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Suhela N. Singh, Ranjan, Kirti & Chandra, gen. n., a new genus for *Conogethes alboflavalis* Moore, 1888 (Lepidoptera: Crambidae, Spilomelinae)

N. Singh, R. Ranjan, J. S. Kirti & K. Chandra

Abstract

We describe a new genus for the Spilomelinae: *Conogethes alboflavalis* Moore, 1888, known to occur in India and Nepal. We provide diagnostic characters for the new genus and comparison with the closely related genera, *Conogethes* Meyrick, 1884 and *Pycnarmon* Lederer, 1863.
KEY WORDS: Lepidoptera, Crambidae, Spilomelinae, *Suhela, Conogethes,* distribution, diagnosis, India.

***Suhela* N. Singh, Ranjan, Kirti & Chandra, gen. n., un género nuevo para *Conogethes alboflavalis* Moore, 1888 (Lepidoptera: Crambidae, Spilomelinae)**

Resumen

Describimos un nuevo género para el Spilomelinae: *Conogethes alboflavalis* Moore, 1888 que se conoce en India y Nepal. Proporcionamos caracteres diagnósticos para el nuevo género y comparamos con los géneros relativamente próximos *Conogethes* Meyrick, 1884 y *Pycnarmon* Lederer, 1863.
PALABRAS CLAVE: Lepidoptera, Crambidae, Spilomelinae, *Suhela, Conogethes,* distribución, diagnosis, India.

Introduction

Spilomelinae is the largest subfamily of superfamily Pyraloidea with 4,097 described species in 338 genera worldwide (NUSS *et al*., 2003-2020; MALLY *et al*., 2019) and 557 species under 153 genera from India (Singh *et al.* in prep.) representing about 25 % of the total Pyraloidea. Of the 338 genera, 87 are monotypic, many others with a very few species, and only about 20 genera are species rich, heterogeneous (MALLY *et al.,* 2019) and in need of thorough revisions. Many new genera and species are being described as the taxonomic studies on Spilomelinae are conducted (XU & DU, 2016; ZHANG & LI, 2016; SINGH *et al*., 2019; LU *et al*., 2020; XIAO-QIANG *et al.,* 2019; LIU *et al*., 2020; KO *et al*., 2020; JIE *et al.,* 2020). During our studies on the genitalia of *Pycnarmon alboflavalis* (Moore, 1888), we found that this species does not conform to the characterization of *Pycnarmon* Lederer, 1863. Originally, *P. alboflavalis* was described in *Conogethes* Meyrick, 1884. However, the study and interpretation of the genitalia of *Conogethes* also not allow us to place *P. alboflavalis* in its original genus. Therefore, we describe here a new genus *Suhela*, gen. n. for the correct placement of *P. alboflavalis* (Moore).

Adult moths were collected with vertical sheet light traps and Lepi LED fitted in the field. Collected material was processed as per standard techniques in lepidopterology (HOLLOWAY, 2001). Adult moths were photographed using a Canon EOS 1300D digital SLR camera. The detailed microphotography of external male genitalia was conducted with a Leica M165C stereomicroscope

attached with a Leica MC190HD camera and enabled with a Leica Application Suite (LAS). The examined specimens are deposited in the National Zoological Collections, Lepidoptera Section, Zoological Survey of India (ZSI), Kolkata, India.

Taxonomy

Genus *Suhela* N. Singh, Ranjan, Kirti & Chandra, gen. n.

Type species: *Conogethes alboflavalis* Moore, 1888. *Indian Lep. Atk*.: 220

The new genus is described here as a monotypic genus for its type species *Conogethes alboflavalis* Moore, 1888 that was originally described from the collections of Staudinger and Moore collected from Darjiling [Darjeeling], India. Later, HAMPSON (1896) studied this species under *Pycnarmon* Lederer, 1863. YAMANAKA (1998) reported *P. alboflavalis* (Moore) from Nepal as a member of *Pycnarmon* and to date it is considered a member of *Pycnarmon*.

Diagnostic characters: The genus *Suhela,* gen. n. is distinguished on the basis of i) underside of male forewing with a fringe of long scales in cell, arising from subcostal nervure, ii) in male genitalia, uncus is triangular, concavely angled on ventral side, giving the appearance of a petal of a lotus temple; chaetae simple, (non-bifid), iii) valva with costa produced medio-dorsally, iv) sacculus, having an inwardly produced triangular structure with its dorsal edge forming a series of mountain like structures, v) middle area of valva is transparent, vi) cucullus is broad, highly setosed, flap like, with a small, mid-ventral spine, vii) spatulated fibula originating from the inner centre of valva and projecting baso-dorsally (towards costa), vii) vesica with two dagger-shaped spines.

Comparison to *Conogethes* and *Pycnarmon*: The species *Suhela alboflavalis*, comb. nov., was incorrectly described in *Conogethes* because i) in male genitalia of *Conogethes* the uncus is capitate with a bulbous ovate head on a tubular, curved neck, the dorsal side of uncus head is densely covered with deeply bifurcated chaetae, ii) saccus is v-shaped, iii) fibula is spine like with broad base, and iv) the cornutus is long needle shape, stretching through almost entire length of aedeagus (in the genus *Suhela*, gen. n., uncus is triangular and covered with simple, non-bifurcated chaetae, saccus is broad U shaped, fibula is spatulated, and the cornuti are robust, dagger-shaped covering half of the phallus length). Furthermore, the genus *Pycnarmon* does not conform to the characterisation of *S. alboflavalis* based on the following characters: i) in *Pycnarmon* (Figs 4, 7) antennae of the male with the shaft thickened to about one-third length, where there is a cleft fringed with hair on each side, ii) in the male genitalia (Figs 16-19) the uncus has a bifurcated tip with a small base, iii) tegumen robust, iv) valva has a bow-shaped costa, v) fibula comma-shaped with broad base, and v) vesica with a small cornutus.

Remark: *Suhela,* gen. n., belongs to the tribe Agroterini based on the upturned labial palpi, and a truncate uncus with simple, non-bifid chaetae (MALLY *et al*., 2019). There is no other genus in Agroterini or in Spilomelinae which can accommodate *P. alboflavalis*. Therefore, we erect *Suhela*, gen. n., for nomenclatural stability.

Distribution: India, Darjiling [Darjeeling] (MOORE, 1888), Sikkim and Andaman (HAMPSON, 1896), Mizoram, Meghalaya, Jharkhand (present study). Nepal (YAMANAKA, 1998).

Etymology: The generic name is after S. Suhel Singh Gill, a social reformist and the great grandfather of the first author.

Suhela alboflavalis (Moore, 1888), **comb. n.** (Figs 1-3, 5-6, 8-15)
Conogethes alboflavalis Moore, 1888: 220. *Indian Lep. Atk*.: 220

Material examined (4 ♂♂, 9 ♀♀): India: Mizoram, Mamit, 2 ♂♂, 26-IX-2013; Mizoram, Mamit, 4 ♀♀, 28-IX-2013; Mizoram, Mamit, 1 ♀, 29-IX-2013, leg. R. Ranjan (Coll. NZCZSI); Meghalaya, Lailad, 1 ♀, 13-IX-2014, leg. R. Ranjan (Coll. NZCZSI); Mizoram, Thingsul, 1 ♀, 18-X-2009, leg. R. Joshi (Coll. NZCZSI); Jharkhand, Dalma Wildlife Sanctuary, Pindrabera, 1 ♂, 21-X-2013, leg. Navneet Singh & Party (Coll. NZCZSI); Jharkhand, Dalma Wildlife Sanctuary, Makulakocha, 1 ♂, 2 ♀♀, 18-IX-2019, leg. R. Ranjan (Coll. NZCZSI).

Description adult: Wingspan: male 16 mm; female 20 mm. Head with vertex and frons pale white; antennae ciliated in male, simple in female; labial palpi upturned, broadly scaled, reaching up to vertex of head, third segment long, acuminate. Thorax whitish with some black spots, collar and tegulae pale whitish, later with a basal and a medial black spot. In male, forewing whitish at base, medial area pale yellowish, terminal area orange yellow, basal and subbasal black bands interrupted at middle; a medial band from below cell to inner margin; discocellular with black lunule followed by some large and smaller spots beyond cell; postmedial line straight from costa to vein M_3 then bent outward to a fine obsolete marking with a large spot below it on inner margin; a black speck at apex; a double, jointed black spot at submarginal area on vein M_{2-3}; underside with a fringe of long scales in cell, rising from subcostal nervure. Hindwing whitish with terminal area orange yellow, a basal black spot below cell; a double, postmedial series of a few large, conjoined black spots below cell; a submarginal black spot on the vein M_{2-3}; few specks on marginal area. In female, underside of forewing is without any fringe, the discocellular lunule is curved.

Male genitalia (Figs 8-14): Discussed under the diagnostic characters of the genus.

Female genitalia (Fig. 15): With papillae anales broad; posterior apophyses shorter than anterior apophyses; ductus bursae short, sclerotised; corpus bursae large, elongate, membranous, sclerotised proximally; signa absent.

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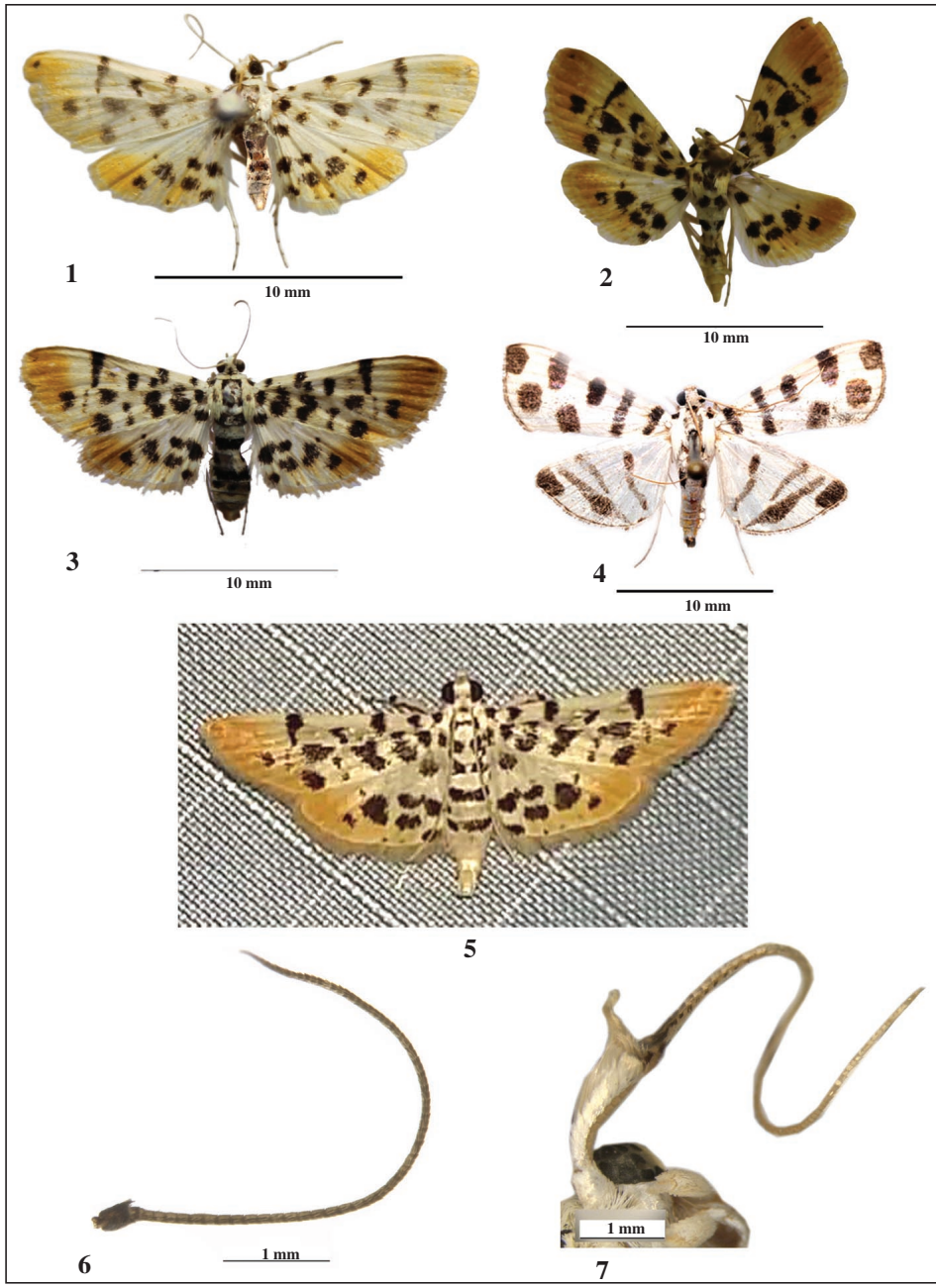
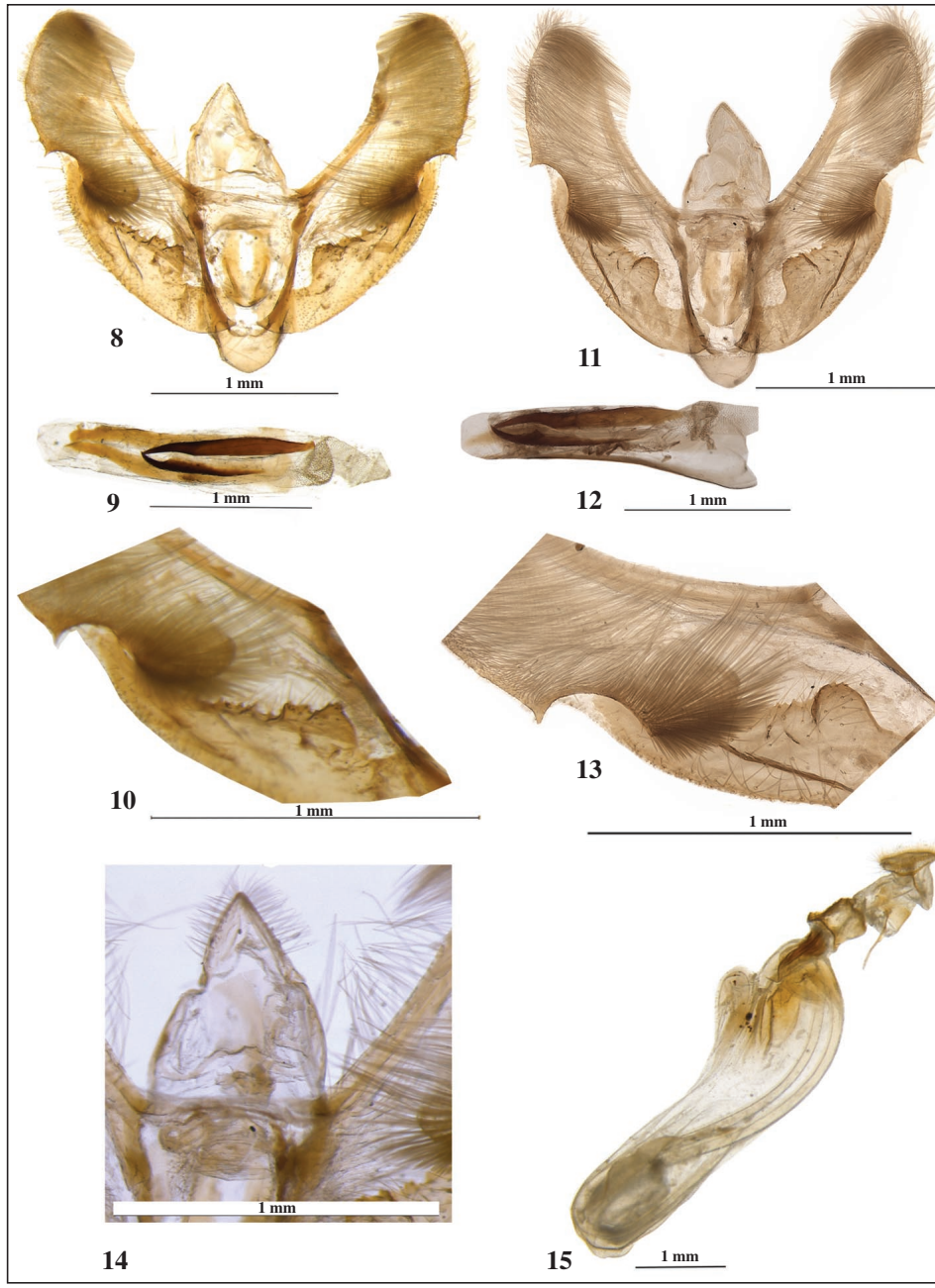


Figures 1-7.– *Suhela alboflavalis*, comb. n. (Figs 1-3, 5-6). **1-2.** Imago male. **3.** Imago female. **5.** Sitting posture. **6.** Antennae male. *Pycnarmon jaguaralis* (Figs 4, 7): **4.** Imago male. **7.** Antennae male.



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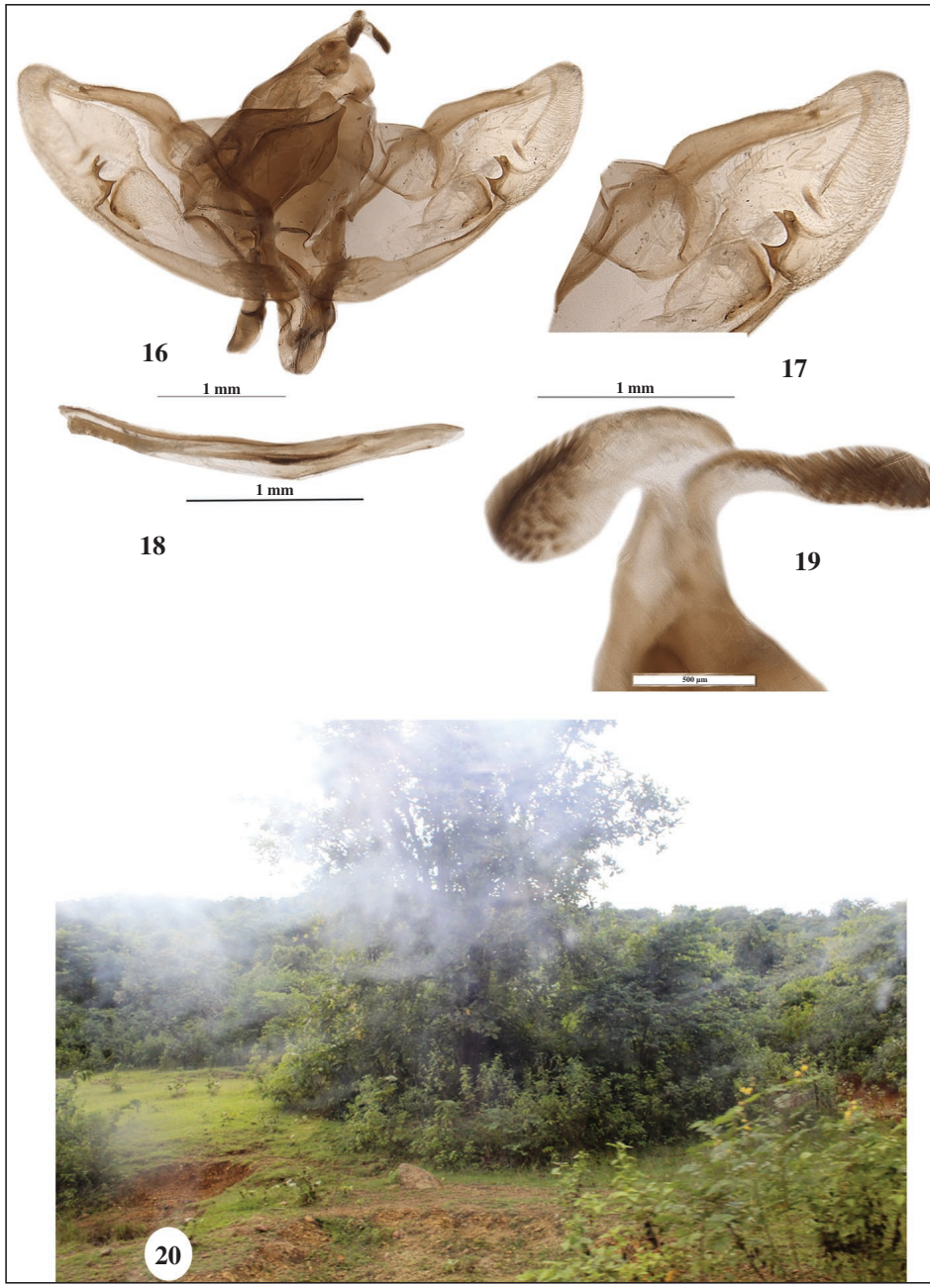

Figures 16-20.– Male genitalia of *P. jaguaralis.* **16.** Genitalia. **17.** Valva. **18.** Phallus. **19.** Uncus. **20.** Habitat of *S. alboflavalis*, comb. n., at DWLS.

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A new species of genus *Patania* Moore, 1888 from India (Lepidoptera: Crambidae, Spilomelinae)

N. Singh, J. Ahmad & K. Chandra

Abstract

In this article, we describe a new species, *Patania shompen* Singh & Ahmad, sp. n. from Great Nicobar Island. The differential diagnosis of the new species is provided with the *Patania iopasalis* (Walker, 1859), *Patania obfuscalis* (Yamanaka, 1998) and *Patania clava* Xu & Du, 2016.
KEY WORDS: Lepidoptera, Crambidae, Spilomelinae, *Patania*, new species, diagnosis, India.

Una nueva especie del género *Patania* Moore, 1888 de la India (Lepidoptera: Crambidae, Spilomelinae)

Resumen

En este artículo, describimos una nueva especie, *Patania shompen* Singh & Ahmad, sp. n. de la Isla Gran Nicobar. Se proporciona la diagnosis diferencial de la nueva especie con *Patania iopasalis* (Walker, 1859), *Patania obfuscalis* (Yamanaka, 1998) y *Patania clava* Xu & Du, 2016.
PALABRAS CLAVE: Lepidoptera, Crambidae, Spilomelinae, *Patania*, nueva especie, diagnosis, India.

Introduction

The genus *Patania* Moore, 1888 was erected for inclusion of two species: *Botys concatenalis* Walker, 1866, as the type species from Darjeeling, India and *Patania semivialis* Moore, 1888. For the long time, *Patania* remained as a sunk generic name (HAMPSON, 1896, 1898; SHIBUYA, 1928, 1929; KLIMA, 1939; BAE *et al*., 2008). However, ROSE & SINGH (1989), KIRTI & GILL (2007) and XU & DU (2016) treated *Patania* as a distinct generic name. Globally, there are about 50 described species of *Patania* (XU & DU, 2016), with 25 species from India (NUSS *et al*., 2003-2021; SINGH *et al.,* in prep). In this paper, we describe a new species from Great Nicobar Island The new species is closely similar to *Patania iopasalis* (Walker, 1859), *Patania obfuscalis* (Yamanaka, 1998) and *Patania clava* Xu & Du, 2016. The differential diagnosis is discussed below.

Material and Method

Collection of adult moths was made by using vertical sheet light trap. The collected specimens were processed as per standard techniques in Lepidopterology. The type specimens and other material studied in this manuscript is deposited in the National Zoological Collections of Zoological Survey of India, Kolkata.

Taxonomic Account

Genus *Patania* Moore, 1888
Patania Moore, 1888. *Lep. Atk.*: 209
Type species: *Botys concatenalis* Walker, 1866, by original designation
Type Locality: Darjeeling, INDIA

***Patania shompen* Singh & Ahmad, sp. n.** (Figs 1-2, 5-7)

Type material: Holotype, ♂. INDIA, Andaman and Nicobar Islands, Great Nicobar Island, SW Road, 12-XI-2018, leg. K. C. Gopi & Party (NZCZSI). Paratype, 1 ♂, INDIA, Andaman and Nicobar Islands, Great Nicobar Island, Laxmi nagar, 11-XI-2018, leg. K. C. Gopi & Party (NZCZSI).

Description: Adult bright ochreous, head with frons and vertex having fuscous spots, labial palpus with basal and subapical brown patches, collar with two fuscous spots, tegula and thorax with fuscous spots. Forewing with basal, subbasal lines present, the latter interrupted below cell; antemedial line inwardly angled below cell; area below cell and between antemedial and subbasal lines suffused with fuscous scales; a medial spot in cell; discocellular annulus filled with fuscous, giving rise to a line reaching inner margin; outwardly slanted postmedial line from costa to vein M3, then slightly bent outward to meet anal angle, minutely dentate; area beyond it and from costa to vein Cu2 fuscous, another fuscous patch below vein Cu1 and between medial and postmedial lines. Hindwing with a spot in cell, a medial broad line from Cu1 to inner margin; a broad postmedial line from costa to vein M3 then outwardly bent to meet anal angle; apical area fuscous, extending in form of a marginal line; abdomen with two dorsal spots on second segment, two similar spots on subterminal segment. Male genitalia with uncus broadly triangular; gnathos clubbed; tegument short and broad; saccus v shaped, slightly compressed laterally; valva broad, tongue shaped, costa almost straight and minutely wavy; fibula small flap like; aedeagus broadening towards apex, a subapical patch of multi-layered spines, apical protrusion small, almost rectangular, vesica with a prominent spine near a large bunch of small spines.

Diagnosis: Externally, *Patania shompen* Singh & Ahmad, sp. n. is closely similar to *P. iopasalis* (Walker, 1859) and *P. clava* Xu & Du, 2016, but is distinct due to the antemedial line of forewing strongly and inwardly angled below cell (it is minutely angled below cell in *P. clava* and almost straight with a small indention below costa in *P. iopasalis*), darkly scaled thorax (paler in *P. clava* and *P. iopasalis*) and labial palpus is having basal and subapical brown patches (whereas only basal patch is present in *P. clava* and only subapical patch in *P. iopasalis*). In male genitalia, *P. shompen*, sp. n. is distinct by the gnathos with clubbed apex, bearing setae (in *P. clava,* gnathos is finger like, slightly widened apically, and in *P. iopasalis* it is sheet like, without apical setae), aedeagus with a small, rectangular protrusion (without any defined head like structure) from apex (in *P. clava* aedeagus apex is having a slant nail head like protrusion with a long base and in *P. iopasalis* aedeagus is having an ovate head like robust protrusion with a short base). Another, closely similar species is *Patania obfuscalis* (Yamanaka, 1998), but *P. shompen*, sp. n. is distinguished by the male genitalia with costa almost straight, gnathos well formed, apical protrusion of aedeagus broader and cornutus is conspicuously longer, whereas in the male genitalia of *P. obfuscalis*, the middle costa is slightly inflated and bearing a cluster of setae, gnathos is vestigial, apical protrusion of aedeagus is narrower and cornutus is conspicuously shorter.

Distribution: So far, the species is only reported from Great Nicobar Island.

Etymology: The Shompen are the indigenous nation of the Great Nicobar Island.

Patania obfuscalis (Yamanaka, 1998) (Figs 3-4, 8-9)
Pleuroptya obfuscalis Yamanaka, 1998. *Tinea*, **15** (suppl. I): 106, figs 897, 900, pl. 142, fig. 30
Type locality: Bagmati, Mt. Phulchouki, [NEPAL]

Material examined: INDIA, Mizoram, Lunglei, Hrangchalkawn, 03-X-2013, 1 ♂, leg. Harsimran Singh (NZCZSI), Sikkim, North Sikkim, Mangan, 24-IV-2014, 1 ♂, leg. Harsimran Singh (NZCZSI).

Diagnosis: *Patania obfuscalis* is another member of a closely similar group of species, *P. iopasalis*, *P. clava*, and *P. shompen*, sp. n. Externally, *P. obfuscalis* can be distinguished from *P. iopasalis, P. clava*, and *P. shompen*, sp. n. by the shorter labial palpi. In male genitalia, *P. obfuscalis* is distinct from all the three closely similar species by the middle of costa slightly inflated and bearing a cluster of setae.

Remark: The images of adults and male genitalia (except the vesica spines) of Indian material exactly match with the description and illustrations of types (YAMANAKA, 1998: 106, fig. 897, pl. 142: 30) and the description by XU & DU (2016: 134). We assume that images of vesica given by YAMANAKA (1998: fig. 897) are due to some technical error. If not so, then our *P. obfuscalis* is probably a new one. But till the physical verification of the type material, we are considering the Indian species as *P. obfuscalis*.

Distribution: Nepal and some areas of China, excluding Hainan Island (XU & DU, 2016), North East India (Sikkim, Mizoram).

Acknowledgements

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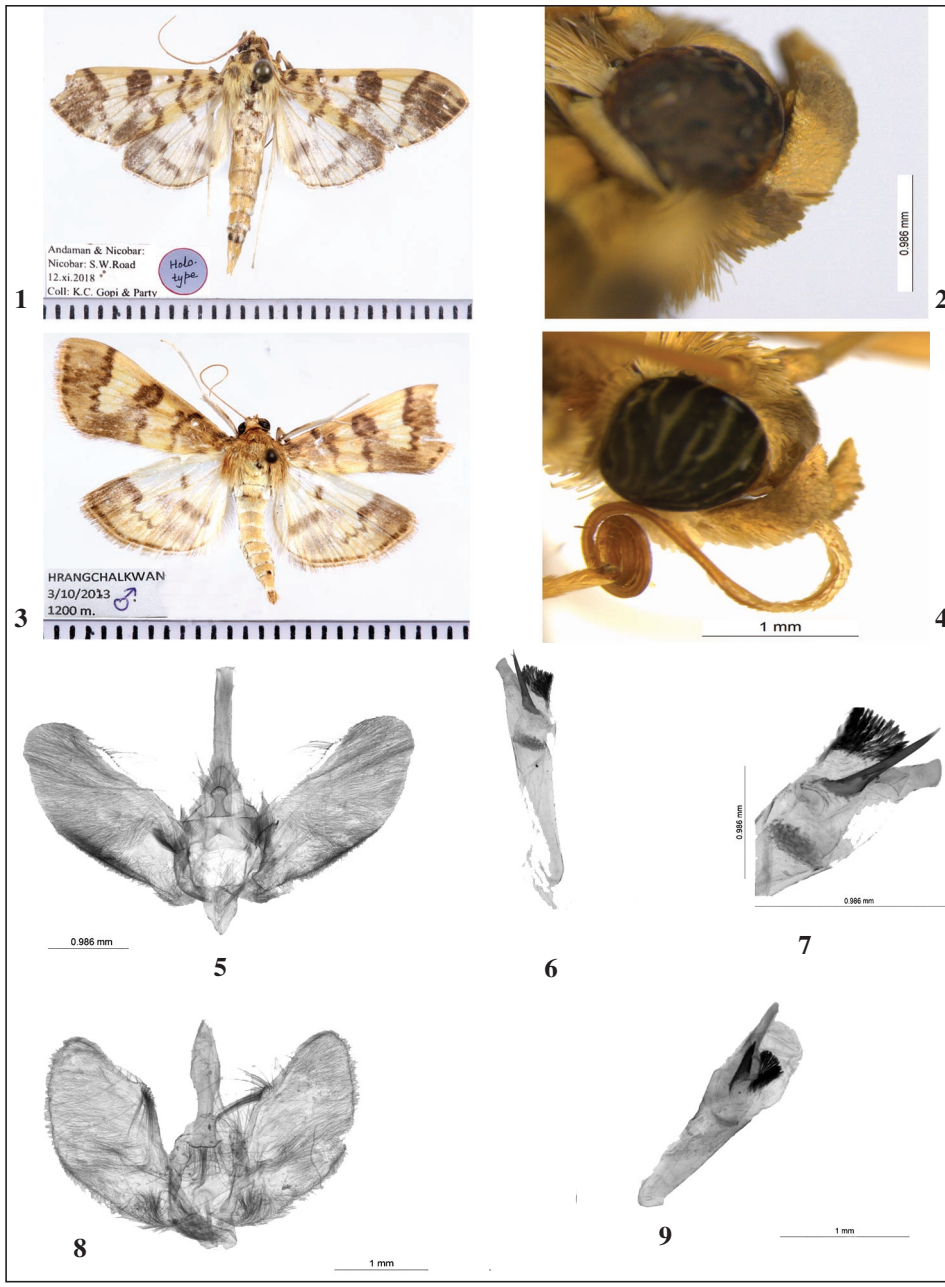

Figures 1-9.– 1-2. *P. shompen* Singh & Ahmad, sp. n., holotype, ♂. **1.** Adult. **2.** Labial palpus. **3-4.** *P. obfuscalis* (Yamanaka). **3.** Adult. **4.** Labial palpus. **5-7.** Male genitalia. *P. shompen* Singh & Ahmad, sp. n., holotype. **8-9.** Male genitalia. *P. obfuscalis* (Yamanaka).

REVISIÓN DE PUBLICACIONES
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L. Rákosy & M. Goia
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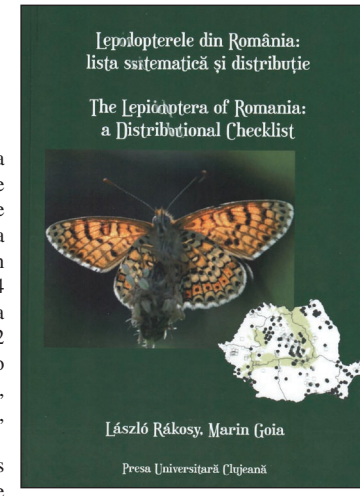

Tenemos en nuestras manos un nuevo volumen dedicado a la Lista detallada de las especies presentes en un país europeo, en este caso de Rumanía de la mano de nuestro estimado colega y Socio de Honor de SHILAP el Prof. Dr. László Rákosy. Esta sería la segunda edición, ya que la primera se publicó en 2003, pero se ha realizado una crítica en profundidad de los resultados de la primera, aumentando la fauna en 184 nuevas especie y eliminando, de la misma, 78 especies, llegando a la conclusión de que en Rumanía tendríamos, en la actualidad, 4.072 especies registradas, excluyéndose las especies, no aclimatadas, como *Bombyx mori* Linnaeus, 1758, *Antheraea perny* (Guérin-Méneville, 1855), *A. yamamai* (Guérin-Méneville, 1861), *Samia cynthia* (Drury, 1773) o *Pachypasa otus* (Drury, 1773).

Como ya va ocurriendo en las fauna de otros países, estos trabajos son excelentes, ya que nos permite conocer, poco a poco, que especies de Lepidoptera se encuentran en los diferentes países europeos, como ya tenemos las faunas de Alemania, Andorra, Austria, Bélgica, Eslovaquia, España, Francia, Italia, Polonia, Portugal, República Checa, etc.

Al presentar los resultados de la fauna, establecen las ocho provincias históricas de Rumanía a saber; Banat, Crişana, Dobrogea, Moldova, Maramueş y Satu Mare, Muntenia, Oltenia y Transilvania.

Entrando en el fondo de la obra tenemos en las página 9 y 10, una lista de las familias consideradas y el número de total especies encontradas en cada provincia, continuando con la Lista de todas las especie detalladas indicando con círculos y circunferencias donde se han encontrado cada una de ellas y de gran importancia son los comentarios que podemos leer entre las páginas 171 y 290, finalizando la obra con 15 planchas a todo color de diferentes especies en vivo, una bibliografía detallada y un índice.

El libro está escrito en inglés y rumano, lo que facilita su lectura, no pudiendo terminar estas líneas, sin felicitar a los autores por un trabajo bien realizado, así como a la Editorial que, nos consta, ha facilitado a los autores la edición de este libro, por lo que recomendamos su adquisición y no pudiendo faltar en cualquier biblioteca que se precie. El precio de este libro es de 33 euros y los interesados deben dirigirse a:

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A contribution to the Oiketicinae fauna of Mexico with the description of *Naevipenna mexicana* Sobczyk, sp. n. (Lepidoptera: Psychidae)

T. Sobczyk

Abstract

Four species of Psychidae are reported from Mexico. While *Astala confederata* (Grote & Robinson, 1894) and *Cryptothelea symmicta* (Dyar, 1914) was already known, *Lumacra hyalinacra* Davis, 1964 was recorded for the first time in Mexico. For the first time, the larval cases of *Cryptothelea symmicta* (Dyar, 1914) and *Lumacra hyalinacra* Davis, 1964 are described and depicted. *Naevipenna mexicana* Sobczyk, sp. n. is described from the state of Chiapas and compared with the two already known species of the genus.
KEY WORDS: Lepidoptera, Psychidae, *Naevipenna*, new species, Mexico.

Una contribución a la fauna de Oiketicinae de México con descripción de *Naevipenna mexicana* Sobczyk, sp. n. (Lepidoptera: Psychidae)

Resumen

Se mencionan cuatro especie de Psychidae de México. Mientras que *Astala confederata* (Grote & Robinson, 1894) y *Cryptothelea symmicta* (Dyar, 1914) ya eran conocidas, *Lumacra hyalinacra* Davis, 1964 se registra por primera vez para México. Se describen y representan, por primera vez, los estuches larvarios de *Cryptothelea symmicta* (Dyar, 1914) y *Lumacra hyalinacra* Davis, 1964. Se describe *Naevipenna mexicana* Sobczyk, sp. n., del Estado de Chiapas y se compara con las dos especies conocidas del género.
PALABRAS CLAVE: Lepidoptera, Psychidae, *Naevipenna*, especie nueva, México.

Introduction

Only 14 species of Psychidae have been reported from Mexico (HEPPNER, 1984; SOBCZYK, 2011). DAVIS (1964) last dealt extensively with the Psychidae in the context of the treatment of the Nearctic fauna. Since then, no new species have been described from Mexico, and even faunistic treatises are rare. The author received individual Psychidae specimens for examination through friends and colleagues. The results are presented below.

Material and methods

The Genitalia slides were made for all species (mostly only one specimen). The genitalia slides were made according to standard procedures. After examination the genitalia and antennae were mounted separately on a microscope slide and were embedded in Euparal. Photograph of specimen were taken with a Canon EOS 600D and objective Canon MP-E 65 mm f/2.8 1-5x Macro.

The terminology of morphological characters follows SAUTER (1956) and SAUTER & HÄTTENSCHWILER (1999).

Label data of type specimens are quoted verbatim. The month of capture of the adults is given in roman numerals.

Interocular index: vertical eye diameter divided by interocular distance measured just above the level on the tentorial pits.

Forewing index: forewing length divided by the forewing width (perpendicular to the measurement length).

Epiphyse index: distance between the epiphysis and the end of the tibia through the length of the tibia (after DIERL, 1964).

Abbreviations

CTS - Collection Thomas Sobczyk (Germany)
DC - discal cell; r - radial vein; m - media vein; A - anal vein; sc - subcosta; cu - cubital vein
e. l. - ex larvae
GU - genital preparation
UNAM (CNIN) - National Insect Collection of the National Autonomous University of Mexico City, Mexico

Results

Astala confederata (Grote & Robinson, 1868) (Figs 1-2)
Psyche confederata Grote & Robinson, 1868. *Trans. Am. ent. Soc.*, **2**: 191, pl. 3, figs 66-67
Type locality: Belfrage, Texas, USA

Material: 1 ♂ (Fig. 1), Mexico, Veracruz, Papantla, 165 m, 19-V-2010, e. l. 06-VI-2010, leg. Riefenstahl (UNAM (CNIN)).

Genital GU-142-2019 Sobczyk (Fig. 2): See DAVIS (1964). Total length 1.1 mm, 0.6 mm wide. Sacculus with 5-6 spines. Phallus slightly curved. Eighth sternite furcations slender, distally divergent.

Discussion: A wingspan of 16-20 mm is given for *A. confederata* (Davis, 1964). The present specimen is still somewhat smaller (15.5 mm wingspan). *A. confederata* is the most densely scaled species of the genus. The other species have hyaline or translucent wings or completely lightened wing fields. The number of antennal segments (22-24) cited by DAVIS (1964) is clearly exceeded by the specimen mentioned here with 28 segments. The species was known for Mexico from Nayarit (description by *Pachythelia lepidopteris* Dyar, 1926 a synonym for *A. confederata*).

Cryptothelea symmicta (Dyar, 1914) (Figs 3-5)
Platoeceticus symmicta Dyar, 1914. *Proc. U. S. natn. Mus.*, **47**: 254
Type locality: Canal Zoe, Ancon, PANAMA

Material: 2 ♂♂ (Fig. 3), Mexico, Veracruz, Papantla, 165 m, 19-V-2010, e. l. 06-VIII-2010, leg. Riefenstahl (UNAM (CNIN), CTS).

Wingspan: 13.5 mm, respectively 13.0 mm.

Genital GU-143-2019 Sobczyk (Fig. 4): See DAVIS (1964). Total length 1.5 mm, 0.4 mm wide. Sacculus with 3-4 spines. Phallus 1.2 mm, thinly and slightly curved. Eight sternite narrow, furcation elongate diverging distally.

Larval case: Male 11.5 x 4.5 mm respectively 12.5 x 5.0 mm (Fig. 5), very densely covered with slightly protruding small leaf fragments.

Discussion: The genus *Cryptothelea* Duncan, 1841 comprises eight species, of which *C. gloverii* (Packard, 1869), *C. congregatus* (Jones, 1945) and *C. symmicta* are known from Mexico. While the other two species have a wingspan of over 14 mm, in *C. symmicta* it is only 8-14 mm (original

description 12 mm). The structure of the larval cases is similar to that of the other two species, but they are also significantly smaller (11.5-12.5 mm in length compared to 15.0-23.0 mm in *C. gloverii* and 15.0-20.0 mm in *C. congregata* Dyar, 1914, see DAVIS, 1964), no indications of the shape of the larval cases could be found and it is possible that this is the first time they are described and illustrated.

Lumacra hyalinacra Davis, 1964 (Figs 6-9)
Lumacra hyalinacra Davis, 1964. *Bull. U. S. natn. Mus.,* **244**: 69, figs 17, 207, 260, 332
Type locality: Juayua, EL SALVADOR

Material: 1 ♂, Mexico, Chiapas, Palenque, N 17º29'0" / W 92º3'0", 05-25-II-2019, e. l. 05-VII-2019, leg. W.-H. Liebig (UNAM (CNIN)).

Additional description: Medium-sized moths with sparsely scaled wings (Figs 6, 7). Wingspan 19 mm, body length 7.7 mm, forewing length 9.5 mm, forewing index 1.9, antennae length 4.0 mm.

Head: Antennae 26 segments black brown, densely scaled. Comb teeth bipectinate, densely scaled, long ciliate ventrally. Reaching the greatest length on the third and fourth antennae (eight times the antennae length), decreasing evenly in length towards the apex. Scapus thickened, pedicellus disc-shaped. Head thickly covered with long hair-shaped, whitish-grey scales, these somewhat darker around the eyes. Eyes small, blackish grey, interocular index 1.5. Labial palps reduced to a fused segment. Tentorial pits and tentorium clearly pronounced.

Thorax: Tibia of all legs with remarkably long grey hairs. Anterior tibia with a long, narrow epiphysis (index 0.9). Mid and hind legs without tibial spurs. Tarsi with sparsely black-grey scales. Thorax with long black hair. Wings elongated, with rounded apex, ten veins from DC, r3 + r4 stalked one third, m2 + m3 short stalked. DC with divided media stem. No branches from A1 + A2 to the inner edge. Hind wing with five veins from the DC, m1 absent, m2 + m3 short-stalked, media stem not bifurcated, sc and rr almost parallel, in 2/3 DC with a bridge.

The outer third of the wing hyaline, covered only with individual, short, curved scales. Basal part with broad, distally rounded scales, some scales also with notches. Occasionally there are narrow, elongated whitish scales between the dark scales. Fringes very broad, distally rounded, multi-pointed. Hind wing scales narrower than fore wing scales. Scale shape rather lanceolate. Fringes, broadly spatulate, multi-pointed.

Abdomen: Dorsally and ventrally covered with black-grey, hair-like scales.

Genital GU-146-2019 Sobczyk (Fig. 8): Total length 1.75 mm. When closed, valva not protrude beyond the rear edge of the tegumen. Tegumen rounded, slightly indented medianally. Sparsely covered with fine short setae. Vinculum elongated, broad, heavily sclerotized median, ending in distally notched short saccus. Valve elongated, distally rounded. The short, curved saccule has 6-8 small thorn cones distally. The slightly curved phallus about length of genital (1.35 mm, largest diameter 0.27 mm).

Larval case: 19 mm long, made of whitish silk, about 3.5 mm in diameter in the front third, decreasing in diameter to the distal end (Fig. 9). The larval case is very stable and can hardly be pressed in.

Discussion: *Lumacra hyalinacra* is hereby reported for the first time from Mexico and the previously unknown larval case is shown and described.

Naevipenna mexicana **Sobczyk, sp. n.** (figs 10-13)

Type material: Holotype 1 ♂, Mexico, Chiapas, Palenque, N17º29'0" / W92º3'0", 05-25-II-2019, e. l. 04-VII-2019, leg. W.-H. Liebig, deposited in UNAM (CNIN).
Paratype (Fig. 11). 1 ♂, same data, but e. l. 12-VII-2019 and 12 larval cases, partially with exuviae (CTS).

Description: (n=4): Medium-sized moth with evenly densely scaled wings. Wingspan 14.0 mm, body length 6.0 mm, forewing length 7.0 mm, forewing index 1.75, antennae length 2.5 mm. Head thickly covered with long hair-like, black-brown scales. Eyes small, blackish grey, eye index 1.3. Labial palps reduced to a fused segment. Tentorial pits and tentorium clearly pronounced. Antennae

black brown, densely scaled, with 21 segments. Pecten bipectinate, densely scaled, long ciliate ventrally. Reaching the greatest length on the third and fourth segments of the antennae (four times the length of the antennae segment), decreasing evenly in length towards the apex. Scapus thickened, pedicellus disc-shaped. Tibia of all legs remarkably long, with black-brown hair-like scales. Anterior tibia with a long, narrow epiphysis (index 0.9). Middle and hind legs with tiny spurs distally on the tibia. Tarsi with distinct yellowish-brown scales. Thorax long haired black brown. Wings elongated, with rounded apex, ten veins from DC, r3 + r4 stalked one third, m2 + m3 short stalked. DC with simple media stem. Without branches from A1 + A2 to the inner edge. Hind wings with five veins from the DZ, m1 absent, media stem simple, not bifurcated, sc and rr in the basal third with a bridge. Scales broadly lanceolate, pointed distally. Fringes very broad, distally rounded, multi-pointed. Hind wing scales narrower than fore wing scales. Scale shape rather lanceolate. Fringes, broadly spatulate, multi-pointed. Abdomen dorsally and ventrally covered with black-grey, hair-like scales.

Male genital GU-147-2019 Sobczyk (Fig. 12): Total length 1.75 mm, 0.6 mm wide. When closed, the valves reach approximately the rear edge of the tegumen. Rounded tegumen, set with individual fine short setae. Vinculum elongated, wide, laterally heavily sclerotized, saccus basal wide and ends in a needle-shaped process that makes up more than a third of the genital length. Valva elongated, distally rounded. The broad, curved sacculus distally occupied with 10-12 small thorn cones. The slightly curved phallus significantly shorter than the length of the genital (0.95 mm, largest diameter 0.2 mm). Eight sternite broader than long, with a broad, heavy base.

Larval case male (Fig. 13): 15-17 mm long, in the front third about 2.5-3.0 mm in diameter, females: 21-24 mm long, in the front third about 4-5 mm in diameter narrowing distally. Larval case dense spun silk covered with lichen particles and very occasional fragments of bark or other plant materials mixed together, dyed black-grey.

Females: Not examined. Only two larval cases with exuvia could be included in the study.

Biology: The male is probably nocturnal (eye index).

Diagnosis: The genus *Naevipenna* Davis, 1964 previously comprised only two species: *Naevipenna apaidropha* (Dyar, 1914) and *Naevipenna crutwellae* Davis, 1975. For *N. aphaidropa* the distribution is given as: “Known from the Panamanian Arc, south to the Guiana Coastal Plain of French Guiana and the Brazilian Highland of Southern Brazil” (DAVIS, 1964). The wingspan is 17-20 mm and the forewing scales are of two types: thinly scattered, hair-like scales and denser, broadly lanceolate scales with blunt, rounded tips. Both scale types mix evenly over both wings (DAVIS, 1964). The main distinguishing feature of *A. aphaidropa* is a distinctive sclerotized spot on the anterior margin of the forewings, which is absent in *N. cruttwellae*. This species is significantly smaller (wingspan 12.5-13 mm) and the fore wing scales are uniformly broadly lanceolate, distally pointed to rounded. The species is reported from Panama and Trinidad (DAVIS, 1975). The male-genital is very narrow and elongated (four times as long as it is wide), the vinculum only gradually becomes narrower and merges into a long but relatively wide sacculus. In *N. mexicana*, the genital is more compact (only three times as long as it is wide) and the sacculus is angular at the base and then needle-shaped. The eight sternite is broader than long (*N. cruttwellae* longer than broad).

The larval cases of both species have the following dimensions: *N. aphaidropa* (males 15-19 mm x 3-4 mm, females: 19-24 mm x 5-6 mm) and *N. cruttwellae* (males 12-15 mm x 2-2, 5 mm, females: 12-16 mm x 2-3 mm).

With a wingspan of 14-15 mm, the values of *N. mexicana* Sobczyk, sp. n. between these two species. The sclerotized spot on the front edge of the forewings typical *of N. aphaidropa* is missing and the scales of the wings are more similar to *N. cruttwellae*. The genital of *N. cruttwellae*, on the other hand, is significantly narrower (four times as long as it is wide), whereas the saccus is significantly wider.

The pupae of this genus differ in the dorsal chaetotaxia of the abdomen in both sexes. *N. mexicana* Sobczyk, sp. n. has significantly more thorns than the other two species. In the males of *N. cruttwellae* and *N. mexicana* Sobczyk, sp. n. the dorsal posterior row of spines in the seventh segment is missing (or is exceptionally reduced to a maximum of 6 spines in *N. mexicana* Sobczyk, sp. n.),

which is present in *N. aphaidropa*. On the 8th segment there are 7-10 spines in *N. aphaidropa*, 5-8 in *N. cruttwellae* and 11-16 in *N. mexicana* Sobczyk, sp. n.

Table 1.– *Naevipenna* male pupa, dorsal abdominal spines (anterior / posterior).

Segment	***Naevipenna aphaidropa* Davis, 1914 (DAVIS, 1975)**	***Naevipenna crutwellae* Davis, 1975 (DAVIS, 1975)**	***Naevipenna mexicana* Sobczyk, sp. n. n=5**
I	0 / 0	0 / 0	0 / 0
II	0 / 0	0 / 0	0 / 0
III	12-16 / 26-34	10-13 / 23-27	6-10 / 46-55
IV	11-16 / 27-33	15-20 / 23-28	26-30 / 50-56
V	11-14 / 24-29	14-18 / 22-30	23-28 / 50-54
VI	14-17 / 20-25	12-15 / 21-23	18-21 / 30-52
VII	8-11 / 8-12	9-12 / 0	17-21 / 0-6
VIII	7-10 / 0	5-8 / 0	11-16 / 0

Table 2.– *Naevipenna* species, female pupa, dorsal abdominal spines (anterior / posterior).

