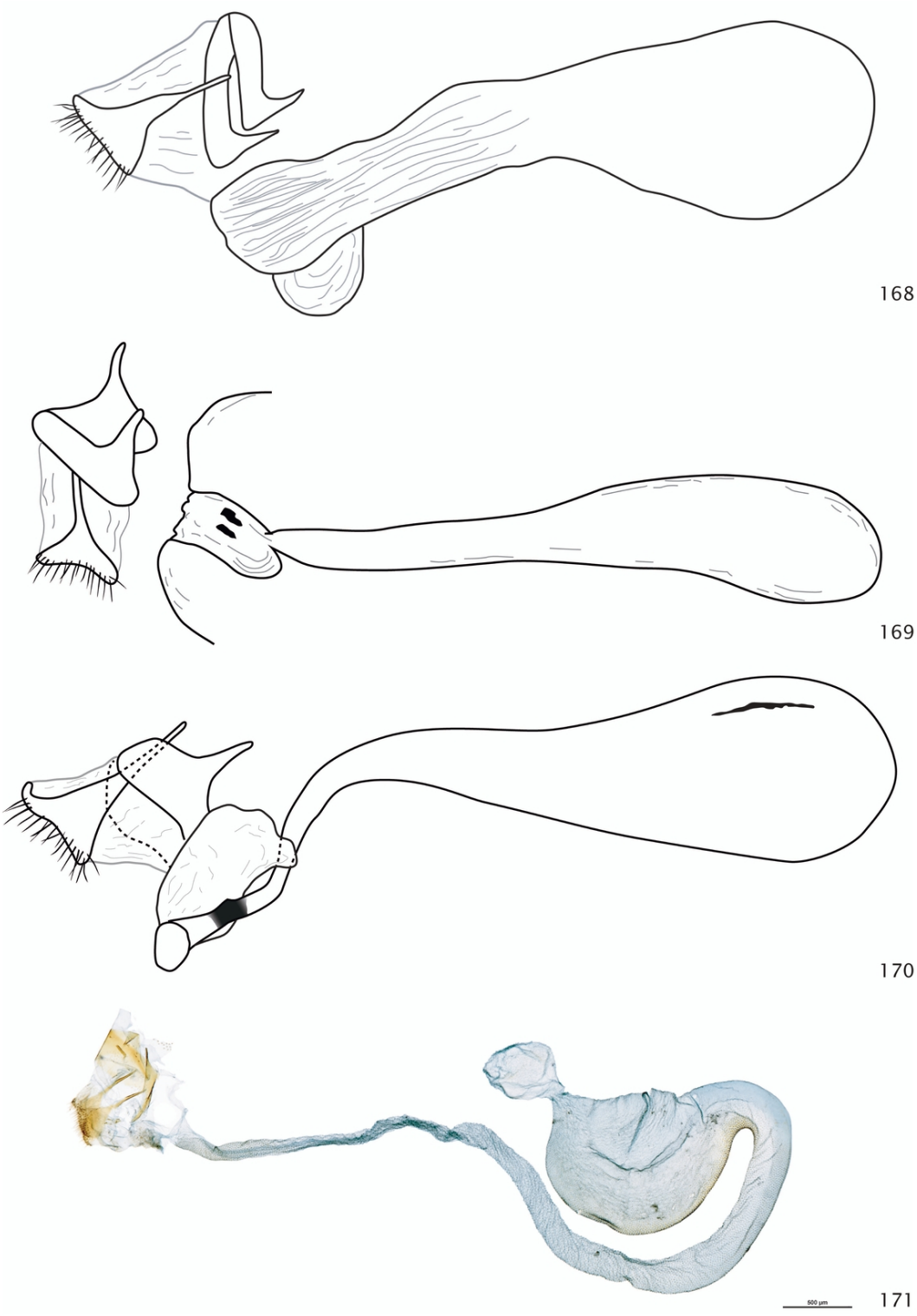
Forewing length 3.5 mm (n = 2), background with a mix of white and brown scales. Antemedian line curved outwards, shortly indented inwards in cubital area, cream. Antemedian band dark brown, medially tawny. Postmedian band tawny, medially widened. Postmedian line white, broadly arched. Margin with seven black spots. Margin chequered cream and dark brown. Hindwing greyish brown.