Segment	***Naevipenna aphaidropa* Davis, 1914 (DAVIS, 1975)**	***Naevipenna crutwellae* Davis, 1975 (DAVIS, 1975)**	***Naevipenna mexicana* Sobczyk, sp. n. n=2**
I	0 / 0	0 / 0	0 / 0
II	0 / 0	0 / 0	0 / 0
III	23-28 / 32-37	0-5 / 30-38	0-11 / 32-40
IV	22-28 / 30-35	12-21 / 27-42	8-22 / 37-51
V	20-28 / 26-29	12-16 / 25-38	8-22 / 39-48
VI	18-21 / 17-24	13-21 / 28-33	10-20 / 10-14
VII	15-17 / 0	9-17 / 0	10-18 / 0
VIII	2-5 / 0	0 / 0	7-8 / 0

Distribution: Currently *N. mexicana* Sobczyk, sp. n. is only known from the type locality. Its occurrence is also expected in other parts of the Yucatan Peninsula in Mexico. This small species that fly during the night can easily be overlooked.

Etymology: The species is named after Mexico, the country where the specimens were collected.

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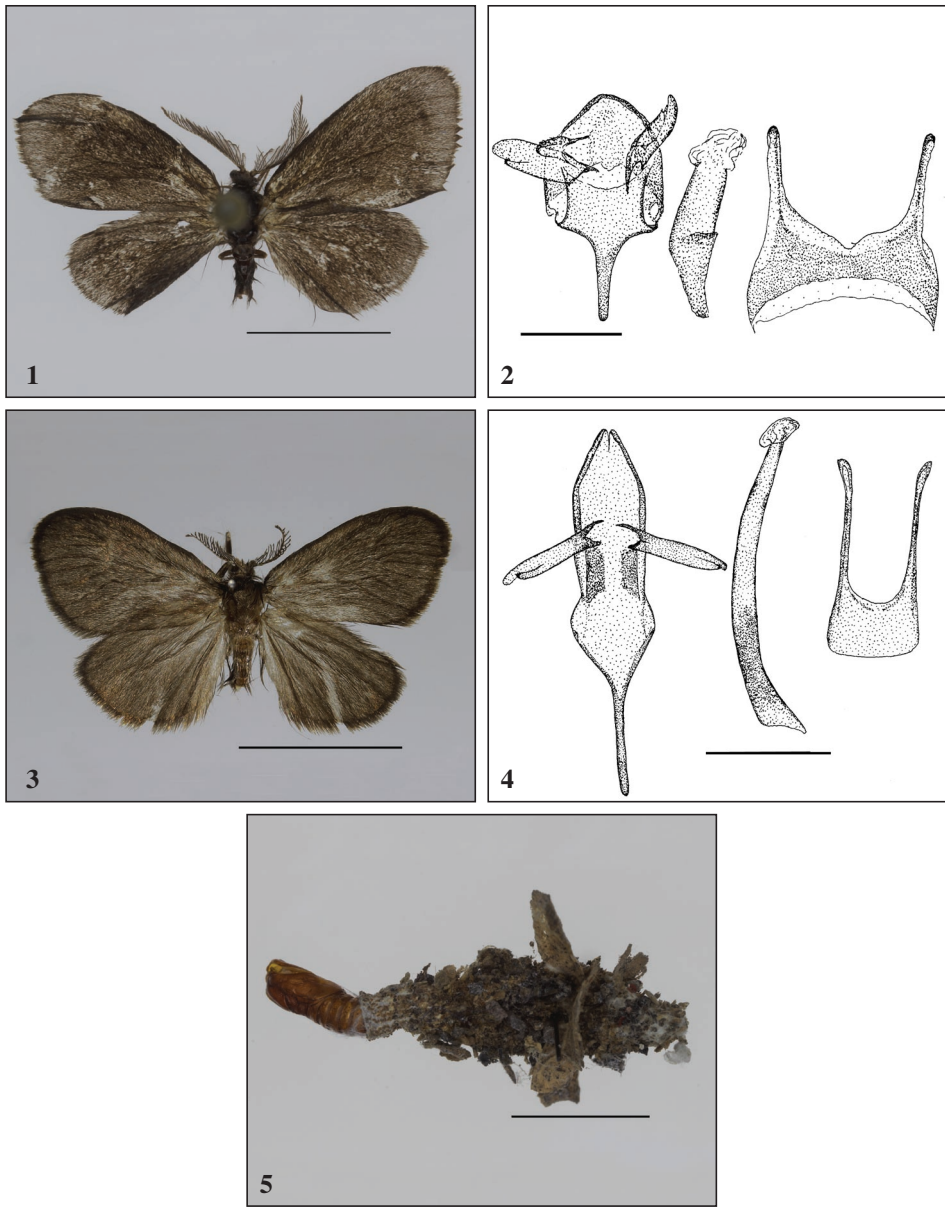
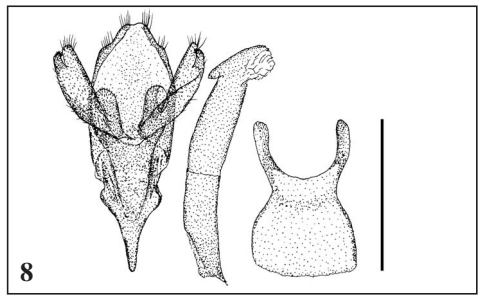
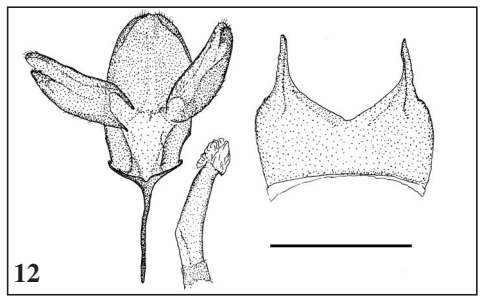


Figures 1-5.– 1-2. *Astala confederata* (Grote & Robinson, 1894), ♂, Mexico, Veracruz, Papantla, 165 m, 19-V-05-2010, e. l. 06-VI-2010, leg. Riefenstahl. **1.** Imago, scale bar 5.0 mm. **2.** Genital (GU-145-2019 Sobczyk), genital, phallus, VIII sternum, scale bar 0.5 mm. **3-5.** *Cryptothelea symmicta* (Grote & Robinson, 1894), ♂, Mexico, Veracruz, Papantla, 165 m, 19-V-2010, e. l. 06-VIII-2010, leg. Riefenstahl. **3.** Imago, scale bar 5.0 mm. **4.** Genital (GU-145-2019 Sobczyk), genital, phallus, VIII sternum, scale bar 0.5 mm. **5.** Larval case, scale bar 5.0 mm.





Figures 6-13.– 6-9. *Lumacra hyalinacra* Davis, 1964, ♂, Mexico, Chiapas, Palenque, 17º29'0" N 92º3'0" W, 05-25-II-2019, e. l. 05-VII-2019, leg. W.-H. Liebig. **6.** Imago, scale bar 5.0 mm. **7.** Live Imago. **8.** Genital (GU-146-2019 Sobczyk), genital, phallus, VIII sternum, scale bar 1.0 mm. **9.** Larval case, scale bar 5.0 mm. **10-13.** *Naevipenna mexicana* Sobczyk, sp. n., ♂, Mexico, Chiapas, Palenque, 17º29'0" N 92º3'0" W, 05-25-II-2019, e. l. 04-VII-2019, leg. W.-H. Liebig. **10.** Holotype (UMAN), scale bar 5.0 mm. **11.** Live holotype. **12.** Genital (GU-147-2019 Sobczyk), genital, phallus, VIII sternum, scale bar 1.0 mm. **13.** Larval case, scale bar 5.0 mm.

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New record of the genus *Erannis* Hübner, [1825] from India (Lepidoptera: Geometridae, Ennominae)

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Abstract

The genus *Erannis* Hübner, [1825] is typically known to be distributed in the Holarctic region. The present paper represents the first record of *Erannis kashmirensis* László, 2003 from India. The species was described from Pakistan and it was previously known exclusively from its type series collected in the NW Himalayas. A brief diagnosis of the habitus, genitalia and photographic illustrations of the species were provided for the validation of the record from India.
KEY WORDS: Lepidoptera, Geometridae, Ennominae, *Erannis*, India.

Nuevo registro del género *Erannis* Hübner, [1825] para India (Lepidoptera: Geometridae, Ennominae)

Resumen

El género *Erannis* Hübner, [1825] es típicamente conocido por su distribución Holártica. El presente trabajo representa el primer registro de *Erannis kashmirensis* László, 2003 para India. La especie fue descrita de Pakistán y fue previamente conocida exclusivamente de su serie tipo colectada en el NO del Himalaya. Se proporciona una breve diagnóstico sobre su morfología, genitalia e ilustración fotográfica de la especie para la validación del registro para India.
PALABRAS CLAVE: Lepidoptera, Geometridae, Ennominae, *Erannis*, India.

Introduction

The Geometridae is the second largest family of moths with 23,002 (VAN NIEUKERKEN *et al*., 2011) species described and distributed all over the world except the Antarctica. The genus *Erannis* Hübner, [1825] belongs to the Boarmiini tribe of the subfamily Ennominae (JIANG *et al*., 2017). A total of 17 species and subspecies belong to this particular genus are known to be distributed mainly in the Holarctic region (RINDGE, 1975; PARSONS *et al*., 1999; LÁSZLÓ, 2003; MÜLLER *et al*., 2019). *Erannis kashmirensis* László, 2003 has been so far documented and described by LÁSZLÓ (2003) from the north-western Himalayan region of Pakistan. Only the males of species belonging to the genus *Erannis* have functional wings and can fly towards light traps. The females are known to bear non-functional "short wing-stumps" (MÜLLER *et al*., 2019) and therefore can't fly, are still unknown for *E. kashmirensis.* The present paper documents the first distributional record of the genus *Erannis* Hübner, [1825] from India.

Material and methods

The specimen was collected during preliminary survey conducted in Lahaul and Spiti district in the month of November 2020. Traditional light trap method with vertical white sheet and 160 watt of Mercury vapour lamp were used to trap the moths. The specimen was collected using glass killing jars charged with ethyl acetate vapours as a killing agent. Specimen preparation was done using standard methods of rehydration, pinning and labelling defined for order Lepidoptera.

Dissection methods of ROBINSON (1976) was used to study the external characteristics of genitalia. The abdomen was firstly detached and kept overnight in 10% KOH for softening the tissues. In the next morning, it was dissected in 20% ethyl alcohol. Microscopic photography was done by a MICAPS MicroView 3.7 digital camera and software by using stereomicroscope.

Results

The reported specimen was collected from Jahalman watershed of Udaipur subdivision near to Jahalman forest rest house at an elevation of 2941m above mean sea level (Figure 1). The local vegetation (Figure 2) around sampling location includes, *Salix fragilis* L. as a major tree species followed by *Populus nigra* L. and stunted form of *Juniperus macropoda* Boiss. Among the shrubs, *Hippophae rhamnoides* (L.) A. Nelson and *Rosa webbiana* Wall. ex Royle were the two major species (RAWAT *et al*., 2010). A small apple (*Pyrus malus* L.) orchard was also part of the local habitat around the light trapping site.

Taxonomic account

Erannis Hübner, [1825]

Erannis Hübner, [1825] 1816. *Verz. Schmett*.: 320

Type species: *Phalaena defoliaria* Clerck, 1759. *Icon. Ins*.: pl. 7, fig. 4, by subsequent designation of HULST (1896a: 363).

An up-to-date characterisation of the genus *Erannis* was provided by MÜLLER *et al*. (2019).

Distribution: Holarctic (RINDGE, 1975; PARSONS *et al*., 1999; MÜLLER *et al*., 2019).

Erannis kashmirensis László, 2003

Erannis kashmirensis László, 2003. *Acta zool. hung.*, **49**(2): 153-158

Material examined: 1 ♂, India, Jahalman Forest rest House, Lahaul and Spiti District, Himachal Pradesh, 32.637283 N, 76.866831 E, 2941 mamsl, 12-XI-2020, coll. Shabnam Kumari, Preserved in Wildlife Institute of India.

Diagnosis: The males of *E. kashmirensis* resembles superficially *E. potopolskii* Viidalepp, 1988 with no striking differences in external male genitalia features (LÁSZLÓ, 2003). However, *E. kashmirensis* can be easily distinguished based on the following characters: Adult males (Figure 3): Length of forewings is almost 25 mm (wingspan 39-45mm and forewing length 21-27 in original description), comparatively paler and with less dense brownish-irroration, longer straight section of postmedial line. Hindwings pale and without the traces of transverse lines.

Male genitalia (Figs 4-5): Ribbon-like gnathos with apically rounded and triangular medial plate, large, well sclerotised shield-shaped juxta with comparatively narrower and rounded dorsal lobe.

The female and early life-history stages of the species are unknown and have not been documented in the current study.

Distribution: Pakistan (LÁSZLÓ, 2003), China (GBIF, unpublished and unconfirmed record),

India (Himachal Pradesh) **new record**.

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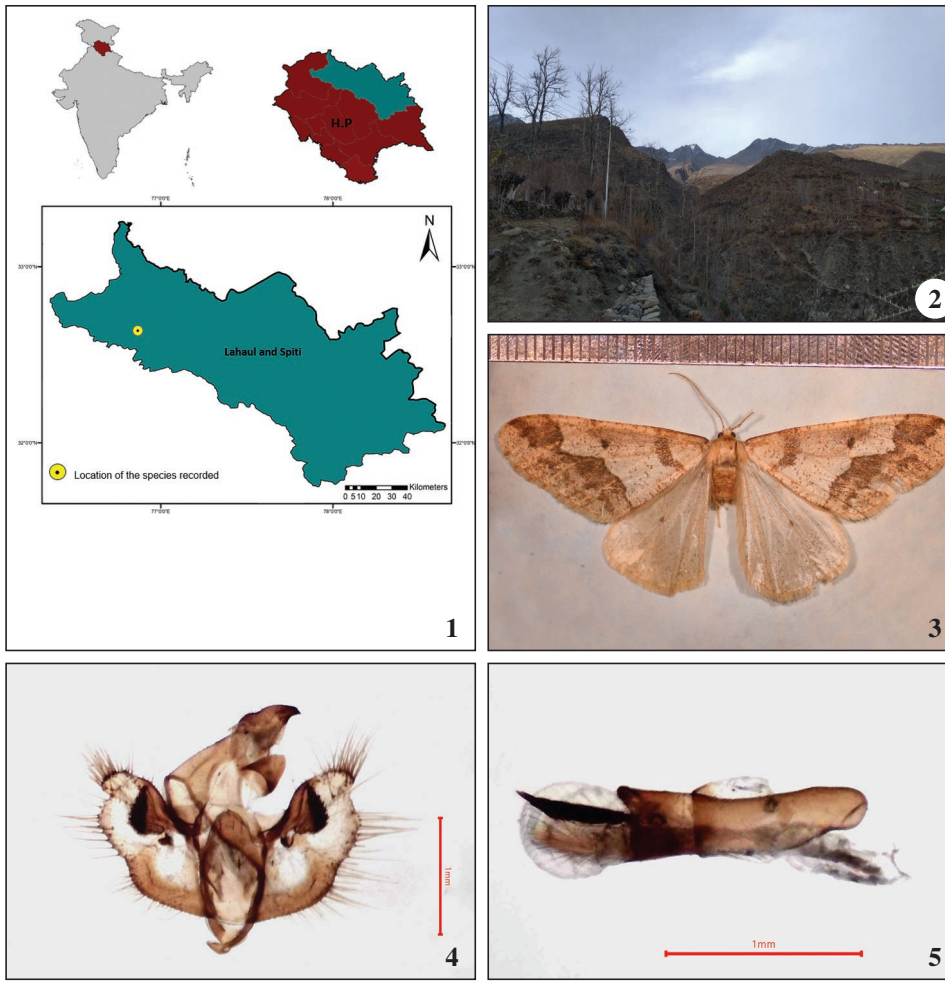

Figures 1-5.– 1. Geographical location of the specimen recorded (Jahalman), Lahaul and Spiti, Himachal Pradesh. **2.** Landscape of the study area. **3.** Male specimen of *E. kashmirensis* collected in Jahalman. **4.** Male genitalia, aedeagus removed. **5.** Male genitalia, aedeagus.

REVISIÓN DE PUBLICACIONES
BOOK REVIEWS

L. Rákosy
Lista Roşie a fluturilor din Romăniaterele din România
187 páginas
Formato: 24 x 17 cm
Presa Universitară Clujeană, Cluj-Napoca, 2021
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Tenemos en nuestras manos una nueva Lista Roja de los Lepidoptera presentes en Rumanía de la mano de nuestro estimado colega y Socio de Honor de SHILAP el Prof. Dr. László Rákosy.

La idea de este proyecto comenzó en 1966 cuando la UICN publicó el primer Libro Rojo de los mamíferos, de ahí que varios países comenzaron a elaborar este tipo de Listas, entre ellos España en 1976 (de la mano de nuestro apreciado amigo el Dr. Gómez Bustillo), seguidos por Alemania (1977) y Reino Unido (1987), posteriormente apareció el primer Libro Rojo de los Lepidoptera en Europa de la mano de Van Swaay & Warren (1999).

Para elaborar este libro se ha basado en el anterior publicado por Rakósy & Goia (2021) presentando los resultados de la fauna, sobre la base de ocho provincias históricas de Rumanía a saber; Banat, Crişana, Dobrogea, Moldova, Maramueş y Satu Mare, Muntenia, Oltenia y Transilvania.

Los resultados de este estudio resultan que de las 1.567 especies y subespecies de Lepidoptera a nivel nacional estudiadas, se detectan 15 que están extintas, 29 en peligro de extinción, 66 vulnerables, 270 están casi en peligro, 988 tiene un impacto mínimo, 178 tiene información deficiente y de 12 no hay información necesaria.

Entrando en el fondo de la obra tenemos entre las página 11 y 64, podemos ver una lista de las especies consideradas y su estatus por provincias. Entre las páginas 65 y 165, podemos ver fotografías de las especies más destacadas, con mapas de distribución y biotopos destacados, con las especies que se encuentran en Rumanía y sobre su estatus de protección en este país, finalizando con una bibliografía y un índice.

El libro está escrito en inglés y rumano, lo que facilita su lectura, no pudiendo terminar estas líneas, sin felicitar al autor por un trabajo bien realizado, así como a la Editorial que, nos consta, ha facilitado al autor la edición de este libro, por lo que recomendamos su adquisición y no pudiendo faltar en cualquier biblioteca que se precie. El precio de este libro es de 35 euros y los interesados deben dirigirse a:

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Individual photographic identification based on unique colour pattern of the thorax of *Acherontia atropos* (Linnaeus, 1758) (Lepidoptera: Sphingidae)

A. Ruiz de la Hermosa, F. Truyols-Henares & S. Pinya

Abstract

Natural marks have increasingly been used as a tool for individual identification. One of the most popular techniques used by natural marks as an individual recognition tool is photo-identification. Photo-identification is a non-invasive alternative to traditional marking, which allows individual recognition of species through time and space. In this study, the APHIS (Automatic Photo Identification Suite) software has been evaluated as software capable of identifying individuals of *Acherontia atropos* (Linnaeus, 1758). The SPM (Spot Pattern Matching) and ITM (Image Template Matching) procedures were tested and found to achieve 100% success of individuals recognition. Thus, for the first time in a Sphingidae, the colour pattern of the dorsal part of the thorax of *A. atropos* is demonstrated to represent a suitable natural mark for individual recognition.
KEY WORDS: Lepidoptera, Sphingidae, *Acherontia atropos*, individual marking techniques, natural marks, APHIS, Balearic Islands, Spain.

Identificación individual fotográfica basada en el patrón de coloración único del tórax de *Acherontia atropos* (Linnaeus, 1758) (Lepidoptera: Sphingidae)

Resumen

Las marcas naturales se utilizan cada vez más como herramienta de identificación individual. Una de las técnicas más utilizadas con las marcas naturales y como herramienta de reconocimiento individual, es la fotoidentificación. La fotoidentificación es una alternativa no invasiva al marcaje tradicional, que permite el reconocimiento individual de especies a través del tiempo y espacio. En este estudio, el software APHIS (Automatic Photo Identification Suite) ha sido evaluado como software capaz de identificar individuos de *Acherontia atropos* (Linnaeus, 1758). Se probaron los procedimientos SPM (Spot Pattern Matching) e ITM (Image Template Matching) logrando el 100% de éxito de individuos reconocidos. Así, por primera vez en una especie de Sphingidae se demuestra que el patrón de color de la parte dorsal del tórax de *A. atropos* constituye una marca natural adecuada para el reconocimiento individual.
PALABRAS CLAVE: Lepidoptera, Sphingidae, *Acherontia atropos*, técnicas de marcaje individual, marcaje natural, APHIS, Islas Baleares, España.

Introduction

Population ecology studies provide basic information to understand population dynamics and are fundamental for the study of conservation, management and control of endangered and invasive species and species of economic importance. Often, these studies are based on capture-mark-recapture (CMR) techniques to estimate population parameters (SOUTHWOOD & HENDERSON, 2009). To develop

properly CMR techniques it is necessary to use individual marking techniques that allow recognising individuals in future capture events. These marking techniques can be artificial or natural, or a combination of both (MANN *et al*., 2000). One of the most commonly used techniques are the artificial ones (OOSTHUIZEN *et al*., 2010; SILVY *et al*., 2012). Several types are used according to the zoological taxa. Specifically, among Lepidoptera these conventional marking techniques consist on manual assignment of an alphanumeric code on the discal cells such as the study done with *Morpho sulvkowskyi* (Kollar, 1850) (Nymphalidae) (PRIETO *et al*., 2005) or with *Boloria acrocnema* Gall & Sperling, 1980 (Lepidoptera: Nymphalidae) (GALL, 1984), the use of fluorescent dust with *Plutella xylostella* (Linnaeus, 1758) (Plutellidae) (CAMERON *et al*., 2002) or the use of tags with a numbered gummed label used in migrating species such as *Danaus plexippus* (Linnaeus, 1758) (Nymphalidae), and the use of commercial quick-drying ink to estimate population parameters (BROWER, 1962; KNIGHT, 1999).

These artificial marking techniques work efficiently, as most of the brands and labels used in animals, are fast and easy to apply (HIGGINS *et al*., 1997). However, artificial marking techniques can be harmful. Some studies pointed out those artificial marking techniques can influence on the capture probability by under or overestimating the demographic parameters as a result of studying a researcher-influenced population rather than the real population. For instance, SINGER & WEDLAKE (1981) found that recapture probability in *Graphium sarpedon* (Linnaeus, 1758) (Lepidoptera: Papilionidae) was affected by the style of capturing and marking. On the other hand, a study carried out on *B. acrocnema* the marking effect generated a large positive bias in population size estimates with no differences in mortality rate (GALL, 1984). Furthermore, a wrong dose of fluorescent dust as a marking technique used in *P. xylostella* (Linnaeus, 1758) resulted in a 7 % of additional mortality (CAMERON *et al.*, 2002). MORTON (1982) stated that the marking process itself is not harmful according to the studies with on *Melanargia galathea* (Linnaeus, 1758) (Lepidoptera: Nymphalidae). Nevertheless, the repeated disturbance of individuals because of the capture, marking and recapture events would have negative effects (MORTON, 1982; MURPHY, 1987).

Therefore, in recent years, natural marks have increasingly been used as a tool for individual identification, especially in vertebrates (STEVICK *et al*., 2001). One of the most popular techniques that use natural marks, as an individual recognition technique, is photo-identification. Photo-identification is a non-invasive alternative to traditional marking techniques, which allows individual recognition (DELANY, 1978; SACCHI *et al*., 2007). In this sense, photo-identification has become an important tool, since it does not influence both upon the vertebrate and the invertebrate species in the same way artificial marking techniques do (GALL, 1984; SPEED *et al*., 2007).

Photoidentification technique requires an image of a fixed part of an organism, which is common to all individuals of the same species, but which must be unique to the individual to study (MOYA *et al*., 2015). In addition, not all species are suitable for photo-identification; those that do not have unique natural patterns cannot be recognised individually. Therefore, the photo-identification is restricted to those species with different colours, spots, or marks among the individuals within a population (MOYA *et al*., 2015). These techniques have been widely used in vertebrates (DUNBAR *et al*., 2014; LANGTIMM *et al*., 2004; SHERLEY *et al*., 2010; ZHENG *et al*., 2016). However, only a few studies used photo-identification with invertebrates. Some of these studies applied it in octopuses (HUFFARD *et al*., 2008), starfishes (CHIM & TAN, 2012), sea cucumbers (RAJ, 1998), crustaceans (FRISCH & HOBBS, 2007) or insects (DÍAZ-CALAFAT *et al*., 2018).

In this study, the death's-head hawkmoth, *Acherontia atropos* (Linnaeus, 1758) (Lepidoptera: Sphingidae), has been chosen as a potential species suitable for photo-identification. This species is native to Africa and southern Europe and is characterised by migrating to northern Europe year after year (KITCHING, 2021). Adult longevity of *A. atropos* was estimated in captivity around 18-30 days in males and 25-40 days in females, which reduces the possibility of variation of natural marks (ZAGIRUNSKII *et al*., 2013). In addition, it has a descriptive skull-shape marked on the thorax that makes it unique in the regions where it occurs. According to this trait we propose to analyse and test if the skull-shape mark can be used to identify individually the specimens of a population because of the apparent variation in shape, colour, and size of this skull. Therefore, the aim of this study is to assess,

for the first time in a moth species, whether the colour pattern of the dorsal part of the thorax of *A. atropos* is suitable for individual recognition.

Materials and methods

To test if the skull shape is different among the specimens of *A. atropos* different specimens were analysed and performed a photo identification test in a simulated closed artificial population. 79 *A. atropos* individuals were collected as dead specimens from honeybee hives in Manacor municipality (Mallorca, Balearic Islands, Spain) during the year 2019. It is common to observe dead specimens of *A. atropos* around beehives, since honey bees kill intruders as *A. atropos* which try to enter the hive (BRUGER, 1946). Once collected, they were preserved in labelled paper bags and stored up frozen for further analysis. Next, all the specimens were extended in entomological drawers and deposited at the Interdisciplinary Ecology Group entomological collection (University of the Balearic Islands, Balearic Islands, Spain).

To recognise each captured specimen between three and five different photographs of the dorsal part of the thorax were taken. Each photograph was labelled with a unique alphanumeric code for each specimen differentiating each picture. The photographs were taken with a digital camera (Canon EOS 50D model) and a natural light source. Then, the three best photographs of each specimen were chosen, and the photographs were evenly distributed into 17 different computer folders (16 computer folders with 14 images and one computer folder with 13 images) to perform 17 CMR sessions. Subsequently, all the pictures were analysed to test if photo-identification of the dorsal part of the thorax is an appropriate technique by using two different procedures within APHIS software (MOYÀ *et al*., 2015).

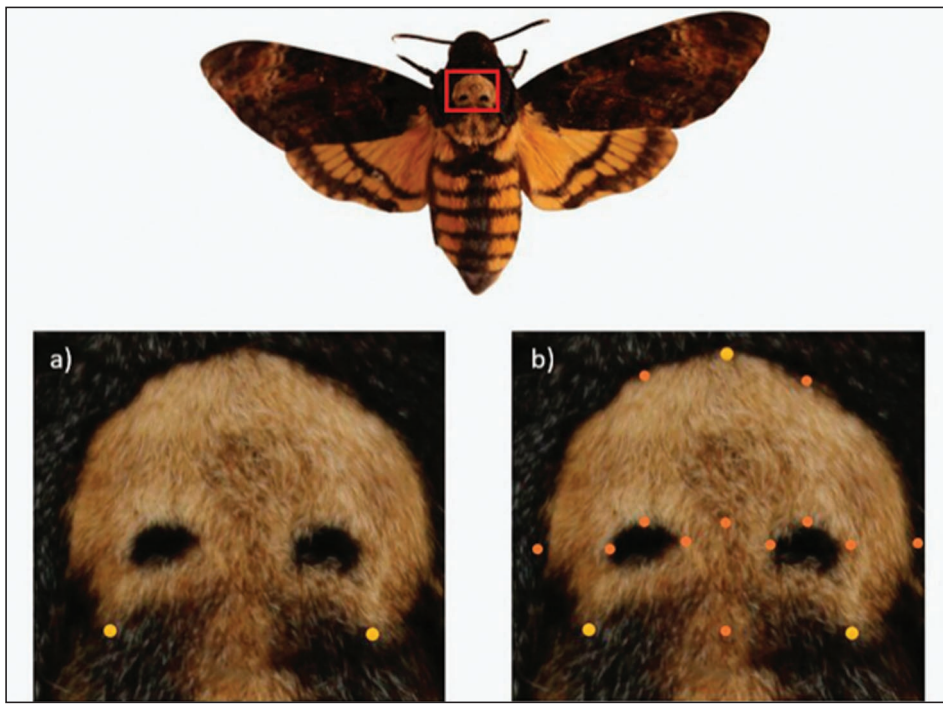

Figure 1.– Set of reference points (yellow points) and accessory points (orange points) selected in the dorsal part of the thorax *Acherontia atropos* when using the ITM (a) and SPM (b) procedure of the APHIS program.

APHIS software

To check if the colour pattern of the natural marks of the dorsal part of the thorax of *A. atropos* is appropriate to perform the photo-identification, APHIS program was used as free software of picture matching (MOYA *et al*., 2015). Unlike other photographic coincidence programs such as I3S Manta (DEN HARTOG & REIJNS, 2008), Wild-ID (BOLGER *et al*., 2012) and Extract Compare (PATERSON *et al*., 2013), APHIS allows to choose up to 100 possibly candidates, making it less likely to make a photographic matching mistake. In addition, APHIS can process hundreds of photographs at the same time and users can select two types of matching procedures: an interactive and newly created SPM (Spot Pattern Matching) and an automatic ITM (Image Template Matching) based on the I3S method (MOYÀ *et al*., 2015).

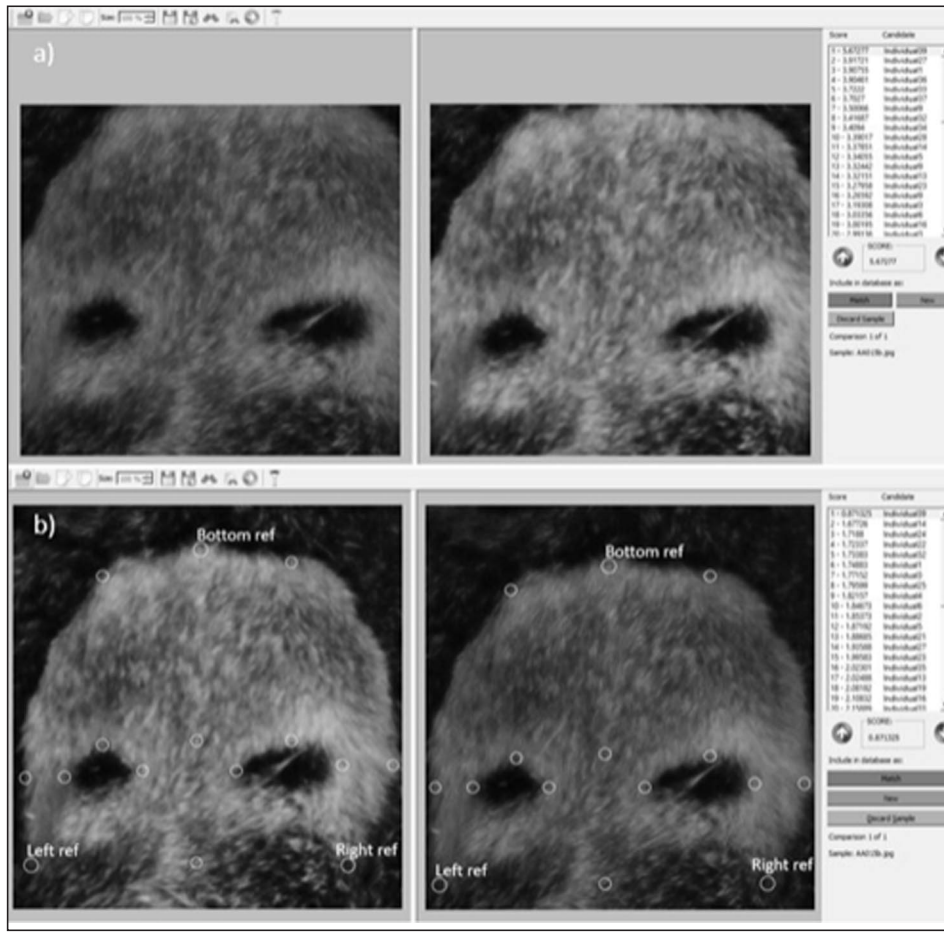

Figure 2.– Examples of photo recaptures of *Acherontia atropos* detected using the ITM (a) and SPM (b) procedures. In both cases, the matching recapture was the first candidate in the candidate list generated by the APHIS program.

By using the ITM procedure, only two reference points are needed, which were chosen on both the left and the right side of the basis of the skull shape (Fig. 1a). On the other hand, for the SPM procedure, three reference points and a minimum of 12 accessory points are needed, so the two points made in the ITM procedure were chosen together with a third reference point and 12 accessory points (Fig. 1b). Once the images are compared, the software provides the most likely candidates ranked by a similarity coefficient for each introduced photograph. It highlights that similarity coefficients are estimated differently. In the SPM procedure the more similar the two compared individuals were the lower the similarity coefficient was. On the other hand, in the ITM procedure the more similar the two compared individuals were the higher the similarity coefficient was (Fig. 2).

Analysis of data

All collected data was organised and processed with a spreadsheet. Subsequently, the statistical program R (R CORE TEAM, 2017) was used to analyse the differences between both procedures. Means, standard deviations, minimums, and maximums of the recapture candidate positions in each procedure were estimated. A Mann-Whitney U distribution (non-parametric) test was used to test differences of mean candidate position in ITM and SPM procedure, since data were not distributed normally, and variances were not homogeneous. Significance level was set to $\alpha < 0.05$.

Results

For the realization of the photo-identification, by means of the SPM and ITM procedures of APHIS software, a total of 79 specimens of *A. atropos* were analysed. By using the ITM procedure all recaptured specimens were matched correctly, and they were individually recognised. 98.73% of the recaptured specimens matched with the first candidate position, and up to 99.37% of the recaptures were established within the performance threshold proposed between the first and the fifth candidate position of recapture. Only one specimen was positioned beyond the threshold, occupying the sixth recapture position, representing 0.63% of the total recaptures obtained. The mean of the similarity coefficients, of all recaptured specimens, was 5.434 ± 0.556 with a minimum of 2.483 and a maximum of 5.920 (Fig. 3. Table 1).

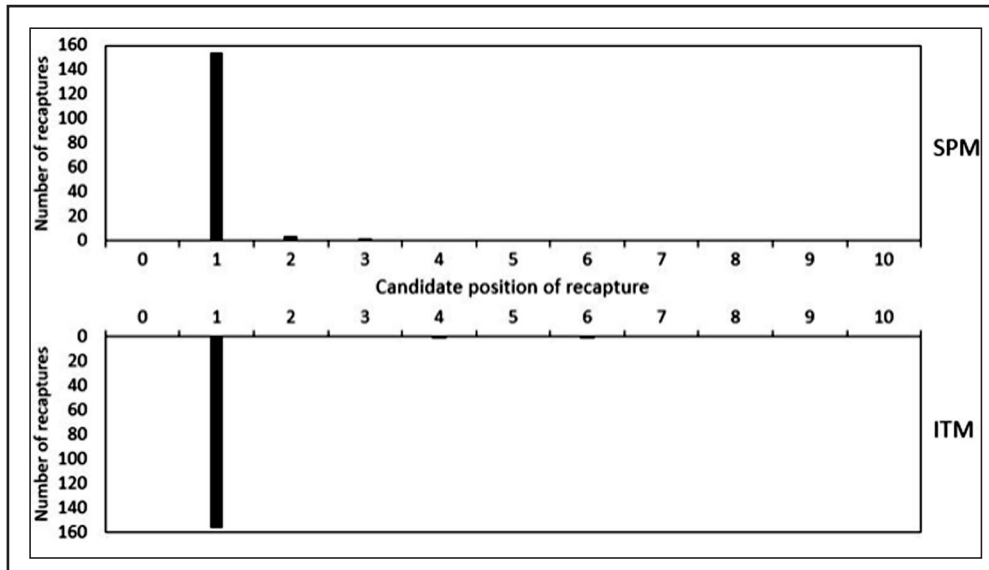

Figure 3.– Distribution of the number of photo recaptures and its candidate position of recapture of *Acherontia atropos* by using both ITM and SPM procedures within APHIS software.

In contrast, by using the SPM procedure all recaptured individuals were matched correctly and they were individually recognised. Ninety-seven (97.47) % of the recaptured specimens matched with the first candidate position, and all the recaptures were established within the performance threshold proposed between the first and the fifth candidate position of recapture. Mean of the similarity coefficients of all recaptured individuals was 0.952 ± 0.261 with a minimum of 0.411 and a maximum of 1.666 (Fig. 3; Table 1).

Table 1.– Number of photo recaptures of *Acherontia atropos* ordered according to their candidate position given by APHIS software and the ITM or SPM procedures with the mean of its similarity coefficient (mean ± typical deviation, range). *It is a single individual so the average, typical deviation is not provided.

	SPM		**ITM**	
	N of captures	Similarity coefficient	N of captures	Similarity coefficient
1st position	154 (97.47 %)	0.946 ± 0.260 (0.411-1.666)	156 (98.73 %)	5.465 ± 0.482 (3.101-5.920)
1st-5th position	158 (100 %)	0,952 ± 0.261 (0.411-1.666)	157 (99.37 %)	5.452 ± 0,505 (3.101-5.920)
> 5th position	-	-	1 (0.63 %)	2.483*
Total	158 (100 %)	0,952 ± 0.261 (0.411-1.666)	158 (100 %)	5.434 ± 0.556 (2.483-5.920)

Recapture of specimens presented a candidate position of recapture that oscillated between the first and the third position (= 1.032 ± 0.209; n= 158) by using the SPM procedure and between the first and sixth position (= 1.051 ± 0.463; n= 158) by using the ITM procedure. No significant differences were obtained in the average number of the recapture positions between the ITM procedure and SPM (M-W U test, U= 12328,00; p= 0.424) (Fig. 4).

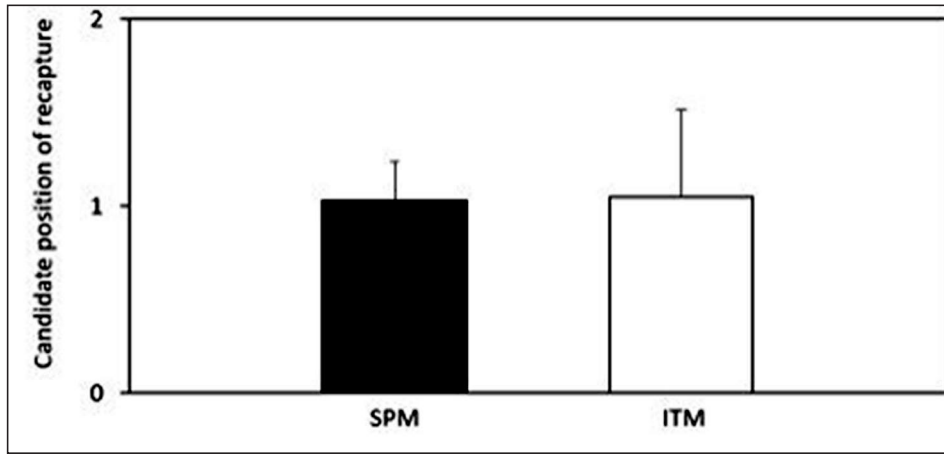

Figure 4.– Candidate position at photo recapture (mean ± typical deviation) of *Acherontia atropos* according to both ITM and SPM procedures using APHIS software.

Discussion

Photo-identification techniques are scarcely used in insects. Some studies on photo-identification has been done with Coleoptera, such as the Cerambycid beetle species *Rosalia alpina* (Linnaeus, 1758) with the colouring pattern of their elytra to recognize them individually (CACE *et al*., 2013; ROSSI DE GASPERI *et al*., 2016) or the Lucanidae beetle species *Lucanus cervus* (Linnaeus, 1758), which the amount of denticles and their position in the jaws vary individually (ROMITI *et al*., 2017). As far as

known, photo-identification has only been used in one other lepidopteran *Heliconius charithonia* (Linnaeus, 1767), which the pattern of colouring of the edge of the hindwings was used to recognize them individually (DENIS & FLORES, 2017).

According to our data, positive results on correct matching with *A. atropos* specimens provided higher values of similarity coefficients than other studies with different taxonomical groups by using APHIS software (MOYA *et al.*, 2015). Even, the obtained similarity coefficients from both SPM and ITM procedures were far higher when compared to other studies carried out with other insects using the same software (e. g. DÍAZ-CALAFAT *et al*., 2018).

The skull-shape located onto the thorax seems to be quite different and variable among all the analysed specimens, and it could be used as a natural mark for individual recognition in *A. atropos*. That is, the colour pattern of the dorsal part of the thorax, and its use for photoidentification provides a reliable tool to identify specimens of this species and it can become an alternative to conventional marking techniques. Consequently, this is the first time ever that it is demonstrated in any moth species. Other species of the genus *Acherontia* [Laspeyres], 1809 such as *A. lachesis* (Fabricius, 1798) and *A. styx* Westwood, 1847 have similar skull-shape onto the thorax, thus suggesting that photoidentification may be a useful individual technique within the genus.

The potential use of photoidentification technique in *A. atropos* is especially important in a species which is considered a natural enemy and a pest of honeybee with economic relevance (HAMIDA, 1999). A high population of this moth species can rapidly deplete the stores in a colony by stealing the honey, though the disturbance it creates is much more serious since it can lead to the abandonment of the queen and worker bees from the hive (SARWAR, 2016). The use of natural marks such as the skull-shape on the thorax would allow one to stablish monitoring schemes of natural populations of *A. atropos* and expand the knowledge of its population dynamics. Specifically, this technique would allow estimating population parameters of *A. atropos* by carrying out CMR studies and its interaction with honeybees.

Further studies should be performed in the future to establish the stability of the natural mark throughout the lifetime of *A. atropos*, since within moth and butterfly species scales are lost because of their activity. On the other hand, new studies are needed to find out if natural marks from other species of Lepidoptera or even insects can be used to recognize individuals within a population, and whether they could be used for photo identification techniques. If positive results arise, the development of population ecology studies based on CMR techniques will uncover some population estimates such as population size or survival rates according to sex, which nowadays are completely unknown for many species of moths and butterflies.

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The authors stated that we do not have any interest or relationship, financial or otherwise, that might be perceived as influencing an author's objectivity or considered a potential source of conflict of interest.

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COMITÉ PARA LA PROTECCIÓN DE LA NATURALEZA, PROYECTO DE INVESTIGACIÓN CIENTÍFICA DE SHILAP / *COMMITTEE FOR THE PROTECTION OF NATURE, PROJECT OF SCIENTIFIC INVESTIGATION OF SHILAP*

Solicitud de autorización para recoger lepidópteros con fines científicos en España

Las solicitudes cumplirán las siguientes condiciones:

1.– Estar al día en el pago de la cuota anual de la Sociedad, antes de solicitar los permisos.

2.– Enviar un correo electrónico al Secretario General de SHILAP con todos los datos personales, incluyendo nombre, apellidos, dirección, DNI o número de pasaporte, número de teléfono (con código del país y prefijo) y correo electrónico. Estos datos serán enviados al Secretario General con un mínimo de 45 días de antelación al período de captura previsto.

3.– Se detallará el área donde se desea capturar el material (provincia y/o región), el período de tiempo (días, meses o todo el año); método de captura que se desea emplear (manga entomológica, grupo electrógeno, etc.), material que se desea recoger (especies, géneros, familias, y/o superfamilias) y cualquier otro dato que se desee añadir.

4.– Todos los socios de SHILAP que soliciten estos permisos para recoger Lepidoptera en España con fines científicos, serán incluidos en el Proyecto de Investigación Científica creado por la Sociedad y denominado: *"Faúnula Lepidopterológica Ibérica, Baleárica y región Macaronésica"*.

5.– Con el fin de contribuir con este Proyecto Científico, se ruega remitan a SHILAP, **o una copia por correo electrónico (e-mail), con el listado del material recogido en EXCEL,** sólo en este formato, indicando la Familia, Subfamilia, Tribu, nombre de la especie (género, especie, autor y año), localidad, coordenadas UTM (1 X 1) o GPS, provincia, fecha de captura, colector y número de machos y hembras capturados (**sólo 5 ejemplares por taxón y localidad, máximo**). Por favor, utilice sólo el *"Catálogo sistemático y sinonímico de los Lepidoptera de la Península Ibérica, de Ceuta, de Melilla y de las islas Azores, Baleares, Canarias, Madeira y Salvajes (Insecta: Lepidoptera)*" (A. VIVES MORENO, 2014)". Esta lista es necesaria para este Proyecto Científico de SHILAP y para nuevas autorizaciones.

6.– Es obligatorio publicar en *SHILAP Revista de lepidopterología,* las nuevas especies o subespecies que se descubran y remitir a SHILAP **una parte del material TIPO**, para su posterior incorporación a la colección de Lepidoptera del Museo Nacional de Ciencias Naturales en Madrid, España.

7.– Se recuerda a todos los socios de la obligación de estar autorizados para recoger Lepidoptera, con fines científicos, en España y que está prohibida todo tipo de actividad comercial, con el material capturado.

8.– Conocer los fines científicos de SHILAP y comprometerse a pagar los gastos de participación en este Proyecto Científico, que la Junta Directiva considere en cada momento.

Application for permits to collect Lepidoptera in Spain for scientific purposes

Applications must abide by the following conditions:

1.– The Society's annual fee must be paid before applying for the permits.

2.– To send an electronic mail the General Secretary of SHILAP, with all the personal data, including name, surname, address, ID card number or Passport number, telephone number (with country code and prefix) and electronic mail address. These data must reach the General Secretary at least 45 days in advance of the foreseen collecting activity.

3.– The collecting area to be visited by the applicant should also be detailed (province and/or region), expected dates (days, months, or the whole year), collecting method (entomological net, generator, etc.), taxonomical groups of interest to be collected (species, genera, families and/or superfamilies); any other data the applicant wishes to add.

4.– All members of SHILAP who apply for these permits to collect Lepidoptera in Spain with scientific purposes, will be included in the Scientific Investigation Project created by the Society and called: *"Lepidopterological Fauna of the Iberian Peninsula, Balearic Islands and Macaronesian region"*.

5.– In order to contribute to this Scientific Project, it is requested to send to SHILAP, **either a copy by electronic mail (e-mail), with the listing of materials collected in EXCEL** (- only in this format, please), indicating the Family, Subfamily, Tribe, name of the species (genera, species, author's name and year), town, UTM (1 X 1) or GPS coordinates, province, dates of capture, collector and numbers of males and females captured (**only 5 specimens per taxon and locality, maximum**). Please, use only the *"Catálogo sistemático y sinonímico de los Lepidoptera de la Península Ibérica, de Ceuta, de Melilla y de las islas Azores, Baleares, Canarias, Madeira y Salvajes (Insecta: Lepidoptera)* (A. VIVES MORENO, 2014)". This list is necessary for this Scientific Project of SHILAP and for new authorizations.

6.– It's obligatory to publish in *SHILAP Revista de lepidopterología*, the new species or subspecies that are discovered and to remit to SHILAP **a part of the TYPE material**, for later incorporation into the Lepidoptera Collection of the National Museum Natural Sciences, Madrid, Spain.

7.– All members are kindly reminded of the obligation to be duly authorized for collecting Lepidoptera, with scientific purposes, in Spain and that it is forbidden all type of commercial activity, with the captured material.

8.– To know about the scientific aims of SHILAP and to commit to pay the expenses of participation in this Scientific Project, that the Board of Directors considers at any given moment.

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A review of the Neotropical Tirathabini genus *Xenophasma* Dognin, 1905 with description of two new species (Lepidoptera: Pyralidae, Galleriinae)

V. O. Becker

Abstract

Three species of *Xenophasma* Dognin, 1905, are recognized from Brazil, two of them new: *Xenophasma albifasciata* Becker, sp. n. and *X. loxogramma* Becker, sp. n., described here. Diagnosis, key to species, and illustrations of the type and two new species are also presented.
KEY WORDS: Lepidoptera, Pyralidae, Galleriinae, Tirathabini, taxonomy, new species, distribution, Brazil.

Revisión del género *Xenophasma* Dognin, 1905 de Tirathabini Neotropical con la descripción de dos especies nuevas (Lepidoptera: Pyralidae, Galleriinae)

Resumen

Se reconocen tres especies de *Xenophasma* Dognin, 1905, para Brasil, dos de ellas nuevas: *Xenophasma albifasciata* Becker, sp. n. y *X. loxogramma* Becker, sp. n., aquí descritas. También se presenta la diagnosis, clave e ilustraciones de las especies tipo y de las dos nuevas.
PALABRAS CLAVE: Lepidoptera, Pyralidae, Galleriinae, Tirathabini, taxonomía, especies nuevas, distribución, Brasil.

Introduction

Xenophasma Dognin, 1905 was established as a monotypic genus in the Schoenobiinae, transferred to the Epipashiinae by HAMPSON (1916), and to the Galleriinae, Tirathabini by SOLIS (1993). Examination of the material in the author's collection (VOB) revealed two further undescribed species from Brazil. The genus is reviewed and a key, descriptions and illustrations are presented for their identification.

Material and methods

This work is based on 38 specimens (9 g. s.) in the author's collection (VOB), 15 in USNM, and 2 in AMC. Specimens representing all the species were taken to the NHMUK and the USNM to be compared with the material deposited there, but, except for *X. notodontoides* Dognin, 1905, nothing that matched. The holotypes of the new species are provisionally deposited in VOB, and will be transferred, together with the collection, to a Brazilian institution in the future. Genitalia were prepared following the methods described by ROBINSON (1976). Terms for morphological characters follow HODGES (1971).

Abbreviations

AMC = Alfred Moser Collection, São Leopoldo, Rio Grande do Sul, Brazil
CPAC = Centro de Pesquisa Agropecuária dos Cerrados, Planaltina, DF, Brazil
FW = forewing
g. s. = genitalia slide
HW = hind wing
NHMUK = Natural History Museum, United Kindom
TS = Type species
USNM = collection of the United States National Museum, Washington, DC
VOB = Vitor O. Becker Collection, Serra Bonita Reserve, Camacan, Bahia, Brazil

Results and discussion

Examination of the material in the collections of NHMUK, USNM, and VOB revealed that three species belong to the genus, two of them undescribed. Diagnosis, descriptions, a key to species, and illustrations are given here to allow their identification.

Xenophasma Dognin, 1905
Xenophasma Dognin, 1905. *Annals Soc. Ent. Belg.,* **49**: 62
TS: *Xenophasma notodontoides* Dognin, 1905. *Annals Soc. Ent. Belg.,* **49**: 62, by original designation.

Diagnosis: Medium size (wingspan 35-44 mm), vinaceous or whitish. Oscelli absent; labial palpi porrect, longer in females; antenna short ciliated in males, filiform in females. FW dusted fuscous-tip scales, group of erected scales next to base, and on cell; costa curved on distal third, termen round; transverse bands and lines absent or ill-defined. Male genitalia: uncus short, apex axcavated; supra transtilla sac present; valva with sacculus well developed, differentiated; juxta large, with or without ventral process directed distad; manica spined distad; phallus long, straight, thin, or expanded distad. Female genitalia with the ostium-antrum area expanded, sclerotized.

Distribution (Fig. 5): Brazil, central and southeastern.

Remarks: The absence of ocelli and gnathos, and the presence of a sac [supra transtilla sac] between anal tube and transtilla, support the current association.

Key to species

1. FW vinaceous .....*notodontoides*
   FW grayish 2
2. FW with black fascia along costa, bent on the distal 1/3 toward termen .....*loxogramma*
   FW with whitish fascia below costa .....*albifasciata*

Xenophasma notodontoides Dognin, 1905 (Figs 5-8, 12-14, 17)
Xenophasma notodontoides Dognin, 1905. *Annals Soc. Ent. Belg.,* **49**: 62

Holotype ♂, BRAZIL: São Paulo, Paranapanema, ex Dognin Col. (USNM) [examined].

Diagnosis: Medium size (wingspan 32-44 mm). Vinaceous. Male (Figs 6, 8) FW length 14-17 mm (wingspan 32-38 mm); female (Fig. 7) FW length 18 mm (wingspan 40 mm). FW costa and termen dark reddish-brown; postmedial band ill-defined, diffuse. HW pinkish. Female labial palpi twice as long as those of males. Male genitalia (Fig. 12): uncus short, thick, wide basally, tapering distad, sharp ridge at apex, ventrally; valva long; sacculus large, prominent, half as long as valva; costa well defined; vinculum triangular; juxta large, nearly square plate, no ventral process; manica (Fig. 13) expanded, spined distad; phallus (Fig. 14) long, straight, expanded gradually distad, apex spined. Female genitalia (Fig. 17) half as long as abdomen; ostium wide, antrum constricted medially, sclerotized basad; ductus bursae narrow, as long as bursa diameter; corpus bursae globose.

Material examined (5 specimens): Type; 3 ♂♂ (2 g. s.), 1 ♀ (1 g. s.). BRAZIL: Minas Gerais, Nova Lima, 850 m, 1-10-I-1985, g. s. 1698 (Becker 55746) (VOB); 1 ♀, Idem, Poté, 500 m, 15-XII-1997, g. s. 6558 (Thöny) (VOB); 1 ♂, São Paulo, São Luis do Paraitinga, 23º20'S - 45º06'W, 900 m, 12-17-XI-2001 (Becker 134094) (VOB); 1 ♂, Bahia, Camacan, Reserva Serra Bonita, 15º23'S - 39º33'W, VIII-2009, g. s. 5657 (Becker 144664) (VOB).

Distribution (Fig. 5): Southeastern Brazil, at mid elevations.

Remarks: The only vinaceus species in the genus.

Xenophasma loxogramma **Becker, sp. n.** (Figs 1-5, 9, 10)

Material examined: 38 ♂♂ (3 g. s.), 8 ♀♀ (1 g. s.). Holotype ♂, BRAZIL: Mato Grosso, Chapada dos Guimarães, 800 m, 20-XI-1994 (Becker 93939) (VOB). Paratypes: 32 ♂♂, 2 ♀♀, Same data as holotype, g. s. 1961 (VOB, USNM); 1 ♀ Idem, Diamantino, Alto Rio Arinos, 350 m, 21-29-IX-1995 (Moser & Furtado) (AMC); 1 ♂, 2 ♀♀, Distrito Federal, Planaltina, 15º35'S - 47º42'W, 1100 m, 19-X-1976, g. s. 366; 15-X-1981, 5-XI-1988, g. s. 1960 (Becker 19711, 58991 (VOB) (CPAC 8742); 1 ♀, Goiás, Goiás, 500 m, 13-15-X-1984 (Becker 52888) (VOB); 1 ♀, Maranhão, Açailândia, 19-27-XI-1990, g. s. 1959 (Becker & Dubois) (VOB); 1 ♀, Minas Gerais, Unaí, 650 m, 21-X-1998 (Becker 117463) (VOB); 3 ♂♂, São Paulo, Luiz Antônio, Jataí, 21º35'S - 47º44'W, 13-18-X-2001 (Becker 133291) (VOB); 1 ♂, Minas Gerais, Aiuruoca, 22º00'S - 44º38'W, 1300 m, 10-12-X-2018 (Becker 157449) (VOB).

Diagnosis: Medium size. Whitish, dusted fuscous. FW whith a dark gray band along costa to distal 2/3 than bent towards termen, above M3.

Description: Male (Fig. 9) FW length 15-17 mm (wingspan 33-38 mm), female (Fig. 10) FW length 18-20 mm (wingspan 40-44 mm). Labial palpus pale yellow, dark gray ventrally, frons and vertex pale yellow. Thorax and abdomen pale yellow; abdomen with a diffuse, dark gray band along dorsum; legs dark gray. FW pale yellow, costa black above cell, from base to distal 2/3, following as a fascia to termen above M3, termen narrowly black. HW pale yellow, margin and cilia dark fuscous. Female darker than male, HW gray. Male genitalia (Fig. 1) uncus wide, tapering distad, slightly expanded before apex; apex slightly excavated distally; valva narrow, curved dorsad; sacculus large, half as long as valva; vinculum triangular; juxta a vertical, rectangular plate folded at the edges; ventral, medial process longer than juxta; manica (Fig. 2) expanded distad, two parallel rows of blunt teeth before apex; phallus (Fig. 3) long, thin, slightly bent dorsad, vesica with a short, sclerotized process. Female genitalia (Fig. 10): over half as long as abdomen; ostium broad, sclerotized; antrum broad; ductus bursae narrow, as long as corpus bursae diameter; corpus bursa globose.

Distribution (Fig. 5): Brazil, central and southeastern, from Mato Grosso to São Paulo.

Etymology: From the Greek *λοχοσ* =slanting, slope + *γραμμε* =line; in reference to the slanting dark fascia on FW.

Remarks: Easily distinguished by the black fascia along costa, bent towards termen.

Xenophasma albifasciata **Becker, sp. n.** (Figs 5, 11, 15, 16, 18)

Material examined (3 specimens): 1 ♂ (1. g. s.), 2 ♀♀ (1 g. s.). Holotype ♀, BRAZIL: Mato Grosso, Diamantino, Alto Rio Arinos, 350 m, 21-29-IX-1995 (Moser & Furtado) (VOB). Paratypes: 1 ♂, 1 ♀, Distrito Federal, Planaltina, 15º35'S – 47º42'W, 1100 m, 19-X-1976, g. s. 1699, 5659 (Becker 19711) (VOB).

Diagnosis: Medium size. Grayish. FW with costa dark fuscous, white diffuse band below costa, from base to termen, below apex; postmedial band diffuse, slightly contrasting. HW whitish in male, gray in female.

Description: Male: FW length 15 mm (wingspan 34 mm), female (Fig. 11) FW length 17 mm (wingspan 38 mm). Head, thorax and abdomen whitish; legs whitish, tarsi fuscous. FW whitish, densely dusted gray scales; costa dark gray along costa to apex, interrupted before distal third; white,

diffuse band below costa, from base to termen below apex; postmedial band ill-defined; margin and cilia dark gray. HW white. Female darker than male; HW dusted gray. Male genitalia (Fig. 15): short, narrow, sharp ridge dorsad; valva short, broad, sacculus large, nearly 2/3 of valva, costa with a curved process folded ventrad; vinculum broad, narrow, short, blunt tooth basad; juxta a large, nearly square plate, medial process conical; manica (Fig. 16), attached to phallus, expanded and minutely spined distad; phallus long, thin, straight. Female genitalia (Fig. 18) half as long as abdomen; ostium posterior margin slightly round; antrum large, sclerotized; ductus bursae, narrow, shorter than corpus bursae diameter; corpus bursae globose.

Distribution (Fig. 5): Central Brazil, in the Cerrado biome.

Etymology: From the Latin *albus* =white + *fascia* =band; in reference to whitish band below costa of FW.

Remarks: Easily distinguished by the grayish FW, with the white fascia below costa.

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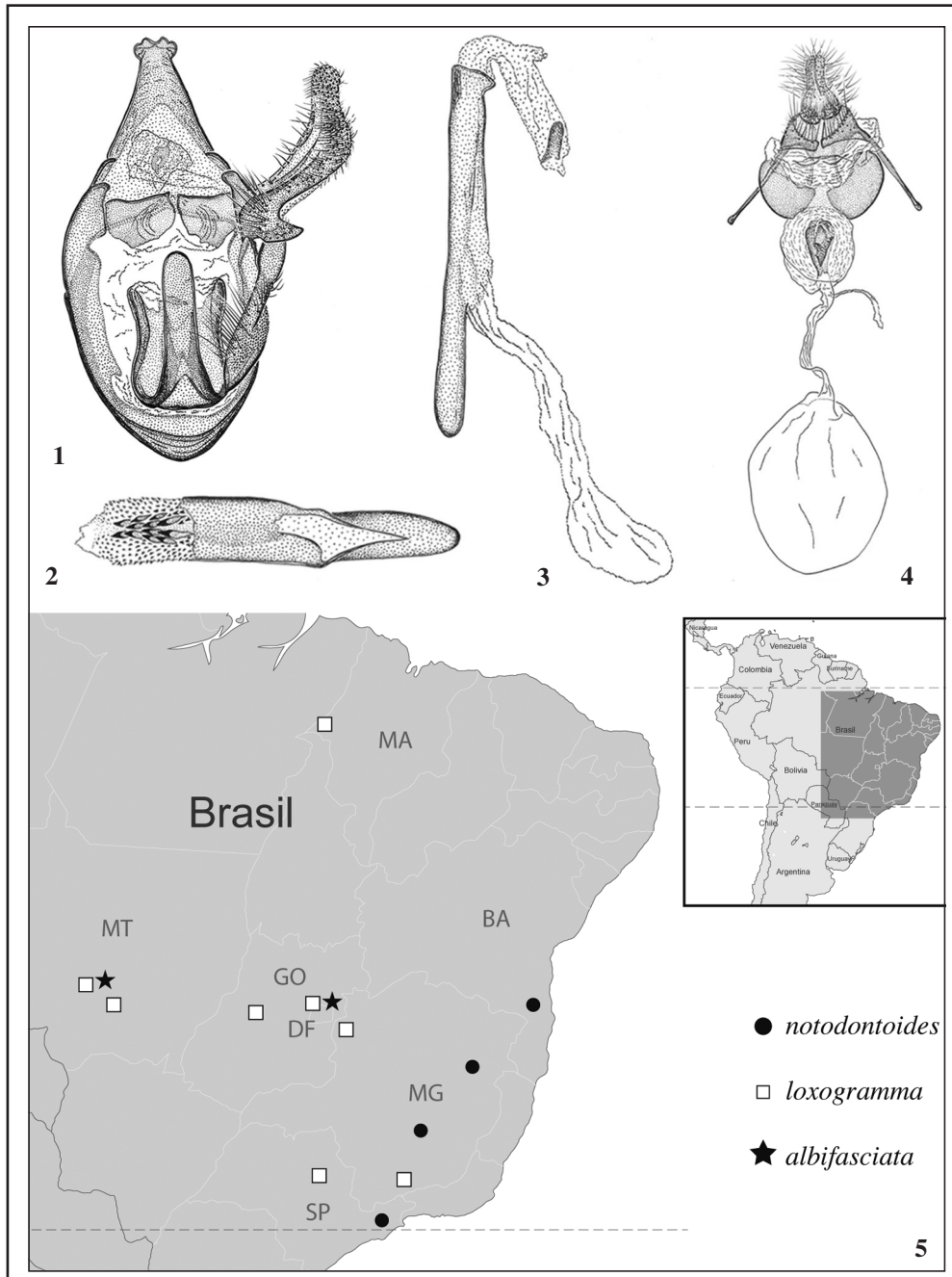
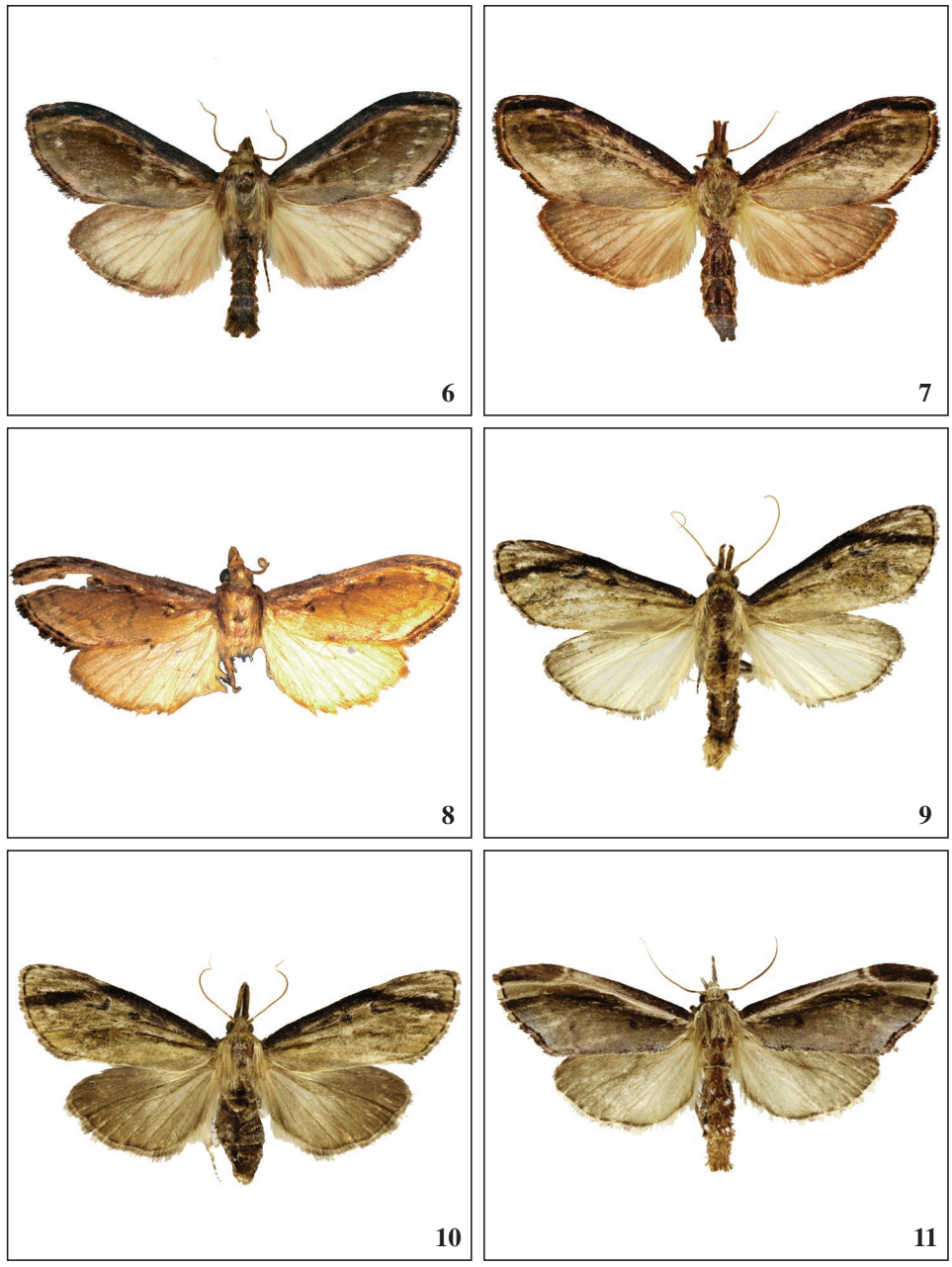
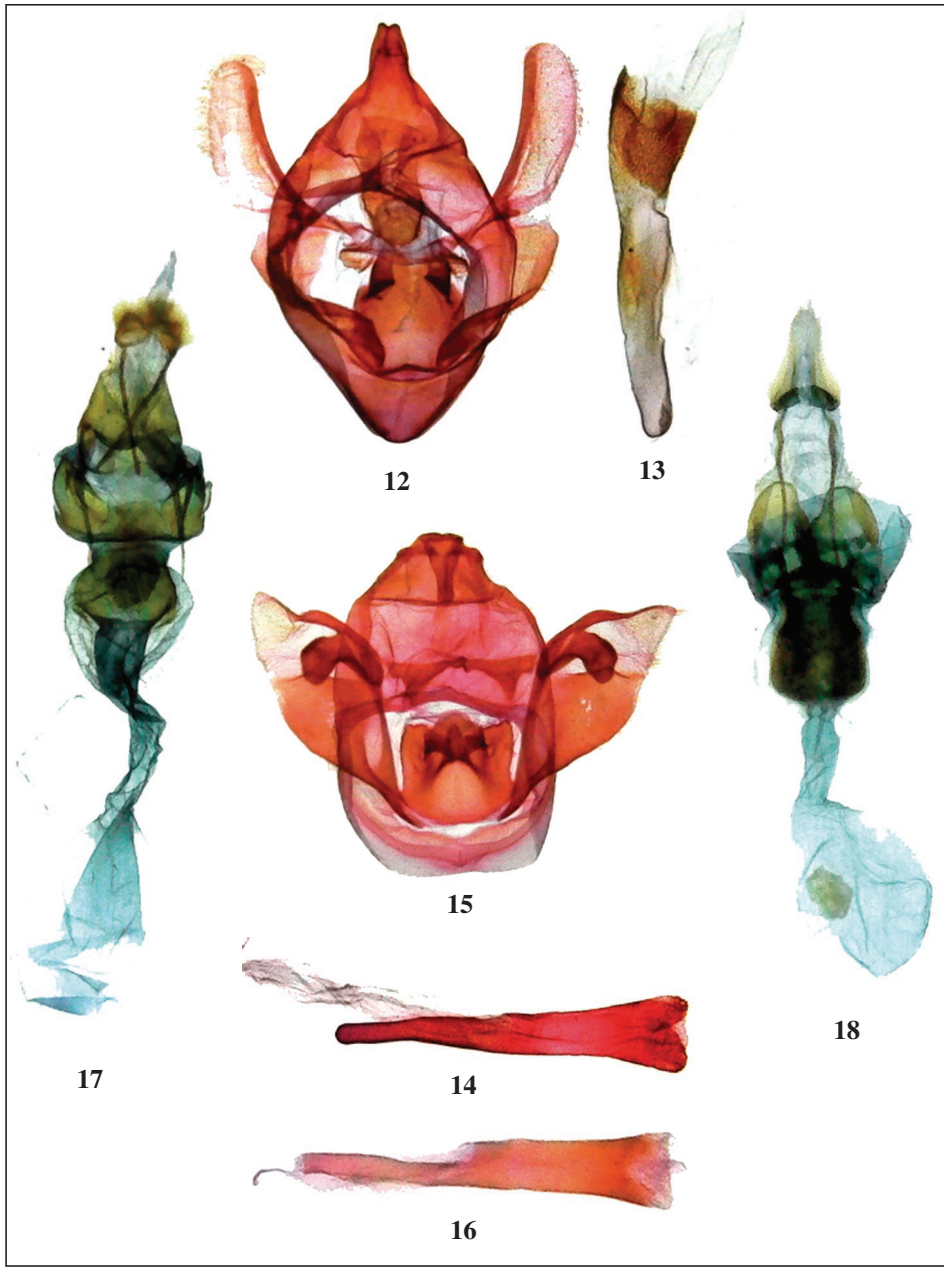


Figs 1-5.– *Xenophasma loxograma* Becker, sp. n., genitalia, paratypes. **1.** male, ventral view. **2.** manica, ventral view. **3.** phallus, lateral view. **4.** female, ventral view. **5.** *Xenophasma* Dognin, 1905, distribution.



Figs 6-11.– *Xenophasma* adults, dorsal view, Brazil. **6-8.** *X. notodontoides* Dognin. **6.** male. **7.** female. **8.** male holotype. **9-10.** *X. loxogramma* Becker, sp. n. **9.** male holotype. **10.** female paratype. **11.** *X. albifasciata* Becker, sp. n., female holotype.



Figs 12-18.– *Xenophasma* genitalia, ventral view, phallus, lateral view, Brazil. **12-14.** *X. notodontoides* Dognin. **12.** Male. **13.** Manica. **14.** phallus. **15-16.** *X. albifasciata* Becker, sp. n., paratype. **15.** male. **16.** phallus. **17.** *X. notodontoides* Dognin, female. **18.** *X. albifasciata* Becker, sp. n., paratype, female.

REVISIÓN DE PUBLICACIONES
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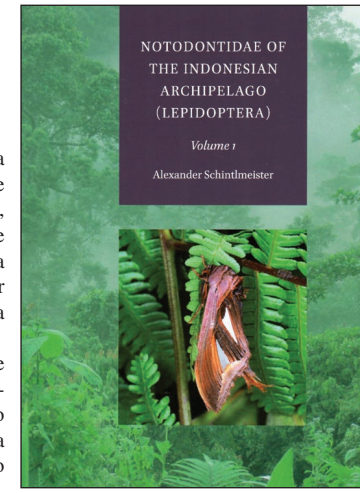

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No podemos terminar estas líneas, sin felicitar al autor por un trabajo bien realizado, así como a la Editorial que continúa apoyando la publicación de estas obras, con una calidad excelente, por lo que recomendamos su adquisición y no pudiendo faltar en cualquier biblioteca que se precie. El precio de este libro es de 141 euros y los interesados deben dirigirse a:

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The first record of endangered *Lycaena helle* ([Denis & Schiffermüller], 1775) for Turkey (Lepidoptera: Lycaenidae)

S. S. Çalışkan & A. Hasbenli

Abstract

Lycaena helle ([Denis & Schiffermüller],1775), is listed as "endangered" on the European Red List of butterflies. We report the first record of this species from Turkey. The EUNIS habitat information and photographs of the area where adult individuals was collected together with habitus dorsal and ventral photographs of the species were provided. The distribution status and habitat of the species in the Palaearctic region were evaluated.
KEY WORDS: Lepidoptera, Lycaenidae, *Lycaena helle*, new record, Eunis, Turkey.

Primer registro de *Lycaena helle* ([Denis & Schiffermüller], 1775) en peligro de extinción para Turquía (Lepidoptera: Lycaenidae)

Resumen

Lycaena helle ([Denis & Schiffermüller],1775), está en la lista Roja Europea de mariposas en peligro de extinción. Citamos el primer registro de esta especie en Turquía. Se porporciona información y fotografías del hábitat EUNIS del área donde se colectó un individuo adulto, junto con una fotografía de la especie de su habitus dorsal y ventral. Fueron evaluadas la distribución, estatus y hábitat de la especie en la región Paleártica.
PALABRAS CLAVE: Lepidoptera, Lycaenidae, *Lycaena helle*, nuevo registro, Eunis, Turquía.

Introduction

Lycaena helle ([Denis & Schiffermüller], 1775), is a species with the relict Boreo-montane Palaearctic distribution (POPOVIĆ *et al*., 2014; BOZANO, 2004; HABEL *et al*., 2014). It is found in most of Fennoscandia throughout Central and Northern Europe (POPOVIĆ *et al*., 2014). It extends from Siberia to the Ussuri region in Russia Belarus, Estonia, Georgia, Kazakhstan, Lithuania, Ukraine to Mongolia and China in the Far East (TUZOV *et al*., 2000; NEKRUTENKO & TSHIKOLOVETS, 2005; BOZANO & WEIDENHOFFER, 2001; KORB & BOLSHAKOV, 2016). The presence of this species in Serbia and Bulgaria in the Balkan Peninsula is an important zoogeographic record (KOLEV & SHTINKOV, 2015).

This species uses peat and sphagnum swamps, flowering moist meadows, forest edges and openings, creeks and slopes as its habitat (TSHIKOLOVETS, 2011). It is a postglacial relict in Central Europe and lives mostly in the highlands (HABEL *et al*., 2011; MARTIN *et al*., 2014). However, some populations are found in moist low meadows (SKORKA *et al*., 2007). The population of the species in Europe has expanded to places where suitable habitats are found (POPOVIĆ *et al*., 2014).

There was a significant decrease in the populations of *Lycaena helle* in many countries in the last decade (VAN SWAAY & WARREN, 1999; KUDRNA *et al*., 2011). Populations in Western and

Central Europe decreased considerably (by 50 to 80%) in the last century. It is currently considered extinct in Hungary, the Czech Republic, Italy, Latvia, and Slovakia (VAN SWAAY *et al*., 2010a).

L. helle is listed in the European Red Data Book and in the Annexes of the Habitats Directive (VAN HELSDİNGEN *et al*., 1996; VAN SWAAY & WARREN 1999; VAN SWAAY *et al*., 2010a).

The aim of this study is to provide information about and discuss the distribution and habitat of this butterfly species in Turkey, which was recorded for the first time in Turkey.

Materials and Methods

A specimen of *Lycaena helle* species was collected in Posof district of Ardaham province in 17 Juny 2020 (Map 1). The specimen was collected during the TANAP (Trans-Anatolian Pipeline), project monitoring studies. The line transect method was employed in monitoring studies (Fig. 1). The specimen prepared in accordance with the museum methods is preserved in the Zoology Museum of Gazi University (ZMGU, Ankara, Turkey). Photographs of the dorsal and ventral wing of the specimen were taken with a Canon camera EOS 50D (Fig. 2).

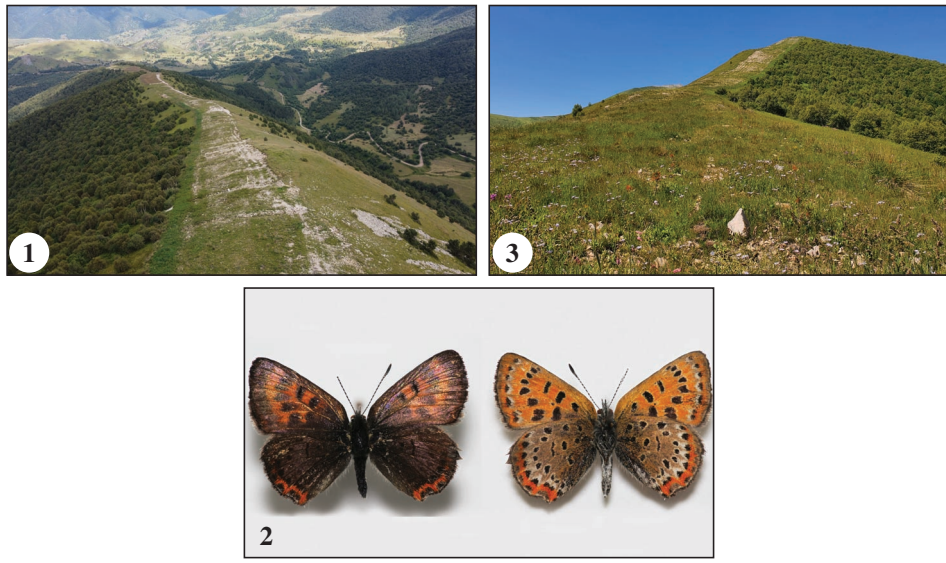
Map 1.– The location of the specimen of *L. helle* ([D. & Schiff.]) collected in Turkey (red pin).

Result and discussion

Within the scope of the Trans-Anatolian Pipeline (TANAP), which is being carried out in Turkey, fauna monitoring studies were carried out along the line. Critical butterfly species were identified, and the EUNIS types of habitats where they spread were determined according to DAVIES *et al*. (2004). The habitat where the species was caught is the "Calcareous alpine and subalpine grassland", located between 2100-2400 m (Fig. 3). The EUNIS habitat code of this habitat is "E4.4". This habitat is suitable for *L. helle*, and it is usual for the species to survive in this habitat. The larvae feed from *Polygonum amphibium* L., *P. bistorta* L., *P. viviparum* (L.) Ronse Decr., *Rumex acetosa* L., *R. acetosella* L., *R. aquaticus* (Trautv.) Hiitonen (TSHIKOLOVETS, 2011). Records of the larval food plant of the Lepidoptera (*Polygonum bistorta* L.) were reported in the same habitat near the location where the

species was collected (TANAP, 2014). This plant species is widely found in the high mountain steppe in the Eastern Anatolia region in Turkey. *Polygonum bistorta* ssp. *carneum* (K. Koch) is a mountain element of Blacksea region and spreads out through Middle and Eastern Blacksea sections, Erzurum-Kars section and Hakkari section (GÜNER, 2012). The fact that the larval food plant is widespread indicates that the necessary conditions exist for *L. helle* to settle and reproduce in the area.

Lycaena helle, which was identified in the monitoring studies carried out in the province of Ardahan in 2020, is the new record for Turkey. This is an important zoogeographic discovery regarding



Figures 1-3.– 1. Aerial photograph of the habitat where the samples were collected. **2.** Habitus of *Lycaena helle* ([D. & Schiff.]). **3.** Acid alpine and subalpine grassland (E4.4) habitat.

the spread of this species. The closest record of the species to Turkey is known as Georgia (Abkhazeti) (DIDMANIDZE, 2004). The available data in Europe show that the very limited habitat base of the species has been deteriorating at an alarming rate over the past two decades. New records of *L. helle* shift the known area of the species in Europe further to the south, which make them very important (POPOVIĆ *et al*., 2014). The identification of the species in Turkey supports that the current distribution area is shifting towards the south.

The reason why only one individual belonging to *L. helle* was caught in this study is that it is a monitoring study carried out along the pipeline, which is a limited area. It is necessary to urgently carry out comprehensive studies in the field to determine the distribution area of the species and the population density. Otherwise, the only known population of the violet copper in Turkey may be on the verge of extinction, as in Europe, without being included in the scope of conservation studies due to insufficient data.

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Description of a new Pterophoridae from Kazakhstan and new distribution records from central Palearctic region (Insecta: Lepidoptera)

K. Nupponen

Abstract

The Pterophoridae results of 60 expeditions to central Palearctic region during 1996-2019 are reported. Covered areas include the Volgo-Ural district, Southern Siberia, Central Asia, the Turanian region and the Caucasus. A new species is described from Kazakhstan: *Procapperia processidactyla* Nupponen, sp. n. from the Karatau Mountains. *Agdistis flavissima* Caradja, 1920 is reported as new to Europe from the lower Volga region. Previously unknown male genitalia of *Agdistis karabachica* Zagulajev, 1990 and *Tabulaephorus maracandicus* Arenberger, 1998 are illustrated. Distribution records of 42 species are reported.
KEY WORDS: Insecta, Lepidoptera, Pterophoridae, new species, new records, former USSR, Palearctic region.

Descripción de un nuevo Pterophoridae de Kazajistán y nueva distribución de registros del centro de la región Paleártica (Insecta: Lepidoptera)

Resumen

Se comunican los Pterophoridae, como resultado de 60 expediciones los Pterophoridae del centro de la región Paleártica durante 1996-2019. Las áreas cubiertas incluyen el distrito Volgo-Uralense, sur de Siberia, Asia central, las región Turánica y el Cáucaso. Se describe una nueva especie de Kazajistán: *Procapperia processidactyla* Nupponen, esp. n. de las montañas Karatau. Se menciona como nueva para Europa de la región del bajo Volga a *Agdistis flavissima* Caradja, 1920. Se ilustra la genitalia del macho, previamente desconocida, de *Agdistis karabachica* Zagulajev, 1990 y *Tabulaephorus maracandicus* Arenberger, 1998. Se menciona la distribución de 42 especies.
PALABRAS CLAVE: Insecta, Lepidoptera, Pterophoridae, nueva especie, nuevos registros, formalmente URSS, región Paleártica.

Introduction

The Pterophoridae fauna of the former USSR has been studied intensively during the last decades (ANIKIN *et al*., 2017; ARENBERGER, 1995, 1997, 1999, 2000, 2001, 2002a, 2002b, 2005; ARENBERGER & BUCHSBAUM, 1994, 1998; NUPPONEN & NUPPONEN, 2011; USTJUZHANIN, 2001; USTJUZHANIN & KOVTUNOVICH, 2014, 2016, 2018a, 2018b, 2019, 2020). Wings of many Pterophoridae are divided in spars, therefore making Pterophoridae diagnostic and easy to recognize on family level. Therefore los Pterophoridae are often collected by

lepidopterists not focused to the Microlepdoptera. As a result, rich material has accumulated in collections exceptionally extensively compared to many other lepidoptera families. Nowadays the Palearctic fauna is moderately well known. However, many species are known to be very local, and unknown species will certainly still hide in remote and hard-to-reach areas.

The present article is based on materials of Pterophoridae collected during 1996-2019 mainly by the author. Further material was donated for study by Pavel Gorbunov (Russia), Timo Nupponen (Finland), and Risto Haverinen (Finland).

Material and methods

The materials, embracing about 2500 specimens of pinned Pterophoridae, originate from intensive collecting during about 60 expeditions to different parts of the former USSR, comprising altogether about 1000 days in the field. About 40 expeditions were made to different parts of Russia (35 to the Volgo-Ural district, two to Altai Mts., two to Buryatia, one to Primoriye), 12 to Kazakhstan, six to Central Asia (two to Uzbekistan, two to Tajikistan, one to Kyrgyzstan, one to Turkmenistan), and three to Caucasus (two to Georgia, one to Azerbaidzan). The material was collected by netting at daytime, as well as by light trapping at night. Two to four light traps with various ultraviolet- and led-lamps were used every night, excluding a few nights with heavy rain. Collection was not focused only on Pterophoridae, but more or less comprehensively covering all families of Lepidoptera.

At first, all plume moth material was sorted based on external characters, and then determined by studying the morphology and, if necessary, the genitalia dissected to confirm species identification. Majority of specimens belonging to the genus *Stenoptilia* Hübner, [1825] were not determined at species level. The material was determined using the available literature (ARENBERGER, 1995, 2002, 2005; ZAGULJAEV, 1997) and proceedings mentioned below in bibliography. Here are reported only species which are significant and contribute to existing knowledge, for example being the first record from country or a certain small area (e.g. Orenburg district), rare and local species (e.g. *Oirata volgensis* (Möschler, 1862)), or species occurs mainly in remote regions and is therefore seldom reported (e.g. *Agdistis ingens* Christoph, 1887). Species not reported here are often widely distributed and common, and these include such as *Crombrugghia distans* (Zeller, 1847) and *Emmelina monodactyla* (Linnaeus, 1758). Distribution data presented below follows mainly those presented in ARENBERGER (1995), USTJUZHANIN & KOVTUNOVICH (2019) and ANIKIN *et al*. (2017). Some additional data were picked up from various recently published articles (see Bibliography below). New regional findings, and notes on determination, habitats etc. are mentioned in the Remarks-section of each species. The materials reported here are deposited in the research collection of T. & K. Nupponen (Espoo, Finland). The type materials are available for loan via Finnish Museum of Natural History, University of Helsinki, Finland (FMNH), or directly from the author. The coordinates are presented in degrees and minutes.

Abbreviations

NUPP	research collection of Kari and Timo Nupponen, Espoo, Finland.
FMNH	Finnish Museum of Natural History, University of Helsinki, Finland.
n×GP	number of genitalia preparations preserved in glycerol.

Result

Procapperia processidactyla Nupponen, sp. n.

Type material Holotype ♂: KAZAKHSTAN, 43º 47’ N 68º 03’ E, 540 m a.s.l., Karatau Mts., Turkestan town 50 km N, 7-V-2010, K. Nupponen leg. In coll. NUPP (FMNH). Paratypes: Ibidem, 2

♂♂, 1 ♀ 6-V-2010, 4 ♂♂, 7-V-2010. Genitalia slides: K. Nupponen prep. no. 1/5-I-2021 ♂, 1/6-I-2021 ♀. In coll. NUPP.

Diagnosis: Externally is similar to many dark species in the genera *Procapperia* and *Capperia* and examination of the genitalia is required for confident determination. The male genitalia are unmistakeable, particularly by a long gnathos with bifurcate tip, and a characteristic process at middle of costal margin of the valva. In the female genitalia, posteriorly slightly asymmetric antrum and shape of sternum VII are diagnostic.

Description (Fig. 4): Wingspan 13.5-16 mm. Head, collar, neck tuft, haustellum, scape, labial palp and thorax and abdomen dark brown, more or less mixed with dirty white. Flagellum 0.65 x length of forewing, dark brown with few white scales at upper surface terminally at each segment; ciliate, sensillae shorter than diameter of flagellum. Legs: upper surface of femur blackish brown, lower surface dirty white with more or less distinct narrow longitudinal stripe; tibia and tarsus blackish brown, striped by three (tibia) or four (tarsus) white rings, being more distinct in hindlegs. Forewing blackish brown, at middle before cleft small white patch; fringes at dorsal margin mixed with white and dark brown, apical half with few blackish brown scales forming four indistinct spots. First forewing lobe with two white bands, inner one moderately broader, outer one narrower and oblique; at apex white costal spot. Second forewing lobe with indistinct subapical white spot. Hindwing dark brown; third lobe at basal two thirds dark brown mixed with white, less so at basal half; apical fifth with black scales at both costal and dorsal margins, dorsal ones longer but present only subapically.

Male genitalia (Fig. 5): Gnathos long, more than half length of phallus, thin and straight, tip bifurcate. Uncus triangular, shorter than gnathos. Valvae symmetrical, at middle slightly bent, distal half shovel-shaped; at middle of costal margin a robust mushroom-like sclerotised process, enlarged distal part densely covered by short but stout thorns. Phallus 0.7 × length of valva, sigmoid, distal fifth constant wide but thinner than basal part. Sternum VIII subpentagonal, posteriorly bifurcate, anterior margin slightly concave, posterolaterally hairy flap on both sides.

Female genitalia (Fig. 6): Ostium widely excavated in the antrum. Antrum funnel-shaped, posteriorly slightly asymmetric. Ductus bursae thin, corpus bursae oval without signa. Sternum VII pentagonal, tip blunt and shallowly concave. Apophyses posteriores about as long as height of sternum VII. Apophyses anteriores reduced.

Bionomy: The habitat is a mountain steppe at low altitude. The specimens were swept on low vegetation in the afternoon sunshine.

Distribution: South Kazakhstan. Only known from type locality, the Karatau Mountains.

Etymology. Lat. *processus* = process. The species name alludes to distinctive costal processes of the valvae.

Remarks: In Fig. 5 (based on slide 1/5-I-2021), the sclerotised process of the right valva was intentionally bent to make the surface thorns visible. Thus, the valvae are symmetrical. The habitat of *P. processidactyla* is illustrated in NUPPONEN (2011: Fig 6). The moth inhabits the same slope as *Scythris polata* Nupponen, 2011. Both species were observed only on a small area of about five acres, although similar slopes in the vicinity were swept for several hours. The Syrdarya Karatau is a moderately low but isolated mountain range, and well-known by numerous vascular plant endemics (eg. KAMELIN, 1990). It is possible that *P. processidactyla* is an endemic species too.

Taxonomic notes and annotated records of Pterophoridae

Agdistis asthenes Bigot, 1970

Agdistis asthenes Bigot, 1970. *Reichebachia*, **12**(28): 283

Material: KAZAKHSTAN, 43º 14’ N 78º 52’ E, 1220 m a.s.l., Charyn River, 8 exx., 1-VI-2014, K. Nupponen & R. Haverinen leg., 2×GP; Kazakhstan, 43º 37’ N 79º 55’ E, 650 m a.s.l., Rakhat Kuduk by Ketmen Mts., 3 exx., 2-VI-2014, K. Nupponen & R. Haverinen leg.; Kazakhstan, 43º 47’ N 79º 54’

E, 515 m a.s.l., Rakhat Kuduk by Ili River shore, tugai forest, 17 exx., 3-VI-2014 K. Nupponen & R. Haverinen leg., 5×GP; Kazakhstan, 43º 46' N 79º 55' E, 515 m a.s.l., Rakhat Kuduk, desert & sand dunes, 2 exx., 4-VI-2014 K. Nupponen & R. Haverinen leg., 1×GP.

Agdistis falkovitshi Zagulajev, 1986

Agdistis falkovitshi Zagulajev, 1986. *Trudy zool. Inst., Leningrad*, **67**: 77

Material: KAZAKHSTAN, 43º 14' N 78º 52' E, 1220 m a.s.l., Charyn River, 2 ♂♂, 1-VI-2014, K. Nupponen & R. Haverinen leg.; Kazakhstan, 43º 37' N 79º 55' E, 650 m a.s.l., Rakhat Kuduk by Ketmen Mts., 3 ♂♂, 2-VI-2014, K. Nupponen & R. Haverinen leg., 2×GP; Kazakhstan, 43º 46' N 79º 55' E, 515 m a.s.l., Rakhat Kuduk, desert & sand dunes, 4 exx., 4-VI-2014 K. Nupponen & R. Haverinen leg., 1×GP.

Agdistis flavissima Caradja, 1920

Agdistis flavissima Caradja, 1920. *Dt. ent. Z., Iris*, **34**: 87

Material: KAZAKHSTAN, 47º 16' N 55º 35' E, 55 m a.s.l., Emba River bank, near Mijaly village, 1 ♂, 1 ♀, 18-V-2010, K. Nupponen leg., Genitalia slide: K. Nupponen prep. no. 2/19-XI-2010; Kazakhstan, 42º 36' N 54º 08' E, 0-47 m a.s.l., Ustyurt Nature Reserve, Onere spring, 1 ♂, 16-V-2011, K. Nupponen leg.; Kazakhstan, 44º 47' N 65º 45' E, 125 m a.s.l., Kyzylorda town 17 km E, 1 ex., 30-IV-2012, K. Nupponen leg.; Kazakhstan, 44º 17' N 66º 34' E, 140 m a.s.l., Baigakum 8 km E, sands, 1 ♂, 10-V-2012, K. Nupponen leg., 1×GP; Kazakhstan, 43º 59' N 79º 34' E, 495 m a.s.l., Ili River valley, Aidarly sands, Aidarly village 6 km SE, 1 ♂, 2-V-2017, K. Nupponen & R. Haverinen leg.; Kazakhstan, 44º 00' N 79º 31' E, 515 m a.s.l., sand dunes by Ili River, Aidarly village 3 km S, 1 ♂, 3-VI-2017, K. Nupponen & R. Haverinen leg. TAJIKISTAN, 37º 18' N 68º 23' E, 312 m a.s.l., Pavlon Tugai, 2 ♂♂, 1-V-2014, T. Nupponen & R. Haverinen leg., 1×GP; Tajikistan, 37º 19' N 68º 27' E, 324 m a.s.l., Tigravai Balka, 3 ♂♂, 2 ♀♀, 3-V-2014, T. Nupponen & R. Haverinen leg., 1×GP. RUSSIA, 48º 09' N 46º 49' E, -9 m, Astrakhan district, Baskunzak salt lake SW, Bogdo, 1 ♂, 4-VI-2001, K. Nupponen leg., Genitalia slide: K. Nupponen prep. no. 2/12-II-2021.

Distribution: China, Turkmenistan, Tajikistan, Uzbekistan, Kazakhstan, European Russia (Astrakhan district).

Remarks: New to Tajikistan, Kazakhstan and Russia. First record from Europe. The species is much more widely distributed in the Central Asian and Turanian deserts than known earlier. *A. flavissima* is a large species (Fig. 7), and externally it can be mixed only with *A. ingens* Christoph, 1887. The species occur often sympatrically. However, males of the two species are readily separated by sternum VIII of the abdomen. Sternum VIII of *A. ingens* is very long and narrow, while that of *A. flavissima* is essentially shorter and terminally broader. The difference is visible even without magnification and removing anal scales. The male genitalia of *A. flavissima* are unmistakeable (ARENBERGER, 1995).

Agdistis gerasimovi Zagulajev & Blumenthal, 1994

Agdistis gerasimovi Zagulajev & Blumenthal, 1994. *Ent. Obozr.*, **73**: 24

Material: UZBEKISTAN, 41º 01' N 68º 36' E, 260 m a.s.l., Sidaryo district, Syr-Darya River, tugai forest, 1 ♂, 24-VII-2009, K. Nupponen leg., 1×GP; Tajikistan, 37º 19' N 68º 27' E, 324 m a.s.l., Tigravai Balka, 4 ♂♂, 1 ♀, 3-V-2014, T. Nupponen & R. Haverinen leg., 1×GP. TAJIKISTAN, 37º 18' N 68º 23' E, 312 m a.s.l., Pavlon Tugai, 1 ♂, 1-V-2014, T. Nupponen & R. Haverinen leg.; Tajikistan, 37º 16' N 68º 20' E, 317 m a.s.l., Pavlon Tugai, 1 ♂, 1 ♀, 4-V-2014, T. Nupponen & R. Haverinen leg., Genitalia slide: K. Nupponen prep. no. 3/1-XII-2020.

Distribution: Tajikistan, Uzbekistan.

Remark: New to Uzbekistan. The species inhabits Tugai forests along Central Asian rivers: Syr-Darya in Uzbekistan, and Amu-Darya in Tajikistan.

Agdistis ingens Christoph, 1887

Agdistis ingens Christoph, 1887. *Mém. Lépid*., **3**: 124

Material: KAZAKHSTAN, 42º 13' N 68º 12' E, 210 m a.s.l., Syr-Darya River valley, Arys village 45 km W, 1 ♂, 3-V-2010, K. Nupponen leg., Genitalia slide: K. Nupponen prep. no. 1/19-XI-2010; Turkestan town 35 km SW, 8 exx., 8-V-2012, K. Nupponen leg.; Kazakhstan, 43º 56' N 68º 14' E, 900 m a.s.l., Kulzhalykar Mts., Suzak settlement 30 km S, 1 ♂, 10-V-2010, K. Nupponen leg.; Kazakhstan, 47º 16' N 55º 35' E, 55 m a.s.l., Emba River bank , near Mijaly village, 1 ♂, 18-V-2010, K. Nupponen leg.; Kazakhstan, 42º 57' N 54º 39' E, 90 m a.s.l., Ustyurt Nature Reserve, Kendyrli, 3 exx., 19-V-2011, K. Nupponen leg.; Kazakhstan, 44º 47' N 65º 45' E, 125 m a.s.l., Kyzylorda town 17 km E, 1 ♂, 30-IV-2012, K. Nupponen leg.; Kazakhstan, 43º 32' N 67º 30' E, 170 m a.s.l., Syr-Darya River, tugai forest, Talap station 13 km SW, 4 exx., 1-V-2012, K. Nupponen leg.; Kazakhstan, 43º 08' N 67º 51' E, 185 m a.s.l., Syr-Darya River, tugai forest; Kazakhstan, 44º 11' N 66º 44' E, 160 m a.s.l., Shieli settlement, 4 exx., 10-V-2012, K. Nupponen leg.; Kazakhstan, 47º 43' N 61º 27' E, 100 m a.s.l., Terektikum Sands, Aralsk town 110 km N, 2 exx., 15-V-2012, K. Nupponen leg.; Kazakhstan, 43º 37' N 79º 55' E, 650 m a.s.l., Rakhat Kuduk by Ketmen Mts., 7 exx., 2-VI-2014, K. Nupponen & R. Haverinen leg.; Kazakhstan, 43º 47' N 79º 54' E, 515 m a.s.l., Rakhat Kuduk by Ili River shore, tugai forest, 2 exx., 3-VI-2014, K. Nupponen & R. Haverinen leg.; Kazakhstan, 43º 46' N 79º 55' E, 515 m a.s.l., Rakhat Kuduk, desert & sand dunes, 1 ♂, 4-VI-2014, K. Nupponen & R. Haverinen leg.; Kazakhstan, 43º 59' N 79º 34' E, 495 m a.s.l., Ili River valley, Aidarly sands, Aidarly village 6 km SE, 15 exx., 2-VI-2017, K. Nupponen & R. Haverinen leg.; Kazakhstan, 44º 00' N 79º 31' E, 515 m a.s.l., sand dunes by Ili River, Aidarly village 3 km S, 2 exx., 3-VI-2017, K. Nupponen & R. Haverinen leg.; Kazakhstan, 44º 07' N 79º 23' E, 792 m a.s.l., foothills of Katutau Mts., Konyrolen River, 1 ♂, 4-VI-2017, K. Nupponen & R. Haverinen leg.; Kyrgyzstan, 41º 25' N 74º 55' E, 1620 m a.s.l., Naryn River valley, near Ak-Tal village, 1 ♂, 3-VIII-2010, K. Nupponen & R. Haverinen leg.; Tajikistan, 37º 18' N 68º 23' E, 312 m a.s.l., Pavlon Tugai, 9 exx., 1-V-2014, 8 exx., 2-V-2014, T. Nupponen & R. Haverinen leg.; Tajikistan, 37º 19' N 68º 27' E, 324 m a.s.l., Tigravai Balka, 34 exx., 3-V-2014, T. Nupponen & R. Haverinen leg.; Tajikistan, 37º 16' N 68º 20' E, 317 m a.s.l., Pavlon Tugai, 1 ♂, 4-V-2014, T. Nupponen & R. Haverinen leg.

Agdistis intermedia Caradja, 1920

Agdistis intermedia Caradja, 1920. *Dt. ent. Z., Iris*, **34**: 88

Material: RUSSIA, 50º 58' N 54º 25' E, 100 m a.s.l., Orenburg district, near Burannoe village, Ilek River valley, 1 ♂, 30-VII-2000, 1 ♂, 1 ♀, 29-VIII-2000, 1 ♀, 12-VI-2001, 1 ♂, 3-VII-2003, 12 exx., 6-7-VIII-2005, 4 exx., 18-19-VIII-2006, K. Nupponen leg., 3×GP; Russia, 50º 59' N 54º 17-22' E, 100 m a.s.l., Orenburg district, Novoiletzk 8 km E, Ilek River valley, 3 ♂♂, 8-VI-1998, K. Nupponen & T. Nupponen leg.; Russia, 50º 40-45' N 54º 26-28' E, 170-230 m a.s.l., Orenburg district, Pokrovka village 20 km S, Schibendy valley, 1 ♂, 29-VI-2003, 2 ♂♂, 26-IX-2005, K. Nupponen leg., 1×GP; Russia, 53º 59' N 61º 12' E, 250 m a.s.l., Cheliabinsk district, Troizkii reserve near Berlin village, 1 ♀, 30-VI-1997, K. Nupponen leg.; Russia, 53º 02' N 62º 06' E, 200 m a.s.l., Cheliabinsk district, Ajat River near Nikolaevka village, 1 ♀, 5-IX-2000, K. Nupponen leg.; Russia, 49º 47' N 44º 25' E, 90 m a.s.l., Volgograd district, Olhovka village 12 km SW, 1 ♂, 1-VI-2001, K. Nupponen leg. AZERBAIJAN, Caspian Sea shore, 41º 22' N 49º 03' E, -36 m a.s.l., Chaygaragasly, 2 ♂♂, 5-VI-2019, K. Nupponen & R. Haverinen leg., 1×GP.

Remarks: The species is widely distributed, from Hungary extending in Russia eastwards to the Altai Mountains. Recently reported from Orenburg district (SACHKOV, 2020). In steppes of the southern Ural Mts. the species is not rare.

Agdistis karabachica Zagulajev, 1990

Agdistis karabachica Zagulajev, 1990. *Ent. Obozr*., **69**(1): 112

Material: Georgia, 41º 12’ N 46º 21’ E, 285 m, Vashlovani Nat. Res., by Pantishara, 8 ♂♂, 30-V-2016, K. Nupponen & R. Haverinen leg., Genitalia slide: K. Nupponen prep. no. 4/1-XII-2020.

Distribution: Turkey, Azerbaijan, Turkmenistan, Georgia.