MALE GENITALIA

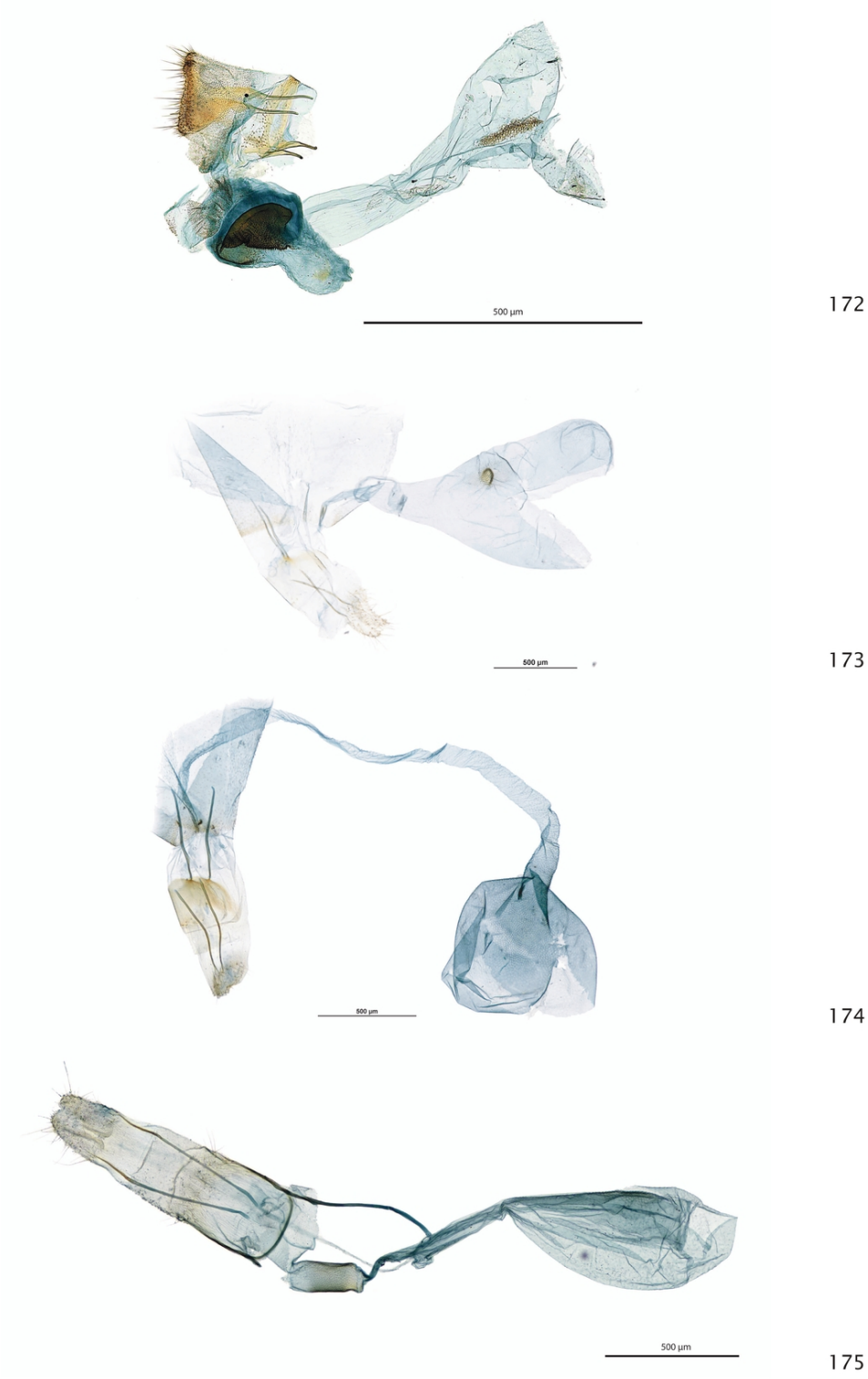
Unknown.

FEMALE GENITALIA (FIG. 178)

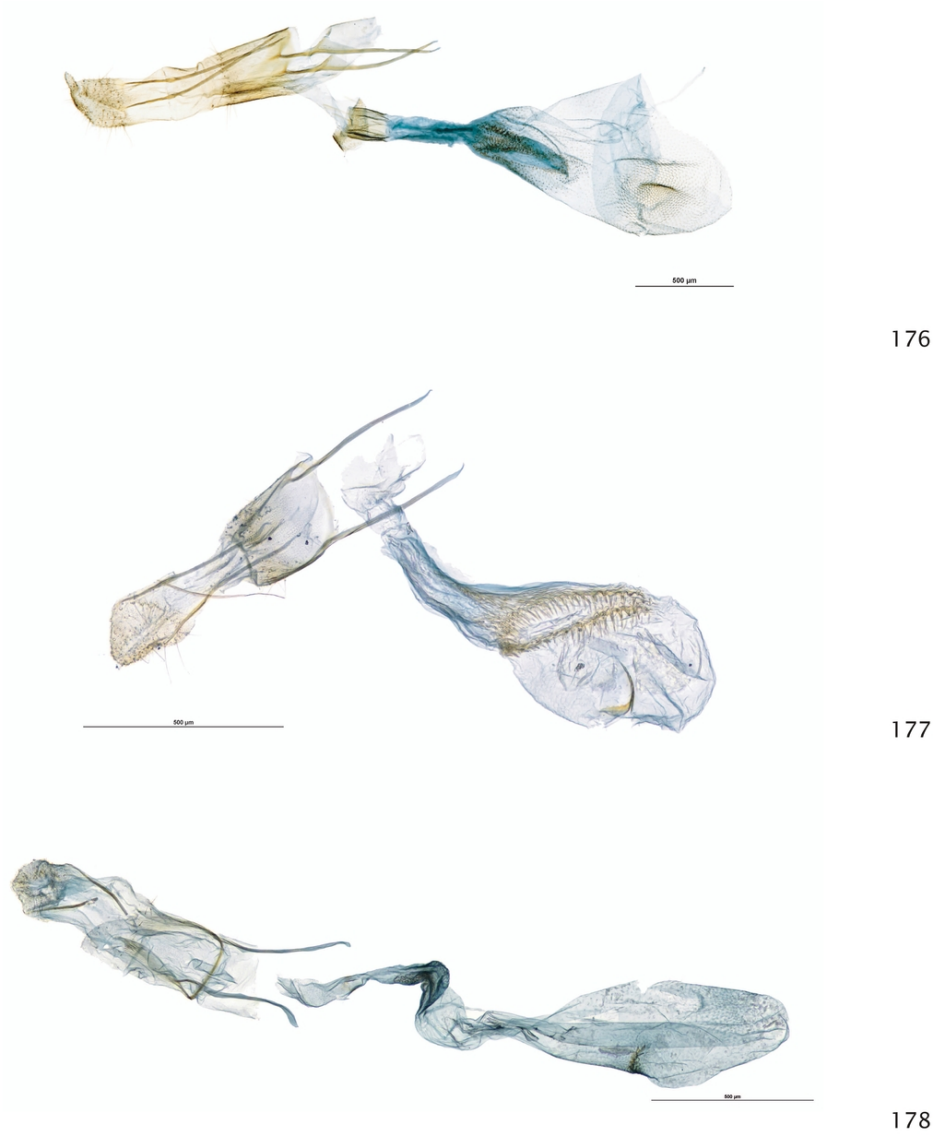
Papillae anales small, triangular in lateral view. Posterior apophyses ca 1.8 X length of tergite VIII. Intersegmental membrane as long as length of tergite VIII. Anterior apophyses ca 1.7 X length of tergite VIII. Colliculum short, anteriorly lightly sclerotized. Ductus bursae ca as long as corpus bursae, straight, basal half covered with minute spicules. Corpus bursae ovoid, membranous with tiny



Figs 168-171. Female genitalia of *Culladia* species. Fig. 168. *Culladia evae* Bleszynski, 1970, adapted from fig. 20, p. 54 of Bleszynski (1970a). Fig. 169. *Culladia suffusella* Hampson, 1896, adapted from fig. 21, p. 54 of Bleszynski (1970a). Fig. 170. *Culladia tonkinella* Bleszynski, 1970, adapted from fig. 9, p. 46 of Bleszynski (1970a). Fig. 171. *Culladia pseudoscoparia* **sp. n.**, paratype, slide TL909♀.



Figs 172-175. Female genitalia of *Culladia*, *Metaeuchromius* and *Microchilo* species. Fig. 172. *Culladia* sp., slide TL1320♀. Fig. 173. *Metaeuchromius micralis* (Hampson, 1919) **comb. nov.**, slide TL997♀. Fig. 174. *Metaeuchromius makintabus* **sp. n.**, paratype, slide TL1056♀. Fig. 175. *Microchilo bundoki* **sp. n.**, paratype, slide TL944♀.



Figs 176-178. Female genitalia of *Microchilo* species. Fig. 176. *Microchilo cebuano* **sp. n.**, holotype, slide TL918♀. Fig. 177. *Microchilo spinosus* **sp. n.**, paratype, slide TL1208♀. Fig. 178. *Microchilo imminutela* **sp. n.**, paratype, slide TL1209♀.

spines, medially with one transverse row of thick sclerotized spines.

DISTRIBUTION

PHILIPPINES: Luzon (Zambales). Collected at an altitude of 150 m.

DNA BARCODING

The highest intraspecific p-distance observed is of 1 % between sample MFNLEP-PYRALPHIL01-D02 from Panay and the samples from Luzon (Zambales).

ETYMOLOGY

From the Latin *minutalis, e:* small, undersized. The name was appended to a series of specimens in the NHMUK.