Remarks: The description of *A. karabachica* is based on a single female. The present material was collected near the type locality (40 km to the north) in similar pistachio forest habitat. As the male genitalia (Fig. 8) do not fit in with those of any described species, the taxon is considered to be conspecific with *A. karabachica*. **New to Georgia**.

Agdistis kazakhstanicus Ustjuzhanin & Kovtunovich, 2014

Agdistis kazakhstanicus Ustjuzhanin & Kovtunovich, 2014. *Entomologist’s Gaz.,* **65**(4): 242

Material: Kazakhstan, 42º 36’ N 54º 08’ E, 0-47 m a.s.l., Ustyurt Nat. Res., Onere spring, 1 ♂, 2 ♀♀, 16-V-2011, K. Nupponen leg.; Ibidem, 1 ♂, 3 ♀♀, 18-V-2008, P. Gorbunov leg.; Kazakhstan, 42º 57’ N 54º 41’ E, 128 m a.s.l., Ustyurt Nat. Res., Kendyrli, 1 ♂, 9-V-2008, P. Gorbunov leg.; Kazakhstan, 43º 24’ N 54º 33’ E, 142 m a.s.l., Ustyurt Nat. Res., Mametkazgan, 1 ♂, 11-V-2008, P. Gorbunov leg.; Kazakhstan, 43º 33’ N 51º 45’ E, -90 m a.s.l., Karagie salt lake, 15-IX-2012, K. Nupponen. Genitalia slides: K. Nupponen prep. no. 1/1-XII-2020 ♂, 1/11-XII-2020 ♀, 4/11-XII-2020 ♀; four male genitalia in glycerol.

Distribution: Kazakhstan: the species is known in SE Kazakhstan (Ili valley) and SW Kazakhstan (southern Ustyurt district and the Mangistau province area).

Agdistis manicata Staudinger, 1859

Agdistis manicata Staudinger, 1859. *Stettin. ent. Ztg*., **20**: 258

Material: Azerbaijan, Caspian Sea shore, 41º 22’ N 49º 03’ E, -36 m a.s.l., Chaygaragasly, 2 ♂♂, 5-VI-2019, K. Nupponen & R. Haverinen leg., 1×GP.

Remarks: The species is widely distributed in the western Palaearctic region: from Spain and Morocco eastwards to the Caspian Sea. New to Azerbaijan.

Agdistis mevlaniella Arenberger, 1972

Agdistis mevlaniella Arenberger, 1972. *Beitr. Naturk. Forsch. SüdwDtl*., **31**: 151

Material: Kazakhstan, 44º 17’ N 66º 34’ E, 140 m a.s.l., Baigakum 8 km E, sands, 1 ♂, 10-V-2012, K. Nupponen leg.; Kazakhstan, 44º 00’ N 79º 31’ E, 515 m a.s.l., sand dunes by Ili River, Aidarly village 3 km S, 1 ♂, 3-V-2017, K. Nupponen & R. Haverinen leg., 1×GP. Tajikistan, 37º 16’ N 68º 20’ E, 317 m a.s.l., Pavlon Tugai, 3 ♂♂, 4-V-2014, T. Nupponen & R. Haverinen leg., Genitalia slide: K. Nupponen prep. no. 2/1-XII-2020.

Agdistis rubasiensis Zagulajev, 1985

Agdistis rubasiensis Zagulajev, 1985. *Ent. Obozr*., **64**(4): 785

Material: Azerbaijan, 39º 29’ N 48º 44’ E, -24 m a.s.l., Bilasuvar 15 km E, salt lake, 1 ♂, 1-VI-2019, K. Nupponen & R. Haverinen leg., Genitalia slide: K. Nupponen prep. no.1/ 2-XII-2020.

Remarks: The species is known from a few localities on the west side of the Caspian Sea. New to Azerbaijan. The habitat in Azerbaijan is a shore of a large salt lake, abundant with *Limonium* and *Tamarix*, as well as *Artemisia* spp. in drier patches. The moth is misleadingly reminiscent of a sympatric *A. adactyla* (Hübner, [1819]), which appears to be smaller and darker in saline habitats than in steppes. The species can easily be determined by dissecting the genitalia (ARENBERGER, 1995). Males of the two species can also be separated by removing anal scales, so that adequate details become visible. In *A. adactyla* the left posterior branch of sternum VIII is *in situ* dorsad and shovel-shaped, while that of *A. rubasiensis* is distally pointed. This method is quick, and useful especially in localities where *A. adactyla* is abundant.

Agdistis sissia Arenberger, 1987
Agdistis sissia Arenberger, 1987. *Z. ArbGem. öst. Ent*., **38**(3-4) (1986): 103

Material: Georgia, 41º 12’ N 46º 21’ E, 285 m a.s.l., Vashlovani Nat. Res., by Pantishara, 10 exx., 30-V-2016, K. Nupponen & R. Haverinen leg., 1×GP.

Distribution: Turkey, Armenia, Azerbaijan, Georgia, Turkmenistan. **New to Georgia**.

Gillmeria macrornis (Meyrick, 1930)
Gillmeria macrornis (Meyrick, 1930). *Exotic Microlepid*., **3**(18): 567

Material: Russia, 52º 02’ N 49º 04’ E, 35 m a.s.l., Saratov district, by Pugatsev village, 1 ex., 2-IX-2002, K. Nupponen leg.; Russia, 50º 58’ N 54º 25’ E, 100 m a.s.l., Orenburg district, near Burannoe village, Ilek River valley, 1 ex., 18-VIII-2006, 10 exx., 19-VIII-2006, K. Nupponen leg., Genitalia slide: K. Nupponen prep. no. 1/10-XII-2020.

Gillmeria rhusiodactyla (Fuchs, 1903)
Platyptilia rhusiodactyla Fuchs, 1903. *Stett. ent. Ztg*., **64**: 14

Materia: Russia, 51º 23’ N 56º 49’ E, 130-340 m a.s.l., Orenburg district, Donskoje village 6 km W, Verbljushka Gora, 1 ♂, 30-V-1998, 1 ♂, 17-VI-1999, 1 ♂, 23-V-2004, K. Nupponen leg.; Russia, 51º 13’ N 57º 37’ E, 350 m a.s.l., Orenburg district, Mednogorsk 20 km S, near Kidriasovo village, 1 ♂, 29-V-1998, K. Nupponen & T. Nupponen leg.; Russia, 50º 40-45’ N 54º 26-28’ E, 170-230 m a.s.l., Orenburg district, Pokrovka village 20 km S, Schibendy valley, 25 exx., 3-7-VI-1998, K. Nupponen & T. Nupponen leg., Genitalia slides: K. Nupponen prep. no. 1/12-XII-2020 1 ♂, 2-12-XII-2020, 1 ♀, 3×GP; Ibidem, 25-26-V-2004, 2 exx., K. Nupponen leg. Kazakhstan, 46º 24’ N 59º 35’ E, 180 m a.s.l., Bozoi village 60 km E, Aral Sea shore 7 km N, 1 ♂, 13-V-2010, K. Nupponen leg.; Kazakhstan, 47º 27’ N 55º 06’ E, 95 m a.s.l., Aktolagai chalk hills, Emba River 40 km NW, 3 exx.,15-V-2010, K. Nupponen leg.; Kazakhstan, 47º 30’ N 55º 07’ E, 209 m a.s.l., Aktolagai chalk hills, Emba River 40 km NW, 5 exx., 17-V-2010, K. Nupponen leg.; Kazakhstan, 46º 24’ N 59º 35’ E, 180 m a.s.l., Bozoi village 60 km E, Aral Sea shore 7 km N, 1 ♂, 13-V-2010, K. Nupponen leg.; Kazakhstan, 47º 43’ N 61º 27’ E, 100 m a.s.l., Terektikum Sands, Aralsk town 110 km N, 6 exx., 15-V-2012, K. Nupponen leg.

Gillmeria stenoptiloides (Filipjev, 1927)
Amblyptilia stenoptiloides Filipjev, 1927. *Ezheg. Gosud. Muz. N. M. Mart.’vanova*, **5**(1): 30

Material: Russia, 50º 14-16’ N 87º 40’ E, 1500 m a.s.l., Altai Mts., Chuja valley, Aktash village 5 km SE, 1 ♂, 5-VII-2000, K. Nupponen & T. Nupponen leg.; Russia, 50º 48’ N 86º 00’ E, 1000 m a.s.l., Altai Mts., by Shashikman village, 2 ♂♂, 7-VII-2000, K. Nupponen & T. Nupponen leg., Genitalia slide: K. Nupponen prep. no. 1/11-XII-2002; Russia, 59º 30-32’ N 59º 09-11’ E, 600 m, North Ural, by Kytlym village, Kosvinskij Kamen, 1 ♂, 10-VII-2003, K. Nupponen leg., Genitalia slide: K. Nupponen prep. no. 1/12-II-2021.

Distribution: Russia (North Ural, South Siberia, Kamchatka, Far East), Japan, NE China.

Remarks: New to the Ural district, and westernmost record of this Siberian species. The moth is readily separated from other plume moth species occurring in the same regions by dark reddish-brown wings (Fig. 9).

It is somewhat questionable whether the area belongs to Europe or not. In some sources all highlands of the Urals are counted as Europe, in some other ones border between Europe and Asia runs along the watershed of the Ural Mountains. The point where the moth was found belongs to both, where is a semi-high area limited in the east in isolated high hills (Kosvinskij Kamen (1519 m), Denezkin Kamen (1292 m), Konzhakovskij Kamen (1568 m)), being actually higher than peaks of the main Ural Mts. in the same latitude. The altitude in the western Siberian plateau is in the average less than 100 m a.s.l., and west from the main Ural chain less than 200 m a.s.l. As altitude in the Kosvinskij Kamen district is in the average higher than 600 m a.s.l., it can reasonably interpreted as highland. The problem is not so serious but may be worth to keep in mind for those who are preparing lists of regional

species list in larger scale (eg. Europe, Siberia), that instead of distict border there exist a large *grey area* in the eastern slopes of the Ural Mts. which can be included in both European and Asian sides on equally good grounds.

Paraplatyptilia sahlbergi (Poppius, 1906)
Stenoptilia sahlbergi Poppius, 1906. *Act. Soc. Faun. Flor. Fenn*., **28**(3): 9

Material: Russia, 66º 51-56' N 65º 32-47' E, 400-600 m a.s.l., Polar Ural, Tjumen district, Krasnyi Kamen, 16 exx.,12-VII-1999, 1 ♂, 13-VII-1999, K. Nupponen & T. Nupponen leg.

Stenoptilia eborinodactyla Zagulajev, 1986
Stenoptilia eborinodactyla Zagulajev, 1986. *Opred. Faune SSSR*, **117.4**(3): 113

Material: Russia, 52º 45' N 53º 05' E, 250-300 m a.s.l., Orenburg district, by Zesnokovka village, 2 ♂♂, 9-VI-2001, K. Nupponen leg.; Russia, 51º 23' N 56º 49' E, 130-340 m a.s.l., Orenburg district, Donskoje village 6 km W, Verbljushka Gora, 1 ♀, 9-IX-2002, 1 ♂, 1 ♀, 10-IX-2002, K. Nupponen leg.; Russia, 50º 40-45' N 54º 26-28' E, 170–230 m a.s.l., Orenburg district, Pokrovka village 20 km S, Schibendy valley, 8 ♂♂, 5 ♀♀, 5-7-VI-1998, K. Nupponen & T. Nupponen leg., Genitalia slide: K. Nupponen prep. no. 1/7-XII-2020 ♂; Ibidem, 1 ♂, 5 ♀♀, 17-VII-1998, 5 ♂♂, 2 ♀♀, 21-22-VI-1999, 1 ♂, 30-VII-2000, 5 ♂♂, 1 ♀, 30-31-VIII-2000, 6 ♂♂, 4 ♀♀, 10-11-VI-2001. 2 ♂♂, 1 ♀, 2-3-VIII-2005, 1 ♂, 5 ♀♀, 21-22-VIII-2006, K. Nupponen leg., Genitalia slide: K. Nupponen 2/7-XII-2020 ♂, 3×GP; Russia, 49º 47' N 44º 25' E, 90 m a.s.l., Volgograd district, Olhovka village 12 km SW, 2 ♂♂, 3-IX-2002, 1 ♀, 4-IX-2002, 2 ♂♂, 25-VIII-2006, K. Nupponen leg.

Remarks: **New to the Orenburg district**. The species inhabits chalk steppes.

Stenoptilia latistriga Rebel, 1916
Stenoptilia latistriga Rebel, 1916. *Dt. ent. Z., Iris*, **30**: 188

Material: Russia, 50º 16-20' N 87º 50-55' E, 2500 m a.s.l., Altai Mts., Kuraisky hrebet, mountain steppe, 1 ♂, 1 ♀, 9-VII-2001, K. Nupponen leg.

Stenoptilia nolckeni (Tengström, 1869)
Pterophorus nolckeni Tengström, 1869. *Cat. lepid. Faun. fenn*., **10**: 366

Material: Russia, 50º 14-16' N 87º 50-55' E, 1500-1700 m a.s.l., Altai Mts., Kuraiskaja steppe, 1 ♂, 25-VI-2000, K. Nupponen & T. Nupponen leg.; Russia, 50º 14-16' N 87º 40' E, 1500 m a.s.l., Altai Mts., Chuja valley, Aktash village 5 km SE, 2 exx., 25-VI-2000, K. Nupponen & T. Nupponen leg.; Russia, 51º 47-48' N 100º 55-58' E, 1450 m a.s.l., SW Buryatia, East Sayan Mts., Mondy village 2 km E, taiga forest/steppe, 5 exx., 13-VI-2002, 2 exx., 14-VI-2002, 3 exx., 15-VI-2002, K. Nupponen leg.

Marasmarcha asiatica (Rebel, 1906)
Platyptilia asiatica Rebel, 1906. *Dt. ent. Z., Iris*, **15**: 108

Material: Kazakhstan, 43º 47' N 68º 03' E, 540 m a.s.l., Karatau Mts.; Turkestan town 50 km N, 1 ♂, 8-V-2010, K. Nupponen leg., 1×GP; Kazakhstan, 47º 26' N 60º 49' E, 150 m a.s.l., Malye Barsuki sands, Karachokat village 5 km NW, 1 ♂, 14-V-2012, K. Nupponen leg., 1×GP; Kazakhstan, 43º 46' N 80º 03' E, 518 m a.s.l., Rakhat Kuduk, desert & sand dunes, 1 ♂, 5-VI-2017, K. Nupponen & R. Haverinen leg., 1×GP.

Marasmarcha colossa Caradja, 1920
Marasmarcha colossa Caradja, 1920. *Dt. ent. Z., Iris*, **34**: 84

Material: Russia, 50º 58' N 54º 25' E, 100 m a.s.l., Orenburg district, near Burannoe village, Ilek River valley, 1 ex., 18-VIII-2006, 5 exx., 20-VI-1999, 32 exx., 3-VII-2003, 1 ♂, 6-VIII-2005, 1 ♂, 7-

VIII-2005, K. Nupponen leg., 1×GP. TAJIKISTAN, 37º 18' N 68º 23' E, 312 m a.s.l., Pavlon Tugai, 19 exx., 1-V-2014, 8 exx., 2-V-2014, T. Nupponen & R. Haverinen leg., 1×GP; Tajikistan, 37º 16' N 68º 20' E, 317 m a.s.l., Pavlon Tugai, 2 ♂♂, 4-V-2014, T. Nupponen & R. Haverinen leg., 1×GP.

Marasmarcha lydia Ustjuzhanin, 1996
Marasmarcha lydia Ustjuzhanin, 1996. *Atalanta*, **27**(1-2): 364

Material: RUSSIA, 51º 37' N 106º 46' E, 600 m a.s.l., S Buryatia, Hamar Daban Mts., Bolshoe Sanzheevka River, Kharamsha village 2 km W, forest steppe, 1 ♂, 27-VI-2002, K. Nupponen leg., 1×GP.

Marasmarcha samarcandica Gerasimov, 1930
Marasmarcha samarcandica Gerasimov, 1930. *Ann. Mus. Zool. Acad. Sic. l'U.R.S.S.*, **31**: 27

Material: RUSSIA, 50º 40-45' N 54º 26-28' E, 170-230 m a.s.l., Orenburg district, Pokrovka village 20 km S, Schibendy valley, 1 ♂, 5-VI-1998, K. Nupponen & T. Nupponen leg.; Uzbekistan, 41º 01' N 68º 36' E, 260 m a.s.l., Sidaryo district, Syr-Darya River, tugai forest, 1 ♂, 9-V-2008, K. Nupponen & R. Haverinen leg. KAZAKHSTAN, 43º 47' N 68º 03' E, 540 m a.s.l., Karatau Mts.; Turkestan town 50 km N, 1 ♂, 6-V-2010, 10 exx., 8-V-2010, K. Nupponen leg. KAZAKHSTAN, 47º 16' N 55º 35' E, 55 m a.s.l., Emba River bank , near Mijaly village, 1 ♂, 18-V-2010, K. Nupponen leg.; Kazakhstan, 48º 09' N 56º 54' E, 130 m a.s.l., Emba River bank, sands near Karkamys village, 3 ♂♂, 19-V-2010, K. Nupponen leg.; Kazakhstan, 45º 30' N 55º 17' E, 110 m a.s.l., Beineu town 18 km N, 1 ♂, 28-V-2011, K. Nupponen leg.; Kazakhstan, 47º 37' N 59º 31' E, 190 m a.s.l., N Bolshoe Barsuki sands, Chelkar settlement 25 km S, 1 ♂, 3-VI-2011, K. Nupponen leg.; Kazakhstan, 48º 38' N 57º 54' E, 200 m a.s.l., Kumzhargan sands by Emba River, 1 ♀, 5-V-2011, K. Nupponen leg.; Kazakhstan, 43º 44' N 68º 19' E, 650 m a.s.l., Karatau Mts., Yankorgan River, 1 ♀, 6-V-2012, K. Nupponen leg.

Remarks: The species was recently reported as new to Russia and Europe (ANIKIN *et al.,* 2017). The habitat in South Ural is a chalk steppe. In Kazakhstan the species inhabits various desert steppes and semideserts.

Oxyptilus ericetorum (Zeller, 1844)
Pterophorus ericetorum Zeller, 1844. *Ber. Schles. Tausch-Ver. Schm*., **5**: 18

Material: RUSSIA, 51º 37' N 57º 34' E, 300 m a.s.l., Orenburg district, Kuvandyk 30 km NE, 1 ♂, 1-VIII-2000, T. Nupponen leg., 1×GP.

Remark: New to the Ural region and Orenburg district.

Capperia celeusi (Frey, 1886)
Oxyptilus celeusi Frey, 1886. *Stett. ent. Ztg*., **47**: 18

Material: RUSSIA, 50º 40-45' N 54º 26-28' E, 170-230 m a.s.l., Orenburg district, Pokrovka village 20 km S, Schibendy valley, 1 ♂, 3-VIII-2005, K. Nupponen leg., 1×GP; Russia, 49º 47' N 44º 25' E, 90 m a.s.l., Volgograd district, Olhovka village 12 km SW, 1 ♂, 18-V-2005, K. Nupponen leg. AZERBAIJAN, Greater Caucasus Mts., 40º 48' N 49º 08' E, 650 m a.s.l., Dizavarchay valley, 2 ♂♂, 30-V-2019, K. Nupponen & R. Haverinen leg.

Remarks: *C. taurica* Zagulajev, 1987 was recently synonymized with *C. celeusi* (USTJUZHANIN & KOVTUNOVICH, 2008). The taxon occurs in the southernmost part of Russia in Daghestan and Kalmykia. Both known habitats in the Volgo-Ural are chalk steppes. **New to the Ural region**.

Oirata poculidactyla (Nupponen & Nupponen, 2001)
Pterophorus poculidactyla Nupponen & Nupponen, 2001. *Ent. Fenn*., **12**(1): 50

Material: Russia, 50º 16-20' N 87º 50-55' E, 2400-2800 m a.s.l., Altai Mts., Kuraisky hrebet, mountain steppe, 2 ♂♂, 7-VII-2001, 1 ♀, 8-VII-2001, 1 ♂, 12-VII-2001, K. Nupponen leg.

Oirata volgensis (Möschler, 1862)
Aciptilus volgensis Möschler, 1862. *Wien. ent. Monatschr*., **6**: 143

Material: Russia, 51º 23' N 56º 49' E, 130-340 m a.s.l., Orenburg district, Donskoje village 6 km W, Verbljushka Gora, 2 ♂♂, 1-VI-1998, 10 exx., ex larva V-1999, 1 ♂, 24-V-2004, 4 ♂♂, 25-V-2004, 2 ♂♂, 31-V-2004, K. Nupponen & T. Nupponen leg.; Russia, 50º 40-45' N 54º 26-28' E, 170-230 m a.s.l., Orenburg district, Pokrovka village 20 km S, Schibendy valley, 30 exx., 26-27-V-2004, K. Nupponen leg.; Kazakhstan, 47º 27' N 55º 06' E, 95 m a.s.l., Aktolagai chalk hills, Emba River 40 km NW, 1 ♂, 15-V-2010, K. Nupponen leg. Kazakhstan, 47º 30' N 55º 07' E, 209 m a.s.l., Aktolagai chalk hills, Emba River 40 km NW, 1 ♂, 17-V-2010, K. Nupponen leg.

Remarks: A rare and very local species inhabiting chalk steppes in the south Urals. For further information, see NUPPONEN & AHOLA (2001).

Tabulaephorus maracandicus Arenberger, 1998
Tabulaephorus maracandicus Arenberger, 1998. *Quadrafina*, **1**: 288

Material: Uzbekistan, 38º 40' N 66º 55' E, 2360 m a.s.l., Hissar Mts., near Maidanak village, 1 ♂, 21-VII-2009, K. Nupponen leg., Genitalia slide: K. Nupponen prep. no. 1/19-XII-2020.

Distribution: Tajikistan, Uzbekistan.

Remark: The description of this species is based on two females. The present male (Fig. 10) was collected from the same area as the type specimens, and externally it fits well in with the holotype. The male genitalia are illustrated here for the first time (Fig. 11). They differ from those of related species in details, such as a rather stout uncus, and shape of saccular processes (left one as long as valva and bent subapically, right one reduced).

Tabulaephorus marptys (Christoph, 1872)
Aciptilia marptys Christoph, 1872. *Hor. Soc. ent. Ross*., **9**: 37

Material: Russia, 50º 40-45' N 54º 26-28' E, 170-230 m a.s.l., Orenburg district, Pokrovka village 20 km S, Schibendy valley, 1 ♂, 3-VI-1998, 1 ♂, 1-VIII-2000, K. Nupponen & T. Nupponen leg.; Russia, 50º 59' N 54º 17-22' E, 100 m a.s.l., Orenburg district, Novoiletzk 8 km E, Ilek River valley, 1 ♀, 9-VI-1998, K. Nupponen & T. Nupponen leg.; Russia, 49º 13-26' N 43º 41-56' E, 45-65 m a.s.l., Volgograd district, Ilovla village 10 km WSW, 11 exx., 2-VI-2001, K. Nupponen, 2×GP; Russia, 51º 11-13' N 106º 10-12' E, 700 m a.s.l., S Buryatia, Hamar Daban Mts., Murtoy River, Gusinoe Ozero village 6 km NW, forest steppe, 10 exx., 19-VI-2002, K. Nupponen leg., 1×GP. Kazakhstan, 48º 33' N 57º 36' E, 190 m a.s.l., Kumzhargan sands by Emba River, near Zhagabulak village, 5 exx., 17-V-2012, 1 ♂, 7-IX-2012, K. Nupponen leg., 2×GP.

Remark: The species is local but not rare in steppes of the southern Ural Mts.

Tabulaephorus narynus Arenberger, 1993
Tabulaephorus narynus Arenberger, 1993. *Nachr. ent. Ver. Apollo, Frankf., N. F*., **13**: 320

Material: Kyrgyzstan, 39º 40' N 72º 32' E, 3220 m a.s.l., Alai Mts., near Kashka-Suu village, 2 ♂♂, 21-VII-2010, K. Nupponen & R. Haverinen leg. Genitalia slide: K. Nupponen prep. no. 1/17-XII-2020. Uzbekistan, 38º 40' N 66º 55' E, 2360 m a.s.l., Hissar Mts., near Maidanak village, 1 ♂, 21-VII-2009, K. Nupponen leg. Tajikistan, 38º 40' N 72º 01' E, 2550 m a.s.l., W Pamir Mts., Vanch River valley, Poi-Mazar village 6 km E, Vanch Nat. Res., 1 ♂, 28-VII-2013, K. Nupponen & R. Haverinen leg.

Distribution: Kyrgyzstan, Uzbekistan, Tajikistan.

Remarks: The species seems to be infrequent but rather widely distributed at high altitudes of the Central Asian mountains.

Calyciphora ludmilae Ustjuzhanin & Kovtunovich, 2011
Calyciphora ludmilae Ustjuzhanin & Kovtunovich, 2011. *Amurian zool. Jl*., **3**(3): 275

Material: KYRGYZSTAN, 39º 39' N 73º 52' E, 2930 m a.s.l., Trans-Alai Mts., Nura River, SW from Irkeshtam village, 2 ♂♂, 30-VII-2010, K. Nupponen & R. Haverinen. 1×GP.

Calyciphora nephelodactyla (Eversmann, 1844)
Alucita nephelodactyla Eversmann, 1844. *Fauna Volg. Ural*.: 609

Material: RUSSIA, 49º 47' N 44º 25' E, 90 m a.s.l., Volgograd district, Olhovka village 12 km SW, 1 ♂, 4-IX-2002, K. Nupponen leg., 1×GP.

Merrifieldia caspia (Lederer, 1870)
Pterophorus caspius Lederer, 1870. *Hor. Soc. ent. Ross*., **8**: 27

Material: UZBEKISTAN, 39º 44' N 68º 16' E, 1455 m a.s.l., Jizzax district, Margusor Mts., near Besh-Kuvi village, 47 exx., 15-VII-2009, K. Nupponen leg., 2xx. KYRGYZSTAN, 40º 33' N 73º 07' E, 1130 m a.s.l., Uzgen, Aldier, 1 ♂, 19-VII-2010, K. Nupponen & R. Haverinen leg.; Kyrgyzstan, 41º 25' N 74º 55' E, 1620 m a.s.l., Naryn River valley, near Ak-Tal village, 1 ♀, 3-VIII-2010, K. Nupponen & R. Haverinen leg. TAJIKISTAN, 38º 06' N 70º 26' E, 1180 m a.s.l., W Pamir Mts., Pianj River, by Zigar village, 1 ♂, 30-VII-2013, K. Nupponen & R. Haverinen leg.

Wheeleria phlomidis (Staudinger, 1871)
Aciptilus phlomidis Staudinger, 1871. *Hor. Soc. ent. Ross*., **7**: 282

Material: RUSSIA, 51º 23' N 56º 49' E, 130-340 m a.s.l., Orenburg district, Donskoje village 6 km W, Verbljushka Gora, 15 exx., 10-12-VI-1998, 4 exx., 17-19-VI-1999, 2 exx., 27-VI-2003, K. Nupponen & T. Nupponen leg., 3×GP; Russia, 50º 40-45' N 54º 26-28' E, 170-230 m a.s.l., Orenburg district, Pokrovka village 20 km S, Schibendy valley, 1 ♂, 10-VI-2001, 2 ♀♀, 29-VI-2003, K. Nupponen leg.; Russia, 49º 47' N 44º 25' E, 90 m a.s.l., Volgograd district, Olhovka village 12 km SW, 1 ♂, 6-VI-2001, K. Nupponen leg., 1×GP.

Pselnophorus poggei (Mann, 1862)
Oxyptilius poggei Mann, 1862. *Wien. Ent. Monatsch*., **6**: 409

Material: AZERBAIJAN, Talysh Mts., 38º 48' N 48º 31' E, 460 m a.s.l., Lerik 10 km E, 1 ♂, 31-V-2019, K. Nupponen & R. Haverinen leg., 1×GP.

Oidaematophorus constanti (Ragonot, 1875)
Oedematophorus constanti Ragonot, 1875. *Bull. Soc. ent. Fr*., **1875**: 230

Material: RUSSIA, 53º 57' N 59º 03' E, 650 m a.s.l., Cheliabinsk district, by Moskovo village, 19 exx., 16-VIII-2006, 1 ♂, 16-VII-2007, K. Nupponen leg., Genitalia slide: K. Nupponen prep. no. 1/14-II-2021 ♂, 1×GP. (Figs 12-13).

Distribution: European species, occurring in western Europe eastwards to Crimea. Separate record from Altai district, southern Siberia (USTJUZHANIN & KOVTUNOVICH, 2019). **New to Ural district**.

Oidaematophorus rogenhoferi (Mann, 1871)
Pterophorus rogenhoferi Mann, 1871. *Verh. zool.-bot. Ges. Wien*, **21**: 79

Material: TAJIKISTAN, 38º 40' N 72º 01' E, 2550 m a.s.l., W Pamir Mts., Vanch River Valley, Poi-Mazar village 6 km E, Vanch Nature Reserve, 1 ♂, 28-VII-2013, 1 ♂, 1 ♀, 29-VII-2013, K. Nupponen & R. Haverinen leg., Genitalia slide: K. Nupponen prep. no. 3/12-II-2021.

Hellinsia chrysocomae (Ragonot, 1875)
Pterophorus chrysocomae Ragonot, 1875. *Bull. Soc. ent. Fr*., **1875**: 74

Material: KYRGYZSTAN, 40º 33' N 73º 07' E, 1130 m a.s.l., Uzgen, Aldier, 2 ♂♂, 19-VII-2010, K. Nupponen & R. Haverinen leg., 1×GP.

Hellinsia innocens (Snellen, 1884)
Pterophorus innocens Snellen, 1884. *Tijdschr. v. Ent*., **27**: 195

Material: Russia, 51º 11-13' N 106º 10-12' E, 700 m a.s.l., S Buryatia, Hamar Daban Mts., Murtoy River, Gusinoe Ozero village 6 km NW, forest steppe, 1 ♂, 19-VI-2002, 1 ♂, 22-VI-2002, K. Nupponen leg., 1×GP; Russia, 51º 00-10' N 85º 35-45' E, 1400-1500 m a.s.l., Altai Mts., Sarlyk region, 1 ♂, 8-VII-2000, K. Nupponen & T. Nupponen leg.

Distribution: Russia (Altai Mts., Irkutsk, Buryatia, Chita district, Sakhalin, Primoriye). **New to the Altai region**.

Hellinsia lienigianus (Zeller, 1852)
Pterophorus lienigianus Zeller, 1852. *Linn. Ent*., **6**: 380

Material: Russia, 51º 54' N 57º 43' E, 450 m a.s.l., Bashkiria, Sakmara River near Jantyshevo village, 1 ♂, 20-VI-1996, K. Nupponen leg., 1×GP.

Hellinsia mongolicus (Zagulajev & Pentschukovskaja, 1972)
Pterophorus mongolicus Zagulajev & Pentschukovskaja, 1972. *Insects Mongolia*, **1**: 691

Material: Russia, 50º 14-16' N 87º 50-55' E, 1700-2000 m a.s.l., Altai Mts., Kuraiskaja steppe, 1 ♀, 26-VI-2000, 2 ♂♂, 27-VI-2000, 1 ♂, 28-VI-2000, K. Nupponen & T. Nupponen leg.; Russia, 50º 14-16' N 87º 40' E, 1500 m a.s.l., Altai Mts., Chuja valley, Aktash village 5 km SE, 1 ♀, 5-VII-2000, K. Nupponen & T. Nupponen leg.; Russia, 51º 47-48' N 100º 55-58' E, 1450 m a.s.l., SW Buryatia, East Sayan Mts., Mondy village 2 km E, taiga forest/steppe, 1 ♂, 13-VI-2002, 1 ♂, 15-VI-2002, K. Nupponen leg.

Hellinsia pectodactylus (Staudinger, 1859)
Pterophorus pectodactylus Staudinger, 1859. *Stett. ent. Ztg*., **20**: 258

Material: Russia, 51º 23' N 56º 49' E, 130-340 m a.s.l., Orenburg district, Donskoje village 6 km W, Verbljushka Gora, 1 ♀, 15-VII-1998, 2 ♀♀, 17-VI-1999, 1 ♀, 19-VI-1999, 1 ♂, 28-VII-2000, K. Nupponen & T. Nupponen leg.; Russia, 50º 58' N 54º 25' E, 100 m a.s.l., Orenburg district, near Burannoe village, Ilek River valley, 2 ♀♀, 30-VII-2000, T. Nupponen leg.; Russia, 50º 40-45' N 54º 26-28' E, 170-230 m a.s.l., Orenburg district, Pokrovka village 20 km S, Schibendy valley, 1 ♂, 5 ♀♀, 3-VI-1998, 3 ♂♂ 13 ♀♀, 7-VI-1998, K. Nupponen & T. Nupponen leg.; Ibidem, 1 ♂, 10-VI-2001, 1 ♂ 28 ♀♀, 17-VII-1998, 3 ♀♀, 2-4-VIII-2005, K. Nupponen leg.; Russia, 53º 02' N 62º 06' E, 200 m a.s.l., Cheliabinsk district, Ajat River near Nikolaevka village, 1 ♀, 5-IX-2000, K. Nupponen leg.; Russia, 48º 02-03' N 46º 37-40' E, 5-10 m a.s.l., Astrahan district, Peski Thikili by Bogdo village, 1 ♂, 30-VIII-2006, K. Nupponen leg.

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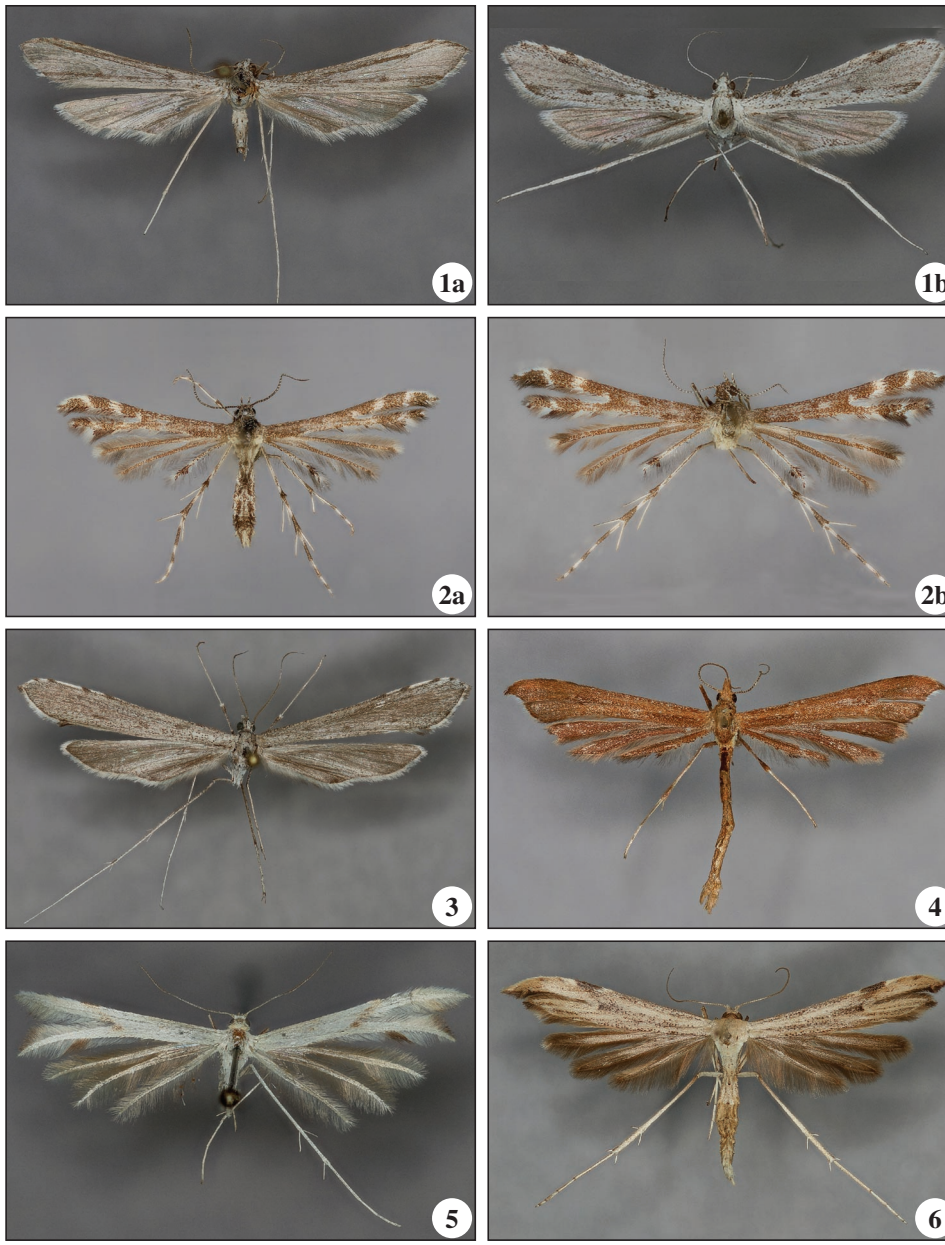
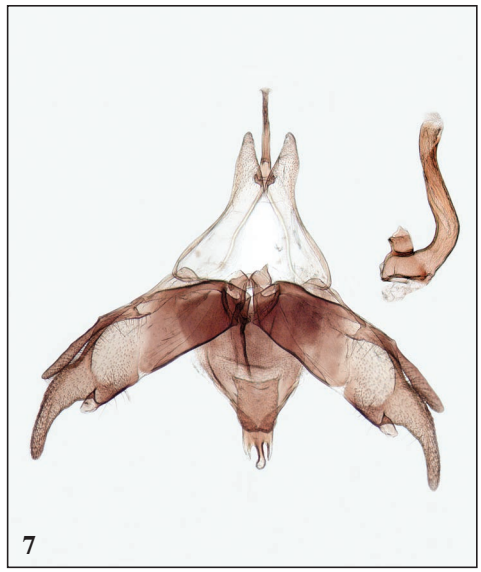
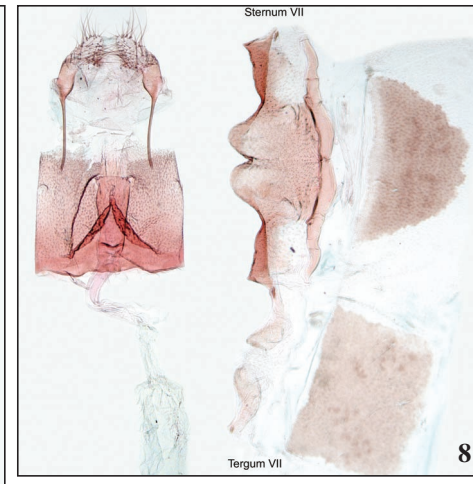
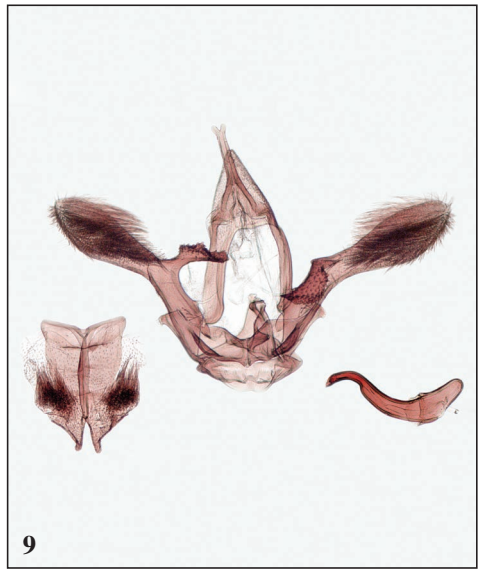
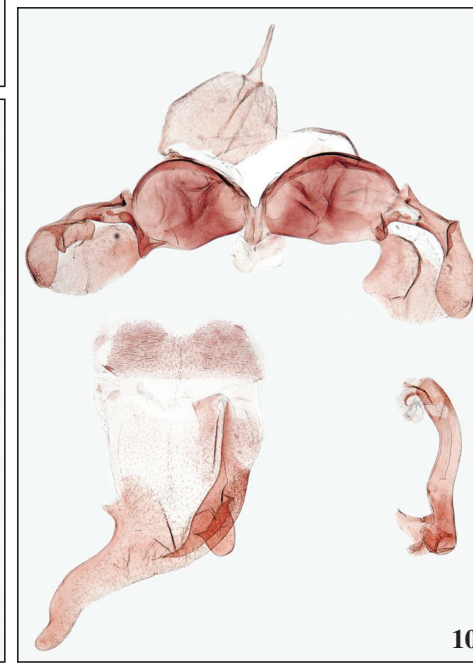


Figs 1-6.– Adults of **1.** *Agdistis kazakhstanicus* Ustjuzhanin, 2014. **1a.** male. **1b.** female. **2.** *Procapperia processidactyla* Nupponen, sp. n. **2a.** male, holotype. **2b.** female, paratype. **3.** *Agdistis flavissima* (Caradja, 1920) (Russia, Astrakhan district). **4.** *Gillmeria stenoptiloides* (Filipjev, 1927) (Russia, North Ural). **5.** *Tabulaephorus maracandicus* Arenberger, 1998 (Uzbekistan). **6.** *Oidaematophorus constanti* (Ragonot, 1875) (Ural).









Figs 7-10.– 7. Male genitalia of *Agdistis kazakhstanicus* Ustjuzhanin, 2014 (GP 1/1-XII-2020 KN). **8.** Female genitalia of *Agdistis kazakhstanicus* Ustjuzhanin, 2014 (GP 1/11-XII-2020 KN). **9.** Male genitalia of *Procapperia processidactyla* Nupponen, sp. n. (paratype: GP 1/5-I-2021 KN). **10.** Male genitalia of *Agdistis karabachica* Zagulajev, 1990 (GP 4/1-XII-2020 KN).

Figs 11-13.– Male genitalia of **11.** *Tabulaephorus maracandicus* Arenberger, 1998 (GP 1/19-XII-2020 KN). **12.** Male genitalia of *Oidaematophorus constanti* (Ragonot, 1875) (Ural; GP 1/14-II-2021 KN). **13.** Female genitalia of *Procapperia processidactyla* Nupponen, sp. n. (paratype: GP 1/6-I-2021 KN).

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Aportación al conocimiento de los clados Ditrysia y Apoditrysia del Parque Natural Cabo de Gata-Níjar (Almería, España) (Insecta: Lepidoptera)

M. Garre, R. M. Rubio, J. J. Guerrero, J. Girdley & A. S. Ortiz

Resumen

Se aportan datos de cuarenta y siete especies pertenecientes a los clados Ditrysia y Apoditrysia del Parque Natural Cabo de Gata-Níjar, parte de las cuales son nuevas citas para la provincia de Almería.
PALABRAS CLAVE: Insecta, Lepidoptera, Parque Natural Cabo de Gata-Níjar, Almería, España.

Contribution to the knowledge of the clades Ditrysia and Apoditrysia from the Cabo de Gata-Níjar Natural Park (Almeria, Spain) (Insecta: Lepidoptera)

Abstract

Data of forty-seven species belonging to the clades Ditrysia and Apoditrysia from the Cabo de Gata-Níjar Natural Park are reported, part of which are new records for Almeria province.
KEY WORDS: Insecta, Lepidoptera, Cabo de Gata-Níjar Natural Park, Almeria, Spain.

Introducción

La fauna lepidopterológica de algunas familias pertenecientes a los clados Obtectomera y Macroheterocera del Parque Natural Cabo de Gata-Níjar ha sido ampliamente estudiada: Geometridae (GARRE *et al.,* 2016), Pyralidae y Crambidae (GARRE *et al*., 2018a, 2018b), Noctuidae (GARRE *et al.*, 2018c) y Cossidae, Limacodidae, Drepanidae, Lasiocampidae, Sphingidae, Notodontidae, Nolidae, Erebidae y Euteliidae (GARRE *et al.*, 2018d). Para el resto de las familias correspondientes a los clados Ditrysia y Apoditrysia no se cuenta con estudios monográficos preliminares circunscritos a este espacio natural, aunque son varias las publicaciones de temática faunística y taxonómica que, desde mediados del pasado siglo, han incluido un determinado número especies pertenecientes a estos clados, algunas de ellas referenciadas en el Apéndice.

El Parque Natural Cabo de Gata-Níjar es un territorio costero situado en la provincia de Almería de especial interés entomológico debido a su situación geográfica en la Península Ibérica y a su proximidad con el norte de África. Destacan sus excepcionales valores paisajísticos, geológicos y botánicos y sus singulares características climáticas que lo convierten en el punto más seco y cálido de Europa (GARRE *et al*., 2016).

El objetivo del presente trabajo es aportar nuevas especies al catálogo lepidopterológico del Parque Natural Cabo de Gata-Níjar y confirmar la presencia de otras.

Material y métodos

Se presentan los resultados de los muestreos realizados en diversas localidades del Parque Natural Cabo de Gata-Níjar entre los años 2013 y 2019 mediante el uso de trampas de luz negra y actínica de 6 W (tipo Heath), ambas asociadas a pantallas reflectoras verticales. Las estaciones de muestreo se ordenan en la Tabla I por municipios, incluyendo la cuadrícula UTM 10 x10 km, la altitud y el hábitat.

La relación de las especies estudiadas se presenta en el Apéndice, detallando para cada taxón la toponimia distintiva, fecha de captura, número de ejemplares, número de preparación de genitalia (prep. gen.), si procede, y referencias bibliográficas específicas del propio parque natural y/o de la provincia de Almería. La ordenación de las especies en sus correspondientes categorías taxonómicas se ha realizado de acuerdo con la nomenclatura y clasificación propuesta por VIVES MORENO (2014).

Tabla I.– Relación de las localidades muestreadas.

Localidad	Municipio	Altitud (m.s.n.m.)	U.T.M.	Hábitat
Rambla de Morales	Almería	3	30SWF67	Matorrales halófilos
Playa del Charco	Almería	3	30SWF67	Dunas marítimas
El Saladero	Carboneras	25	30SWF99	Cornicales
Cañada de Méndez	Níjar	70	30SWF98	Espartales y tomillares
Cañada del Madroñal	Níjar	190	30SWF87	Espartales y tomillares
Rambla de Jayón	Níjar	210	30SWF88	Retamares

Resultados y discusión

Se aportan datos de 47 especies de los clados Ditrysia y Apoditrysia del Parque Natural Cabo de Gata-Níjar pertenecientes a las familias Psychidae (2), Tineidae (2), Autostichidae (5), Depressariidae (3), Coleophoridae (2), Pterolonchidae (1), Scythrididae (1), Cosmopterigidae (3), Gelechiidae (9), Pterophoridae (2) y Tortricidae (17). Las especies citadas por primera vez para la provincia de Almería, como resultado de la revisión bibliográfica, están identificadas en el Anexo con un asterisco (*).

Entre todas las especies destacan los endemismos ibéricos *Oiketicoides eganai* (Agenjo, 1963), *Placodoma ragonoti* (Rebel, 1900), *Symmoca perobscurata* Gozmány, 1957, *Symmoca petrogenes* Walsingham, 1907 y *Chrysoesthia hispanica* Karsholt & Vives, 2014. Otras especies solamente se conocen en la Península Ibérica de Almería como *Ethmia lepidella* (Chrétien, 1907) y *Bactra simpliciana* Chrétien, 1915. También es destacable el tortrícido *Platynota stultana* Walsingham, 1884, originario de América del Norte e introducido en Europa recientemente, convertido en la actualidad en una importante plaga para numerosos cultivos del sureste de España. El resto de las especies son nuevas citas para el catálogo lepidopterológico de Almería o confirman su presencia en la provincia y/o en el propio parque natural.

Agradecimiento

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APÉNDICE

Familia Psychidae Boisduval, [1821]

**Oiketicoides eganai* (Agenjo, 1963)
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Placodoma ragonoti (Rebel, 1900)
Material estudiado: Cañada de Méndez, 14-VIII-2018, 1 ♂; 14-VIII-2018, 1 ♂.
Referencias bibliográficas: citada anteriormente en Tabernas por SOBCZYK & NUSS (2013).

Familia Tineidae Latreille, 1810

**Neurothaumasia ragusaella* (Wocke, 1889)
Material estudiado: Cañada de Méndez, 22-VIII-2017, 1 ♂; 14-VIII-2018, 1 ♂; Rambla de Jayón, 23-VIII-2017, 1 ♀.

Trichophaga bipartitella (Ragonot, 1892)
Material estudiado: Cañada de Méndez, 15-VIII-2019, 1 ♂; Playa del Charco, 23-II-2015, 1 ♂.
Referencias bibliográficas: citada en Almería y Laujar de Andarax por AGENJO (1952) y en el Cabo de Gata por PETERSEN & GAEDIKE (1992).

Familia Autostichidae Le Marchand, 1947

Heringita heringi Agenjo, 1953
Material estudiado: Cañada de Méndez, 14-VIII-2017, 1 ♂; 18-VIII-2017, 1 ♂ (prep. genit. 0905 M.G.); Rambla de Jayón, 22-VIII-2016, 1 ♂, 1 ♀.
Referencias bibliográficas: citada en el Cabo de Gata y Rioja (Almería) por VIVES MORENO (1983).

**Symmoca signatella* Herrich-Schäffer, 1855
Material estudiado: Cañada de Méndez, 21-VIII-2018, 1 ♂ (prep. genit. 1075 M.G.).

**Symmoca perobscurata* Gozmány, 1957
Material estudiado: Cañada de Méndez, 14-VIII-2017, 1 ♂ (prep. genit. 1071 M.G.); 19-VIII-2019, 1 ♀ (prep. genit. 1356 M.G.); 22-VIII-2019, 1 ♀; Rambla de Jayón, 21-VIII-2017, 1 ♀ (prep. genit. 1355 M.G.).

Symmoca petrogenes Walsingham, 1907
Material estudiado: Cañada de Méndez, 17-VIII-2017, 1 ♂ (prep. genit. 1080 M.G.).
Referencias bibliográficas: citada en Almería por AGENJO (1952).

Stibaromacha ratella (Herrich-Schäffer, 1855)
Material estudiado: Cañada de Méndez, 20-VIII-2019, 1 ♂.
Referencias bibliográficas: citada en Almería por AGENJO (1952).

Familia Depressariidae Meyrick, 1883

**Agonopterix thapsiella* (Zeller, 1847)
Material estudiado: Rambla de Morales, 31-X-2016, 1 ♀ (prep. genit. 0863 M.G.).

Ethmia lepidella (Chrétien, 1907)
Material estudiado: Playa del Charco, 19-X-2013, 1 ♂; 13-XI-2016, 1 ♂; Rambla de Morales, 19-X-2013, 1 ♂.
Referencias bibliográficas: citada anteriormente en Almería por VIVES MORENO (1992) y en El Pozo del Esparto (Cuevas de Almanzora) por HALL (2006).

Ethmia bipunctella (Fabricius, 1775)
Material estudiado: Cañada de Méndez, 19-VIII-2019, 1 ♂; Cañada del Madroñal, 13-III-2015, 1 ♂.

Referencias bibliográficas: citada anteriormente en Almería por AGENJO (1952).

Familia Coleophoridae Hübner, [1825]

**Coleophora vestalella* Staudinger, 1859

Material estudiado: Cañada de Méndez, 17-VIII-2018, 1 ♂ (prep. genit. 1045 M.G.); 20-VIII-2019, 1 ♂ (prep. genit. 1189 M.G.).