Checklist of the Philippines Scopariinae & Crambinae

CRAMBINAE

Ancylolomia orchidea Bleszynski, 1970
Ancylolomia westwoodi Zeller, 1863
Angustalius malacelloides (Błeszyński, 1955)
Calamotropha anacantha **sp. n.**
Calamotropha obliterans (Walker, 1863)
Calamotropha philippinensis **sp. n.**
Calamotropha unicolorellus (Zeller, 1863)
Catoptria philippinensis **sp. n.**
Chilo auricilius Dudgeon, 1905
Chilo infuscatellus Snellen, 1890
Chilo luteellus (Motschulsky, 1866)
Chilo pulverata (Wileman & South, 1917)
Chilo sacchariphagus (Bojer, 1856)
Chilo suppressalis (Walker, 1863)
Culladia evae Bleszynski, 1970
Culladia hastiferalis (Walker, 1865)
Culladia pseudoscoparia **sp. n.**
Culladia suffusella (Hampson, 1896)
Culladia tonkinella (Walker, 1865)
Gargela aculea **sp. n.**
Gargela acutibrachium **sp. n.**
Gargela minuta Song et al., 2009
Gargela negrosensis **sp. n.**
Gargela polyacantha Li, 2019
Gargela xanthocasis (Meyrick, 1897)
Glaucocharis altissima **sp. n.**
Glaucocharis clytia (Błeszyński, 1966)
Glaucocharis hamulus **sp. n.**
Glaucocharis kabundukanis **sp. n.**
Glaucocharis kayumanggi **sp. n.**
Glaucocharis lathonia (Błeszyński, 1966)
Glaucocharis negrosensis **sp. n.**
Glaucocharis sungay **sp. n.**
Glaucocharis uncusellus **sp. n.**
Metaeuchromius makintabus **sp. n.**
Metaeuchromius micralis (Hampson, 1919)
Metaeuchromius rizali **sp. n.**
Microchilo bundoki **sp. n.**
Microchilo cebuano **sp. n.**
Microchilo imminutela **sp. n.**
Microchilo spinosus **sp. n.**

SCOPARIINAE

Eudonia penicula **sp. n.**
Eudonia barbipennis Hampson, 1897
Micraglossa kianganensis **sp. n.**
Micraglossa polisensis **sp. n.**
Micraglossa tagalica Nuss, 1998
Scoparia abo **sp. n.**
Scoparia aenea **sp. n.**
Scoparia bicornuta **sp. n.**
Scoparia fulvida **sp. n.**
Scoparia ifugaoensis **sp. n.**
Scoparia luzonensis **sp. n.**
Scoparia masiita **sp. n.**
Scoparia meyi Nuss, 1998
Scoparia monticola Nuss, 1998
Scoparia negrosensis **sp. n.**
Scoparia noacki Nuss, 2002
Scoparia philippinensis (Hampson, 1917)
Scoparia spadix Nuss, 1998
Scoparia tenuispina **sp. n.**

Species incertae cedis

Calamotropha sp. 1 cf. *oculalis*
Calamotropha sp. 2 cf. *oculalis*
Eschata cf. miranda Błeszyński, 1965
Roxita sp.

Discussion

Incongruence between morphology and DNA barcodes

The low match ratio of 0.47 between morphospecies and molecular-delimited species can be linked to different factors. Species pairs or triplets could not be efficiently separated by the ASAP delimitation method and were merged into one MOTU in three cases. These low divergence cases might reflect a recent speciation event or might be caused by other factors inherent to mitochondrial DNA such as incomplete lineage sorting or introgression as reported in butterflies (Cong et al., 2017). Other cases of DNA barcode sharing between two closely related yet morphologically distinct species is known in the species pair *Scoparia ambigualis*/*Scoparia basistrigalis* (Barcoding Of Life Database; Matthias Nuss, pers. comm.), suggesting that introgression occurs in *Scoparia*. This underlines the need for caution when interpreting the delimited MOTUs, as different species can be lumped under a same MOTU.

Twenty-two of the morphospecies investigated (30%) were split into two or more MOTUs. In all cases, the MOTUs represented different geographical populations from different mountain ranges or islands (e.g., *Scoparia philipinnensis* in Fig 179c and *Metaeuchromius micralis* in Fig 179d), suggesting partial or complete isolation between these popu-

lations due to geographical barriers. These values are similar to those found in Lepidoptera from Papua New Guinea (Craft et al., 2010) and in butterflies of the Samoan islands (Bruschini et al., 2023). The results of the ASAP analysis here can thus be explained by the inherent geography of the region favoring isolation and divergence of local demes, resulting in an overlap between intra- and interspecific variation that is detrimental to the performance of distance-based methods such as ASAP (Ahrens et al., 2016). In some cases, the geographical gaps in the sampling might influence negatively the performance of ASAP as it underestimates the intraspecific variation in these cases (Lohse et al., 2009; Phillips et al., 2019).

Endemism

An apparent rate of Philippine endemism of 95% is observed in mountain dwelling Scopariinae. Only *Scoparia monticola* has been reported so far outside of the Philippines, extending its distribution to China (W. Li & Liu, 2013) and Sumatra (Nuss, 1998). Notably, the Bornean fauna has been only superficially investigated so far for Scopariinae, without revealing similar morphotypes. The Crambinae show a lower endemism rate of roughly 50%, presumably due to the occurrence of many lowland species. These endemism rates are higher than that of the endemism rate in butterflies (40.7%; Treadaway & Schröder, 2012) and closer to that observed in low-dispersal groups such as mammals (64%) or amphibians (77%) (Ong et al., 2002). This is presumably due to the large number of mid- or high-elevation species that are less likely to disperse to distant areas. The Scopariinae show a strong geographical structure and represent the majority of endemic species for the Philippines. In the Crambinae, the Diptychophorini account for a substantial part of the species diversity on the archipelago; *Glaucocharis* and *Gargela* form the two most species-rich genera and represent together nearly 40% of the total Crambinae diversity on the archipelago. Scopariinae and *Glaucocharis* share the same ecology; both groups feed on mosses (Beever & Dugdale, 1994; Glime, 2017; Nuss, 1999).

Distribution patterns & drivers of diversification

Star-shaped haplotype networks in *Angustalius malacelloides*, *Culladia hastiferalis,* and *Microchilo bundoki* **sp. n.** reveal rapid demographic expansion across the archipelago there (see Fig. 179a and 179b). Similarly, the widespread crop pest species *Chilo auricilius*, *Chilo infuscatellus,* and *Chilo suppressalis* all share their haplotype with specimens from continental Asia, suggesting recent, human-aided dispersal to the Philippine archipelago facilitated the expansion of crop cultures (see haplotype networks d, e, g, h on Fig. S2d). *Microchilo bundoki* **sp. n.**, whose host plant is currently unknown, is also likely to feed on grasses. Other cases reveal high local mitochondrial haplotype diversity, suggesting large population sizes as observed in *Glaucocharis altissima* **sp. n.** and *G. clytia* (Fig. 179e, f).

Within Luzon, four centers of endemism can be highlighted: the Cordillera Central, the Southern Sierra Madre, the Bicol Peninsula, and the Zambales mountains. These mountain ranges have been highlighted as sub-centers of endemism in mammals (Heaney et al., 2016). Investigating MOTU endemism reveals here an endemism rate for these mountain ranges (33-52%) similar to those observed for medium-sized islands such as Negros (46%) and Mindoro (48%), suggesting that the Luzon mountain range acts as "sky islands" for dispersal and speciation. Interestingly, Mindoro does not have any endemic species, and haplotypes identical to those found on Luzon in *Eudonia penicula* **sp. n.** and *Gargela minuta* suggest that some exchange occurred between the two islands. A putative explanation here is a frequent colonization and extinction from either Luzon or Palawan, with limited in-situ diversification (MacArthur & Wilson, 1967).

The islands of Leyte, Mindanao, and Samar form together the Mindanao Pleistocene aggregate island complex that was shown to host a similar fauna in several groups (R. M. Brown et al., 2013; de Jong & Treadaway, 1993). The DNA barcode haplotype network reveals this pattern at the intraspecific level in *Gargela aculea* **sp. n.** and *Gargela acutibrachium* **sp. n.** where specimens group in the same MOTU or in sister-group MOTUs with respect to the specimens from Luzon and Negros. DNA barcodes further reveal several cases of deep splits between the lineages from Samar and Leyte and that of Mindanao in the *Scoparia spadix* species group, *Scoparia* cf. *tenuispina* **sp. n.**, *Calamotropha obliterans*, *Gargela acutibrachium* **sp. n.**, *Metaeuchromius micralis*, *Metaeuchromius makintabus* **sp. n.**, with two MOTUs found in Leyte in the latter species. This implies that these populations remained isolated despite the existence of land bridge connections between Mindanao, Samar, and Leyte during the Pleistocene ice ages (R. M. Brown et al., 2013).

The island of Negros shows, on the other hand, no unequivocal faunal connection to either Luzon + Mindanao nor to the Mindanao Pleistocene Aggregate Island complex. Its fauna includes two presumably endemic species (*Glaucocharis negrosensis* **sp. n.** and *Gargela bidentella* **sp. n.**) and have species distributed over the Northern part of the archipelago including Mindoro and Luzon (e.g., *Glaucocharis agnathosellus*, *E. penicula* **sp. n.**), while, in other cases, it shares species with the Southern part of the archipelago including Leyte/Samar and Mindanao (e.g., *Glaucocharis uncusellus* **sp. n.**, *Calamotropha philippinensis* **sp. n.**, *Gargela acutibrachium* **sp. n.**). The haplotype structure reveals similar ambivalent patterns, with closer affinity to those of Luzon or Mindoro in *Gargela aculea* **sp. n.**, *Scoparia meyi*, while in *Glaucocharis lathonia* a unique haplotype is shared among specimens from Leyte, Mindanao, and Negros, differing from that found on Luzon. The present pattern is similar to that observed in the Hesperiidae, where the fauna of Negros has been shown to be equally populated by species from a Northern origin (Luzon) and from a Southern origin (Mindanao), presumably resulting from either changing colonization opportunities from the two major islands (de Jong & Treadaway, 1993). Finally, the available