**Coleophora involucrella* Chrétien, 1905

Material estudiado: Cañada de Méndez, 24-VIII-2017, 1 ♂ (prep. genit. 1031 M.G.).

Familia Pterolonchidae Meyrick, 1918

**Pterolonche pulverulenta* Zeller, 1847

Material estudiado: Cañada de Méndez, 16-VIII-2018, 1 ♂ (prep. genit. 1361 M.G.); Cañada del Madroñal, 16-V-2016, 1 ♂ (prep. genit. 1363 M.G.); Cerro de la Cruz, 16-V-2016, 1 ♂.

Familia Scythrididae Rebel, 1901

Enolmis acanthella (Godart, 1824)

Material estudiado: Cañada de Méndez, 21-VIII-2018, 1 ♂ (prep. genit. 1030 M.G.); 12-VIII-2019, 1 ♂; Rambla de Morales, 3-V-2015, 1 ♂ (prep. genit. 0908 M.G.).

Referencias bibliográficas: citada en Almería y en el Puerto de la Ragua (Bayárcal) por NUPPONEN & NUPPONEN (2004).

Familia Cosmopterigidae Heinemann & Wocke, [1876]

**Pyroderces caesaris* Gozmány, 1957

Material estudiado: Cañada de Méndez, 12-VIII-2019, 1 ♂ (prep. genit. 1190 M.G.).

**Eteobalea dohrnii* (Zeller, 1847)

Material estudiado: Cañada de Méndez, 17-VIII-2018, 1 ♂ (prep. genit. 1344 M.G.); Rambla de Jayón, 21-VIII-2017, 2 ♂♂.

**Alloclita recisella* Staudinger, 1859

Material estudiado: Cañada de Méndez, 16-VIII-2017, 1 ♂; 17-VIII-2017, 2 ♀♀; 22-VIII-2017, 1 ♀; 16-VIII-2018, 1 ♀; 14-VIII-2019, 1 ♀.

Familia Gelechiidae Stainton, 1854

**Stomopteryx detersella* (Zeller, 1847)

Material estudiado: Cañada de Méndez, 18-VIII-2016, 1 ♂; 23-VIII-2017, 1 ♂; 16-VIII-2018, 1 ♂; 17-VIII-2018, 1 ♂; 22-VIII-2019, 1 ♀.

**Stomopteryx basalis* (Staudinger, 1876)

Material estudiado: Cañada de Méndez, 17-VIII-2017, 1 ♂; 18-VIII-2017, 1 ♂; 12-VIII-2019, 1 ♂; 20-VIII-2019, 1 ♂.

**Mesophleps corsicella* Herrich-Schäffer, 1856

Material estudiado: Cañada de Méndez, 17-VIII-2018, 1 ♀ (prep. genit. 1047 M.G.).

**Pseudosophronia cosmella (*Constant, 1885)

Material estudiado: Rambla de Jayón, 21-VIII-2017, 1 ♂.

Dichomeris lamprostoma (Zeller, 1847)

Material estudiado: Cañada de Méndez, 12-VIII-2019, 1 ♂.

Referencias bibliográficas: citada anteriormente en Almería por AGENJO (1952).

Epidola stigma Staudinger, 1859
Material estudiado: Cañada de Méndez, 14-VIII-2018, 1 ♀; 15-VIII-2019, 1 ♀.
Referencias bibliográficas: citada anteriormente en Almería por AGENJO (1952).

**Chrysoesthia gaditella* (Staudinger, 1859)
Material estudiado: Cañada de Méndez, 22-VIII-2019, 1 ♀.

Chrysoesthia hispanica Karsholt & Vives, 2014
Material estudiado: Cañada de Méndez, 14-VIII-2017, 1 ♂; 13-VIII-2018, 1 ♀; 15-VIII-2019, 1 ♂.
Referencias bibliográficas: descrita como nueva especie en Almería, el Cabo de Gata y Tabernas por KARSHOLT & VIVES MORENO (2014), entre otras localidades del sureste peninsular.

Metzneria aestivella (Zeller, 1839)
Material estudiado: Cañada de Méndez, 13-VIII-2018, 1 ♀; 17-VIII-2018, 1 ♂ (prep. genit. 1042 M.G.); 20-VIII-2018, 1 ♂ (prep. genit. 1041 M.G.); 14-VIII-2019, 1 ♂ (prep. genit. 1180 M.G.); 15-VIII-2019, 2 ♂♂, 1 ♀ (prep. genit. 1202 M.G.); 20-VIII-2019, 2 ♂♂ (prep. genit. 1203 M.G.).
Referencias bibliográficas: citada anteriormente en Almería por AGENJO (1952) y en el Cabo de Gata y Rioja por VIVES MORENO (2001), que la describió como una nueva especie, *Metzneria expositoi* Vives, 2001 y que posteriormente se ha considerado como sinonimia de *M. aestivella* por HUEMER & KARSHOLT (2020).

Familia Pterophoridae Latreille, [1802]

**Stangeia siceliota* (Zeller, 1847)
Material estudiado: Rambla de Jayón, 23-VIII-2017, 1 ♂ (prep. genit. 0897 M.G.).

**Merrifieldia leucodactyla* ([Denis & Schiffermüller], 1775)
Material estudiado: Rambla de Jayón, 21-VIII-2017, 1 ♂ (prep. genit. 0870 M.G.).

Familia Tortricidae Latreille, [1802]

Phtheochroa syrtana Ragonot, 1888
Material estudiado: Cañada del Madroñal, 31-X-2016, 1 ♂.
Referencias bibliográficas: Citada anteriormente en el Cabo de Gata por DERRA (1989) y en Tabernas por ŠUMPICH (2011).

**Cochylimorpha hilarana* (Herrich-Schäffer, 1851)
Material estudiado: Cañada de Méndez, 18-VIII-2016, 1 ♂; 19-VIII-2016, 1 ♂; 24-VIII-2017, 1 ♂; Rambla de Jayón, 23-VIII-2016, 1 ♂; 24-VIII-2016, 1 ♂; 25-VIII-2016, 1 ♂ (prep. genit. 0776 M.G.); 21-VIII-2017, 1 ♂.

**Cochylimorpha cultana* (Lederer, 1855)
Material estudiado: Cerro de la Cruz, 13-III-2015, 2 ♂♂ (prep. genit. 0777 M.G.).

**Phalonidia contractana* (Zeller, 1847)
Material estudiado: Cañada de Méndez, 14-VIII-2018, 1 ♂.

**Aethes williana* (Brahm, 1791)
Material estudiado: Cañada de Méndez, 20-VIII-2019, 1 ♂.

Oxypteron schawerdai (Rebel, 1936)
Material estudiado: Playa del Charco, 8-XII-2013, 1 ♂ (prep. genit. 1347 M.G.).
Referencias bibliográficas: citada anteriormente en Tabernas por ŠUMPICH (2011).

**Lozotaenia cupidinana* (Staudinger, 1859)
Material estudiado: El Saladero, 23-II-2015, 1 ♂.

**Cacoecimorpha pronubana* (Hübner, [1799])
Material estudiado: El Saladero, 15-II-2015, 1 ♂.

**Clepsis consimilana* (Hübner, [1817])
Material estudiado: El Saladero, 15-II-2015, 1 ♂; 27-III-2015, 1 ♂ (prep. genit. 0791 M.G.).

Platynota stultana Walsingham, 1884
Material estudiado: Playa del Charco, 3-V-2015, 1 ♂.
Referencias bibliográficas: citada anteriormente como nueva para Europa en Agua Dulce (Roquetas de Mar) y Cabo de Gata (Almería) por GROENEN & BAIXERAS (2013).

Bactra simpliciana Chrétien, 1915
Material estudiado: Playa del Charco, 3-V-2015, 1 ♂ (prep. genit. 0793 M.G.).
Referencias bibliográficas: Citada anteriormente en Punta Entinas y Retamar por GASTÓN *et al.* (2018).

**Acroclita subsequana* (Herrich-Schäffer, 1851)
Material estudiado: Playa del Charco, 13-IX-2016, 2 ♂♂; Rambla de Morales, 23-II-2015, 1 ♂ (prep. genit. 0805 M.G.).

Epinotia thapsiana (Zeller, 1847)
Material estudiado: Cañada del Madroñal, 4-IV-2015, 1 ♀; Rambla de Jayón, 23-VIII-2017, 1 ♂.
Referencias bibliográficas: citada anteriormente en el Cabo de Gata por HACKMAN (1968).

**Zeiraphera griseana* (Hübner, [1799])
Material estudiado: Rambla de Jayón, 26-VIII-2016, 2 ♀♀ (prep. genit. 0803 M.G.).

**Pseudococcyx tessulatana* (Staudinger, 1871)
Material estudiado: Cañada de Méndez, 13-VIII-2018, 1 ♀.

**Cydia fagiglandana* (Zeller, 1841)
Material estudiado: Rambla de Jayón, 21-VIII-2017, 1 ♀ (prep. genit. 1365 M.G.).

Selania resedana (Obraztsov, 1959)
Material estudiado: Cañada de Méndez, 17-VIII-2018, 1 ♀; Rambla de Jayón, 21-VIII-2017, 1 ♀ (prep. genit. 0942 M.G.)
Referencias bibliográficas: citada anteriormente en Níjar por ŠUMPICH (2011).

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A new genus and two new species of Tirathabini from the Neotropical region (Lepidoptera: Pyralidae: Galleriinae)

V. O. Becker

Abstract

The genus *Atrigalleria* Becker, gen. n. with two new species: *Atrigalleria chlorogramma* Becker, sp. n., from Ecuador and *A. chlorographa* Becker, sp. n., from Ecuador and Costa Rica are described.
KEY WORDS: Lepidoptera, Pyralidae, Galleriinae, Tirathabini, new genus, new species, distribution, Costa Rica, Ecuador, Neotropical.

Un género y dos especies nuevos de Tirathabini de la región Neotropical (Lepidoptera: Pyralidae, Galleriinae)

Resumen

Se describe el género *Atrigalleria* Becker, gen. n. con dos especies nuevas: *Atrigalleria chlorogramma* Becker, sp. n., de Ecuador y *A. chlorographa* Becker, sp. n., de Ecuador y Costa Rica.
PALABRAS CLAVE: Lepidoptera, Pyralidae, Galleriinae, Tirathabini, género nuevo, especies nuevas, distribución, Costa Rica, Ecuador, Neotropical.

Introduction

The taxa described here do not look like any of the known Neotropical Galleriinae. As they resemble Noctuidae, the specimens treated here were discovered, in the collections, mixed with unsorted material of this group.

Material and methods

This review is based on 11 (5 g. s.) specimens in VOB and 3 in the CMNH. The holotypes of the new species are provisionally deposited in VOB, and will be transferred, together with the collection, to a Brazilian institution in the future. Some paratypes will be deposited in the USNM. Genitalia were prepared following the methods described by ROBINSON (1976). Terms for morphological characters follow HODGES (1971).

Abbreviations

CMNH Carnegie Museum of Natural History, Pittsburgh, USA
FW forewing
g. s. genitalia slide

HW hind wing
TS Type species
VOB Vitor O. Becker Collection, Serra Bonita Reserve, Camacan, Bahia, Brazil.

Results and discussion

The characters of abdomen and male genitalia indicates that the two species described here belong to an undescribed genus of Pyralidae, Galleriinae.

***Atrigalleria* Becker, gen. n.**
TS: *Atrigalleria chlorographa* Becker, sp. n.

Diagnosis: The black colour with green lines on the forewings is unique among the taxa in the subfamily.

Description: Body black. Proboscis and ocelli absent; labial palpi slightly longer than maxillary palpi in males, porrect, twice as long in females; antenna laminate. FW Cu1 before end of cell, M2-M3 connected at lower angle of cell; M1-Rs connected at the upper angle of cell. HW female frenulum with two bristles. Abdomen: tympanum closed medially, praecinctorium absent. Male genitalia: uncus long, tappering distad, with sparse, short setae dorsally; gnathos absent; sac below anal tube present; juxta large, with two lateral arms extendig distad to base of uncus; valva short, broad; phallus long, thin, slightly curved dorsad.

Distribution: Known from the Andes, north to Costa Rica, at mid elevations.

Etymology: From the Latin *ater, atra, atrum* = black, and *Galleria* a genus name; feminine.

Remarks: The tympanum closed medially, venulae well developed, and the praecinctorium absent indicates that this genus belongs to the Galleriinae or the Chrysauginae, as defined by SOLIS (1992) and MUNROE & SOLIS (1999: 240). The genitalia lacking a gnathos and presenting a sac between transtilla and the anal tube, combined with the absence of ocellus, places it in the Galleriinae, Tirathabini (WHALLEY, 1964: 570). The only character which is not congruent with Galleriinae is the female frenulum with two bristles. Most Galleriinae and Chrysauginae females have three bristles, but there are exceptions, e. g. *Michaelshaffera* Solis, 1998 (SOLIS, 1992: 81).

Key to species

-FW with black area, between middle green line and postmedial band, not crossed by green line ....*chlorographa*

-FW with black area, between middle green line and postmedial band, crossed by a green line that starts at the basal third of costa, crosses the green median line, connecting to the potmedial band before tornus .....*chlorogramma*

***Atrigalleria chlorographa* Becker, sp. n.** (figs 1-3, 5, 6)

Material examined: 11 ♂♂ (3 g. s.5652-5654) 2 ♀♀ (1 g. s. 5655). Holotype ♂, ECUADOR: Pichincha, San Miguel de los Baños, Milpe, 00º01'N - 78º51'W, 1170 m, 1-30-I-2015 (Thöny) (VOB); paratypes: 5 ♂♂, same data as holotype; 1 ♂, 1 ♀, Esmeraldas, Alto Tambo, 00º53'N - 78º31'W, 780 m, 1-30-I-2015 (Thöny); 3 ♂♂, Esmeraldas, Rio Cristal, Cotacachi-Cayapas Reserve, 1350 m, 20-VIII-1996 (Hillman) (CMNH); COSTA RICA: 1 ♂, Guanacaste, Estación Pitilla, 9 km S. Sta. Cecilia, 7700 m, 24-VIII-11-IX-1992 (Rios); 1 ♀, San José, Parque Nacional Braulio Carrillo, Estación Carrillo, 700 m, VII-1984 (Chacón) (VOB).

Diagnosis: Black. FW marked with green lines. Black area, distad of median line not interrupted.

Description: Male (fig. 2) FW length 12-15 mm (wingspan 28-34 mm), female (fig. 3) FW length 30 mm (wingspan 64 mm). Palpi black, greenish at tip; frons green, antenna pale yellow. Thorax black;

posterior margin of patagia, tegula and posterior margin of thorax green; legs black, tarsi greenish. FW black, crossed with green lines: basal band oblique, from base of costa, connecting to antemedial band at basal third of dorsum; antemedial band from basal third of costa connecting to an elongate blotch on cell, down to dorsum, connecting with basal band; medial line wide, from distal third of costa, connecting to median line on cell, forming an elongate blotch with a black dot in the middle; postmedial band, from before termen, oblique to near termen on M2, then a zigzag along termen to tornus; termen green; cilia spotted black. HW black. Abdomen black, a green band along middle ventrally. Male genitalia (fig. 5): uncus long, thin, tapering distad; sparse, short setae dorsally; gnathos absent, sac below anal tube present; valva short, broad, margins nearly parallel, narrowing slightly towards half; distal margin oblique to round apex; juxta large; two long lateral arms reaching base of uncus; phallus (fig. 6) long, thin, curved dorsad.

Distribution (fig. 1): Ecuador, Costa Rica, at mid to high elevations.

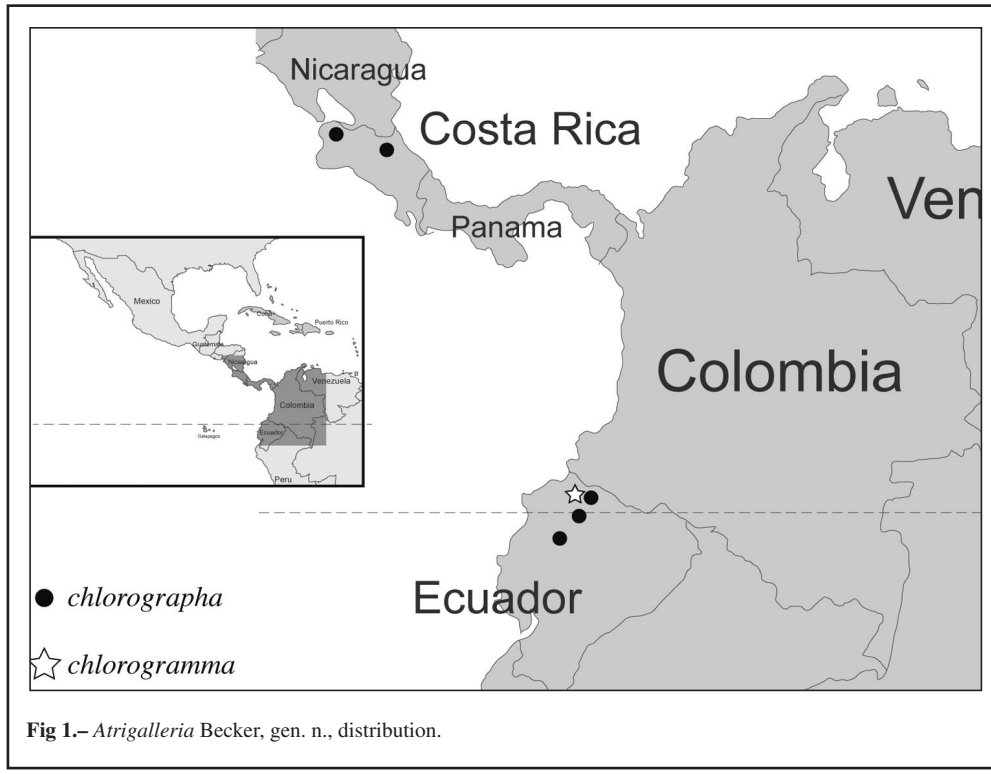

Fig 1.– *Atrigalleria* Becker, gen. n., distribution.

Etymology: From the Greek *χλώρος* [chloros] = green, and *γραφικό* [grapho] = write.

Remarks: Similar to *A. chlorogramma*, but smaller, and with the extension of the green line not crossing the black area distad of the median line, and male genitalia with valva longer and narrower.

***Atrigalleria chlorogramma* Becker, sp. n.** (figs 1, 4, 7, 8)

Material examined: Holotype ♂, ECUADOR: Esmeraldas, Alto Tambo, 00º53'N - 78º31'W, 780 m, 1-30-I-2015, g. s. 5656 (Thöny) (VOB).

Diagnosis: Black. FW marked with green lines. Black area, distad of median line crossed by a green line that starts from basal third of costa connecting with the postmedial band near tornus.

Description: Male (fig. 4) 18 mm (wingspan 40 mm). Very similar to the former, except for the black area distad of median line, crossed by a line. Male genitalia (fig. 7): uncus tapering distad; valva short, less than twice as long, margins parallel; distal margin oblique from middle towards apex; phallus (fig. 8), long, thin, bent dorsal.

Distribution (fig. 1): Ecuador, known from the type locality only.

Etymology: From the Greek *χλώρος* [chloros] = green, and *γραμμέ* [gramme] = line.

Remarks: Similar to *A. chlorographa*, but larger, and with the extension of the green line, that stars at basal third of costa, crossing the black area distad of the median line; male genitalia with valva shorter and broader than those of *A. chlorographa.*

Acknowledgements

Hubert Thöny, Camacã, Bahia, Brazil, presented most of the specimens studied; Paulo Nunes, Serra Bonira Reserve, Camacan, Bahia, Brazil, prepared the illustrations; Bernard Landry, Museum d'Histoire Naturelle, Geneva, Switzerland, reviewed the manuscript, made several corrections and suggested some changes that improved the article.

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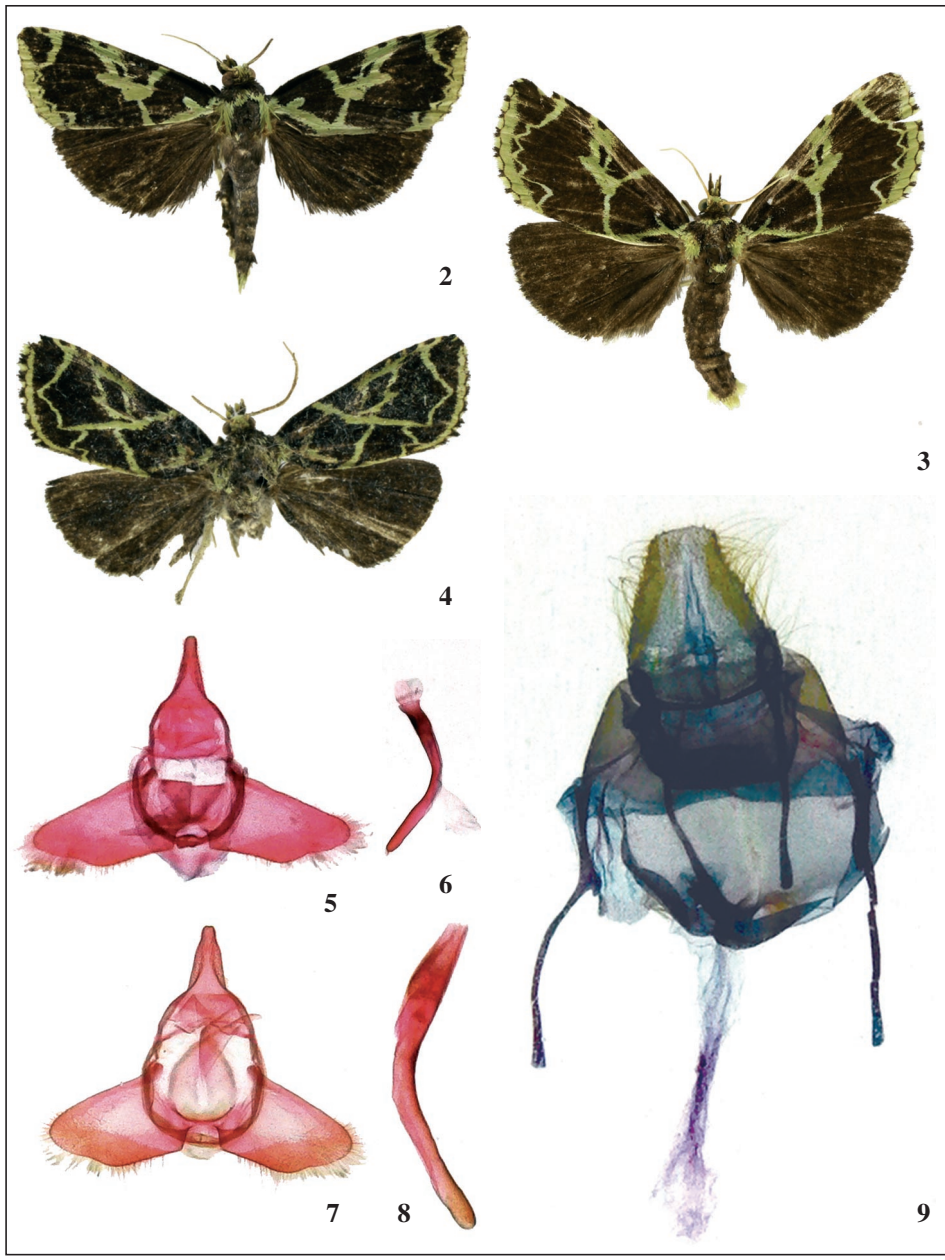
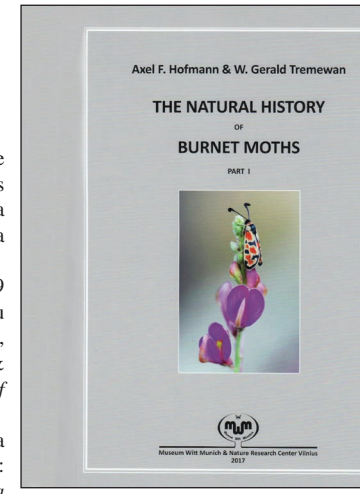


Figs 2-9.– 2-4. Adults, dorsal view, Ecuador. **2.** *Atrigalleria chlorographa* Becker, sp. n., male holotype. **3.** *A. chlorographa* Becker, sp. n., female paratype. **4.** *A. chlorogramma* Becker, sp. n., male holotype. **5-9.** Male genitalia, ventral view, phallus, lateral view, Ecuador. **5-6.** *A. chlorographa* Becker, sp. n., male paratype. **7-8.** *A. chlorogramma* Becker, sp. n., male holotype. **9.** *A. chlorographa* Becker, sp. n., female paratype.

REVISIÓN DE PUBLICACIONES
BOOK REVIEWS

A. F. Hofmann & W. G. Tremewan
The Natural History of Burnet Moths. Part I
XVII + 630 páginas
Formato: 30'5 x 21 cm
Museum Witt Munich, Munich and Vilnius, 2017
ISBN: 978-3-940732-32-3



Tenemos en nuestras manos una monografía de primer nivel sobre la fauna de Zygaenidae de la Región Paleártica, de la mano de los estimados colegas y especialistas de referencia mundial en esta familia como son Axel Hofmann y W. Gerald Tremewan, que constituye su obra cumbre.

El concepto de esta obra se originó en Marruecos en el año 1989 cuando los autores visitaban las Montañas del Alto Atlas y finalizó su escritura en 1997, precedida de otros trabajos sobre esta popular familia, como *The Western Palaeartic Zygaenidae* (NAUMANN, TARMANN & TREMEWAN, 1999) o *Phenotypes and the Mendelian Genetics of Burnet Moths* (TREMEWAN, 2006).

La obra pretende publicase en tres partes y después de una introducción y agradecimientos, se divide en ocho capítulos: Introducción; Origen, filogenia y sistemática; Complejo de *Zygaena purpuralis / minos*; Distribución y zoogeografía; Morfología, terminología y primeros estadios; Variación y fenotipo; Patrones geográficos y clústeres, todos a cuál más interesantes.

Entre las páginas 52 a 57, nos presenta la lista detallada de las especies y subespecies aquí consideradas y ya dentro del octavo capítulo, podemos ver los más destacados autores especializados en el estudio de estas especies desde Eleazar Albin (1690-1741), August Johann Rösel von Rosenhof (1705-1759), Carl von Linné (1707-1778), etc., hasta mi querido amigo Clas Michael Naumann (1939-2004). Es importante destacar que entre las páginas 517 hasta la 582, nos presentan fotografías de la genitalia del macho y de la hembra de las especies consideradas; con una detallada bibliografía y un índice finaliza este volumen. Todo el volumen está profusamente ilustrado a todo color.

No podemos terminar estas líneas, sin felicitar a los autores por un trabajo colosal, así como a la Editorial que continúa apoyando la publicación de estas obras, con una calidad excelente, por lo que recomendamos su adquisición y no pudiendo faltar en cualquier biblioteca de todos los interesados en Zygaenidae. El precio de este libro es de 150 euros y los interesados deben dirigirse a:

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Estados inmaturos de Lepidoptera (LXI). *Neurothaumasia ankerella* (Mann, 1867) en Huelva, España (Lepidoptera: Tineidae, Nemapogoninae)

M. Huertas-Dionisio

Resumen

Se describen e ilustran los estados inmaturos de *Neurothaumasia ankerella* (Mann, 1867), que vuela en Huelva, así como su ciclo biológico, su alimentación (madera húmeda y deteriorada situada debajo de la corteza de un alcornoque muerto *Quercus suber* L.) y la distribución.
PALABRAS CLAVE: Lepidoptera, Tineidae, Nemapogoninae, *Neurothaumasia ankerella,* estados inmaturos, Huelva, España.

Immature stages of Lepidoptera (LXI). ***Neurothaumasia ankerella*** **(Mann, 1867) in Huelva, Spain (Lepidoptera: Tineidae, Nemapogoninae)**

Abstract

The Immature stages of *Neurothaumasia ankerella* (Mann, 1867) from Huelva, Spain, are described and illustrated, as well as its biological cycle, feeding (damp and deteriorated wood located under the bark of a dead cork oak *Quercus suber* L.) and its distribution.
KEY WORDS: Lepidoptera, Tineidae, Nemapogoninae, *Neurothaumasia ankerella,* immature stages, Huelva, Spain.

Introducción

Neurothaumasia ankerella (Mann, 1867), es muy llamativa, por tener las alas superiores negras con manchas blancas (figs. 1 y 2), vuela en bosques de robles y sus orugas se alimentan de árboles muertos. Se la ha encontrado en varios países de Europa y norte de África. Hay algunos ejemplares que presentan una tonalidad parda en las alas delanteras que hacen pensar en otra especie, como *Tinea geratocoma* Walsingham, 1907 y *Tinea ankerella* var. *nigratella* Chrétien, 1917, solo la genitalia elimina esta confusión (PETERSEN, 1957; GAEDIKE, 2015). De las obtenidas de Fuente la Corcha (Beas) Huelva, una de ellas, un poco deteriorada, tiene el aspecto de las señaladas anteriormente, con las partes blancas de las alas delanteras invadidas por escamas parduscas (fig. 3).

Material y métodos

El día 25 marzo 2016, en un alcornocal de Fuente La Corcha (Beas) Huelva, se observó, cerca de un arroyo, varias ramas y troncos en el suelo (restos de una poda) de *Quercus suber* L., con los extre-

extremos muy húmedos (fig. 18), con mucho cuidado se empezó a retirar la corteza, encontrando varias orugas de diversos tamaños entre el serrín, fueron capturadas para observar su ciclo biológico y determinar la especie. Había ramas más pequeñas con la corteza muy podrida, que recolectamos para observarla mejor. Estas se introdujeron en bolsas de plástico que cada día se pulverizaban con agua, a la vez que se buscaban nuevas orugas. Luego se introdujeron en cajas plástico duro para que fuera más fácil observarlas. El 7 abril se descubrieron varios capullos, saliendo los adultos en abril y mayo.

Estados inmaturos

En la bibliografía consultada, no hay descripciones de sus estados inmaturos, por lo que aquí se hace por primera vez. No hay datos del huevo. La oruga de última edad (figs. 4 y 5) mide 14 mm de longitud, cuerpo translúcido con tonalidad amarillenta, en el que se destacan las bases de las setas anchas y lisas, que portan setas translúcidas (fig. 6). Espiráculos muy claros con el peritrema pardusco. Tabula (zona del protórax que incluye las setas L1, L2 y L3) elíptica, con una placa ancha detrás en forma de media luna que no porta setas (fig. 12). Patas torácicas muy claras, las ventrales del color del cuerpo, portando ganchos amarillo claro que cierra el círculo, con un número de uñas entre 18 y 19 (fig. 11) y las patas anales de 9 a 12 uñas (fig. 10). La cápsula cefálica (fig. 7) mide 1,25 mm de ancho, de color pardo, con el borde superior de los epicráneos negros. En las antenas, la antacoria translúcida, con una mancha amarillo claro; el artejo basal translúcido; artejo medio amarillo claro con la zona inferior translúcida y el artejo terminal amarillo claro. El escudo protorácico (fig. 8) trapezoidal, con una mancha triangular a cada lado, pardo claro, unidas en la parte inferior y separadas en la zona superior por una cuña. El escudo anal (en la figura 9 con el noveno urito) amarillo claro con la zona anterior rugosa.

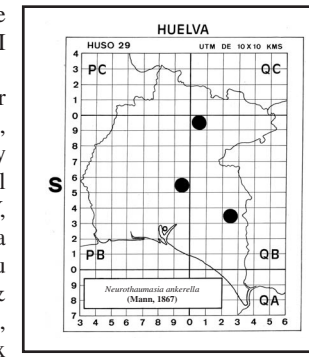
La crisálida hembra (figs.13, 14 y 15), mide de 6 a 7 mm de longitud, amarillo translúcido, con la piel blanda, siendo muy delicada. La prolongación cefálica es subconica, estando rematada en la zona superior por dos puntas amarillo oscuro, una delante de la otra, que vista lateralmente, recuerda la cresta de un gallo. En el dorso de los uritos 3 a 8, una línea curvada de pequeñas espinas castañas, más cortas en el octavo urito. Las antenas se unen al final, no sobrepasando el extremo de las alas. Final del abdomen redondeado, con 4 puntas pequeñas oscuras, dos a cada lado de la depresión anal y 6 setas ganchudas en la zona lateral-dorsal (figs. 16 y 17). El capullo es subcilíndrico, de 12 x 3 mm, entre el serrín de la madera que le ha servido de alimento, preparando una galería al exterior por donde saldrá el adulto.

Quetotaxia

Para la numeración de las setas se ha seguido a HINTON (1946), observándose que su distribución es muy particular, siendo una mezcla de varias especies de esta familia (fig. 12). En el protórax, la seta L3 que normalmente es corta, en esta especie es muy larga. En los segmentos abdominales 1 a 8, la seta D2 está más separada del dorso que la seta D1; las setas L1 y L2, forman una línea casi paralela al dorso. En el octavo urito está presente la seta SV2 y en el noveno las setas D1 y D2 están en paralelo con el dorso. En el escudo anal (fig. 9) la seta D1 está muy cerca de la SD2.

Ciclo biológico y distribución

Tiene dos generaciones, según los datos publicados, una en mayo (CORLEY, 2005) y otra en septiembre-octubre CHRÉTIEN (1917), CORLEY *et al*. (2000), CORLEY (2015), este último también la señala de julio. En Huelva la hemos encontrado en abril-mayo, ex larvas y también en junio y agosto. Con estos datos se interpreta que tiene dos generaciones solapadas entre abril y octubre. Vuela en bosques de robles, alimentándose de la zona deteriorada de debajo de la corteza de los árboles muertos, sobretodo *Quercus suber* L. (CHRÉTIEN, 1917; RUNGS, 1980) y también de los olmos (PARENTI, 2000), aprovechando, en algunos casos, las galerías de *Cerambyx cerdo* Linnaeus, 1758 en robles



viejos (SPULER, 1910), o las galerías creadas por las larvas de Coleoptera de las familias Cerambycidae y Buprestidae (JAWORSKI *et al*., 2011; JAWORSKI, 2016).

Vuela en parte de Europa: Alemania, Dinamarca, Hungría, Sur de Rusia, Francia, Península Ibérica y en Marruecos, Argelia, Turquía, Irán, Georgia (GAEDIKE, 2015). También en Checoslovaquia y Cerdeña (PETERSEN, 1957, 1960). En Portugal en Alportel (Algarve) (CORLEY *et al*., 2000), Sâo Româo (Algarve) (CORLEY, 2005), Alto Alentejo y Trás-os-Montes (CORLEY, 2015). De España ha sido citada de Murcia (PETERSEN, 1957, 1960), de Port Bou (Gerona) (PETERSEN, 1964), de Málaga y Santander (PETERSEN & GAEDIKE, 1992). Datos corroborados por VIVES MORENO (1986, 2014). En Huelva ha sido detectada en Fuente La Corcha (Beas) ex larvas, abril y mayo 2006, UTM PB95; en Arroyo Algarbe (Hinojos) un macho el 6-VIII-2005, UTM QB23 y en Santa Ana la Real un macho el 21-VI-2008, UTM QB09 (ver mapa). Debe estar extendida por todos los lugares donde esté el alcornoque.

Discusión

Con esta especie, *Neurothaumasia ankerella*, se demuestra el aprovechamiento que los insectos hacen de la propia Naturaleza, lo que parece un deterioro del propio bosque al morir muchas de sus plantas, es aprovechado por otras especies para su desarrollo, por lo que por este motivo, nada se desperdicia, llevando así un control para que el propio bosque funcione. Por ese motivo es conveniente respetar la Naturaleza viva y en desarrollo, como la muerta. Para hacer este tipo de trabajo, ha hecho falta robar parte de ella, para lograr saber algo más y darlo a conocer para que todos la respeten. Junto a las orugas de esta especie, se encontraron otras en el mismo medio, que no pudieron llegar a feliz término, por lo que hay todavía varias especies de Lepidoptera, que consumen árboles muertos, que sería muy interesante descubrir.

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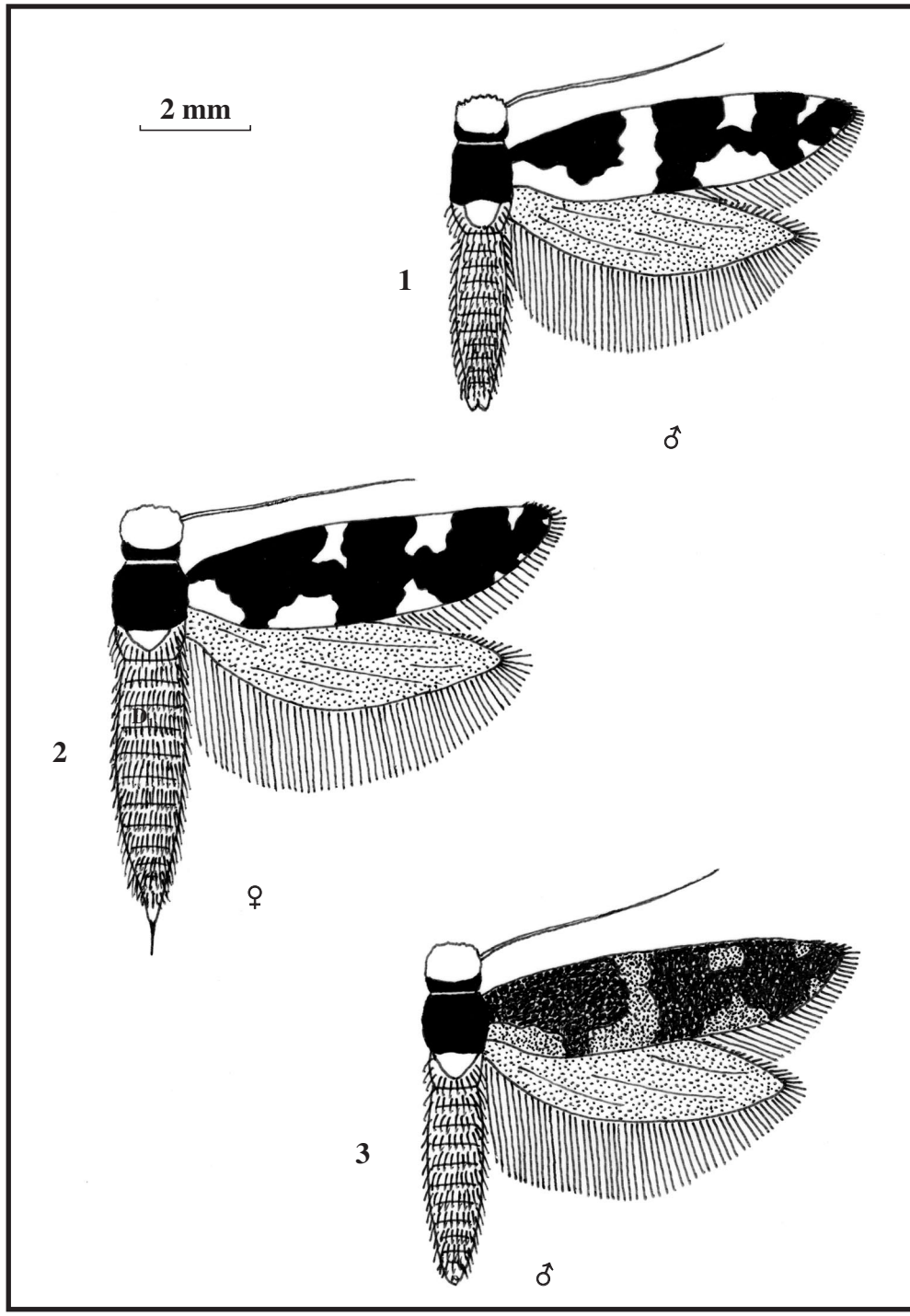
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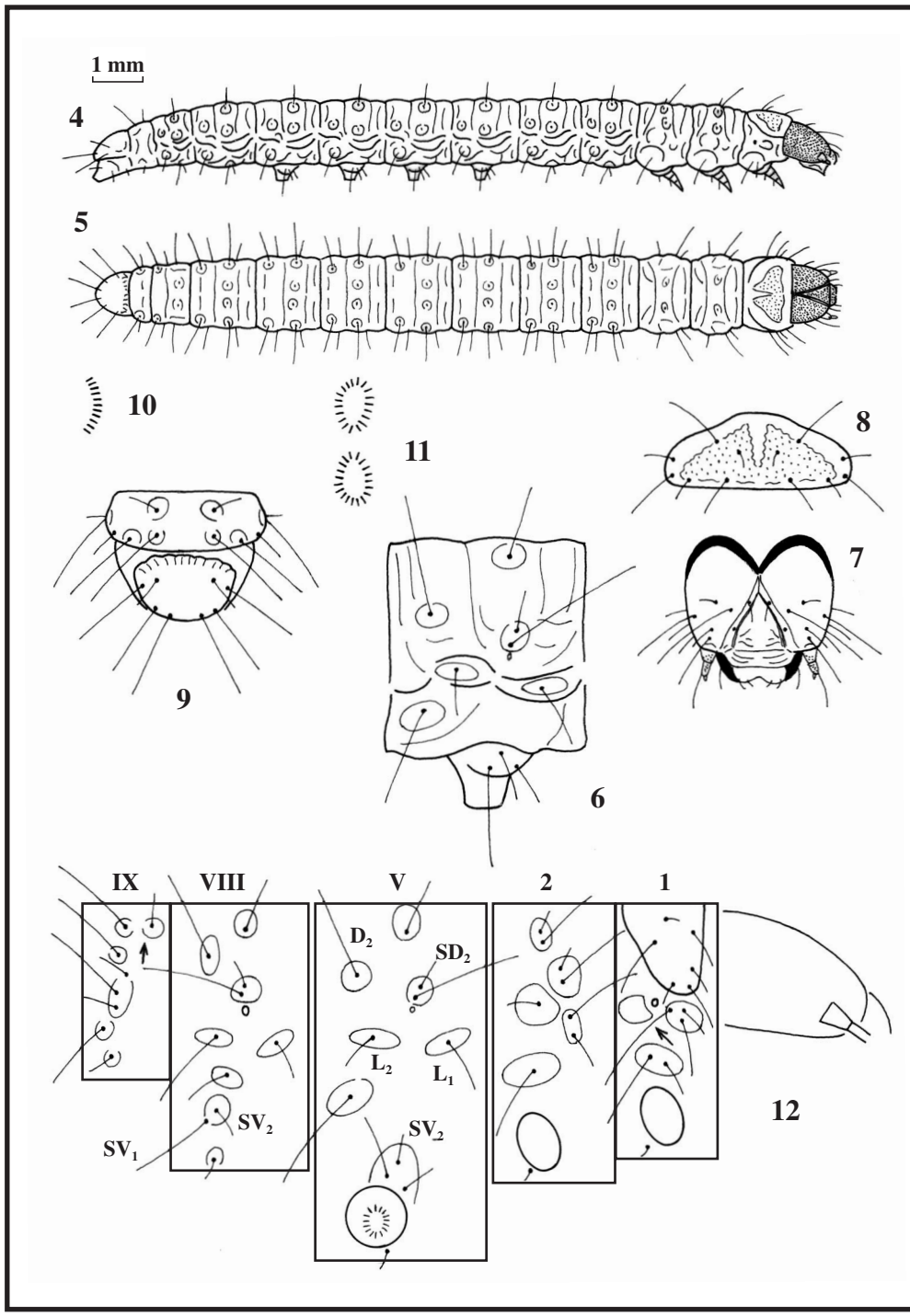
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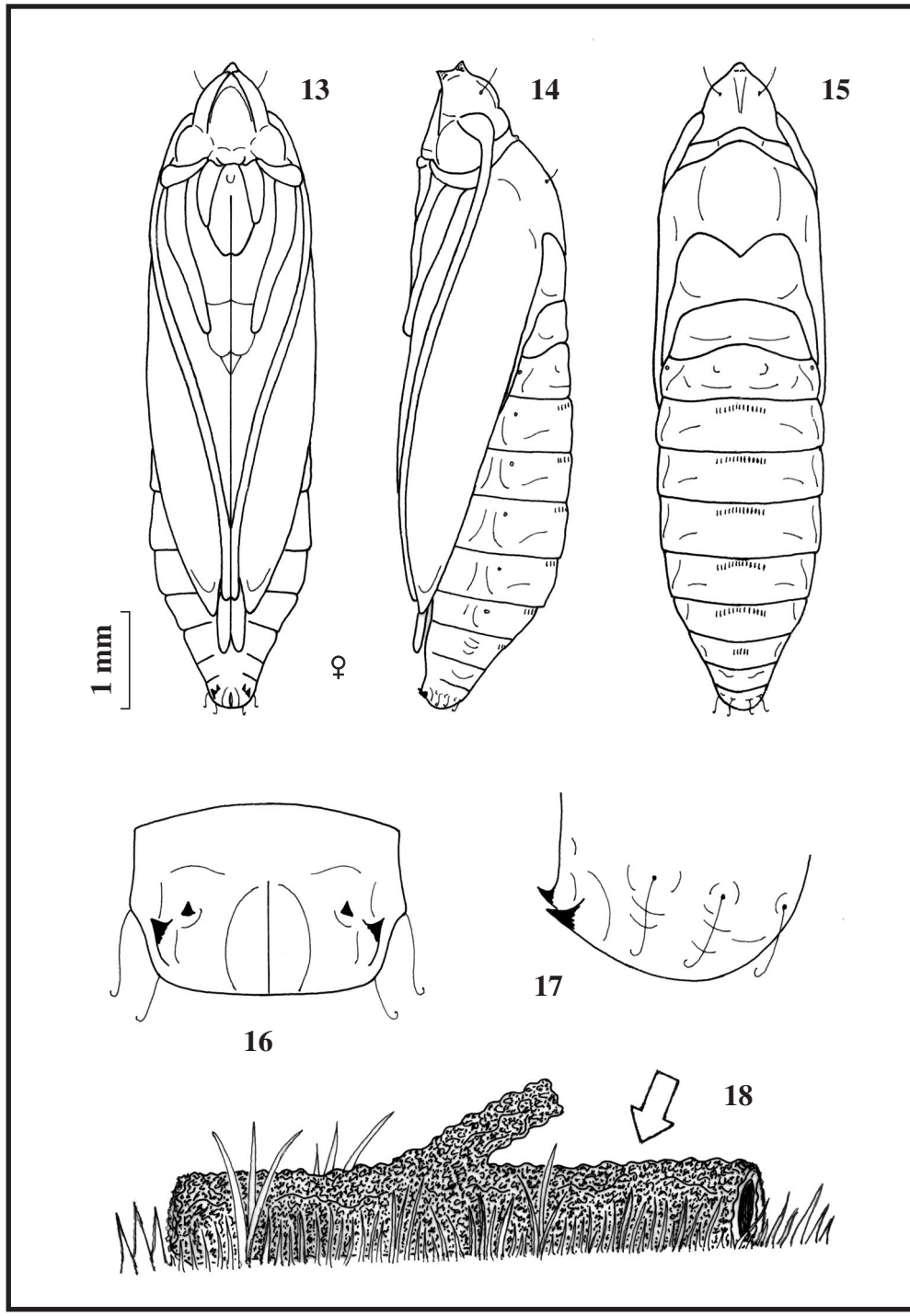
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Two new species and one new record of the genus *Macaduma* Walker, 1866 from China (Lepidoptera: Erebidae, Arctiinae)

T. T. Zhao, K. Bucsek & H. L. Han

Abstract

In this paper, two new species of the genus *Macaduma* Walker, 1866: *Macaduma huanglianshana* Zhao, Bucsek & Han, sp. n. and *Macaduma. chenglaiae* Zhao, Bucsek & Han, sp. n., are described from Yunnan Province, China. Meanwhile, another species: *M. micra* Dubatolov & Bucsek, 2016 is reported for the first time from China. Adults of these species are illustrated, and images of the male genitalia are provided.
KEY WORDS: Lepidoptera, Erebidae, Arctiinae, *Macaduma*, new species, taxonomy, distribution, China.

Dos nuevas especies y un nuevo registro del género *Macaduma* Walker, 1866 de China (Lepidoptera: Erebidae, Arctiinae)

Resumen

En este trabajo se describen dos nuevas especies de la provincia Yunnan, China del género *Macaduma* Walker, 1866, *Macaduma huanglianshana* Zhao, Bucsek & Han, sp. n. y *M. chenglaiae* Zhao, Bucsek & Han, sp. n. y se registra por primera vez para China a *M. micra* Dubatolov & Bucsek, 2016. Se ilustran los adultos de estas especies y se proporcionan las imágenes de la genitalia del macho.
PALABRAS CLAVES: Lepidoptera, Erebidae, Arctiinae, *Macaduma*, nuevas especies, taxonomía, distribución, China.

Introduction

The genus *Macaduma* Walker, 1866 was established based on the type species *Macaduma tortricella* Walker, 1866 from Java, Indonesia (WALKER, 1866). In recent years, eight species from Southeast Asia and southern China have been described and recorded (FANG, 2000; HOLLOWAY, 2001; ČERNÝ & PINRATANA, 2009; BUCSEK, 2012, 2014; DUBATOLOV & BUCSEK, 2016; BAYARSAIKHAN *et al*., 2020). Up to now, only one species: *M. tortricella* has been reported in China (FANG, 2000). In this study, two new species of the genus *M. huanglianshana* Zhao, Bucsek & Han, sp. n. and *M. chenglaiae* Zhao, Bucsek & Han, sp. n. are described in Yunnan Province, China, and *M. micra* Dubatolov & Bucsek, 2016 is described as new to the Chinese fauna.

Materials and methods

The specimens were trapped by a mercury lamp at night during July and August 2018. Photographs of the adult specimens were taken with the Nikon D700 camera. Dissection and preparation of the genitalia slides were followed standard methods (KONONENKO & HAN, 2007). Photographs of the genitalia slides were taken with an Olympus microscope and Helicon Focus software, and the pictures

were further processed in Adobe Photoshop CS6. All specimens of these new species are deposited in the collections of Northeast Forestry University, Harbin, China (NEFU).

Taxonomic account

Genus *Macaduma* Walker, 1866
Macaduma Walker, 1866, *List Spec. Lepid. Insects Colln Br. Mus.,* **35**: 1704
Type species: *Macaduma tortricella* Walker, 1866
Type locality: Java, INDONESIA
= *Psapharacis* Turner, 1899. *Trans. R. Soc. S. Aust.,* **23**: 14
Type species: *Psapharacis toxophora* Turner, 1899
Type locality: Brisbane, AUSTRALIA

Descriptions of new species and new record species

***Macaduma huanglianshana* Zhao, Bucsek & Han, sp. n.** (Figs 1, 8, 15, 16)

Material: Holotype ♂, China, Yunnan Province, Luchun, Mt. Huanglian, 27-31-VII-2018, H. L. Han, J. Wu leg., genitalia No. ztt-277-1, coll. NEFU. Paratype: 1 ♂, same data as for holotype, genitalia No. ztt-281-1; coll. NEFU.

Description: Wingspan 18-19 mm in male. Head, patagium, and tegula dark brown. Antennae filiform. Thorax brown. Forewing ground color brown scattered little black; basal area, veins, and inner margin dark. Hindwing brown diffuse, small, dark brown flecks, fringe brown. Abdomen brown with pale yellow anal tuft.