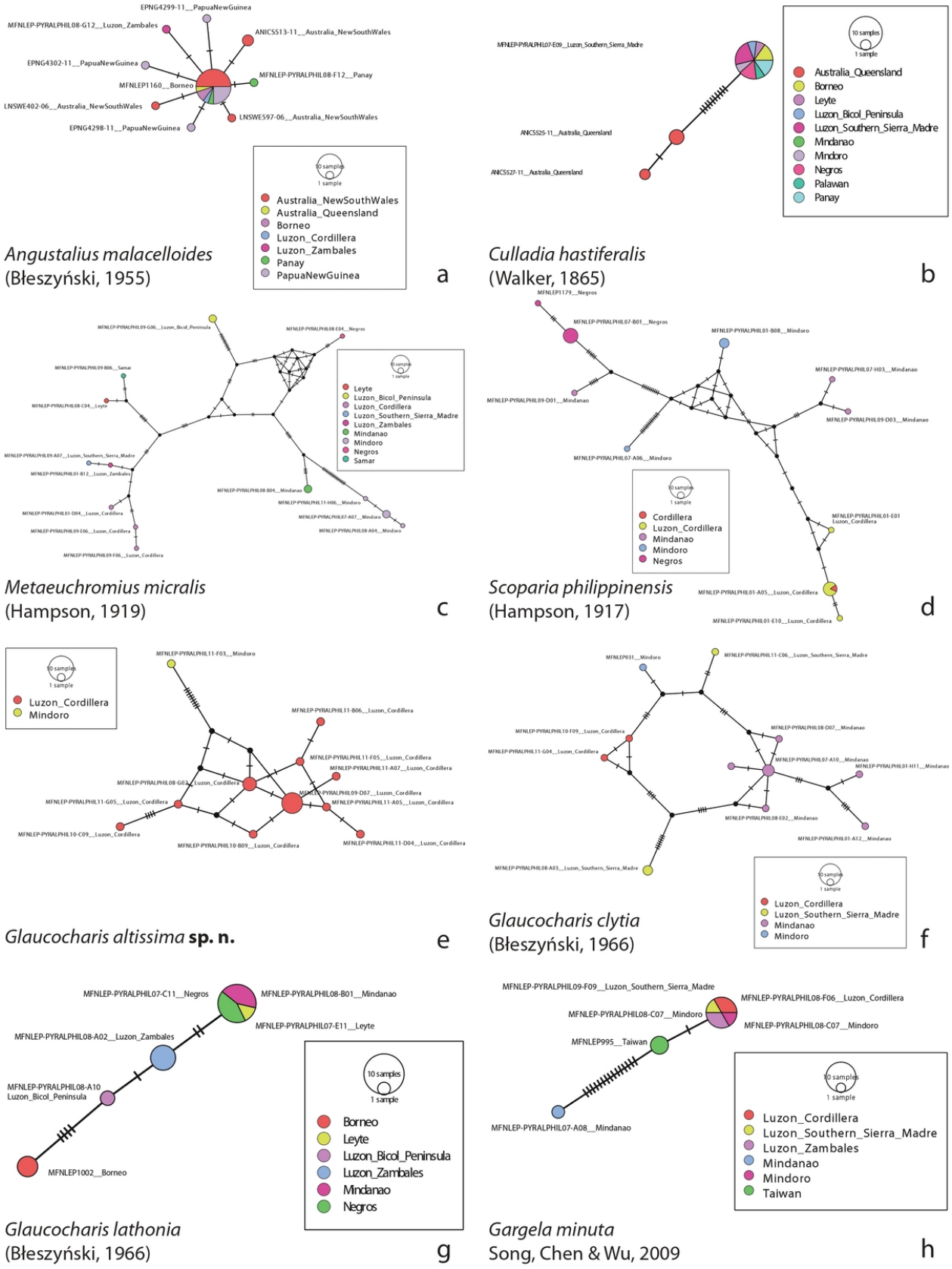


Fig. 179. Haplotype network reconstruction using the Median-joining network method for the species *Angustalius malacelloides* (a), *Culladia hastiferalis* (b), *Metaeuchromius micralis* (c), *Scoparia philippinensis* (d), *Glaucocharis altissima* **sp. n.** (e), *Glaucocharis clytia* (f), *Glaucocharis lathonia* (g), *Gargela minuta* (h).