Male genitalia: Tegumen triangular, thin. Uncus slender, slightly swollen subapically, with a hooked apex. Vinculum narrow, weakly sclerotized. Juxta weakly sclerotized, with a strongly sclerotized tapering process. Valva rather flat, broad, and asymmetrical, in the left one, sacculus broad at the base, narrowing distally, cucullus weakly sclerotized, ending in irregular sawtooth shape; in the right one, the top of cucullus relatively flat, with two apical elongations on both sides, and the ventral elongation is about twice as long as the dorsal one. Aedeagus slender, vesica with a long cornutus, and plate of minute spiculi.

Female unknown.

Diagnosis: This new species is similar to *M. cinnamum* Bucsek, 2012 (Figs 2, 9), but can be separated from it by the following characters (*M. cinnamum* details are in parentheses): head and thorax dark brown, abdomen brown with pale yellow anal tuft (head and thorax cinnamon-brown, abdomen black with ochreous pubescence); the ground color of forewing brown scattered little black, the hindwing pale brown (forewing cinnamon-brown, hindwing dark brown). In the male genitalia, the juxta has a long and tapering process (without process); valva wider than *M. cinnamum*, apical elongations of valva nearly triangular or tapering (all apical elongations of valva rounded); aedeagus straight (aedeagus significantly bent).

Distribution: China (Yunnan: Mt. Huanglian) (Fig. 15).

Etymology: The species is named after the type locality, Mt. Huanglian, Yunnan province, China.

Bionomics: The collection site is located in Huanglian Mountain National Nature Reserve. The reserve is one of the three slides of the "Green Delta" that borders China, Vietnam, and Laos. It is also the intact tropical rain forest that connects southwest Chinaand Southeast Asia and is rich in biodiversity. The reserve is the only one with the most complete vertical distribution of subtropical monsoon evergreen broad-leaved forest, mountain mossy evergreen broad-leaved forest, mountain mossy dwarf forest, and secondary forest in the south of Yunnan. The specimens were collected in July (Fig. 16).

***Macaduma chenglaiae* Zhao, Bucsek & Han, sp. n.** (Figs 3, 10, 17, 18)

Material: Holotype ♂, China, Yunnan Province, Menglun, Mannanxing village, 8-VIII-2018, H. L. Han, J. Wu leg., genitalia No. ztt-275-1; coll. NEFU.

Description: Wingspan 18-19 mm. Head, patagium, and tegula dark brown. Antennae filiform. Thorax brown. Forewing ground color dark brown, costa strongly convex, external edge with triangular process; outer margin with a gentle concave arc at M_2. Hindwing dark brown, costal band light brown, fringe pale to smoky brown. Abdomen brown with black fringe and light brown anal tuft.

Male genitalia: Tegumen triangular and thin, slightly shorter than uncus. Uncus thick, covered with setae, slightly curved, swollen subapically with hooked apex. Juxta weakly sclerotized is slender and ribbonlike. Vinculum narrow, weakly sclerotized. Valva asymmetrical, with apical processes, which is membranous at ventral side, and weakly sclerotized at dorsal side; in the left valva, cucullus with a hook-shaped elongation on the dorsal side, in the right one, cucullus bifurcated, the middle part concave, and acute at both sides. Aedeagus curved, bent at middle, with three different sized cornuti on vesica proximally, a long cornutus and a plate of minute spiculi on the vesica.

Female unknown.

Diagnosis: The new species is externally similar to *M. borneana* Holloway, 2001 (Figs 4, 11) and *M. malayana* Bucsek, 2014 (Figs 5, 12), but it can be separated from the latter by the following characters (*M. borneana* details are in parentheses; *M. malayana* details are in parentheses): the ground color of forewing is dark brown (lighter; brownish black, apex and termen cinnamon brown); the forewing is of typical shape for the genus, costal margin strongly bent forming a triangle (typical shape; costal margin rounded). In the male genitalia, base of the left valva is wider and the middle part is clearly segmented (narrow at both ends and wide in the middle; narrow, no segmented); the elongation of left cucullus is short hook-shaped, on the dorsal side (slender and noticeably longer than *M. chenglaiae*; on the ventral side, slightly thicker than *M. chenglaiae*); the elongation of right cucullus is bifurcated, ending in two triangles (bifurcated, sclerotized and slender; slightly curved and sharp); the aedeagus bent at middle, with three differently sized cornuti on basal vesica (bent near the caecum, vesica with cornuti more than three; two small and a larger cornutus on vesica).

Distribution: China (Yunnan: Menglun) (Fig. 17).

Etymology: The species name is dedicated to Mrs. Cheng-Lai Fang, a famous researcher of Chinese lepidopter.

Bionomics: Menglun town is located in the northwest of Mengla County, Xishuangbanna, on the east bank of Lancang River basin, with a landscape of low hills and intermountain basins. The zonal vegetation in Menglun is mainly tropical seasonal rain forest. The specimens were collected close to a broad-leaved forest with ferns and shrubs in August (Fig. 18).

Macaduma micra Dubatolov & Bucsek, 2016 (Figs 6, 13)

Macaduma micra Dubatolov & Bucsek, 2016. *Euroasian Ent. Jl.*, **15**(3): 234, figs 12, 31

Type locality: Kon Tum Prov. Sa Thay Distr., Bargok Comm, Chu Mon Ray, VIETNAM

Material: China: Prov. Yunnan, Mengyang, Yexianggu, 2 ♂♂, 4-5-VIII-2018, H. L. Han, J. Wu leg., genitalia No. ztt-279-1, ztt-282-1; coll. NEFU. **New for China**.

Diagnosis: Wingspan 18-19 mm in male. The forewings are dark and of typical wing shape for the genus. In male genitalia, tegumen triangular, slightly shorter than uncus; uncus slightly swollen medially, sharp distally; juxta with strongly sclerotized process; valva are not completely asymmetrical, the left cucullus is larger than the right. Aedeagus curved, bent at middle, with a long cornutus and a plate of minute spiculi on the vesica.

Distribution: China (Yunnan), Cambodia (Cardamom Mountains), Vietnam (Kon Tum)**.**

Key to the species of the genus *Macaduma* Walker, 1866 in China based on the male genitalia

1 Apex of left valva not trifurcate.....2
- Apex of left valva trifurcate.....*M. huangliangshana* sp. n.
2 The apical elongation of left cucullus not long hook-shaped.....3
- The apical elongation of left cucullus long hook-shaped .....*M. chenglaiae* sp. n.
3 Juxta with a strongly sclerotized and strip-shaped process .....*M. micra*
- Juxta with a weakly sclerotized and angular process .....*M. tortricella*

Acknowledgments

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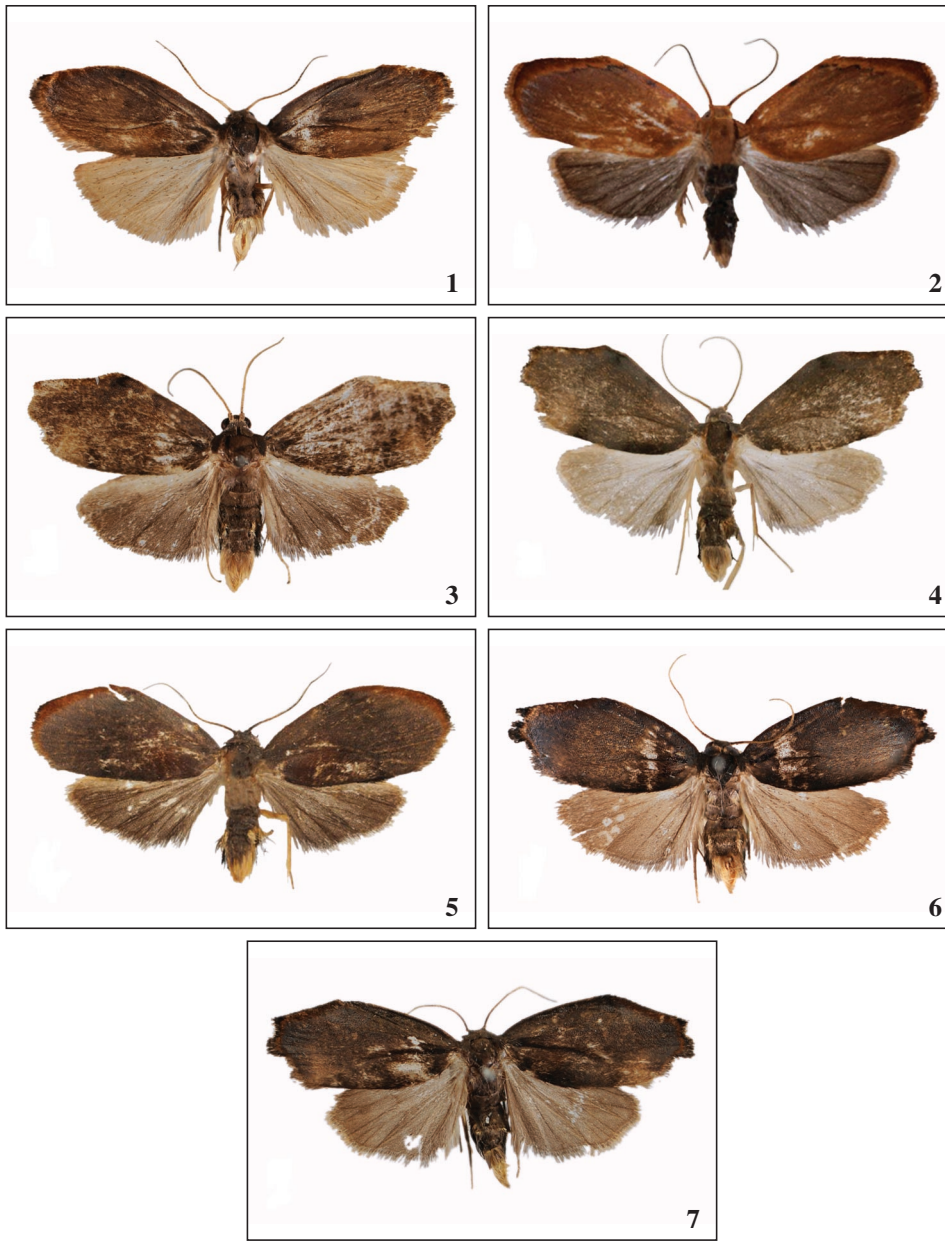
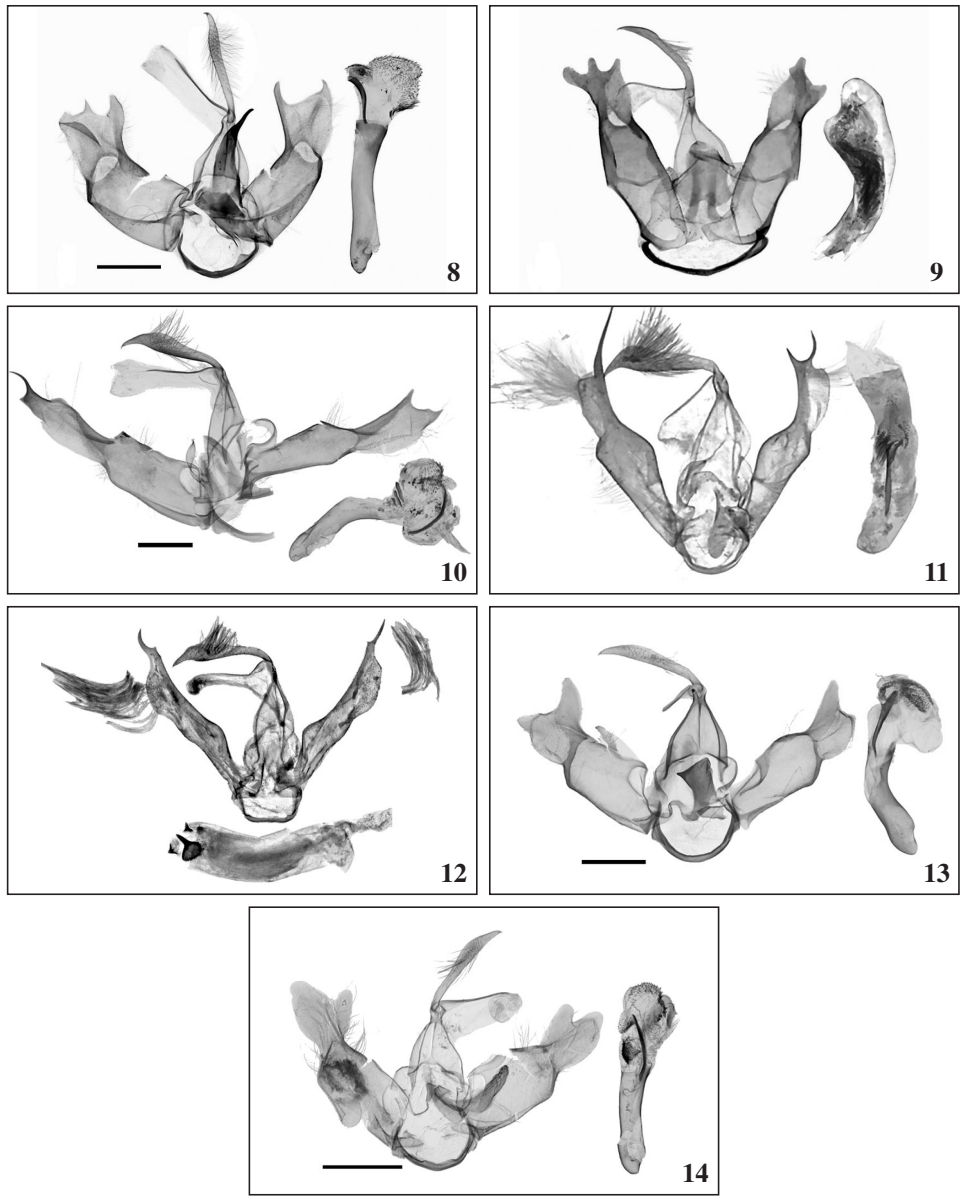
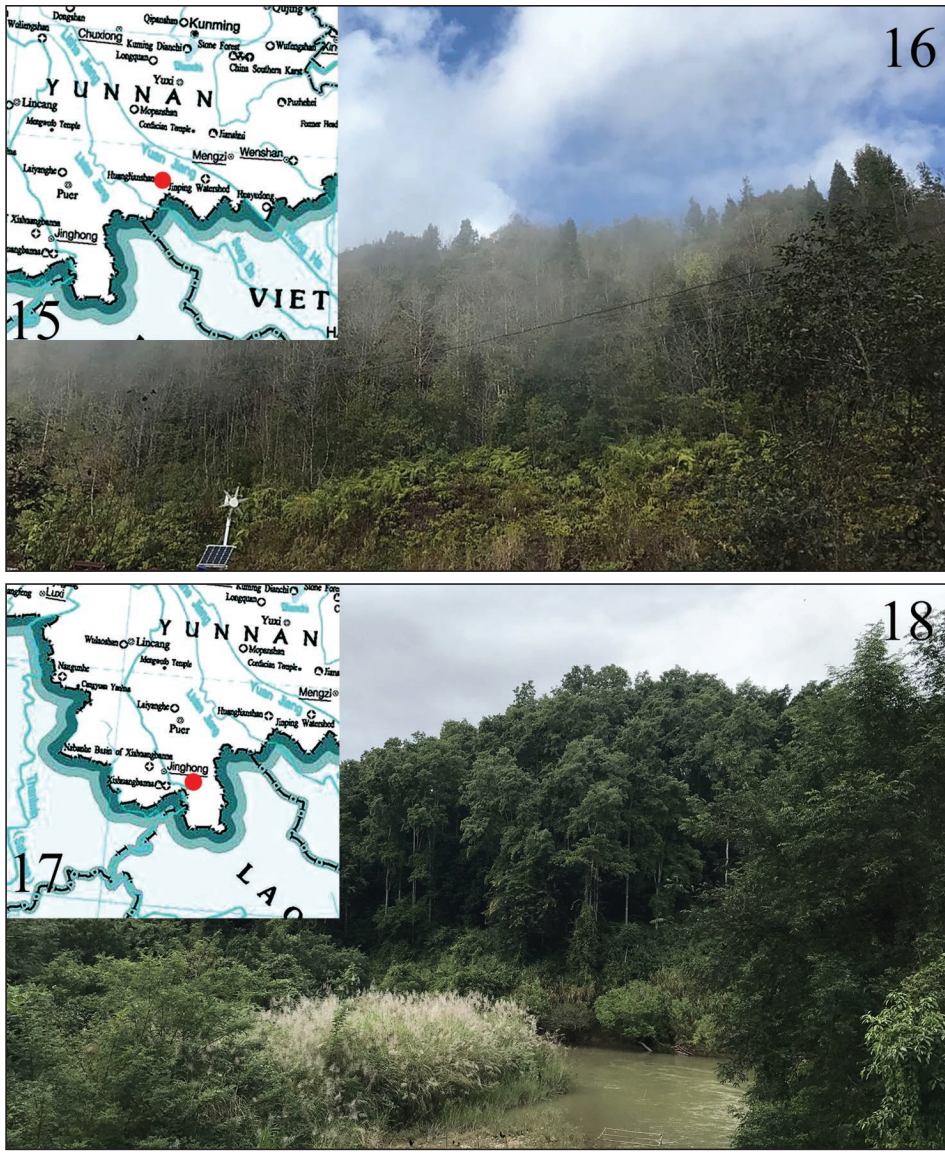


Figs 1-7.– Adults of *Macaduma* sp. **1.** *M. huanglianshana* Zhao, Bucsek & Han, sp. n., male, holotype. **2.** *M. cinnamum* Bucsek, male, holotype (after BUCSEK, 2012: Fig. 221). **3.** *M. chenglaiae* Zhao, Bucsek & Han, sp. n., male, holotype. **4.** *M. borneana* Holloway, male (after BUCSEK, 2012: Fig. 219). **5.** *M. malayana* Bucsek, male, holotype (after BUCSEK, 2014: Fig. 47). **6.** *M. micra* Dubatolov & Bucsek, male. **7.** *M. tortricella* Walker, male.



Figures 8-14.– Male genitalia of *Macaduma* sp. **8.** *M. huanglianshana* Zhao, Bucsek & Han, sp. n., holotype, genitalia No. ztt-277-1. **9.** *M. cinnamum* Bucsek, holotype (after BUCSEK, 2012: Genitalia Pl. Mal130a).**10.** *M. chenglaiae* Zhao, Bucsek & Han, sp. n., holotype, genitalia No. ztt-275-1. **11.** *M. borneana* Holloway, (after BUCSEK, 2012: Genitalia pl. Mal213). **12.** *M. malayana* Bucsek, male, holotype (after BUCSEK, 2014: Genitalia Pl. MalS39). **13.** *M. micra* Dubatolov & Bucsek, genitalia No. ztt-279-1. **14.** *M. tortricella* Walker, genitalia No. ztt-252-1. Scale bars: 0.5mm.



Figures 15-18.– Maps and habitat of the two new species. **15.** Yunnan Prov., Mt. Huanglian (red dot). **16.** Collecting site close to a broad-leaved forest with ferns and shrubs. **17.** Yunnan Prov., Menglun (red dot). **18.** Collecting site close to the tropical rain forest.

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New data on Old World Polyorthini. The genus *Lopharcha* Diakonoff, 1941 recorded from the Canary Islands (Spain) and Tanzania (Lepidoptera: Tortricidae)

P. Falck, L. Aarvik & A. Vives Moreno

Abstract

Dichelia constanti Rebel, 1894 is transferred to the genus *Lopharcha* Diakonoff, 1941 resulting in the combination *Lopharcha constanti* (Rebel, 1894) comb. n. *Lopharcha africana* Aarvik, sp. n. is described from Tanzania. *Kanaria* Larsen, 2020 is synonymized with *Lopharcha* Diakonoff, 1941, syn. n. These are the first records of *Lopharcha* from the Afrotropical region and the western part of the Palaearctic region.
KEY WORDS: Lepidoptera, Tortricidae, new species, new records DNA-barcodes, new synonym, Canary Islands, Spain, Tanzania.

Nuevos datos sobre los Polyorthini del Viejo Mundo. El género *Lopharcha* Diakonoff, 1941 registrado de las Islas Canarias (España) y Tanzania (Lepidoptera: Tortricidae)

Resumen

Dichelia constanti Rebel, 1894 es transferida al género *Lopharcha* Diakonoff, 1941 resultando la combinación *Lopharcha constanti* (Rebel, 1894) comb. n. Se describe de Tanzania *Lopharcha africana* Aarvik, sp. n. *Kanaria* Larsen, 2020 se sinonimiza con *Lopharcha* Diakonoff, 1941, syn. n. Estos son los primeros registros de *Lopharcha* para la región Afrotropical y el oeste de la región Palaeártica.
PALABRAS CLAVE: Lepidoptera, Tortricidae, nueva especie, nuevos registros del código de barras ADN, nuevas sinonimias, Islas Canarias, España, Tanzania.

Introduction

CLARKE (1955) characterized a small group of Tortricidae genera as follows: "A unique group of the Tortricidae consisting of the four closely related genera *Ardeutica*, *Atteria*, *Polyortha*, and *Pseudatteria* is peculiar in that the harpe [= valva] of the male is split longitudinally along the ventral edge, forming a longitudinal pocket for the reception of an abdominal hair-pencil. The four genera are South American". In his revision of the Neotropical *Pseudatteria* OBRAZTSOV (1966) gave the group formal rank as a tribe, Polyorthini. DIAKONOFF (1974) reported the tribe from the Indo-Australian region and assigned a number of genera and species to Polyorthini. Prior to his revision, many of the species had been misplaced in *Acleris* Hübner, [1825]. RAZOWSKI (1979) realized that the enigmatic Palaearctic (and European) genera *Olindia* Guenée, 1845 and *Isotrias* Meyrick, 1895 also belong to Polyorthini. Together with the tribes Hilarographini and Chlidanotini, the Polyorthini constitute the

subfamily Chlidanotinae (HORAK & BROWN, 1991), and molecular data (REGIER *et al*., 2012) indicate that Polyorthini is the earliest branching group of Tortricidae.

Polyorthini was recorded from the Afrotropical region as late as in 2000 by RAZOWSKI & TUCK (2000) who transferred the genus *Ebodina* Diakonoff, 1968 from Tortricini to Polyorthini. They also described the genus *Xeneboda* Razowski & Tuck, 2000, from West Africa. Currently two species of *Ebodina* and three species of *Xeneboda* are known from Africa and Madagascar (DE PRINS & DE PRINS, 2011-2021).

The largest genus of Polyorthini in the Old World is *Lopharcha* Diakonoff, 1941 with 23 species distributed from India and Nepal in the west to New Zealand and Japan in the east (GILLIGAN, 2003-2019). DIAKONOFF (1974) performed a comprehensive revision of the 17 species known to him and diagnosed the genus. The assignment of the two species dealt with here to *Lopharcha* represents a huge extension of the known geographical range of the genus. Arguments for the assignment are presented below.

Material and methods

Most of the specimens from the Canary Islands were attracted to an 8 watts super actinic light. The specimens from Tanzania were attracted to mercury vapour bulbs run by a portable generator. Genitalia were dissected following ROBINSON (1976). Specimens from the Canary Islands were photographed with a Canon EOS 700D camera equipped with a Canon EF 100 mm objective and the Tanzanian specimen with the Microptics photographic system. The genitalia slides of material from the Canary Islands were photographed using a Soptop CX40T Trinocular microscope in conjunction with a Toup Tek P10500A-E3 / E3ISPM05000KPA-E3 / 5.0MP USB3 camera. Photos of the genitalia of the Tanzanian material were taken through a Leica DM 6000B microscope using a Leica DFC 420 digital camera.

DNA samples were prepared from dried legs according to the prescribed standards and processed at the Canadian Centre for DNA Barcoding (CCDB, Biodiversity Institute of Ontario, University of Guelph) to obtain the 658 base-pair long barcode fragment of the mitochondrial COI gene (cytochrome c oxidase I). Intra- and interspecific distances of DNA barcode fragment were calculated using analytic tools of BOLD with the Kimura 2-parameter model of nucleotide substitution. Genetic clusters are presented with their barcode index number (BIN; cf. RATMNASINGHAM & HERBERT, 2013).

We examined the DNA Barcode from *Lopharcha constanti* (Rebel, 1894) from the islands of Gran Canaria, La Gomera and Tenerife (Canary Islands, Spain).

Abbreviations used

GP	Genitalia preparation
PF	Collection of Per Falck, Neksø, Denmark
MNCN	Collection of Antonio Vives, Museo Nacional de Ciencias Naturales, Madrid, Spain
NHMO	Natural History Museum, University of Oslo, Oslo, Norway
NHMUK	The Natural History Museum, London, United Kingdom
ZMUC	Zoological Museum, Natural History Museum of Denmark, Copenhagen, Denmark

Taxonomy

Genus *Lopharcha* Diakonoff, 1941
Lopharcha Diakonoff, 1941. *Treubia*, **18**: 424
Type species: *Lopharcha quinquestriata* Diakonoff, 1941
Type locality: INDONESIA, Java
= *Canaria* Larsen, 2020, **syn. n.**
Canaria Larsen, 2020a. *SHILAP Revta. lepid*., **48**(190): 325

Type species: *Canaria palmariana* Larsen, 2020
Type locality: SPAIN, La Palma
= *Kanaria* Larsen, 2020, **syn. n.**
Kanaria Larsen, 2020b. *SHILAP Revta. lepid*., **48**(191): 512 (Replacement name for *Canaria* Larsen, 2020 which is a homonym of *Canaria* Partington, 1835)

Lopharcha is characterised externally by the relatively narrow hindwing and the pointed forewing with tufts of raised scales. The male genitalia are typical for the tribe, with long and narrow uncus, gnathos with medial arm, and large, oval, split valva. The phallus is of variable shape. In the female genitalia the signum may be entirely missing or consist of one or two bundles of dense, slender, and diverging spines, or consist of a concave and scobinate sclerite. In the two species treated in the present work, the signum is represented by numerous spines. The ductus bursae is membranous, often with sclerite in posterior part; it varies in length and width. DIAKONOFF (1974) compared *Lopharcha* with *Polylopha* Lower, 1901, a genus with mainly Asian and Australian distribution. This genus has broader hindwing, a spined sacculus in the male genitalia, and in the female genitalia a large signum of unique shape (DIAKONOFF, 1974). *Polylopha* is a compact genus of closely allied species, whereas *Lopharcha* is much more diverse. Future research may show that *Polylopha* is a specialized branch subordinate under *Lopharcha*. In that case the former generic name would have priority. In our view the separation of the Canary Islands taxa from *Lopharcha* at the genus level will make *Lopharcha* polyphyletic and eventually lead to additional splitting. LARSEN (2020a) separated *Kanaria* (as *Canaria*) from *Lopharcha* based on the presence of (1) the spiny bursa in the female, the presence of (2) a cubital pecten in both sexes, and (3) the presence of a blotch of stronger scales on the base of the underside of the forewing. He also mentioned (4) that in the male genitalia *Kanaria* differs from *Lopharcha* in the strongly sclerotized and curved vinculum, the very large phallus without cornuti, the lack of a large coremata tuft on the eight sternite and the lack of the large anellus plate found in the type species of *Lopharcha*. However, the configuration of the sclerites inside the corpus bursae in *Lopharcha* is not uniform. Using the type of signum as a main criterion for generic division, would lead to the splitting of *Lopharcha* into at least three separate genera. The presence or absence of specialized scales on the forewing underside is a character of the species level. The presence of a cubital pecten in *Kanaria* should be confirmed. It is missing in the examined material of *Lopharcha constanti* (Rebel, 1894), a species closely related to the two species described by LARSEN (2020a). The absence of a cubital pecten is universal in the subfamily Chlidanotinae (HORAK & BROWN, 1991). The characters in the male genitalia mentioned by LARSEN (2020a) separating *Kanaria* from the type species of *Lopharcha*, *L. quinquestriata* Diakonoff, 1941, may be correct, but they do not separate *Kanaria* from other species of the genus; compare figures in DIAKONOFF's (1974) work. That the coremata are missing can be considered as a secondary loss. There are several cases in Lepidoptera where secondary sexual characters are present in one and missing in another of two closely related species. It is worth mentioning that Kevin TUCK, former curator of the Tortricidae in NHMUK, London, identified a specimen from La Palma as belonging to the genus *Lopharcha*. Consequently, we consider *Kanaria* Larsen, 2020 as a synonym of *Lopharcha* Diakonoff, 1941, **syn**. **n**.

Lopharcha constanti (Rebel, 1894), **comb. n.** (Figs1-4)
Dichelia constanti Rebel, *in* REBEL & ROGENHOFER, 1894. *Annln naturh. Mus. Wien*, **1894**: 85
Type locality: SPAIN, Tenerife, La Laguna.
Epagoge constanti, WALSINGHAM, 1908. *Proc. zool. Soc. Lond.*, **1907**: 993
Hastula constanti, KLIMESCH, 1987. *Vieraea*, **17**: 300
Avaria constanti, BROWN, 2005. *World Cat. Insects*, **5**: 145; VIVES MORENO, 2014. *Cat. sist. sin. Lep*., **2014**: 230

Material examined: SPAIN, Gran Canaria, Los Tilos de Moya, 500 m, 11 ♂♂, 8 ♀♀, 11-24-VI-2018, leg. P. Falck (PF, MNCN), genitalia slides 3365PF, 3366PF, 3368PF, 3370PF, DNA sample Lepid Phyl 0531PF/CILEP0531-20; same data but, 1 ♀, 17-30-IX-2018, leg. P. Falck (PF), genitalia slide 3546PF; same data but, 2 ♀♀, 4-23-III-2019, leg. P. Falck (PF), DNA samples Lepid Phyl 0529PF/CILEP0528-

20, 0530PF/CILEP0529-20; same data but 2 ♂♂, 8-20-VIII-2020, leg. P. Falck (PF), genitalia slide 3604PF; Barranco de Azuaje, 270 m, 1 ♂, 8-20-VIII-2020, leg. P. Falck (PF); same data but, 1 ♂, 9-22-VI-2021, leg. P. Falck (PF), DNA sample Lepid Phyl 0929PF/CILEP0928-21; La Gomera, El Cedro, 650 m, 1 ♀, 9-12-VIII-2021, leg. P. Falck (PF), genitalia slide 3550PF, DNA sample Lepid Phyl 0930PF/CILEP0929-21; La Palma, Barranco Nogales, 500 m, 1 ♀, leg. P. Stadel Nielsen (ZMUC), genitalia slide KRT/La Palma "Lopharcha sp. det. K. Tuck"; Tenerife, Las Mercedes, 750 m, 8 ♀♀, 13-26-VIII-2019, leg. P. Falck (PF), DNA samples Lepid Phyl 0528PF/CILEP0527-20, 0526PF/CILEP0525-20.

Redescription male (Fig. 1): Wingspan 10-12.5 mm. Head and neck brown to yellowish brown, rough scaled. Labial palps relatively long (approximately 2.5 diameter of the eye) and straight, segment 2 dorsally with long and rough scales, yellowish brown, laterally dark brown, and lighter medially, segment 3 short, brown to yellowish brown, with lighter tip. Antenna slightly shorter than half of forewing length, weakly ringed dark brown and yellowish, with short cilia, before middle with few rough scales at each segment. Tegula and thorax brown to yellowish brown. Forewing narrow, costa evenly curved towards pointed apex, termen very oblique, concave below apex; colour brown with admixture of yellowish brown, black and reddish scales, base dark brown, before 1/3 an oblique lighter brown fascia, slightly widening towards dorsum, medially edged by 3-4 diffuse black spots, with few raised scales, almost forming a transverse line, distally edged by black brown and red scales, distal part of forewing with some indistinct brown and reddish transverse lines, apical spot diffuse black, terminal spots black, diffuse. Fringes of the same colour as the wing; underside yellowish brown. Hindwing quite narrow and pointed, termen oblique and strongly concave, light brown to yellowish brown, towards apex more greyish, at the base a tuft of long hairy scales. Fringes of the same colour as the wing, fringe-line darker brown. Abdomen brown to yellowish brown, apically yellowish. Female (Fig. 2): Wingspan 10-14.5 mm. Generally, much darker blackish brown, and without the characteristic yellowish-brown colour seen in the male. Wing pattern similar to that of male, but the black spots edging the median fascia has many raised scales, the indistinct transverse lines are reddish, and the scale tuft at the base of hindwing is large.

Genitalia male (Fig. 3): Uncus long and slender, slightly tapering towards apex; socii relatively large, rounded, covered by medium long setae; gnathos well developed, heavily sclerotized, subtriangular, hook-shaped in lateral view; tegumen short, rounded posteriorly; valva relatively large, membranous, consists of two layers with a longitudinal slit laterally (genitalia in situ), about 1/3 from costa; medial layer with costa arched towards pointed apex, dorsum almost straight until fl before apex, sparsely covered with setae; lateral layer with less arched costa and covered with medium long setae, especially along costa; vinculum well sclerotized rounded; juxta subrectangular, covered with small spikes; phallus as long as valva, straight. Culcita placed on U-shaped sternit VIII (Fig. 3a) with ventrally long scales (The scales are easily lost during genitalia dissection).

Genitalia female (Fig. 4): Papillae anales elongate, as long as posterior apophysis, densely covered by setae; posterior apophysis slightly longer than anterior apophysis; sterigma rounded posteriorly, funnel-shaped; colliculum narrow and membranous; ductus bursae membranous, slightly widening anteriorly, narrowing just before corpus bursa; corpus bursae round, almost completely covered by short spikes; bulla seminalis large.

DNA barcodes: We obtained full length DNA barcodes (658 bp) from two specimens and DNA barcode fragments of 643bp and 622bp from two specimens from the island of Gran Canaria, full length DNA barcodes (658 bp) from two specimens from the island of Tenerife. The barcodes fall within Barcode Index Number (BIN) BOLD: AEE9965. We also obtained full length DNA barcodes (658 bp) from one specimen from the island of La Gomera, with Barcode Index Number AEN8025. The intraspecific maximum p-distance is 0.48% in the Tenerife/ Gran Canaria population, but the minimum p-distance is 5.76% to the La Gomera specimen. The minimum p-distance to the nearest neighbour, an unidentified Tortricidae species from Asia, is 6.67%, with the Barcode Index Number (BIN) BOLD: ADI6186.

A high intraspecific variation in COI between the specimens from separate islands of the Canary

Islands, in this case La Gomera and Tenerife/Gran Canaria, is quite common (FALCK *et al*., 2021), it has been observed in several families e. g. Tineidae, Scythrididae, Cosmopterigidae, Tortricidae (P. Falck, unpublished).

Remarks: *Dichelia constanti* was described by REBEL (1894) on the basis of three unevenly preserved specimens collected by A. Cabrera at La Laguna, Tenerife. We have not been able to trace the type specimens in the Cabrera collection, in the Museo Nacional de Ciencias Naturales, Madrid, or in the Natural History Museum, Vienna, and the specimens are probably lost. However, thanks to Rebel's detailed and very precise description of the wing-pattern, colour and the characteristic shape of both fore- and hindwings, we are convinced of the identity of this species. Further, a part of the examined material was collected close to the type locality. The host-plant of *L. constanti* is unclear, Rebel wrote "Señor Cabrera, welcher mir mittheilte, dass er diese Art auf Tenerife (Laguna) im Mai und Juni angetroffen habe, wo die Raupe auf *Datura stramonium* lebe". This can be interpreted as the specimens were collected as adult, and larvae were present living on *Datura stramonium* L.- not necessarily larvae of *L. constanti.* This assumption is supported by WALSINGHAM (1908) "This is one of the very few species, recorded from Tenerife, which I was unable to find, although I searched on *Datura stramonium,* at La Laguna, in May and June".

It is necessary to establish the following new combinations:

Lopharcha constanti (Rebel, 1893), **comb. n.**, present in Tenerife and Gran Canaria.
Lopharcha palmariana (Larsen, 2020), **comb. n.**, present in La Palma.
Lopharcha gomeriana (Larsen, 2020), **comb. n.**, present in La Gomera.

***Lopharcha africana* Aarvik, sp. n.** (Figs 5-9)

Type material: Holotype, ♂, TANZANIA: Iringa Reg., Mufindi Distr., Kigogo Forest. 1900 m, 23-25-XI-2005, L. Aarvik, M. Fibiger, A. Kingston, genitalia slide NHMO 1777 (NHMO). Paratypes, 3 ♂♂, 3 ♀♀, same data as holotype, genitalia slide ♂ NHMO 1776, ♀ NHMO 1778 (NHMO); 1 ♀ in MNCN.

Diagnosis: There is no species of Tortricidae known from Africa, with which *L. africana* sp. n., could be confused. It shares with species of the genus *Acleris* (subfamily Tortricinae, tribe Tortricini) the presence of groups of raised scales in the forewing. However, in the latter genus the forewing has a sub-rectangular shape, whereas in *Lopharcha* the forewing is more arched and apically prolonged. Further, the hindwing is narrower in *Lopharcha* than in members of *Acleris*. The genitalia differ profoundly from those of *Acleris*.

Description of male: wingspan 14.5 mm. (n = 4). Antennae brownish grey, with appressed scales and minutely ciliate, each segment basally white. Labial palpi (Fig. 6) 2.4 times diameter of eyes, with white-tipped brownish grey scales, second segment with broad, fan-shaped scale brush, third segment slightly protruding from scale brush of second segment. Head and thorax brownish grey, scales white tipped. Forewing relatively narrow, costa evenly curved towards pointed apex, termen concave below apex; ochreous brown in tornal and sub-terminal third, the same colour forms an oblique band from one third of costa and a small patch at mid costa; remaining part of wing dark grey. Tufts of raised scales present at one third from base, in the middle, and at two thirds from base. Cilia grey, with darker grey base. Hindwing narrow apically pointed; brownish grey, cilia concolorous with wing, with darker basal line. Legs beige, fore- and midleg with grey suffusion on tibiae and tarsus, on tarsus forming rings. Abdomen grey dorsally, beige ventrally, segment VIII with lateral tufts of large, oval scales (Fig. 7).

Description of female: wingspan 17.5-18.0 mm. (n = 4). Apart from larger size and lack of abdominal scale tuft, externally similar to male.

Genitalia male (Fig. 8): Tegumen higher than broad, the pedunculi are strongly developed; uncus long and slender, slightly narrowed medially; socii weak; gnathos with band-like lateral arms, medial process with triangular base and rod-like extension; transtilla laterally broad, narrow and nearly divided in middle; anellus bilobed, set with denticles; juxta a rounded plate, excavated on top; valva broadly

oval, with deep split throughout; phallus cylindrical, with rod-like apical process. Coremata (Fig. 8a) as lateral bundles of hair-like scales are well developed.

Genitalia female (Fig. 9): Papillae anales slender, broadened in posterior half; apophyses posteriores slightly longer than apophyses anteriores; sterigma broad, saddle-shaped, with medial convexity; ductus bursae short and broad, sclerotized in middle; corpus bursae oval, posteriorly with dentate area; ductus seminalis inserted posteriorly into corpus bursae.

Variation: In the forewing the ochreous parts may be more or less replaced by dark grey, making the wing nearly unicolorous.

Remarks: A short and broad phallus in the male genitalia, resembling the one in *Lopharcha africana* n. sp., is present in *L. rapax* (Meyrick, 1908) from Sri Lanka and *L. cryptacantha* Diakonoff, 1974 from India. Judging from DIAKONOFF's (1974: fig. 42a) illustration the phallus in *L. cryptacantha* has a rod-like apical extension which parallels the one present in *L. africana* sp. n. The short and broad ductus bursae in the female genitalia is unlike the one present in other species of the genus. However, the variation is considerable and *L. amethystas* (Meyrick, 1912) has a relatively wide and short ductus approaching the one found in the African species. The male genitalia of *L. africana* sp. n. fit perfectly well in *Lopharcha*, whereas the female genitalia indicate an isolated position.

Discussion: We are not able to decide whether the genus *Lopharcha* consists of one or three species from the Canary Islands. It was not possible for us to study the holotypes of *L. gomeriana* and *L. palmariana,* described from a single male and a single female respectively. Due to the lack of additional specimens from La Gomera and La Palma we hesitate to synonymize these species. However, we did not observe any morphological differences in the females between the populations from Tenerife / Gran Canaria, La Gomera and La Palma.

Lopharcha constanti is probably an endemic species and could be an old relict connected with the occurrence of the Laurisilva forest as stated by LARSEN (2020a: 329). This is supported by the fact that all known specimens are recorded at the edge or near Laurisilva forest and that the first known specimens are recorded more than a hundred years ago, long before the intense international traffic began.

The type locality of *L. africana* sp. n., Kigogo Forest, is situated in the Southern Highlands of Tanzania, which is a part of the Eastern Arc (WASSER & LOVETT, 1993), a disjunct range of ancient mountains in south-eastern Kenya and eastern Tanzania. The forests of these mountains were characterised as a hot-spot by MYERS (1990), indicating that they feature exceptional concentration of endemic species (MYERS, 1988). Today only fragments of these forests remain.

The present records of *Lopharcha* from the Canary Islands and Tanzania represent a huge extension of range for this group of moths. Both species are from isolated high-altitude forests which in periods of the past were much larger than today (BRAMWELL & BRAMWELL, 2001; CLARKE, 2003). Thus, we can assume that the two species described here are remnants of an old lineage which was once more widespread and diverse.

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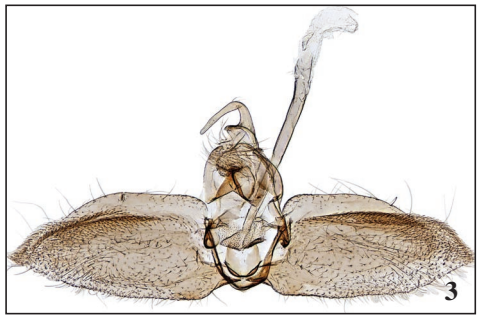
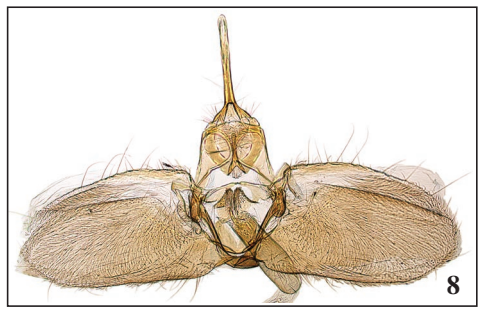
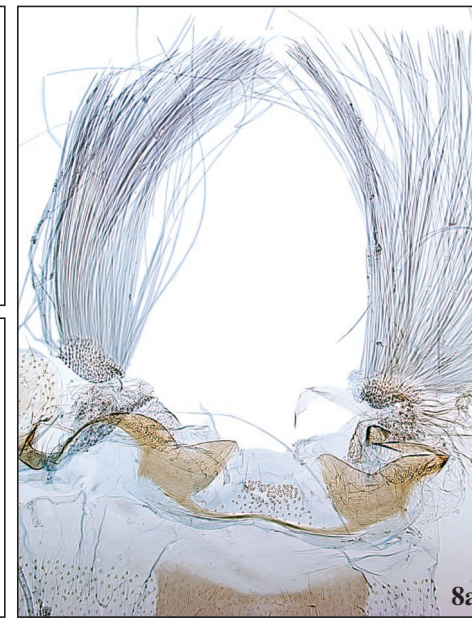


Figs 1-4.– 1. *Lopharcha constanti* (Rebel, 1894), ♂, Gran Canaria, 10.5 mm. **2.** *Lopharcha constanti* (Rebel, 1894), ♀, Gran Canaria, 12.5 mm. **3.** *Lopharcha constanti* (Rebel, 1894), ♂, GP3370PF. **3a.** Coremata, GP3370PF. **4.** *Lopharcha constanti* (Rebel, 1894), ♀, GP3367PF.





Figs 5-9.– 5. *Lopharcha africana* Aarvik, sp. n., Tanzania, 18.0 mm. **6.** *Lopharcha africana* Aarvik, sp. n., head in profile. **7.** *Lopharcha africana* Aarvik, sp. n., tip of male abdomen, dorsal view. **8.** *Lopharcha africana* Aarvik, sp. n., ♂, GP NHMO1776. Scale 1 mm. **8a.** Coremata, GP NHMO1777. Scale 1 mm. **9.** *Lopharcha africana* Aarvik, sp. n., ♀, GP NHMO1778. Scale 1 mm.

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New addition to the larval food plants of *Trypanophora semihyalina* Kollar, [1844] from India (Lepidoptera: Zygaenidae)

T. Sheikh, A. H. Parrey & A. A. Dar

Abstract

Rubus ellipticus Smith 1815 (Rosaceae) is reported as new larval food plant for *Trypanophora semihyalina* Kollar, [1844] for the first time from India.
KEY WORD: Lepidoptera, Zygaenidae, *Trypanophora semihyalina*, food plants, India.

Nueva planta nutricia de *Trypanophora semihyalina* Kollar, [1844] de India (Lepidoptera: Zygaenidae)

Resumen

Se cita por primera vez a *Rubus ellipticus* Smith 1815 (Rosaceae) como nueva planta nutricia para *Trypanophora semihyalina* Kollar, [1844] en India.
PALABRAS CLAVE: Lepidoptera, Zygaenidae, *Trypanophora semihyalina*, planta nutricia, India.

Introduction

Lepidoptera comprises of Butterflies and Moths. According to VAN NIEUKERKEN *et al*. (2011), 157,424 species of Lepidoptera under 15,578 genera have been reported globally. 13,500 species of moths have been reported from India (CHANDRA, 2011). Moths are characterized by drably-colored scales on the body, phytophagous and predominantly nocturnal nature. They are also considered vital for ecosystem services because of various roles such as agricultural pests (SHARMA & BISEN, 2013), food for mammals (VAUGHAN, 1997), birds (WILSON *et al*., 1999), night pollinators (MACGREGOR *et al*., 2015). They are very sensitive to climate changes and vegetation alterations, making them an important group for monitoring climate and habitat changes (DAR & JAMAL, 2021a). The sudden decline of moths has severe effects on birds, bats and plants because of keystone role of moths in an ecosystem (DAR & JAMAL, 2021b). *Trypanophora semihyalina* Kollar, 1844 is a species of moth in the Zygaenidae family. It is found in south-east Asia, including India, China, Hong Kong and parts of Taiwan (ANONYMOUS, 2022).

Previous recorded food plants of this moth caterpillar are *Barringtonia acutangula* (L.) Gaertn. (Family: Lecythidaceae), *Bombax ceiba* Linnaeus (Malvaceae), *Careya* sp. Roxb. (Lecythidaceae), *Carissa carandas* (Linnaeus Apocynaceae), *Gardenia* J. Ellis (Rubiaceae), Holarrhena sp. R. Br. (Apocynaceae), *Lagerstroemia* including *Lagerstroemia indica* (L.) Pers. (Lagerstroemia) and *Lagerstroemia speciosa* (L.) Pers. (Lagerstroemia), *Ricinus communis* Linnaeus (Euphorbiaceae), *Rosa* sp. Linnaeus (Rosaeceae), Shorea robusta Roth (Dipterocarpaceae), *Terminalia* including *Terminalia*

catappa Linnaeus (Combretaceae) and *Terminalia tomentosa* Linnaeus (Combretaceae) and *Ziziphus* including *Ziziphus mauritiana* Lam. (Rhamnaceae) (ROBINSON *et al*., 2010). MESHRAM & GARG (2000) reported this moth as a defoliator of *Gmelina arborea* Roxb. (Lamiaceae). This caterpillar also seen as pest on *Mangifera indica* Linnaeus (Anacardiaceae) in southern West Bengal (JHA & PAUL, 2002). *Psidium guajava* Linnaeus (Myrtaceae) is also reported as larval host plant from West Bengal in previous studies (ARAJUSH PAYRA, 2020).

Results and discussions

On 31-VIII-2019, First author found the caterpillar (Figs 3-4) of *Trypanophora semihyalina* Kollar feeding on *Rubus ellipticus* Smith (Rosaceae) inside Baba Ghulam Shah Bashah University in Rajouri district of Jammu and Kashmir, India at an altitude of around 1200 m and the coordinates were recorded as (33º23'38.2'' N, 74º20'36.8'' E) (Fig. 4). After August same species caterpillar was found on 6-IX-2019 and 2-XI-2019 on *Rubus ellipticus*. Caterpillar was showing defense (Fig. 1) also on touching the leaf in the form of watery drops like.

Acknowledgement

Authors are thankful to Mr. Sankararaman H for the identification of caterpillar of *Trypanophora semihyalina* Kollar, [1844] and Authors are also very thankful to Sh. Om Prakash Sharma (IFS Retd.) for the identification of food plant *Rubus ellipticus* Smith, 1815.

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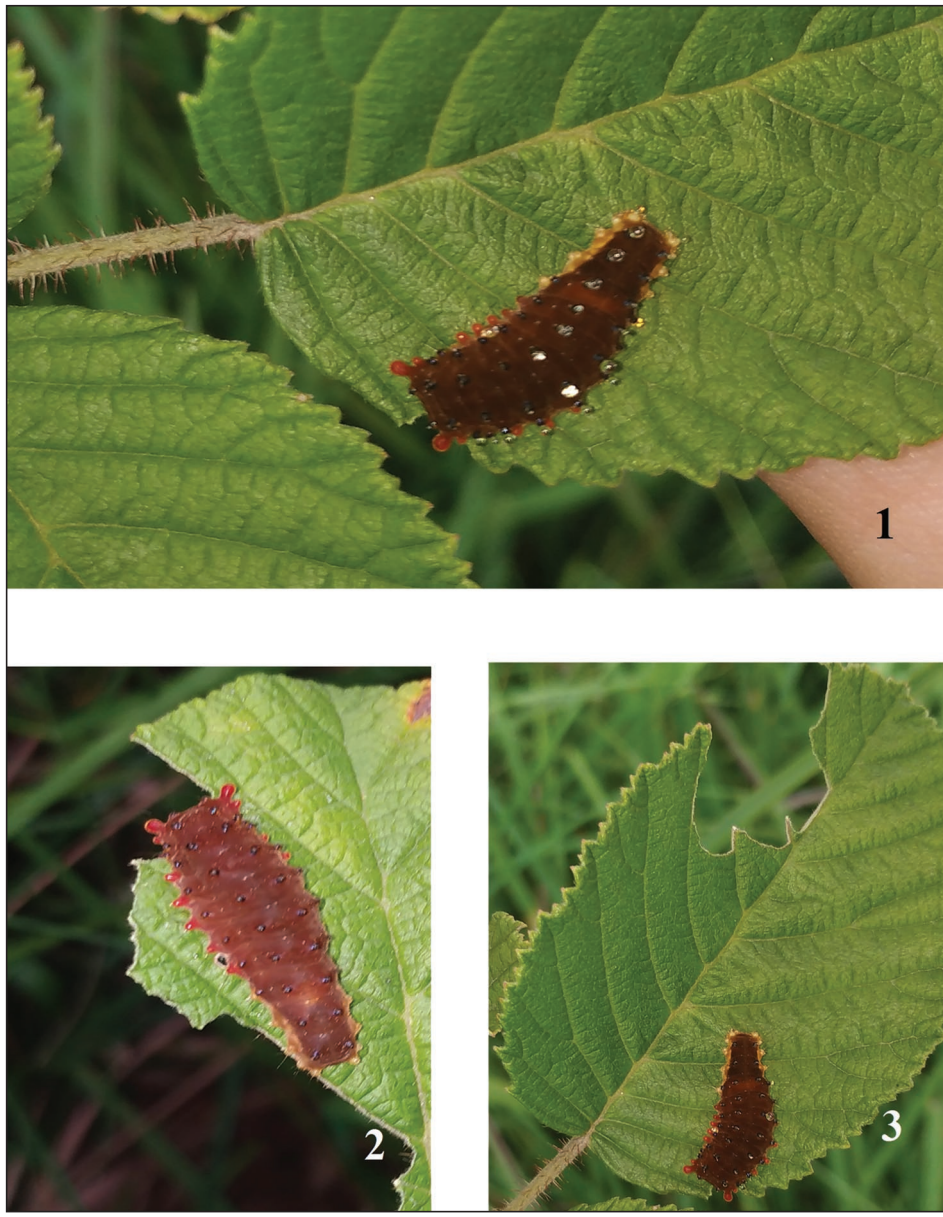
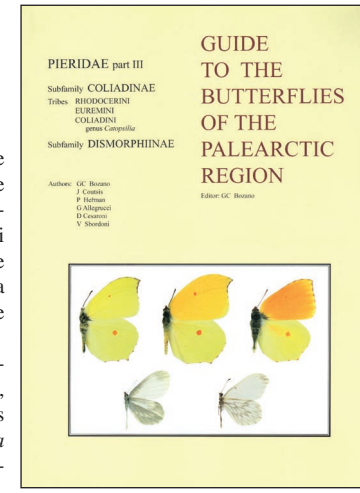


Figures 1-3.– 1. Caterpillar of *Trypanophora semihyalina* Kollar showing defense. **2-3.** Caterpillar feeding on *Rubus ellipticus*.