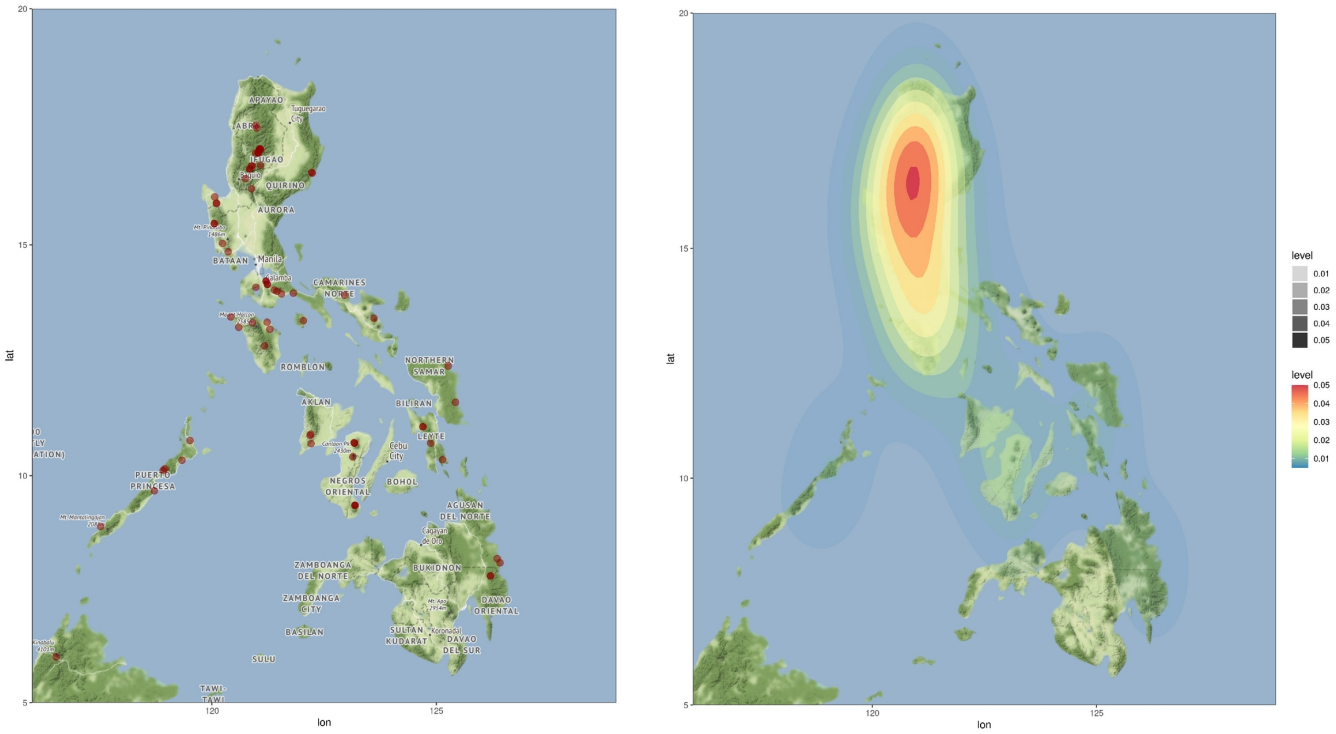


Fig. 180. Collecting localities as well as density mapping of the collecting effort on the Philippines generated with R-packages ggmap.

material from Palawan was insufficient to discuss its faunal affinities here, but a strong similarity with the Sundaland fauna can be expected, as observed elsewhere in the Hesperiidae (de Jong & Treadaway, 1993).

Homogeneous morphology in some groups suggests small in situ species radiations in the Philippines. This is, for example, the case in the group formed by *S. spadix*, *S. noacki*, *S. bicornuta* **sp. n.**, and *S. aenea* **sp. n.** These species share the short triangular uncus, the long and slender gnathos projection, and nearly identical female genitalia. Different elevational distribution has been proposed to promote speciation in some groups of vertebrates (R. M. Brown et al., 2013) as well as in Trichoptera (Mey, 2003). Non- or partly overlapping elevational distributions in genera such as *Gargela*, *Glaucocharis,* and *Microchilo* suggest that adaptation to an elevational ecozone might also play a role in diversification. Specialization on different host plants is another possible driver of diversity in sympatric lineages and has been reported on tropical moth communities (Craft et al., 2010).

Colonization routes

Four routes have been proposed to colonize the Philippine archipelago by Dickerson (1928): from Taiwan via the Batanes and Babuyan island chain; from Borneo via Palawan; from Borneo via the Sulu archipelago; and from Sulawesi. A fifth route from Papua over the Sangihe–Talaud–Sarangani island chain has been later emphasized by other authors (Diamond & Gilpin, 1983; Dickinson et al., 1991; Inger, 1954). While our knowledge from the fauna of the neighboring regions is scarce, some biogeographical affinities can be inferred from the morphology, DNA barcodes, or both. Several species are found to be shared with Borneo, i. e., *Calamotropha obliterans*, *Glaucocharis lathonia*, *Microchilo spinosus* **sp. n.**, or have a sister-species from Sumatra (*Eudonia penicula* **sp. n.**) or Java (*Calamotropha* cf. *oculalis*, *Scoparia meyi,* and *S. spadix*; unpublished data). In the case of *Calamotropha obliterans*, haplotype network reconstruction reveals that a specimen from Palawan (DNA voucher MFNLEP-PYRALPHIL09-A08) shares its haplotype with another specimen (DNA voucher MFNLEP1161) from Tawau Hills, Borneo (see Fig. S2b), suggesting a recent crossing of the Balabac Strait between Borneo and Palawan. For *Glaucocharis lathonia*, the haplotype network reconstruction suggests a colonization of the Philippines from Borneo (or vice-versa) via the Palawan route, while an identical haplotype found on Leyte, Mindanao, and Negros suggest a recent spreading over these islands (see Fig. 179g). Furthermore, striking similarities between female genitalia of *Glaucocharis clytia, G. kabundukanis* **sp. n.**, and *G. altissima* **sp. n.** with those of the *ajaxella* species group from Papua suggests a likely colonization of the Philippines from Papua New Guinea. Finally, colonization of the distant island of Taiwan is evidenced in *Gargela minuta*, with haplotypes from Taiwan and the Philippines differing by only two base pairs (see Fig. 179h). Revisional studies of the Crambinae and Scopariinae fauna of the surrounding regions such as Sundaland, Continental Asia, Wallacea, and Papua are strongly needed in order to have a good estimate of the influence of each region on the current diversity observed in the Philippines.

Cryptic diversity

The high diversity in DNA barcodes between island-specific MOTUs in several species are signs of a marked lineage differentiation and raises the question as to whether these MOTUs represent cryptic species or not. Similar high genetic differentiation between island populations in the Philippines has been debated in birds (Hosner et al., 2018; Lohman et al., 2010). In insects, cases of deep genetic differentiation have been reported in the montane genus *Hoploscopa* Meyrick, 1886 (Lepidoptera) (Léger et al., 2020) as well as other insect orders such as Coleoptera (Komarek & Freitag, 2020) and Ephemeroptera (Kaltenbach et al., 2020). These mitochondrial lineages could represent different real geographical species where morphological differentiation is moderate because of low selective pressure acting on these characters, or they may result from mechanisms affecting mitochondrial DNA such as introgression, incomplete lineage sorting, or symbiont-driven genetic flow (Hurst & Jiggins, 2005). Cases of discrepancy between mitochondrial genetic diversity and nuclear genomic diversity have been reported elsewhere in Lepidoptera (Cong et al., 2017; Doorenweerd et al., 2022; Hinojosa et al., 2019; Lopez-Vaamonde et al., 2021), prompting caution when interpreting results relying on mitochondrial markers alone. This underlines the need to include additional nuclear markers in further studies in order to test whether or not these mitochondrial lineages represent real cryptic species.

Geographical sampling

The collecting density (Fig. 180) reveals that, although collecting localities are widely spread, the material available was predominantly collected on Luzon and that some geospatial gaps remain in our sampling in the Philippines. High elevation sampling has mainly been performed on Luzon, where altitudes over 2000 m can be reached by motorized transport. Palawan, Mindanao, Negros, and Panay have high mountain ranges (>2000 m above sea level), and collecting at higher elevations there should be undertaken in future expeditions. Furthermore, Palawan geological history is completely different than that of the other islands (Hall, 1998), and it shows the least faunal similarities with other Philippines islands in vertebrates (Heaney, 1986). Hence, future surveys on the island hold the promise of new species discoveries in both groups. Mindanao and its multiple mountain ranges are expected to host a large unexplored diversity as the unique sampled locality (Mount Agtuuganon) has the highest MOTU endemicity (79%). Mindanao is, with 79,000 km^2, the second largest island after Luzon and has been shown to be in the stage of intra-island allopatric diversification in birds (Hosner et al., 2013), which suggests that a similar pattern could be observed in moths. Undersampling of Mindanao has been reported in DNA barcodes and species occurrence data and can be explained by the risk of terrorism that kept foreign researchers away (Berba & Matias, 2022). Finally, future sam-

pling should be extended to yet unexplored islands such as Camiguin, Sibuyan, or other mountain ranges from Palawan, Panay, or Eastern Luzon.

Conclusion and outcomes

The present revision of the Crambinae and Scopariinae of the Philippines has uncovered thirty-two new species, showing that slightly over half of the diversity in these two groups was undescribed until now. Furthermore, six species were reported for the first time from the Philippines. At least another seven further species (five *Glaucocharis* species, one *Calamotropha* near *oculalis*, one *Culladia* sp.) represented exclusively by female specimens or by males that could not be matched to the type specimen were recognized as new but are not formally described here. The high discrepancy between the number of lineages inferred from the morphology and from the species delimitation analysis of the DNA barcoding dataset suggests several cases of cryptic geographical species that will require further investigations. Three cases of MOTU sharing suggest the occurrence of evolutionarily young lineages. The present status of the diversity of Crambinae and Scopariinae suggests an endemism rate of 50% for the Crambinae and 95% for the mountain dwelling Scopariinae. Further expeditions to undersampled islands and mountains such as Mindanao and Palawan will surely reveal additional species.

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Supplementary Materials

Fig. S1. RAxML analysis of the complete DNA barcode dataset with bootstrap supports from 400 bootstrap replicates displayed on nodes with support above 50.

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Fig. S2. Haplotype network reconstruction using the Median-joining network method for selected species of Crambinae and Scopariinae

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Table S1. List of the material investigated with specimen metadata.

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Table S2. Second best partitioning model of the ASAP species delimitation analysis (asap-score=5.00; P-val=6.16*e-02)

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Table S3. P-distance matrix of the DNA barcode sequences of the Scopariinae of the Philippines.

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Table S4. P-distance matrix of the DNA barcode sequences of the Crambinae of the Philippines.

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