Figure 4.– A map showing the Location of *Trypanophora semihyalina* caterpillar in Rajouri district of Jammu and Kashmir, India. (Map source: Google Earth Maps).

REVISIÓN DE PUBLICACIONES
BOOK REVIEWS

G. C. Bozano & C. Della Bruna
Guide to the Butterflies of the Palearctic Region. Pieridae III
70 páginas
Formato: 29'5 x 21 cm
Omnes Artes. Milano, 2016
ISBN: 978-88-87989-20-5



Tenemos en nuestras manos un nuevo volumen de esta interesante serie sobre los Rhopalocera de la región Paleártica, en esta ocasión se trata de la subfamilia Coliadinae Swainson, [1821] 1821-22, con las tribus Rhodocerini Duponchel, [1835], Euremini Grote, 1898 y Coliadini Swainson, [1821] 1821-22, así como la subfamilia Dismorphiinae Schatz, [1866], con la tribu Leptideini Grote, 1897 dentro de la familia Pieridae Swainson, [1820] 1820-21, constituyendo la tercera entrega de esta familia.

En esta nueva parte, podemos ver las especies Paleárticas del género *Gonepteryx* Leach, [1815] 1830, abarcando un total de 14 especies, incluidas las poblaciones endémicas de la Macaronesia. Las interesantes especies asiáticas de los géneros *Dercas* Doubleday, 1847 y *Eurema* Hübner, [1819] 1816 o tratando el problemático género *Leptidea* Billberg, 1820 con el complejo *sinapis-reali-juvernica*.

Como ya es habitual en esta obra, después de las consideraciones generales sobre la familia Pieridae, las subfamilias Coliadinae y Dismorphiinae, nos dan una relación de todas y cada una de las especies consideradas en el área de estudio. Ya dentro de cada una de las especies, se nos dan datos sistemáticos y sinonímicos, los principales caracteres para su diagnosis, la morfología de la genitalia del macho, las principales características que permiten separar las subespecies consideradas como válidas por los autores, así como interesantes notas taxonómicas. Todas las especies están perfectamente fotografiadas en color, permitiendo identificarlas, así como dibujos con detalles anatómicos de interés, un mapa de distribución de cada una de ellas y una bibliografía especifica.

No podemos terminar estas líneas, sin felicitar a los autores por un trabajo bien realizado, así como a la Editorial que como siempre, no ha escatimado medios para mantener el mismo nivel de calidad de los anteriores fascículos, por lo que recomendamos vivamente su adquisición y no pudiendo faltar en cualquier biblioteca que se precie. El precio de este libro es de 32 euros y los interesados deben dirigirse a:

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Contribution to the knowledge of the Papilionoidea fauna of Dhofar (Sultanate of Oman) (Insecta: Lepidoptera)

R. Verovnik, M. Seizmair, V. Hula, Z. Mráček & Z. F. Fric

Abstract

The Lepidoptera fauna of Dhofar province and Sultanate of Oman in general have been poorly studied with a total of 63 species recorded so far for the province. Our aim was to study the distribution of Lepidoptera more in detail, in particularly for some rare species with limited records. We sum up the results of 13 expeditions to Dhofar in the period between 2008 and 2019. Lepidoptera were recorded from 67 localities covering mostly the three mountain ranges in the region. Among 65 species recorded *Colias crocea* (Geoffroy, 1785) is new for the country and three are new for the region (*Papilio machaon muetingi* Seyer, 1976, *Papilio demoleus* Linnaeus, 1758 and *Pelopidas thrax* (Hübner, [1821])) bringing the total to 72 species recorded for Dhofar. Additionally, interesting records for the following species are discussed in detail: *Colotis liagore* (Klug, 1829), *C. protomedia* (Klug, 1829), *Acraea neobule* Doubleday, 1847, *Melitaea deserticola scotti* Higgins, 1941, *Melanitis leda* (Linnaeus, 1758), *Cigaritis dhofarina* Seizmair, 2017, *Chloroselas esmeralda bilqis* Larsen, 1983, *Tarucus balkanicus* (Freyer, 1844), *Azanus moriqua* (Wallengren, 1857), *Euchrysops lois* (Butler, 1886), *Spialia colotes semiconfluens* de Jong, 1978, and *Spialia zebra bifida* (Higgins, 1924). Further surveys during monsoon season would be valuable to complement our study.
KEY WORDS: Lepidoptera, Papilionoidea, distribution, Dhofar, Oman.

Contribución al conocimiento de los Papilionoidea de Dhofar (Sultanato de Omán) (Insecta: Lepidoptera)

Resumen

La fauna de Lepidoptera de la provincia de Dhofar y del Sultanato de Omán, en general ha sido poco estudiada con un total de 63 especies registradas, hasta ahora, de la provincia. Nuestro objetivo fue estudiar la distribución de los Lepidoptera más en detalle, en particular para algunas especies raras con registros limitados. Sumamos los resultados de 13 expediciones a Dhofar en el período comprendido entre 2008 y 2019. Se registraron los Lepidoptera de 67 localidades que cubrían principalmente las tres cordilleras en la región. Entre las 65 especies registradas *Colias crocea* (Geoffroy, 1785) es nueva para el país y tres son nuevas para la región (*Papilio machaon muetingi* Seyer, 1976, *Papilio demoleus* Linnaeus, 1758 y *Pelopidas thrax* (Hübner, [1821])) del total de las 72 especies registradas para Dhofar. Adicionalmente, se discuten en detalle los registros para las siguientes especies: *Colotis liagore* (Klug, 1829), *C. protomedia* (Klug, 1829), *Acraea neobule* Doubleday, 1847, *Melitaea deserticola scotti* Higgins, 1941, *Melanitis leda* (Linnaeus, 1758), *Cigaritis dhofarina* Seizmair, 2017, *Chloroselas esmeralda bilqis* Larsen, 1983, *Tarucus balkanicus* (Freyer, 1844), *Azanus moriqua* (Wallengren, 1857), *Euchrysops lois* (Butler, 1886), *Spialia colotes semiconfluens* de Jong, 1978 y *Spialia zebra bifida* (Higgins, 1924). Futuras visitas durante la temporada del monzón serían valiosas para complementar nuestro estudio.
PALABRAS CLAVE: Lepidoptera, Papilionoidea, distribución, Dhofar, Omán.

Introduction

Dhofar is the southernmost province of the Sultanate of Oman bordering Yemen to the west and Rub al Khali desert of the Saudi Arabia in the north. Its southern part is characterised by rugged mountain chains that retain clouds during mid-June to mid-September monsoon period forming so called desert fog oasis known for their high plant biodiversity (MILLER, 1994; PATZELT, 2015). The seaward facing slopes in particular are covered by thick deciduous forests that turn into *Themeda* tall-grass savannah further inland from the edge of the escarpment (PATZELT, 2011). Wider coastal plains and the northern sides of the mountain chains are gradually becoming drier changing into stone deserts interspersed by wadis with generally well-developed fringe vegetation (MOSTI *et al*., 2012).

The Lepidoptera fauna of Dhofar and Oman in general has been relatively poorly studied with first accounts published only in the seventies (LARSEN, 1977). In the first overview of Lepidoptera of Dhofar, LARSEN (1980) lists 56 species. In his final account, published as an appendix to his study of the zoogeography of Arabian Lepidoptera, that number has been raised to 62 species (LARSEN, 1984b). His pioneering work has been supplemented by two monographs with extensive information on species ecology, behaviour, and distribution (LARSEN, 1984a; LARSEN & LARSEN, 1984). Further faunistic papers for Dhofar were published by POLAK & VEROVNIK (1998, 2009) and SCHMIDT *et al*. (2020) however with no new additions. A series of reports by Seizmair added *Gegenes nostrodamus* (Fabricius, 1793), *Colotis protomedia* (Klug, 1929) and most prominently a new endemic species *Cigaritis dhofarina* Seizmar, 2017 to the list (SEIZMAIR, 2016, 2017a, 2017b). In 2019 a checklist of Lepidoptera of Dhofar based mainly on LARSEN's list (1983) was published covering 63 species (COWAN & COWAN, 2019).

The main aim of our surveys was to complement the so far limited knowledge about the distribution of Lepidoptera in Dhofar province, in particularly for some rare species with only single records for the region. Despite focused surveys for such species a wider coverage of the region was also important, thus surveys were conducted also in areas and localities without prior records. The more important findings, including new records for the region, are discussed in detail.

Material and Methods

The results presented in this paper are based on surveys by the five authors in a total of 13 expeditions undertaken to Dhofar in the period between 2008 and 2019. The research activities have been concentrated in the autumn period October / November and the winter period January / February. The only expedition outside this period was in the spring at the beginning of April in 2014.

The sampling activities of the authors were focussed on the coastal mountain system in the south western part of Dhofar (Tab. 1, Fig. 1) which includes the following ranges: Al Qamar in the district Sarfait-Dalkuth in the extreme southwest of the country, reaching into the eastern Hadramaut in Yemen, Qara in the northern surroundings of Salalah, and Samhan to the east of Salalah, in the northern surroundings of Mirbat. The Dhofar mountain chains are part of a comprehensive mountain system extending in southwest-northeast direction along the whole of the southern coastal line of Yemen and along the Hadramaut valley, reaching as far as Dhofar in the northeast. The highest elevation in the Dhofar mountain chain is at around 1850 m in the Samhan Mts. while Al Qamar and Qara Mts. reach approximately 1300 m and 1100 m, respectively. The sampling activities of the authors took place in the mountains at altitudes of up to 1300 m as well as at the foot of the mountains, in particular in the coastal stretches to the west and east of Dalkuth, at Al Mughsayl beach, on coastal plains near Salalah, and in wider surroundings of Hasik.

The coastal mountain system is clearly distinguished from the central and eastern desert areas of Dhofar in the abundance of vegetation particularly in the monsoon affected southern slopes of the Jabal Al Qamar and Jabal Qara mountains. The herb layer there is predominantly composed of Asteraceae, Euphorbiaceae, Brassicaceae and Fabaceae comprising around 130 species. The shrub layer is dominated by Caparaceae, Malvaceae, and Rubiaceae comprising approximately 45 species. The tree

layer is mainly composed of Moraceae represented by four species of *Ficus*, Rhamnaceae, the predominant species being *Ziziphus spina-christi* (L.), Moringaceae, and Fabaceae (MOSTI *et al*., 2012). The overall composition of the herb and shrub layers is characterised by Nubo-Sindian and Iran-Turanian elements. The tree layer on the contrary contains the least species and is considered as an Eritreo-Arabian relict (LARSEN, 1984b).

The material collected was determined on the basis of external features using monographs published by LARSEN (1984a) and LARSEN & LARSEN (1984). For the determination of species complexes difficult to distinguish by habitus (*Deudorix* spp., *Leptotes* spp., *Spialia* spp.) genital morphological features were used. Standard procedures for genital extraction and fixation were implemented. The nomenclature mainly follows the "African Butterfly Database" (ABDB, 2020) complemented by WIEMERS *et al*. (2018) for the species also present in Europe.

List of localities

The list of localities contains the relevant toponyms, coordinates, altitude, a short description of the habitat, and dates of the visits. The names of the authors/observers are abbreviated. The numbered localities are shown on the map (Fig. 1) and referred to in the results section for each species recorded (Tab. 1).

1. Sarfayt, slopes above the road to Yemen W of the village; 16º40'50.07"N, 53º06'31.99"E; 800 m; sparse woodland, small rocky gullies; 29-30-I-17 (MS), 28-I-18 (RV), 19-I-19 (RV)
2. Sarfayt, at the top of the plateau just before the military base; 16º42'4.37"N, 53º07'11.53"E; 1210 m; barren rocky slopes with flowers and dwarf bushes; 19-I-19 (RV)
3. Sarfayt, small wadi on the slopes N of the road to the plateau with military base; 16º42'11.02"N, 53º07'11.53"E; 1120 m; grassy and rocky slopes, small gully with bushes; 19-I-19 (RV)
4. Sarfayt, at the main road NE of town before the turn to Dhalkut; 16º42'31.44"N, 53º08'37.31"E; 910 m; bushy and rocky slopes, moderately grazed grassland; 9-X-18 (ZF), 19-I-18 (VH)
5. Sarfayt, at a road curve about 5 km NE of the town; 16º42'34.01"N, 53º08'53.52"E; 1010 m; bushy and rocky slopes, overgrazed in some places; 19-I-18 (VH), 27-I-18 (MS), 29-I-18 (RV)
6. Dhalkut, on the plateau below the main road W of the town; 16º42'0.82"N, 53º11'39.98"E; 450 m; open grassland with solitary shrubs; 22-I-18 (VH)
7. Dhalkut, along the road and above the beach W of the town; 1641'55.26"N, 5313'17.40"E; 20 m; ruderal rocky slopes, grasslands, woods; 29-30-I-17, 19-23-I-18, 26-27-I-18, 5-7-XI-18, 2-4-II-19, 23-24-XI-19 (MS), 28-I-18, 19-I-19 (RV), 8-XII-18, 25-X-19 (ZM)
8. Dhalkut, Dara Hafoof, along the road towards wadi Sayq 3 km NE of the village; 16º43'54.70"N, 53º13'18.68"E; 640 m; heavily grazed open woodland; 19-I-18 (MS), 28-I-18 (RV)
9. Dhalkut, wadi Sayq, along the road and below the bridge along the stream; 16º44'57.73"N, 53º13'34.03"E; 450 m; overgrown wadi with bushy areas, rocky slopes, road verges; 29-31-I-17, 20-27-I-18, 4-8-XI-18, 3-4-II-19, 25-XI-19 (MS), 9-X-17 (ZF), 29-I-18, 19-XI-19 (RV)
10. Dhalkut, above wadi Sayq, along the road towards Dhalkut 1,3 km from the bridge; 16º44'30.79"N, 53º13'44.40"E; 480 m; flowery slopes along the road; 29-I-18 (RV)
11. Dhalkut, wadi Sayq, on the plateau N of the valley near the road; 16º45'23.18"N, 53º14'11.31"E; 1035 m; dry meadows at the edge of the limestone plateau; 19-I-18 (VH)
12. Dhalkut, 3 km E of the town, eastern end of the road; 16º42'42.0"N, 53º15'48.1"E; 130 m; ruderal and rocky slopes, grasslands; 26-XI-19 (MS)
13. Rakhyut, along the road to the town N of Ambruf village; 16º45'54.31"N, 53º20'7.95"E; 675 m; grazed forest meadows; 9-X-17 (ZF)
14. Rakhyut, in the gorge above the entrance of a large cave; 16º45'18.14"N, 53º23'42.95"E; 70 m; dry wadi with wooded rocky slopes; 20-XI-19 (RV)
15. Rakhyut, at the beach at the end of the road E of the town; 16º44'55.57"N, 53º26'17.04"E; 10 m; ruderal vegetation along the road; 20-XI-19 (RV)

16. Ajdarawt, pastures at NE edge of the village 16º47’37.61”N 53º33’47.87”E 1030 m pasture with low bushes, small gully 29-I-18 (RV)
17. Ajdarawt, along the main road to Salalah on the ridge E of the town; 16º49’30.32”N, 53º38’56.19”E; 1075 m; hilltop with scattered shrubs, pasture; 8-X-17 (ZF)
18. Qamar Mts, at the road on the plateau SW of the police checkpoint; 16º49’43.49”N, 53º39’39.12”E; 1000 m; plateau and rocky slopes with bushes and acacia trees; 19-I-18, 21-I-18 (VH)
19. Qamar Mts, along the escarpment above the road NE of the police checkpoint; 16º50’8.10”N, 53º40’37.63”E; 790 m; rocky slopes with bushes and acacia trees; 20-XI-19 (RV)
20. Qamar Mts, large wadi along the main road 10 km W Al Mughsail; 16º51’50.1”N, 53º43’11.7”E; 630 m; large wadi with steep rocky slopes, bushes, *Boswellia* trees; 9-XI-18, 29-XI-19 (MS)
21. Al Mughsayl, in the side valley of wadi Mughsayl; 16º53’52.47”N, 53º45’49.07”E; 20 m; dry wadi with rich vegetation, bushes, solitary trees; 18-I-18 (VH), 30-I-18, 20-XI-19 (RV)
22. Al Mughsayl, side valley W of the beach; 16º52’58.09”N, 53º46’00.07”E; 30 m; dry wadi with scarce bush vegetation; 8-XI-08, 3-XII-18 (ZM), 10-X-17 (ZF), 18-I-18 (VH)
23. Al Mughsayl, slopes above the Marneef cave parking; 16º52’42.01”N, 53º46’1.73”E; 40 m; dry shrubby pasture on a slope; 21-I-18 (VH)
24. Al Mughsayl, near abandoned houses in the main Mughsayl wadi; 16º53’33.58”N, 53º46’25.87”E; 10 m; acacia trees, bushy and rocky slopes; 30-I-18 (RV)
25. Al Mughsayl, in the wadi along the main road to Salalah NE of the beach; 16º53’48.52”N, 53º48’50.40”E; 30 m; overgrazed pasture, rocky and bushy slopes; 18-I-18 (VH), 30-I-18 (RV)
26. Urzuq, small dry wadis E of a big quarry at the edge of the plateau; 17º03’43.20”N, 53º49’0.94”E; 1070 m; dry gully with small shrubs, rocky slopes; 17-XI-19 (RV)
27. Al Mughsayl, wadi on both sides of the road 5 km NE of the beach; 16º54’26.3”N, 53º49’30.1”E; 70 m; dry wadi with rocky slopes and bushy areas; 28-I-17, 5-6-XI-18 (MS)
28. Al Mughsayl, near the main road to Salalah NE of the beach; 16º54’51.82”N, 53º50’18.79”E; 45 m; dry wadi with grassland and scarce bushes; 8-X-17 (ZF), 18-I-18 (VH)
29. Eal Aleali, on the crest to the W of the village; 17º03’39.48”N, 53º51’39.12”E; 950 m; open woods with flowery undergrowth; 17-XI-19 (RV)
30. Ayun wadi, below the Ayun village; 17º15’17.66”N, 53º52’59.67”E; 665 m; dry wadi with scarce bush vegetation; 10-XI-08 (ZM)
31. Ayun wadi, in the gorge SW of the village; 17º14’46.91”N, 53º53’20.28”E; 685 m; open grasslands with small shrubs, rocky slopes; 11-X-17 (ZF)
32. Ayun wadi, small wadi at the main road SE of the main gorge; 17º13’14.95”N, 53º54’21.77!E; 730 m; small side gullies with bushes, trees and rocky slopes; 11-X-17 (ZF), 17-XI-19 (RV)
33. Ayun wadi, small side wadi along the road E of the main gorge; 17º14’27.74”N, 53º54’31.91”E; 730 m; dry wadi with acacia trees and bushes; 17-XI-19 (RV)
34. Teetam, at the viewpoint W of the village; 17º06’13.81”N, 53º54’40.49”E; 940 m; ruderal area, rocky slopes with bushes; 17-XI-19 (RV)
35. Ayun wadi, small wadi N of the main road and 7 km E of the main gorge; 17º15’15.99”N, 53º57’47.59”E; 730 m; flowery dry river bed with rocky slopes and bushy areas; 17-XI-19 (RV)
36. Salalah, Ain Garziz, along side-tracks at the turn to the wadi; 17º05’34.99”N, 54º04’22.70”E; 100 m; dry wadi with bushes and small trees, pastures; 11-X-17 (ZF)
37. Salalah, Ain Garziz, at the lower waterfall; 17º06’19.29”N, 54º04’29.52”E; 320 m; gravels with bushes, open woods; 17-XI-19 (RV)
38. Quairoon Haritti, surroundings of the village; 17º15’11.32”N, 54º05’11.87”E; 875 m; dry pastures with scarce trees and bushes; 9-XI-08 (ZM)
39. Quairoon Haritti, last wadi before desert plain, E of the road to Thumrait; 17º18’06.11”N, 54º05’19.32”E; 700 m; dry wadi with scarce bush and herb vegetation; 3-XII-18, 21-X-19 (ZM)
40. Quairoon Haritti, in the wadi below the abandoned main road; 17º17’2.40”N, 54º05’39.54”E; 770 m; dry wadi with sparse bushes and large diversity of flowers; 18-XI-19, 23-XI-19 (RV)

41. Quairoon Haritti, about 2 km NE of the village; 17º15'49.63"N, 54º05'42.95"E; 830 m; dry pastures with scarce trees and bushes; 8-XI-08, 21-X-19 (ZM)
42. Salalah, N of the city and E of the road to Jahaneen; 17º07'59.88"N, 54º06'14.20"E; 445 m; grassy slopes, pastures; 11-X-17 (ZF)
43. Salalah, al Hafa, plantations at the beach; 17º00'13.29"N, 54º06'56.26"E; 5 m; fruit market with gardens; 11-X-17 (ZF)
44. Salalah, parking lot at the road to Thumrait, left side; 17º07'42.56"N, 54º08'19.59"E; 165 m; partly ruderal, scarce bushes and trees; 5-XII-18, 22-X-19 (ZM)
45. Ain Sahiounout, along the road to the plateau NW of the wadi; 17º10'24.48"N, 54º09'58.89"E; 320 m; woods, flowering road verges; 18-XI-19 (RV)
46. Arkut, in the wadi N of the village; 17º11'54.50"N, 54º10'36.47"E; 380 m; dry wadi with overgrazed grasslands and woods; 18-XI-19 (RV)
47. Ain Sahiounout, in the main wadi upstream from the waterfall; 17º09'4.51"N, 54º10'52.64"E; 145 m; grassy wadi with gravels, rocks, woodland edges; 18-XI-19 (RV)
48. Arkut, small peak along the road N of the village towards Irita 17º13'15.35"N 54º12'11.32"E 630 m grassy slopes, woodland edge at hilltop 18-XI-19 (RV)
49. Nirin wadi, along the walley E of the main road; 17º16'9.49"N; 54º12'52.02"E; 750 m; dry wadi with sparse bushes, overgrazed grasslands; 18-XI-19 (RV)
50. Ayn Razat, along the stream in parallel to the gardens; 17º07'41.35"N, 54º13'59.67"E; 100 m; rich vegetation along a permanent stream; 31-I-18, 21-XI-19, 23-XI-19 (RV)
51. Ayn Razat, valley above the gardens; 17º07'22.30"N, 54º14'21.25"E; 120 m; dry wadi with bushes and solitary trees; 31-I-18, 21-XI-19, 23-XI-19 (RV)
52. Ayn Razat, upper part of the valley above the side road; 17º08'4.54"N, 54º14'44.31"E; 230 m; dry wadi with woods and overgrazed grassy areas; 21-XI-19 (RV)
53. Ayn Hamran, area around the spring; 17º06'1.23"N, 54º17'3.11"E; 100 m; woods, parkland and greens; 31-I-18 (RV)
54. Ayn Tubrook, around the parking area below the waterfall; 17º06'3.39"N, 54º19'35.82"E; 120 m; woods, open areas near the road; 21-XI-19 (RV)
55. Ayn Anthum, woods and open areas at the waterfall; 17º07'4.69"N, 54º22'0.05"E 270 m; sparse woods, grassy areas along small dry gullies; 21-XI-19 (RV)
56. Khawr Rawir, at the old Darbat bridge N of the lagoon; 17º03'07.32"N, 54º25'34.32"E; 10 m; partly ruderal, bushy slopes, lush vegetation along the stream; 7-IV-14, 6-II-18, 23-X-19 (ZM)
57. Darbat wadi, along the main road just above the turn to Darbat; 17º04'21.28"N, 54º26'54.81"E; 290 m; open forest, ruderal vegetation on its edge; 12-X-17 (ZF)
58. Khawr Rawir, at the SW edge of the lagoon; 17º01'51.95"N, 54º26'6.91"E; 5 m; grassland, ruderal vegetation; 13-X-17 (ZF)
59. Darbat wadi, in the valley further up from the end of the road; 17º06'58.22"N, 54º27'19.83"E; 200 m; wadi with water, overgrazed grasslands, woods; 12-X-17 (ZF), 1-II-18 (RV)
60. Quashroub, at the NE edge of the village; 17º02'43.35"N, 54º32'32.48"E; 80 m; semi-ruderal land, scarce tree vegetation, overgrazed area; 7-XII-18 (ZM)
61. Salafan wadi, small side valley E of Jibjat village; 17º14'17.86"N, 54º32'43.73"E; 890 m; bushy and rocky wadi with flower rich vegetation; 22-XI-19 (RV)
62. Mirbat, Hinnah wadi, near the pools in baobab woods; 17º03'16.05"N, 54º36'27.83"E; 330 m; dense woods, small clearings, rocky slopes; 14-X-17 (ZF), 1.II.18 (RV)
63. Samhan Mts., Dharirat, in a small wadi W of the village; 17º07'9.33"N, 54º38'41.93"E; 980 m; dry rocky wadi with sparse trees and bushes; 22-XI-19 (RV)
64. Samhan Mts., along the track on the escarpment E of the viewpoint; 17º06'43.03"N, 54º42'43.76"E; 1270 m; rocky slopes with rich flowering vegetation, sparse bushes; 22-XI-19 (RV)
65. Hasik, at a large lagoon N of the town; 17º36'2.59"N, 55º15'14.64"E; 5 m; semi desert with solitary bushes; 14-X-17 (ZF)

66. Hasik, large wadi about 5 km S of the town; 17º23'35.46"N, 55º17'21.13"E; 15 m; gravels with small bushy patches, rocky slopes 2-II-18 (RV)
67. Hasik, small wadi with an oasis about 10 km S of the town; 17º22'18.27"N, 55º17'3.74"E; 60 m; dry rocky and bushy wadi, palm grove; 2-II-18 (RV)

Results

During our surveys, a total of 67 localities in Dhofar province were visited and over all 65 Lepidoptera species were recorded (Table 1).

Tab. 1.– The distribution of Papilionidae and Hesperiidae in the southern part of Dhofar, Sultanate of Oman. Numbering of the localities corresponds to the list of localities in Materials and Methods section.

Species	distribution
PAPILONIDAE	
PAPILIONINAE	
Papilio machaon muetingi Seyer, 1976	56
Papilio demodocus Esper, 1798	7, 36, 39, 44, 48, 50, 51, 56
Papilio demoleus Linnaeus, 1758	see discussion
PIERIDAE	
PIERINAE	
Pontia glauconome Klug, 1829	7, 9, 10, 14, 21, 24, 25, 32, 38, 39, 40, 44, 51, 56, 60, 64
Belenois aurota (Fabricius, 1793)	1, 3, 4, 7, 9, 10, 11, 13, 14, 15, 18, 19, 21, 22, 23, 24, 25, 26, 27, 29, 31, 32, 33, 34, 35, 38, 39, 40, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 58, 59, 60, 61, 62, 63, 64
Pinacopteryx eriphia tritogenia (Klug, 1829)	5, 7, 9, 10, 14, 19, 21, 22, 23, 24, 25, 36, 44, 47, 50, 51, 53, 54, 56, 60, 62, 63
Colotis amata calais (Cramer, 1775)	4, 7, 9, 10, 14, 15, 18, 21, 22, 23, 24, 25, 27, 28, 35, 37, 39, 40, 44, 47, 50, 51, 52, 56, 58, 62, 66, 67
Colotis phisadia (Godart, 1819)	7, 9, 15, 32, 39, 58, 66
Colotis chrysonome (Klug, 1829)	1, 7, 19, 20, 21, 24, 25, 29, 31, 51, 52, 64
Colotis halimede (Klug, 1829)	7, 9, 10, 20, 21, 22, 23, 25, 27, 28, 50, 51, 56, 64
Colotis danae eupompe (Klug, 1829)	4, 7, 14, 19, 21, 22, 24, 25, 27, 30, 31, 32, 33, 34, 36, 38, 39, 44, 47, 51, 52, 53, 56, 60, 66, 67
Colotis evarne (Klug, 1829)	7, 9, 14, 18, 19, 21, 22, 24, 25, 27, 28, 29, 30, 32, 36, 38, 39, 40, 44, 45, 47, 51, 52, 53, 56, 57, 60, 61, 62, 63, 66, 67
Colotis antevippe zera (Lucas, 1852)	1, 7, 9, 10, 14, 19, 24, 25, 27, 36, 39, 44, 50, 51, 52, 55, 59, 61, 62, 63, 64
Colotis liagore (Klug, 1829)	7, 22
Colotis daira (Klug, 1829)	1, 7, 9, 12, 14, 24, 50
Colotis eris contractus Gabriel, 1954	4, 7, 9, 10, 18, 19, 21, 22, 24, 44, 51, 52, 53, 56, 60, 61, 62
Colotis protomedia (Klug, 1829)	7, 12
Colotis fausta (Olivier, 1807)	7, 9, 19, 34, 40, 61, 64, 67
Nepheronia buqueti buchanini (Rothschild, 1921)	4, 7, 23, 29, 37, 40, 44, 45, 62
COLIADINAE	
Colias crocea (Geoffroy, 1785)	see discussion
Catopsilia florella (Fabricius, 1775)	1, 7, 9, 13, 19, 21, 22, 24, 28, 36, 38, 39, 40, 41, 44, 47, 48, 50, 51, 52, 53, 56, 57, 60, 61, 64
Eurema hecabe solifera (Butler, 1875)	1, 3, 4, 6, 7, 9, 10, 13, 14, 15, 20, 45, 46, 47, 50, 51, 52, 55, 56, 60, 63, 64

NYMPHALIDAE	
Danainae	
Danaus chrysippus (Linnaeus, 1758)	1, 7, 9, 14, 15, 21, 22, 28, 36, 37, 40, 44, 46, 47, 49, 50, 51, 52, 53, 55, 56, 59, 60, 61, 63
Acraeinae	
Acraea neobule Doubleday, 1847	7, 9
Charaxinae	
Charaxes hansali arabica Riley, 1931	1, 5, 7, 10, 19, 29, 45, 47, 48, 50, 51, 52, 63
Charaxes varanes bertrami Riley, 1931	1, 6, 7, 13, 14, 44, 45, 51, 52, 53, 59, 62, 63
Nymphalinae	
Melitaea deserticola scotti Higgins, 1941	9
Vanessa cardui (Linnaeus, 1758)	1, 6, 17, 34, 45, 50, 51, 59, 61, 64
Junonia hierta cebrene Trimen, 1870	1, 3, 4, 5, 7, 9, 10, 13, 14, 15, 16, 19, 22, 32, 33, 36, 39, 40, 44, 51, 56, 59, 60, 61, 63
Junonia orithya here Lang, 1884	3, 6, 7, 9, 14, 19, 21, 22, 26, 34, 36, 37, 38, 39, 40, 41, 42, 44, 46, 47, 48, 49, 50, 51, 52, 54, 55, 56, 57, 59, 60, 61, 63, 64
Hypolimnas misippus (Linnaeus, 1764)	51
Byblia ilithyia (Drury, 1773)	7, 9, 14, 20, 22, 23, 50, 51, 60, 61, 63
Satyrinae	
Melanitis leda (Linnaeus, 1758)	43
Ypthima asterope (Klug, 1832)	1, 3, 4, 5, 7, 9, 10, 11, 14, 19, 21, 24, 26, 35, 40, 61, 62, 63, 64, 67
LYCAENIDAE	
Theclinae	
Myrina silenus (Fabricius, 1775)	1, 3, 4, 7, 9, 29, 38, 40, 41, 45, 46, 47, 48, 50, 51, 62, 64
Deudorix livia (Klug, 1834)	5, 7, 8, 9, 17, 21, 22, 32, 34, 51, 53, 61, 64
Aphnaeinae	
Cigaritis dhofarina Seizmair, 2017	1
Chloroselas esmeralda bilqis Larsen, 1983	21, 28, 56
Axiocerces harpax kadugli Talbot, 1935	1, 5, 7, 9, 10, 19, 20, 35, 63
Polyommatinae	
Anthene amarah (Guérin-Méneville, 1849)	1, 4, 5, 7, 9, 10, 13, 18, 19, 20, 21, 22, 23, 31, 32, 44, 51, 55, 56, 61, 63
Lampides boeticus (Linnaeus, 1767)	1, 4, 5, 6, 7, 9, 29, 51, 61
Leptotes pirithous (Linnaeus, 1767)	1, 5, 6, 7, 8, 15, 19, 21, 22, 23, 24, 42, 45, 47, 50, 51, 53, 54, 55, 56, 57, 59, 60, 61, 62, 63
Cacyreus virilis Stempffer, 1936	1, 3, 4, 7, 9, 13, 19, 40, 51, 61, 64
Tarucus theophrastus (Fabricius, 1793)	21, 22, 23, 36, 37, 40, 44, 47, 51, 59
Tarucus rosaceus (Austaut, 1885)	9, 14, 21, 22, 25, 37, 40, 44, 46, 47, 50, 51, 52, 53, 54, 56, 60, 64
Tarucus balkanicus (Freyer, 1844)	32
Zizeeria knysna (Trimen, 1862)	7, 9, 21, 22, 29, 34, 35, 39, 41, 42, 47, 50, 51, 55, 57, 59, 61, 62, 63, 64
Zizula hylax (Fabricius, 1775)	1, 3, 4, 7, 9, 13, 14, 21, 22, 23, 24, 29, 39, 40, 41, 42, 49, 54, 55, 57, 61, 62, 63, 64
Azanus ubaldus (Stoll, 1782)	1, 7, 18, 21, 24, 31, 32, 33, 51, 53, 56, 58, 60, 61, 63
Azanus jesous (Guérin-Méneville, 1849)	1, 4, 7, 9, 13, 17, 19, 21, 22, 24, 32, 33, 35, 40, 51, 53, 55, 56, 59, 60, 61, 64, 65
Azanus moriqua (Wallengren, 1857)	9, 18, 19, 51, 53, 55, 60, 62
Chilades parrhasius (Fabricius, 1775)	1, 5, 7, 21, 24, 51, 65
Freyeria trochylus (Freyer, 1844)	1, 2, 7, 9, 12, 14, 19, 21, 22, 23, 24, 25, 26, 31, 32, 35, 37, 39, 40, 46, 47, 50, 51, 52, 56, 59, 61, 63, 64

Euchrysops lois (Butler, 1886)	11, 20, 21, 27
Euchrysops osiris (Hopffer, 1855)	1, 3, 4, 13, 14, 21, 22, 40, 49, 51, 52, 57, 59, 62, 63
HESPERIIDAE	
COELIADINAE	
Coeliades anchises jucunda (Butler, 1881)	4, 5, 7, 9, 10, 14, 23
PYRGINAE	
Sarangesa phidyle (Walker, 1870)	9, 18, 22, 26, 29, 39, 40, 56, 61, 63, 64
Gomalia elma (Trimen, 1862)	7, 9, 14, 21, 23, 50, 51, 61, 64
Spialia doris (Walker, 1870)	5, 9, 35, 40, 53, 56
Spialia colotes semiconfluens de Jong, 1978	40
Spialia zebra bifida (Higgins, 1924)	2, 9, 16, 20, 21, 22, 25, 63
Spialia mafa higginsi Evans, 1937	5, 8, 9, 16, 21, 22, 40, 51, 57, 64
HESPERIINAE	
Pelopidas mathias (Fabricius, 1798)	22, 50, 52, 59
Pelopidas thrax (Hübner, [1821])	44
Gegenes pumilio (Hoffmannsegg, 1804)	9

Discussion

With a total of 71 Lepidoptera species the fauna of Dhofar is comparatively rich reflecting its specific position, orogeny, and summer monsoon providing higher levels of precipitation facilitating also high plant diversity (MILLER, 1994; MOSTI *et al*., 2012). We were able to observe most of the known species in the region with notable exclusions of *Hypolimnas bolina* (Linnaeus, 1758), *Iolaus glaucus* Butler, 1886, *Cigaritis acamas bellatrix* (Butler, 1886), *Cigaritis scotti* (Gabriel, 1954), *Spialia mangana* (Rebel, 1899), and *Gegenes nostrodamus* (Fabricius, 1793). All these species were observed only once in Dhofar and are undoubtedly rare or occurring only during monsoon period which was not covered by our surveys.

Among most widespread species *Belenois aurota* (Fabricius, 1793) was by far the commonest recorded at 48 localities which is not surprising given its migratory potential. Other common species occurring at 25 or more sites were: *Colotis amata calais* (Cramer, 1775), *Colotis danae eupompe* (Klug, 1829), *Colotis evarne* (Klug, 1829), *Catopsilia florella* (Fabricius, 1775), *Danaus chrysippus* (Linnaeus, 1758), *Junonia hierta cebrene* Trimen, 1870, *Junonia orithya here* Lang, 1884, *Leptotes pirithous* (Linnaeus, 1767), and *Freyeria trochylus* (Freyer, 1844). On the other hand several rare species were recorded including *Colias crocea* (Geoffroy, 1785) which is new for the Sultanate of Oman, while *Papilio machaon muetingi* Seyer, 1976, *Papilio demoleus* Linnaeus, 1758, and *Pelopidas thrax* (Hübner, 1821) are new for the Dhofar province. These, and additional iteresting species are discussed in more detail below:

Papilio machaon muetingi Seyer, 1976

The species inhabits Holarctic with links to Oriental and Afrotropical regions. This is the first record from Dhofar. It was captured twice, first in November 2008 and secondly during early spring season in April 2014, both specimens on the bank of Darbat River just before the coastal lagoon (locality 56). Number of antennal segments was counted to more than 33, therefore we identified both specimens as *P. machaon muetingi*. Related and superficially similar species *P. saharae* possess less than 33 segments (PITTAWAY *et al*., 1994). It seems that Salalah surroundings mark the southernmost distribution of this species in Arabia. Its incidence during dry period is possibly very restricted, however that might be different during the rainy season for which we have no information. It is also an open question if the *P. machaon* presence in Dhofar represents an indigenous small, isolated colony or is it a subject of an accidental human introduction.

Papilio demoleus Linnaeus, 1758

This Oriental species is replaced in Afrotropical region by *Papilio demodocus* Esper, 1798 and this has been used as a good example of vicariance by LARSEN (1984b), as the latter species inhabits only Dhofar region while *P. demoleus* is limited to the oasis in the northern Oman. So far, no range overlap has been reported for both species (MORGUN & WIEMERS, 2012), although *P. demoleus* has been unintentionally dispersed to other continents (GUERRERO *et al*., 2004; MORGUN & WIEMERS, 2012). The first record of the species for Dhofar is in oasis conditions in the northern desert of the region, where a single specimen was photographed on 22-11-2018 at Al Beed Farm east of Ubar (18º21'14.32"N, 54º0'45.52"E) by Sander Bot (OBSERVADO, 2018). As it is a known pest on citrus it remains to be seen if it will invade the coastal region of Dhofar, where plantations are abundant around Salalah town and how it will interact with autochthonous *P. demodocus*.

Colotis liagore (Klug, 1829)

Although the commonest *Colotis* in northern Oman, it appears to be very sporadic and rare in Dhofar. It was first mentioned for Dhofar by LARSEN (1983), but without indicating exact locality. Its presence was confirmed by POLAK & VEROVNIK (1992) with a single specimen collected in foothills of Quara Mountains in wadi Nahiz. We found the species at Al Mughsayl (locality 22) and the coastal stretch west of Dhalkut (locality 7). Again, only single specimens were observed, however the new records indicate a wider range of the species in Dhofar.

Colotis protomedia (Klug, 1829)

The species was reported as new to the fauna of Oman by SEIZMAIR (2017a) on the basis of specimens collected on the coastal stretch west of Dhalkut at the base of the Qamar Mountains. For a discussion on the hitherto known distribution of this Afrotropical species on the Arabian Peninsula and its ecology the reader is referred to aforementioned paper. The species is a regular resident at this locality and has been particularly common in the late autumn of 2019 (Fig. 6). Further records could be taken by the second author at another location along the coast east of Dhalkut. Thus, all the records for Dhofar are up to now confined to the littoral stretch near Dhalkut. The presence of the species is bound to the occurrence of the larval host plant *Maerua sp.,* the population in Dhofar exclusively on *Maerua crassifolia*. Comparison of the material collected in Dhofar to material from Africa and Saudi Arabia in the Zoological Sate Collection Munich did not reveal any constant differences in external features between the African populations and populations on the Arabian Peninsula. Therefore, no sub-specific status is attributed to the Arabian populations.

Colias crocea (Geoffroy, 1785)

This widespread west Palaearctic species, known also for its strong migrations, has so far not been observed in Oman despite its ocasional sightings in the neighboring UAE (GILLET, 1997). Its surprising presence in Dhofar was first noted by Dirk Stadie on 9-10.10.2011 when he collected a single specimen south of Quairoon Haritti (17º12'52"N, 54º04'26"E). Valérie Goethals added an additional record on platform Observation (OBSERVADO, 2014) with multiple specimens seen on irrigated fields at Al Beed Farm east of Ubar deep in the desert region (18º21'14.32"N, 54º0'45.52"E) on 29-XI-2014. Given the abundance of the species at the time it is possible that the larval stages of the Lepidoptera were accidentally introduced with alfa-alfa hay or seeds to the site. No observations of the species were made during our surveys.

Acraea neobule Doubleday, 1847

The species is widely distributed and common in sub-Saharan Africa. On the Arabian Peninsula, on the contrary, the species is highly localised and rare. In Dhofar it was first recorded by Pittaway at Ayn Razat in 1980 (LARSEN, 1984a). Since then, no further records for Dhofar were published until a single fresh male specimen was collected at the coast west of Dhalkut (SEIZMAIR, 2018). During our surveys, the second author managed to reconfirm its presence at the Dhalkut site and found the species

at a new locality in wadi Sayq, well into the Qamar Mountains. Four fresh male specimens were observed at the road verge feeding on unidentified *Euphorbia*. The recent observations remove any doubt on permanent residency of the species in Dhofar.

Melitaea deserticola scotti Higgins, 1941

The distribution of this subspecies on the southern Arabian Peninsula ranges from the Asir Mountains in the extreme northwest of Yemen over Aden, the wadi Hadhramaut to Dhofar in highly localized populations of low densities (LARSEN, 1982, 1984a, 1984b). The records for Dhofar have been up to now confined to the dry plateau beyond Qara Mountains in Ayun area (LARSEN, 1984a) where the species was recorded for the first time in the Oman Flora and Fauna Survey project. In November 2019, the second author (MS) found a single fresh male specimen (Fig. 4) in the western part of Qamar Mountains in wadi Sayq along the road verge (Fig. 3). This corroborates the recent published record from eastern Qamar Mountains (SCHMIDT *et al*., 2020). The species was previously recorded from Qamar mountains in Sarfait area near the border with Yemen in 1985 (Howard Elston; unpublished records).

Melanitis leda (Linnaeus, 1758)

This is usually a common Lepidoptera with wide distribution covering Africa, Oriental and Australian regions. Unlike other Lepidoptera, this species is crepuscular, flying during dusk and dawn. It is frequently found at lights. The species was recorded from Oman only few times. LARSEN & LARSEN (1980) mention this species from Sarfayt while LARSEN (1983) adds records from Ain Arzat and its vicinity. More recently the species was photographed in wadi Darbat (COWAN & COWAN, 2019). We found one individual sitting on a streetlamp in fruit market in Salalah; the place is surrounded by gardens and banana plantations.

Cigaritis dhofarina Seizmair, 2017

It was described as a separate species on the basis of external differences to *Cigaritis somalina* (Butler, 1888) and *Cigaritis scotti* Gabriel, 1954, both previously reported from Arabian Peninsula. Interestingly, this species is genetically closer to the South African congeneres such as *Cigaritis natalensis* (Westwood, 1851) than to *C. somalina*, the latter being distributed in Somalia, Ethiopia, northern Kenya and Yemen (LARSEN, 1984a). No further observations were made beyond the type material. In November 2019, the first author (RV) found the habitat of the type locality on the slopes immediately at the border to Yemen near Sarfayt destroyed by human impact (border wall construction works at the frontier).

Chloroselas esmeralda bilqis Larsen, 1983

This is an East African species, living in open sparse scrubland or savannah. In Dhofar it was first recorded by H. Horsfall, but no locality is given (LARSEN, 1984b). We found the species at two sites near Al Mughsayl (localities 21, 28) and at Darbat River just before the coastal lagoon (locality 56), all in the coastal plains. The Lepidoptera were observed in low numbers perching on tops of *Acacia* shrubs or low trees. It was more common in January, but it is easily overlooked due its small size and very rapid and direct flight. Males were patrolling among small bushes in dry wadi feeding on *Euphorbia larica* Boiss. (Fig. 5). Another similar species, *C. arabicus* (Riley, 1932), is reported from wadi Hadhramaut, Yemen (LARSEN, 1991), but has so far not been found in Oman.

Tarucus balkanicus (Freyer, 1844)

It is a species widespread in Mediterranean area, northern part of Africa and in the Middle East. The species is common in northern parts of Oman, but from Dhofar it is known only from few records, LARSEN (1983) reports this species from Sarfait and Darbat-Mirbat road. We found it only in Wadi Ayun area (locality 32), where they were numerous around *Acacia* shrubs in semidesert-like landscape.

Azanus moriqua (Wallengren, 1857)

The species is widely distributed and common in sub-sahrian Africa. On the Arabian Peninsula, on the contrary, the species is highly localised and rare. It was recorded from north-western Yemen, and the Asir Mountains of Saudi-Arabia (LARSEN, 1982; LARSEN, 1984a). LARSEN & LARSEN (1984) mentions a single record by F. J. Walker in Dhofar near Thumrait. Since then no further published records had been known for Dhofar until SEIZMAIR (2017b) reported two records, a male and a female collected in the western part of Qamar Mountains (wadi Sayq). During our surveys we extended its known range considerably with new records from foothills of Qara Mountains (Ayn Razat, Ayn Hamran, Ayn Anthum, Quashroub, wadi Hinnah) and two records from eastern part of Qamar Mountains (localities 18, 19), confirming the recent observation of the species in this region (SCHMIDT *et al*., 2020). The species could be even more widespread but is easily overlooked due to low density of occurrence and similarity to other congeners.

Euchrysops lois (Butler, 1886)

The distribution of this rare species is confined to the Horn of Africa and the south-western parts of the Arabian Peninsula (BALLETTO & LARSEN, 1984; LARSEN, 1984b). The species was first recorded by Guichard at the Salalah Thumrait road (LARSEN, 1980) and then in Ayun area (LARSEN & LARSEN, 1984). Additional record was provided by SEIZMAIR (2017b) at Al Mughsayl which seems to be the stronghold for the species with one additional locality (locality 21) discovered during our surveys in this area. The species was observed also in a nearby large wadi in the eastern part of Qamar Mountains (locality 20) and above wadi Sayq (locality 11) in the same mountain system. All the records in Dhofar are confined to the arid areas with high disturbance regime and prevalence of *Lavandula* sp. and *Campylanthus* sp.

Spialia colotes semiconfluens de Jong, 1978

This is one of the rarest *Spialia* in Dhofar recorded only by LARSEN (1980) from the road Salalah to Thumrait and Aqabat al Hatab from the same area. We found a single specimen in a small wadi along the abandoned old road north of Quairoon Haritti, possibly in close proximity of the old records. The otherwise rocky wadi with sparse bushes was covered by large diversity of flowering plants attracting many Lepidoptera. Both, *Spialia doris* and *S. mafa higginsi* shared the habitat with *S. colotes*. The species is otherwise distributed also in western Yemen and Asir Mountains in Saudi Arabia (LARSEN, 1980; PITTAWAY, 1985).

Spialia zebra bifida (Higgins, 1924)

Reported widespread in Dhofar by LARSEN & LARSEN (1984), however known only from a single additional locality in Arabia from Aden, Yemen (LARSEN, 1980). Our records corroborate Larsen as we found the species at nine localities from Sarfayt escarpment in the south (locality 2) through wadi Sayq (locality 9), Qamar Mountains, where it was already reported by SEIZMAIR (2017), Al Mughsayl (localities 21, 22, 25), to the northern slopes of Samhan mts. (locality 63). It prefers small rocky gullies with sparse vegetation and is easily overlooked due to small size and fast flight.

Pelopidas thrax (Hübner, [1821])

The species is found in most Africa, eastern Mediterranean, Arabia and north western India. LARSEN (1984b) ranked *P. thrax* among migratory Paleotropical species with a limited Oriental distribution. In northern Oman *P. thrax* lives in oasis whereas in Dhofar it has by then not been recorded (LARSEN & LARSEN, 1984). We captured the species on the semi-ruderal parking place with a scarce bush density and relatively rich grass and herbal vegetation in the foothills of Qara Mountains (locality 44). Its presence in Dhofar seems to be local and scarce but could be masked by the presence of similar and more widespread *P. mathias*.

Despite our exhaustive surveys covering most of the Dhofar coastline and mountain parts of the region there are still areas which were not studied at all, most notably the highest parts of Samhan Mts. and the wadi systems to the north of the range (part of Samhan Nature Reserve). Additionally, surveys

during monsoon season from June to September should provide further insights into the fauna of Lepidoptera of Dhofar, as some of the species are likely to be seasonal or even occur only during that period. We hope our surveys will initiate additional studies of the Lepidoptera of the Sultanate of Oman and Arabian Peninsula in general.

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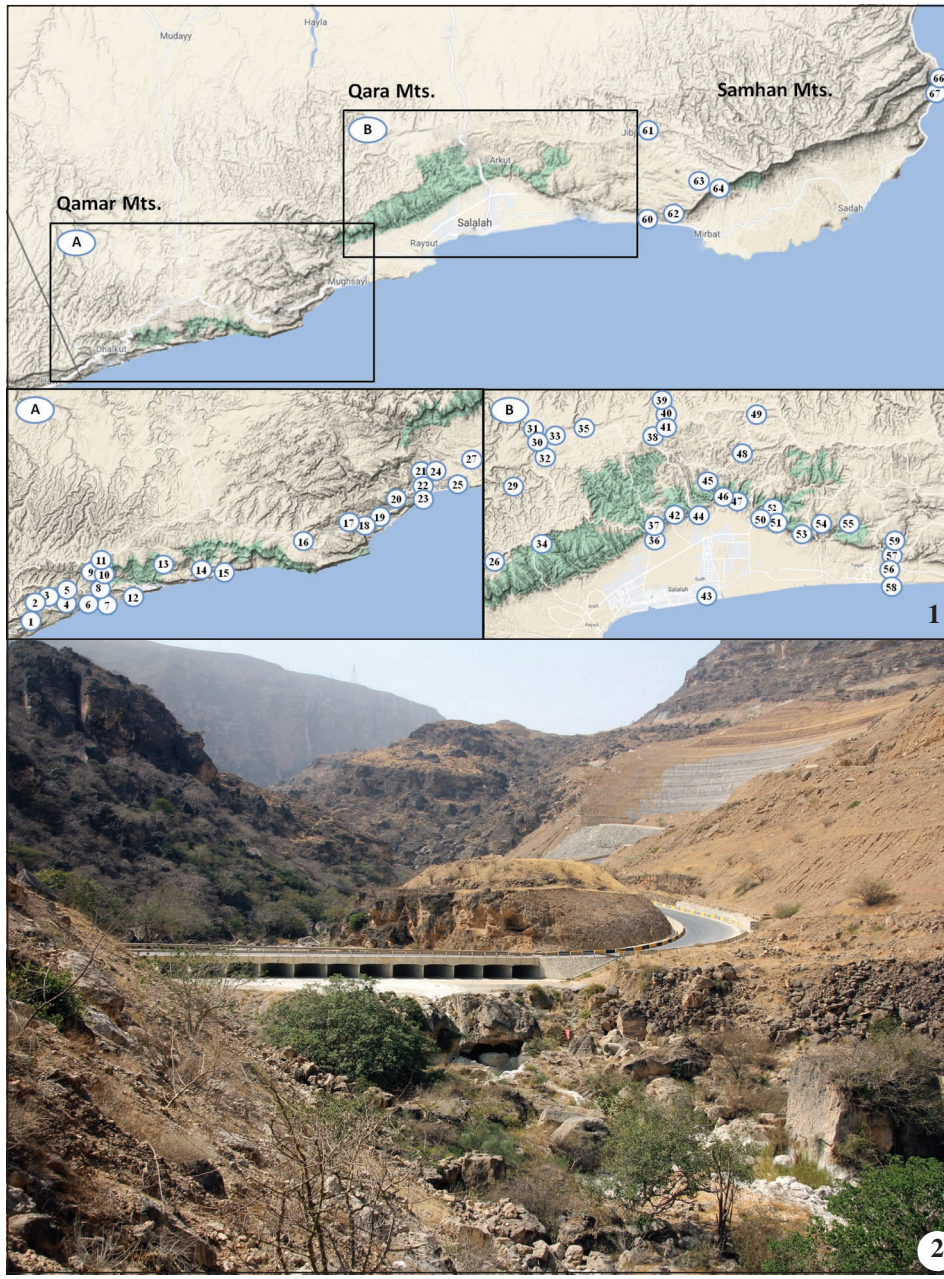
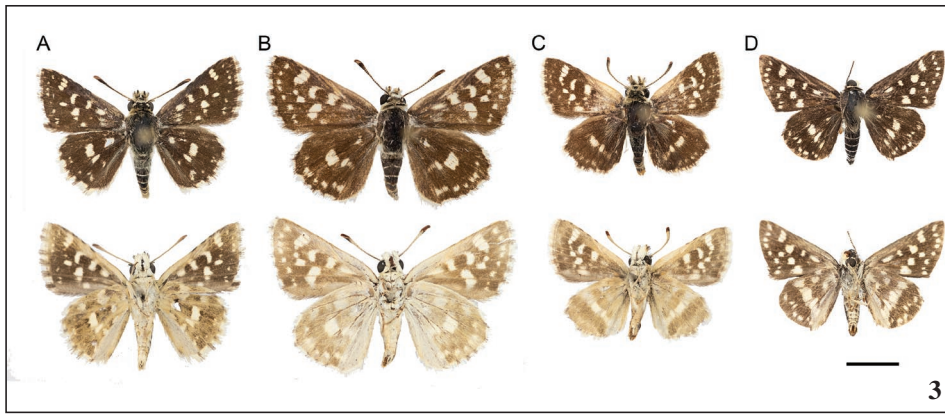


Figures 1-2.– 1. Distribution of the sampling localities. The localities are numbered as in List of localities. The areas of Qamar and Qara Mts are enlarged for clarity. **2.** Upper part of Wadi Sayq, the habitat of many rare butterfly species like *Melitaea deserticola*, *Acraea neobulae*, *Spialia zebra* and *Gegenes pumilio*.



Figures 3-6.– 3. Representatives of the genus *Spialia* collected in Dhofar: A. *Spialia mafa,* B. *Spialia doris,* C. *Spialia zebra,* D. *Spialia colotes*. **4.** *Melitaea deserticola scotti* collected by MS in Wadi Sayq in November 2019. **5.** *Chloroselas esmeralda bilqis* feeding on *Euphorbia larica* Boiss. near Al Mughsayl. **6.** *Colotis protomedia* has so far been recorded only from environs of Dhalkut.

REVISIÓN DE PUBLICACIONES
BOOK REVIEWS

R. Bryner
Adelidae (Lepidoptera). Beitrag zur Kenntnis der Biologie und Bestimmungshilfe für die europäischen Arten
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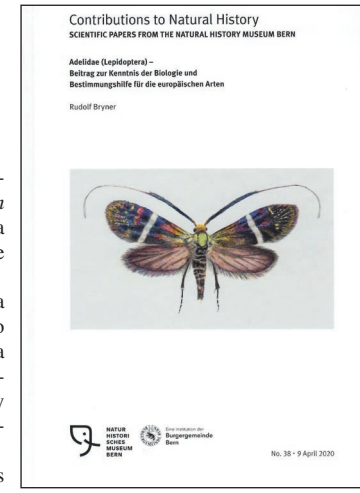

Dentro de las publicaciones del Naturhistorisches Museum de Berna, nos encontramos a *Contributions of Natural History. Scientific from the Natural History Museum Bern* y en su monografía número 38, de la mano de Rudolf Bryner y después de nueve años de trabajo, aparece este interesante trabajo sobre la familia Adelidae Bruand, [1851] 1847.

Siempre nos hemos sentido atraídos por esta interesante familia con sus delicadas antenas y su actividad diurna y aunque en un principio pensábamos que se trataría sólo la fauna presente en Suiza, tuvimos una agradable sorpresa al comprobar que se consideraban las especies presentes en Europa con dos subfamilias Adelinae Bruand, [1851] 1847 y Nematopogoninae Hinton, 1955 que forman parte de los Adelidae, tratándose 55 especies.

Después de la introducción y los agradecimientos, nos habla de los métodos y materiales utilizados, incluidos el ADN código de barras genético, siguiendo un pequeño capítulo sobre los Heliozelidae e Incurvariidae, con sus correspondientes fotografías identificativas de los adultos y sus minas. Ya dentro de los Adelidae nos habla de los principales géneros considerados, con una lista detalladas de las especies y subespecies tratadas, seguido por un interesante capítulo sobre los estados inmaturos, larvas, estados embrionarios y pupas, que de algunas de las especies eran desconocidos.

En la parte más importante de la monografía aparecen todas y cada una de las especies tratadas, en las que se da la diagnosis, variaciones encontradas, la distribución conocida en Europa, haciendo más hincapié en Suiza, continuando con la bionomía, estados larvarios y plantas nutricias, se presentan fotografías en color de los adultos y la genitalia del macho. Es importante destacar, entre las páginas 414 y 458, podemos ver fotografías de los adultos de manera individual y posteriormente en planchas, así como de los dibujos de la genitalia del macho, de la hembra y del VII esternito, finalizando la obra con una extensa bibliografía y un índice. La importancia de la obra aumenta al considerarse una nueva sinonimia: *Nemapogon caliginella* Varenne & Nel, 2018 de *N. pilella* ([Denis & Schiffermüller], 1775).

No podemos terminar estas líneas, sin felicitar al autor por un trabajo bien realizado, por lo que recomendamos su adquisición y no pudiendo faltar en cualquier biblioteca de los interesados en la familia Adelidae. El precio de este libro es de 93 francos suizos y los interesados deben dirigirse a:

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Reticularisus Wu, Wu & Han, a new subgenus of the genus *Rhamnosa* Fixsen, 1887 from China, with description of a new species (Lepidoptera: Limacodidae)

J. Wu, C. S. Wu & H. L. Han

Abstract

A new subgenus, *Reticularisus* Wu, Wu & Han, subgen. n., with type species *Rhamnosa henanensis* Wu, 2008, of the genus *Rhamnosa* Fixsen, 1887 is described and illustrated. For the sake of contrast, the type species of the other two subgenera in this genus have been given, including adults and male genitalia. *Rhamnosa* (*Reticularisus*) *shierbeihoua* Wu, Wu & Han, sp. n., a Limacodidae collected from the southwest of China is described as new to science. Also, the new species is illustrated with images of the adult and male genitalia and compared with the similar species *Rh. henanensis*.
KEY WORDS: Lepidoptera, Limacodidae, *Reticularisus*, new subgenus, new species, taxonomy, China.

Reticularisus **Wu, Wu & Han, un nuevo subgénero del género** *Rhamnosa* **Fixsen, 1887 de China, con descripción de una nueva especie (Lepidoptera: Limacodidae)**

Resumen

Se describe e ilustra un nuevo subgénero, *Reticularisus* Wu, Wu & Han, subgen. n., con la especie tipo *Rhamnosa henanensis* Wu, 2008, del género *Rhamnosa* Fixsen, 1887. Para contrastar, se da la especie tipo de los otros dos subgéneros en este género, incluyendo los adultos y la genitalia del macho. Se describe como nueva para la ciencia a *Rhamnosa (Reticularisus) shierbeihoua* Wu, Wu & Han, sp. n., un Limacodidae capturado del suroeste de China. También la nueva especie es ilustrada con imágenes del adulto y genitalia del macho y comparada con la especie similar *Rh. henanensis*.
PALABRAS CLAVE: Lepidoptera, Limacodidae, *Reticularisus*, nuevo subgénero, nueva especie, taxonomía, China.

Introduction

The genus *Rhamnosa* Fixsen, 1887, was based on the type species *Rh. angulata* Fixsen, 1887 from Korea. Before 1933, at least 8 species of this genus were described, all of which came from Asia, including China, Korea and India (FIXSEN, 1887; HERING, 1931, 1933; MATSUMURA, 1931). However, in the next 80 years, no new species of this genus have been described. In 2008, Wu described a species: *Rh. henanensis* Wu, 2008 from Henan Province, China; in the second year, Wu and Fang reviewed the species of *Rhamnosa* from China and reported 8 species distributed in China, including 2 new species: *Rh. bifurcivalva* Wu & Fang, 2009, syn. n. (male = *Thosea sinensis* (Walker, 1855), female = *Rhamnosa uniformoides* Wu & Fang, 2009) and *Rh. uniformoides* Wu & Fand, 2009 (WU, 2008; WU & FANG, 2009).

SOLOVYEV & WITT (2009) divided this genus into two subgenera based on the characteristics of the appearance and male genitalia: *Rhamnosa* Fixsen, 1887 and *Caniodes* Matsumura, 1927; at the same time, he improved the taxonomic status of the subspecies *Rh. angulata kwangtungensis* Hering, 1931 to make it an independent species *Rh. kwangtungensis* Hering, 1931. Afterwards, SOLOVYEV & DUBATOLOV (2015) designated *Rh. angulata kwangtungensis* Hering, 1931 as a synonym for *Rh. hatita* (Druce, 1896). Among 'The catalog of the Limacodidae moths of Taiwan', Solovyev making *Caniodes takamukui* Matsumura, 1927, *Cania notodonta* Hampson, 1897 and *Rh. uniformis rufina* Hering, 1931 as a synonym of *Rh.* (*Caniodes*) *uniformis* (Swinhoe, 1895) (SOLOVYEV, 2017).

Currently, the genus includes eight species, ranging from India to China, Vietnam, Korea and Russia, seven of which are distributed in China. In this study, a new species collected from the southwest of China was described. However, after careful comparison, this new species and its similar one, *Rh. henanensis* Wu, 2008, cannot completely match the currently known subgenera in appearance and male genitalia. Therefore, we formally establish the third subgenus *Reticularisus* based on these two species herein.

Material and methods

The specimens were collected using the illumination of a 220V/450W mercury light and DC black light in Guizhou Province and Chongqing Municipality, China. Standard methods for dissection and preparing of the genitalia slides were used (described by KONONENKO & HAN, 2007). The specimens were photographed using a Nikon D700 camera while the genitalia slides were captured using an Olympus photo microscope aided by Helicon Focus software and then further processed using Adobe Photoshop CS6. The type material of the new species is deposited in the collection of the Northeast Forestry University (NEFU), Harbin, China.

Taxonomic account

Genus *Rhamnosa* Fixsen, 1887
Rhamnosa Fixsen, 1887. *In* Romanoff, *Mem. Lepid.*, **3**: 339
Type species: *Rhamnosa angulata* Fixsen, 1887
Caniodes Matsumura, 1927. *J. Coll. Agri. Hokkaido imp. Univ*., **19**: 91
Type species: *Caniodes takamukui* Matsumura, 1927
Rnamnopsis Matsumura, 1931. *Ins. Mats.*, **5**: 101
Type species: *Rhamnopsis arizanella* Matsumura, 1931

The genus is similar in appearance to the genus *Cania* Walker, 1855 by the forewing has two distinct lines running from the costal margin to the inner margin, but in *Rhamnosa* Fixsen, 1887, the male antennae bipectinated almost till the apex, the middle of the inner margin has a dentiform tuft with an incision near the turnus; the base of the R_1 is strongly curved, and the terminal 2/3 is close to the Sc; R_5 and R_3+R_4 are stalked. The M_1 and Rs of the hindwing is stalked; Sc+ R_1 originate from the base of the discal cell. The male genitalia are characterized by slender phallus; the vesica contains a long row of hair-like cornuti with large apical area of cornuti.

Descriptions of new subgenus and new species

***Reticularisus* Wu, Wu & Han, subgen. n.** (Figs 2-5)
Type species: *Rhamnosa henanensis* Wu, 2008, here designated.

Description: The subgenus characterized by the ground color of forewing is pale yellow, covering with reddish-brown scales on the surface. The antemedial and postmedial lines are entire, not parallel, straight, dark, running from the wing margin near the apex to the inner margin. The venation of forewing is obvious dark brownish red to brown. The hindwing is usually paler. The apical areas in

both wings are dark (Figs 2, 4). The male genitalia are diagnostic with the apical part with massive tiny spines, the basal part flat, with the sclerotized lateral process or not. The saccus is short. The valva is without basal process (Figs 3, 5).

Etymology: The name *Reticularisus* refers to the lines on the forewings that are reticulated, from Latin *"reticularis*".

Distribution: China.

Diagnosis: The subgenus is distinguished from other known subgenera by the unparallel antemedial and postmedial lines, and obvious dark brownish red to brown venation of forewing in the adults; by the apical part of juxta with massive tiny spines, and the valva without basal process in the male genitalia. In the subgenus *Rhamnosa*, the antemedial and postmedial lines of forewing are entire, almost parallel (Fig. 6); the male genitalia with long and strong, up-curved basal process; the saccus is long; the juxta with long medial and shorter, horn-shaped lateral process (Fig. 7). In the subgenus *Caniodes*, the antemedial and postmedial lines of forewing are not entire, dotted, almost parallel (Fig. 8); the male genitalia with short and hairy apically basal process; the saccus is short; the juxta with long lateral process bearing a long, slender, curved process (Fig. 9).

***Rhamnosa* (*Reticularisus*) *shierbeihoua* Wu, Wu & Han, sp. n.** (Figs 2, 3)

Material: Holotype ♂, China, Guizhou Province, Zunyi City, Shierbeihou scenic spots, Shuanghe village, 3-5-VIII-2020, H. L. Han, J. Wu leg., genitalia No. WuJ-301-1, coll. NEFU. Paratypes: 2 ♂♂, same data as for holotype, coll. NEFU; 1 ♂, China, Chongqing Municipality, Mt. Simian, 23-VII-6-VIII-2018, G. X. Wang, W. J. Li leg., genitalia No. WuJ-277-1, coll. NEFU; 1 ♂, Chongqing Municipality, Mt. Simian, 24-VII-4-VIII-2019, T. T. Zhao, S. C. Deng leg., genitalia No. WuJ-278-1, coll. NEFU.

Description: Wingspan 25-27mm in male. Head vertex densely covered with reddish-brown scales; labial palpus brown; the male antenna bipectinated almost to the apex. Thorax mainly reddish-brown covered with pale yellow scales; tegula pale yellow. The forewing base color is pale yellow, mixed massive reddish-brown scales; the costal and outer margin near the apex is reddish-brown to black; there are two oblique, dark lines running from the outer margin where near the apex, to the inner margin, one of which is to the 1/3, and another to the 2/3 from the wing base; venation of forewing obvious, dark brown; terminal line distinct, dark brown to yellowish-brown; fringe long, dark brown at the apex and gradually turn pale yellow towards the turnus; the dentiform tuft is located between the two oblique dark lines at the inner margin of the forewing, mixed pale yellow and reddish-brown. The hindwing ground color is pale yellow without pattern; the terminal line and fringe at the apex is dark brown. The abdomen dorsally pale yellow to grayish-white, with yellow annular hairs between the abdomere.

Male genitalia: Uncus with an acute and strongly sclerotized apex; gnathos burly, hook-shaped; tegumen long. Valva long, the middle part is the widest, and there are a large number of hairs on the whole surface; costa simple, straight, subterminal slightly concave; sacculus curved in an arc-shaped, slightly sclerotized at the base, with an unobvious process, without sacculus process; cucullus rounded. Juxta obviously divided into two parts, the apical part Y-shaped, with massive tiny spines; the basal part flat, sclerotized. Vinculum ring-shaped. Saccus inconspicuous. Phallus slender, longer than valva, strongly bent and forms almost a right angle at the 1/3 near the caecum; caecum thick, gradually thinner towards the terminal, end of phallus with a ring composed of long spines.

Female: Unknown.

Diagnosis: The new species is very similar to *Rh. henanensis* in appearance but can be distinguished from the latter by the position of the two oblique dark lines on the forewing. In *Rh. shierbeihoua*, these two lines are touching at the outer margin near the apex, but in *Rh. henanensis*, which touching at the costal margin near the apex. The difference between these two species is particularly obvious in the male genitalia. The new species can be separated from *Rh. henanensis* by the following characters (*Rh. henanensis* details are between parentheses): the gnathos is smooth (suddenly narrowed near the apex); the apical part of juxta is Y-shaped with massive tiny spines, the

basal part without lateral plate (the apical part is not Y-shaped, the lateral side of the basal part is strongly sclerotized, with a saw-toothed plate at the terminal of the sclerotized area); phallus strongly bent and forms almost a right angle at the 1/3 near the terminal, end of phallus with a ring composed of long spines (slightly curved near the caecum, the end of phallus without any spines).

Distribution: China (Guizhou, Chongqing) (Fig. 1).

Etymology: The species is named for its type-locality in Shierbeihou scenic spots, Zunyi City, Guizhou Province, China.

Fig 1.– Distribution map of *Rh.* (*Reticularisus*) *shierbeihoua* Wu, Wu & Han, sp. n.: Guizhou Province (triangle) and Chongqing Municipality (circle), China.

Bionomics: The moths fly in July and August. The specimens were collected with a light trap close to a mixed broadleaf-conifer forest and subtropical mixed forest (Figs 10-11).

Discussion

Currently, the genus contains 9 species, which are belong to three subgenera, but the taxonomic position of some of them is still unclear. The subgenus *Rhamnosa* includes 5 species: *R. angulata* Fixsen, 1887, *R. dentifera* Hering & Hopp, 1927, *R. hatita* (Druce, 1896), *R. convergens* Hering, 1931 and *R. arizanella* (Matsumura, 1931). The subgenus *Caniodes* includes 2 species: *C. uniformis* (Swinhoe, 1895) and *C. uniformoides* Wu & Fang, 2009. The new subgenus *Reticularisus* includes 2 species: *R. henanensis* Wu, 2008 and *R. shierbeihoua* Wu, Wu & Han, sp. n. Although, at present this genus is known to be only distributed in Asia, it has a wide range of distribution, with records from India to China, Vietnam, Korea and Russia.

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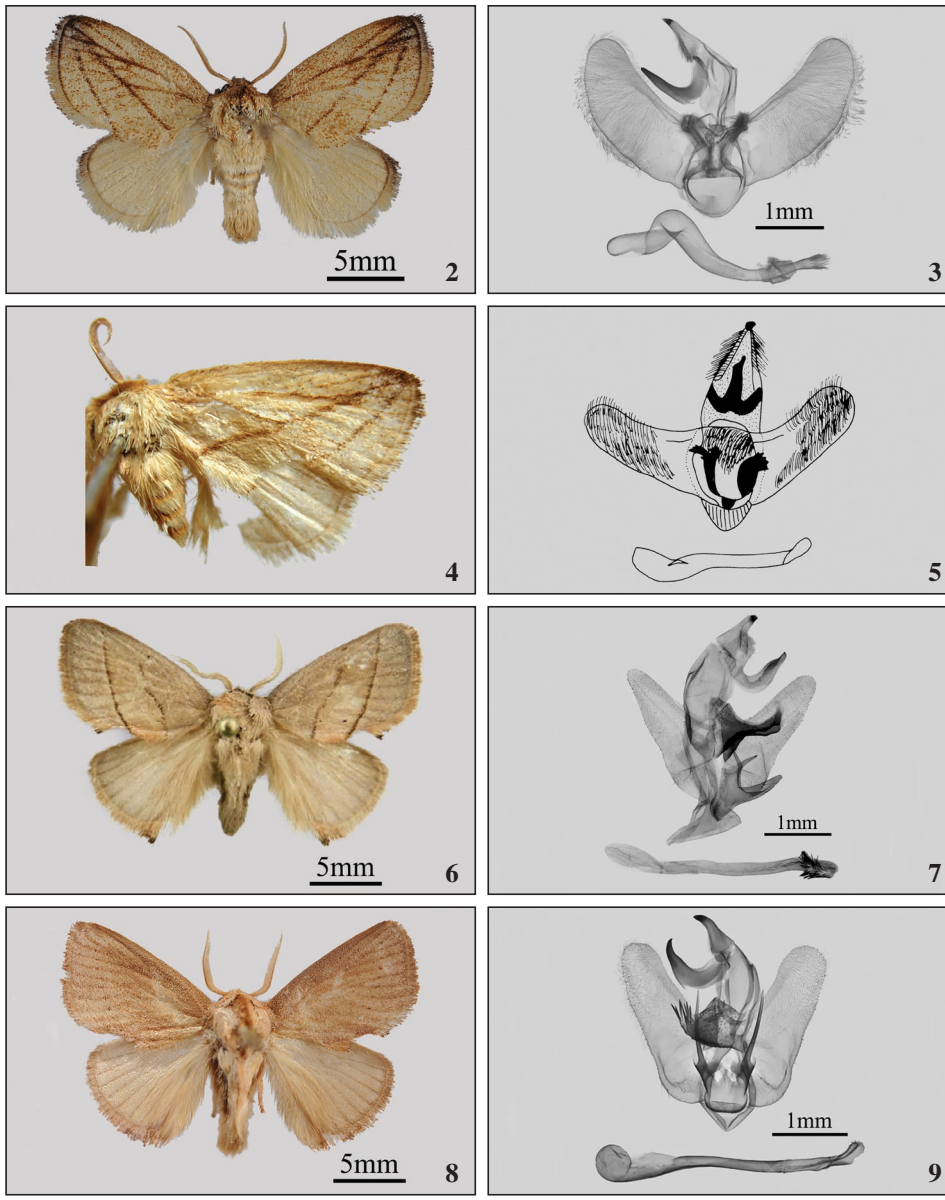

Figs 2-9.– 2-5. *Rhamnosa* (*Reticularisus*) spp., adults and male genitalia. **2-3.** *Rh.* (*Reticularisus*) *shierbeihoua* Wu, Wu & Han, sp. n., male, holotype. **4-5.** *Rh.* (*Reticularisus*) *henanensis* Wu, 2008, male, holotype. **6-9.** Type species of known subgenera of *Rhamnosa*, adults and genitalia, male. **6-7.** *Rh.* (*Rhamnosa*) *angulata* Fixsen, 1887 (after SOLOVYEV & DUBATOLOV, 2015). **8-9.** *Rh.* (*Caniodes*) *uniformis* (Swinhoe, 1895), Prov. Guangdong, China, genitalia No. WuJ-362-1. Scale bars: adults, 5 mm; male genitalia, 1 mm.

Figs 10-11.- 10. Guizhou Province, Zunyi City, Shierbeihou scenic spots, Shuanghe village: collecting site close to a mixed broadleaf-conifer forest with patches of grassland. **11.** Chongqing Municipality, Mt. Simian: collecting site close to a subtropical forest with massive shrubs growing in the ground cover layer of the forest.

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New data on Noctuoidea from the Canary Islands, Spain (Lepidoptera: Noctuoidea)

P. Falck & O. Karsholt

Abstract

We describe three new species: *Zebeeba orzolae* Falck & Karsholt, sp. n. (Erebidae: Rivulinae), *Nyctobrya vilfredi* Falck & Karsholt, sp. n. (Noctuidae: Bryophilinae) and *Agrotis corralejoi* Falck & Karsholt, sp. n. (Noctuidae: Noctuinae). The unknown female of *Mniotype loslobensis* (Fischer, Saldaitis & Ivinskis, 2007) (Noctuidae: Hadeninae) and its genitalia are described and illustrated. Twelve species are recorded as new to the fauna of the Canary Islands: *Epharmottomena eremophila* (Rebel, 1895), *Eublemma thermobasis* Hampson, 1910, *Eublemma candidana* (Fabricius, 1794), *Araeopteron ecphaea* (Hampson, 1914), *Gnamptonyx innexa* (Walker, 1858) and *Rhabdophera acrosticta* (Püngeler, 1904) (Erebidae), *Nycteola columbana* (Turner, 1925) (Nolidae), *Amyna axis* Guenée, 1852, *Polymixis aurora commixta* (Rungs, 1943), *Nonagria typhae* (Thunberg, 1784), *Mythimna languida* (Walker, 1858) and *Leucania zeae* (Duponchel, 1828) (Noctuidae). Five species are, because of different errors, removed from the list of Lepidoptera found in the Canary Islands: *Schrankia taenialis* (Hübner, [1809]), *Cosmia affinis* (Linnaeus, 1767), *Hecatera sancta* (Staudinger, 1859), *Agrotis boeticus* (Boisduval, 1837) and *A. aistleitneri* Behounek & Speidel, 2009. The genus *Gerarctia* Hampson, 1905 is, based on personal information from H. Hacker, synonymised with *Zebeeba* Kirby, 1892, syn. n., and *Gerarctia poliotis* Hampson, 1905 is transferred to *Zebeeba* as *Z. poliotis* (Hampson, 1905), comb. n. DNA barcodes of *Caradrina rebeli* Staudinger, 1901 from different Canary Islands are compared, and it is concluded that the species occurs in two subspecies: *C. rebeli rebeli* Staudinger, 1901 and *C. rebeli lanzarotensis* Pinker, 1962.
KEY WORDS: Lepidoptera, Erebidae, Nolidae, Noctuidae, new species, DNA barcodes, Canary Islands, Spain.

Nuevos datos sobre Noctuoidea de las Islas Canarias, España (Lepidoptera: Noctuoidea)

Resumen

Describimos tres nuevas especies: *Zebeeba orzolae* Falck & Karsholt, sp. n. (Erebidae: Rivulinae), *Nyctobrya vilfredi* Falck & Karsholt, sp. n. (Noctuidae: Bryophilinae) and *Agrotis corralejoi* Falck & Karsholt, sp. n. (Noctuidae: Noctuinae). Se describe e ilustra la desconocida hembra y genitalia de *Mniotype loslobensis* (Fischer, Saldaitis & Ivinskis, 2007) (Noctuidae: Hadeninae). Doce especies se registran como nuevas para las Islas Canarias: *Epharmottomena eremophila* (Rebel, 1895), *Eublemma thermobasis* Hampson, 1910, *Eublemma candidana* (Fabricius, 1794), *Araeopteron ecphaea* (Hampson, 1914), *Gnamptonyx innexa* (Walker, 1858) and *Rhabdophera acrosticta* (Püngeler, 1904) (Erebidae), *Nycteola columbana* (Turner, 1925) (Nolidae), *Amyna axis* Guenée, 1852, *Polymixis aurora commixta* (Rungs, 1943), *Nonagria typhae* (Thunberg, 1784), *Mythimna languida* (Walker, 1858) y *Leucania zeae* (Duponchel, 1828) (Noctuidae). Cinco especies son, debido a diferentes errores, removidas de la lista de Lepidoptera encontradas en las Islas Canarias: *Schrankia taenialis* (Hübner, [1809]), *Cosmia affinis* (Linnaeus, 1767), *Hecatera sancta* (Staudinger, 1859), *Agrotis boeticus* (Boisduval, 1837) y *A. aistleitneri* Behounek & Speidel, 2009. El género *Gerarctia* Hampson, 1905 es, basado sobre información personal de H. Hacker, sinonimizado con *Zebeeba* Kirby, 1892, syn. n. y *Gerarctia poliotis* Hampson, 1905 es transferido a *Zebeeba* como *Z. poliotis* (Hampson, 1905), comb. n. Se compara el ADN código de barras de *Caradrina rebeli*

Staudinger, 1901 de diferentes Islas Canarias y se concluye que la especie ocurre en dos subespecies: *C. rebeli rebeli* Staudinger, 1901 y *C. rebeli lanzarotensis* Pinker, 1962.
PALABRAS CLAVE: Lepidoptera, Erebidae, Nolidae, Noctuidae, nuevas especies, ADN código de barras, Islas Canarias, España.

Introduction

Fieldwork undertaken in the Canary Islands since 2016 by the first author has revealed a number of new and partly undescribed species of Lepidoptera for these islands. It may not be surprising that several species of smaller, so-called Microlepidoptera have been overlooked by previous researchers, but an increase of 15 % of the relatively large Pyraloidea species (FALCK *et al.*, 2019) shows that the Lepidoptera fauna of the Canary Islands is probably not as well investigated as one might have expected.

The Noctuoidea is a mega-diverse group of larger moths. During the last decade, family level classification has undergone a number of changes (ZAHIRI *et al.*, 2010, 2012, 2013). In the most recent list to include Canary Island Lepidoptera VIVES MORENO (2014) listed 2 species of Notodontidae, 2 Nolidae, 29 Erebidae, 1 Euteliidae and 99 Noctuidae. Here we describe 1 new Erebidae and 2 new Noctuidae. Moreover, we record 6 species of Erebidae, 1 Nolidae and 5 Noctuidae as new to the fauna of the Canary Islands, and we suggest that five species are removed from the list of Canary Islands, for various reasons.

Material and methods

Most of the specimens were attracted to an 8 watts super actinic light. Genitalia were dissected following ROBINSON (1976). Whole specimens were photographed with a Canon EOS 700D camera equipped with a Canon EF 100 mm objective. The genitalia slides were photographed using a Soptop CX40T Trinocular microscope in conjunction with a Toup Tek P10500A-E3 / E3ISPM05000KPA-E3 / 5.0MP USB3 camera.

DNA samples were prepared from dried legs according to the prescribed standards and processed at the Canadian Centre for DNA Barcoding (CCDB, Biodiversity Institute of Ontario, University of Guelph) to obtain the 658 base-pair long barcode fragment of the mitochondrial COI gene (cytochrome c oxidase I). Intra- and interspecific distances of DNA barcode fragment were calculated using analytic tools of BOLD with the Kimura 2-parameter model of nucleotide substitution. Neighbour-joining trees were constructed using MEGA 6 (TAMURA *et al.*, 2013) under the Kimura 2-parameter model for nucleotide substitutions with the closest European species in BOLD as outgroups. Genetic clusters are presented with their barcode index number (BIN; cf. RATMNASINGHAM & HERBERT, 2013).

We examined the morphology from all species and the DNA Barcode from new and cryptic species.

Abbreviations used

GP	Genitalia preparation
PF	Collection of Per Falck, Neksø, Denmark
MNCN	Collection of Antonio Vives, Museo Nacional de Ciencias Naturales, Madrid, Spain
NHMUK	Natural History Museum, London, United Kingdom
ZMUC	Zoological Museum, Natural History Museum of Denmark, Copenhagen, Denmark

Results

EREBIDAE
Rivulinae

The genus *Zebeeba* Kirby, 1892 = *Gerarctia* Hampson, 1905, **syn. n**., is originally a South African

genus and includes, besides the Mediterranean species *Z. falsalis* (Herrich-Schäffer, 1839), several East African and a number of South African species, several of which are still undescribed (HACKER, 2021: 80 and pers.com. 15-II-2021). Until now, about 20 species have been described.

Zebeeba poliotis (Hampson, 1905), **comb. n.**
Ingura poliotis Hampson, 1905. *Ann. Mag. Nat. Hist*., (7) **15**(89): 449

***Zebeeba orzolae* Falck & Karsholt, sp. n.** (Fig. 1)

Holotype ♂: SPAIN, Lanzarote, Mojón Blanco, Orzolá, 20 m, 21-X-10-XI-2019, leg. P. Falck, genitalia slide 3473PF, DNA sample Lepid Phyl 0601PF/CILEP0600-20 (PF).

Description: Adult. Wingspan 14.5 mm. Labial palp porrect, segment 2 whitish grey with grey scale tuft, segment 3 grey, very short. Antenna pale grey, with indistinct grey rings, very shortly ciliate. Head and neck pale grey mottled with darker grey. Tegula and thorax grey. Forewing ground colour whitish grey mottled with grey, at dorsum before tornus an indistinct large reddish-brown spot, reniform stigma creamy white bordered distally by dark grey, postmedian fascia indistinct dark grey not reaching dorsum, apical streak indistinct, dark grey. Hindwing grey, paler towards base. Fringe yellowish white.

Male genitalia (Figs 29, 29a): Uncus long, relatively broad, pointed. Valva short, narrow and knob-shaped. Saccus very broad, anterior margin concave. Phallus large, longer than valva, distally slightly bent.

Female genitalia: Unknown.

Diagnosis: *Z. orzolae* resembles *Z. poliotis* (Fig. 2), the only other *Zebeeba* species known from the Canary Islands (Spain). Males can be distinguished by the shortly ciliate antenna, bipectinate in *Z. poliotis,* otherwise it can be distinguished by the whitish coloured forewing without wing pattern in the inner half and the smaller wingspan. *Z. orzolae* also resembles some South African species e. g. *Z. mediorufa* (Hampson, 1910) and *Z. fuscipars* (Hampson, 1910) (HACKER, 2021: 601). It can be distinguished by the lack of wing pattern in the inner half of forewing. In the genitalia the very short, narrow and knob-shaped valva and the broad concave saccus are characteristic. The genitalia of *Z. poliotis* are figured by PINKER (1965: pls. 23).

Molecular diagnosis: We obtained DNA barcode fragments of 601 bp. Barcode Index Number (BIN) BOLD: AEE6226.

Biology: Early stages unknown, but the larva probably feeds on Asparagaceae (HACKER, 2021: 80). The specimen was attracted to an 8 watts super actinic light in a sandy area near the coast.

Distribution: Known only with certainty from the northern part of the island of Lanzarote, but probably also from Fuerteventura - see remarks. The species is probably endemic to the Canary Islands (Spain).

Etymology: The species is named after the small town Orzolá placed nearby the type-locality.

Remarks: HACKER & SCHMITZ (1996: 180) mention a Noctuidae species from Fuerteventura *"Auf dieser Insel konnte jedoch eine kleinere, Phycitinae-ähnliche Noktuide nachgewiesen werden, die habituell poliotis ähnelt, jedoch einen anderen Fühler- und Genitalbau aufweist und vermutlich eine unbeschriebene Art darstellt*", the specimen is also figured (Tafel M: 1). It has not been possible to study this specimen, but it most likely belongs to *Z. orzolae.*

Hypenodinae

Schrankia taenialis (Hübner, [1809])
Pyralis taenialis Hübner, [1809]. *Samml. Eur. Schmett*.: pl. 23, fig. 151

The species is mentioned by REBEL & ROGENHOFER (1894: 67) from The Canary Islands (La Palma) on the basis of two specimens *"Zwei geflogene, auffallend kleine (Exp. 14-16 mm) und schmalflügelige Exemplare durch Prof. Simony am 26 August 1889 an einer mit Juncus und*

Petroselinum bewachsenen feuchten Stelle…". The specimens are most likely confused with *S. costaestrigalis* (Stephens, 1834), a quite common species from Gran Canaria, La Palma and Tenerife. HACKER & SCHMITZ (1996: 170) also doubted the La Palma record of *S. taenialis*, and it is not mentioned by BÁEZ *et al*. (2010: 312). The species should be removed from the list of Lepidoptera occurring in the Canary Islands (VIVES MORENO, 2014: 614).

Calpinae

Epharmottomena eremophila (Rebel, 1895) (Fig. 3)
Armada eremophila Rebel, 1895. *Verh. Zool.-bot. Ges. Wien*, **45**: 350

Material examined: SPAIN, Fuerteventura, Corralejo, 10 m, 1 ♀, 1-27-XI-2017, leg. P. Falck; Caldereta, 120 m, 1 ♂, 27-II-19-III-2018, leg. P. Falck (PF). **New to the Canary Islands**.

Distribution: North Africa and the Middle East, Ghana (FREINA & BEHOUNEK, 1996: 16).

Biology: Early-stage unknown. The adult flies during winter.

Remarks: *E. eremophila* is probably a migrant from Africa.

Boletobiinae

Eublemma thermobasis Hampson, 1910 (Fig. 4)
Eublemma thermobasis Hampson, 1910. *Cat. Lep. Phal*., **10**: 135, pl. 152, fig. 27

Material examined: SPAIN, Gran Canaria, Puerto Rico, 50 m, 1 ♂, 11-24-VI-2018, leg. P. Falck; San Filipe, 25 m, 2 ♂♂, 24-X-13-XI-2020, leg. P. Falck; Lanzarote, Mojón Blanco, Orzolá, 20 m, 1 ♀, 21-X-10-XI-2019, leg. P. Falck, DNA sample Lepid Phyl 0603PF/CILEP602-20; Tenerife, El Médano, 15 m, 12 ♂♂, 4 ♀♀, 1-20-III-2017, genitalia slide 2499PF, same data but 6 ♂♂, 1 ♀, 18-XI-8-XII-2018, same data but 6 ♂♂, 1 ♀, 21-V-3-VI-2019, leg. P. Falck, DNA sample Lepid Phyl 0602PF/CILEP601-20 (all PF). **New to the Canary Islands**.

Distribution: Morocco (one record from 1994), East Africa from Sudan to Ethiopia and the Arabian Peninsula from Yemen to Jordan (HACKER, 2019: 335). The species is considered to be resident in the Canary Islands (Spain).

Biology: Unknown.

Remarks: We obtained DNA barcode from two specimens. Barcode Index Number (BIN) BOLD: ACL6036.

Eublemma candidana (Fabricius, 1794) (Fig. 5)
Pyralis candidana Fabricius, 1794. *Ent. Syst*., **3**(2): 245

Material examined: SPAIN, Tenerife, La Cuesta, 1 ♀, III-1924, leg. H. P. Duurloo, genitalia slide 3818 M. Fibiger (ZMUC). **New to the Canary Islands**.

Distribution: Europe (Mediterranean countries), Turkey, Middle East, Caucasus, Trans-Caucasus and Central Asia (FIBIGER *et al*., 2010: 68).

Biology: The larvae feed in April-May and again in July on flowers of *Helichrysum* (FIBIGER *et al*., 2010: 68).

Remarks: The record of *E. candidana* from the Canary Islands is probably due to accidental introduction or migration, as the species has not been found on the islands for almost a hundred years.

The collector of the specimen, Hans Peter Duurloo was a Danish lepidopterist who travelled and collected Lepidoptera in the Canary Island during 1924-1926 (HENRIKSEN, 1936: 413).

Araeopteron ecphaea (Hampson, 1914) (Fig. 6)
Araeoptera ecphaea Hampson, 1914. *Ann. Nat. Hist*., **13**: 167

Material examined: SPAIN, Gran Canaria, Maspalomas, 10 m, 1 ♂, 1 ♀, 17-30-IX-2018, leg. P. Falck (PF). **New to the Canary Islands**.

Distribution: Central Africa, North Africa (Morocco, Tunisia), Middle East and Europe (the southern Mediterranean from Greece to Spain) (FIBIGER *et al.*, 2010: 52; HACKER, 2019: 243).

Biology: Early stages undescribed. *E. ecphaea* inhabits moist areas with *Phragmites* (FIBIGER *et al.*, 2010: 52).

Remarks: *E. ecphaea* is probably a resident of the Canary Islands.

Erebinae

Gnamptonyx innexa (Walker, 1858) (Fig. 7)

Alamis innexa Walker, 1858. *List Specimens lepid. Insects Colln Br. Mus*., **15**: 1797

Material examined: SPAIN, Gran Canaria, Carreteria, 455 m, 1 ♂, 8-20-VIII-2020, leg. P. Falck; Pie de la Cuesta, 500 m, 1 ♂, 1 ♀, 21-VIII-4-IX-2020, leg. P. Falck (PF). **New to the Canary Islands**.

Distribution: Spain (FIBIGER *et al*., 2010: 233), Cape Verde Islands, North Africa, through the Middle East to Afghanistan and India (FREINA & BEHOUNEK, 1996: 19; HACKER, 2016).

Biology: The larva feeds on *Acacia* species. It is continuously brooded, and the adults are migratory (FIBIGER *et al.,* op. cit.).

Remarks: *G. innexa* is probably a migrant from Africa.

Rhabdophera acrosticta (Püngeler, 1904) (Fig. 8)

Pericyma acrosticta Püngeler, 1904. *Iris*, **16**: 290, pl. 6, fig. 6

Material examined: SPAIN, Fuerteventura, Corralejo, 10 m, 1 ♀, 7-27-XI-2017, leg. P. Falck (PF). **New to the Canary Islands**.

Distribution: From North Africa to the Middle. East Distribution map cf. HACKER (2016: 327). In Europe one specimen from Malta (LEPIFORUM, 2021).

Biology: Early stages are probably undescribed.

Remarks: *R. acrosticta* is probably a migrant from Africa.

NOLIDAE

Chloephorinae

Nycteola columbana (Turner, 1925) (Fig. 9)

Sarrothripus columbana Turner, 1925. *Entomologist's Rec. J. Var*., **37**: 77

Material examined: SPAIN, Fuerteventura, Corralejo, 10 m, 1 ♂, 7-27-XI-2017, leg. P. Falck, genitalia slide 3472PF (PF). **New to the Canary Islands**.

Distribution: South Europe, Turkey, North Africa (Morocco, Algeria, Tunisia) and the Middle East (FIBIGER *et al.*, 2009: 138).

Biology: Early stages are probably undescribed. The larva feeds on *Quercus*.

Remarks: The genitalia of both sexes are figured by FIBIGER *et al.* (2009: figs 81, 245).

NOCTUIDAE

Bagisarinae

Amyna axis Guenée, 1852 (Fig. 10)

Amyna axis Guenée, 1852. *Hist. Nat. Insc. Spec. Gen. Lep. Noct*., **5**(1): 407

SPAIN, La Gomera, Valle Gran Rey, 1 larva, 25-II-2013, leg. J. Köhler (KÖHLER, 2014).

Material examined: SPAIN, Lanzarote, Puerto del Carmen, 25 m, 1 ♂, 21-X-10-XI-2019, leg. P. Falck; Mojón Blanco, Orzolá, 20 m, 3 ♂♂, 1 ♀, 21-X-10-XI-2019, leg. P. Falck; El Bosquecillo, 610 m, 4 ♂♂, 21-X-10-XI-2019, leg. P. Falck (all PF). **New to the Canary Islands**.

Distribution: *A. axis* is described from Tahiti and is widely distributed in the tropics around the world. In Africa from the south to Sudan, Mauretania and Saudi-Arabia in the north.

Biology: The larva from La Gomera was found sitting on *Rumex vesicarius* L. without eating

(KÖHLER, 2014: 179). The larva is reported feeding from several plants e. g. *Arachis hypogaea* L., *Beta vulgaris* L., *Celosia sp.*, *Chenopodium album* L. Bosc ex Moq., *Corchorus capsularis* L., *Hibiscus cannabinus* L., *Spinacia oleracea* L. often as a pest (LEPIFORUM, 2008-2021).

Remarks: *A. axis* has probably become a resident of the Island of Lanzarote due to either migration or accidental importation.

Bryophilinae

The subgenus *Nyctobrya* Boursin, 1957 is treated in two relatively new articles BEHOUNEK & SPEIDEL (2013) and FISCHER & FREINA (2014) with description of two new species. Hitherto, five species and one subspecies are known: *N. simonyi* (Rogenhofer, 1889), *N. simonyi debilis* (Rebel, 1894), *N. canaria* (Alphéraky, 1890), *N. maderensis* (Bethune-Baker, 1891), *N. pinkeri* Behounek & Speidel, 2013 and *N. hierroana* Fischer & Freina, 2014. Until recently it was assumed that the subgenus was endemic to the Macaronesian region, but *N. simonyi* is now recorded from Morocco (LEPIFORUM, 2008-2021).

Nyctobrya vilfredi Falck & Karsholt, sp. n. (Figs 11, 12)

Holotype ♀: SPAIN, Gran Canaria, Ayacata, 1400 m, 17-30-IX-2018, leg. P. Falck, DNA sample Lepid Phyl 0572PF/CILEP571-20 (ZMUC).

Paratypes: SPAIN, Gran Canaria, Los Tilos, 600 m, 1 ♀, 5-VIII-1979, leg. & P. Stadel Nielsen; Barranco de la Virgen, Moya, 400 m, 1 ♀, 20-VII-1984, leg. P. Olsen, B. Skule & P. Stadel Nielsen; Pinos de Galdar, 1200 m, 15 ♂♂, 46 ♀♀, 24-VII-1984, 14 ♂♂, 45 ♀♀, 31-VII-1984, genitalia slides 3653, 3836 M. Fibiger, leg. P. Olsen, B. Skule & P. Stadel Nielsen (all ZMUC); Ayacata, 1400 m, 1 ♂, 2 ♀♀, 17-30-IX-2018, genitalia slide 3294PF, DNA sample Lepid Phyl 0574PF/CILEP573-20, leg. P. Falck (PF); Pie de la Cuesta, 500 m, 1 ♀, 17-30-IX-2018, genitalia slide 3300PF, DNA sample Lepid Phyl 0573PF/CILEP572-20, leg. P. Falck (PF); Carreteria, 455 m, 14 ♂♂, 23 ♀♀, 8-20-VIII-2020, leg. P. Falck, genitalia slides 3462PF, 3463PF, DNA sample Lepid Phyl 0758PF/CILEP757-20 (MNCN, PF); Fontanales, 1100 m, 7 ♀♀, 8-20-VIII-2020, leg. P. Falck (PF); Barranco de Moya, 80 m, 3 ♂♂, 3 ♀♀, 8-20-VIII-2020, leg. P. Falck (PF); Barranco de Azuaje, 270 m, 1 ♂, 7 ♀♀, 8-20-VIII-2020, leg. P. Falck, DNA sample Lepid Phyl 0757PF/CILEP756-20 (PF); Barranco de Guayadeque, 700 m, 5 ♀♀, 21-VIII-4-IX-2020, leg. P. Falck (PF).

Description: Male adult. Wingspan 23.5-29 mm. Labial palp upturned, segment 2 with black and creamy white scale-tuft, segment 3 as long as segment 2, slender, black mottled with creamy white and with creamy white tip. Antenna black, cilia in male having length of antenna diameter, in female very short. Head and neck blackish grey, neck with yellowish tipped scales towards thorax; tegula and thorax blackish grey. Forewing ground colour dark grey-brown; basal patch and claviform stigmata darker, orbicular and reniform stigmata brownish distinctly bordered with black; antemedian fascia black; postmedian fascia jagged, black, irregularly bordered distally with white; fringe dark grey. Hindwing of the same concolorous with forewing, paler at base; postmedian fascia indistinct, discal spot clearly recognizable; fringe dark grey.

Female adult: Wing pattern as in male, but with black ground colour, heavily mottled with white between subbasal- and antemedian fasciae; postmedian fascia distinct, bordered with white.

Male genitalia (Figs 30, 30a): Uncus long and spatulate. Tegumen sub-triangular. Valva short, very broad at the base, slightly narrowing distally; apical process at the end of costa small and triangular, ventral edge apically pointed. Ampulla long, fairly robust and evenly curved. Juxta trapezoid, anteriorly acute. Phallus relatively short and broad, vesica with large group of small cornuti.

Female genitalia: (Fig. 36): Ostium membranous, narrow and rounded. Ductus bursae relatively long and broad, sclerotized, transition to ostium short, constricted and membranous. Corpus bursae membranous, pear-shaped, posterior apex pronounced, rounded and slightly sclerotized.

Molecular diagnosis (Fig. 39): We obtained full length DNA barcodes (658 bp) from three

specimens and DNA barcode fragments of 607 bp and 528 bp from two specimens all from the island of Gran Canaria. All the barcodes fall within Barcode Index Number (BIN) BOLD: AEE9804. The maximum intraspecific distance is 0.17% (mean 0.05%, n=5). The minimum p-distance to nearest neighbour *N. canaria* is 3.03%, with the Barcode Index Number (BIN) BOLD: AEE9801. The result supports the status of *N. vilfredi* sp. n. as a separate species.

Diagnosis: *N. vilfredi* is closely related to *N. canaria* (Figs 13, 14). It can often be distinguished by the light tipped apex of labial palps, and females are normally more contrasting and with strong white admixture in basal part of the forewing, but a safe determination requires dissection of the genitalia. It can be distinguished from *N. simonyi* and *N. pinkeri* (Figs 15, 16) by the longer segment 3 of the labial palps (Figs 17, 18). In the male genitalia *N. vilfredi* differs from *N. canaria* (Figs 31, 31a) by the short and broad valva without projection of the ventral edge, and the cornuti are larger. From *N. simonyi*, *N. pinkeri*, *N. hierroana* and *N. maderensis* it differs by the lack of the large and robust cornutus. In the female genitalia it differs from all other members of the genus by the long and broad ductus bursae and by the anterior rounded, sclerotized apex of corpus bursae.

Biology: Early stages unknown. The specimens were attracted to light during July to late September at altitudes ranging from 80-1400 m.

Distribution: Only known from the central and northern part of the island of Gran Canaria.

Etymology: The species name is dedicated to the first author`s youngest grandson Vilfred.

Remarks: In the island of Gran Canaria, *N. pinkeri* is widespread in mountainous regions, but in the northern part of the island the species is found in ravines near sea level in a much smaller and a greyer form, with a wingspan of 19-21 mm (usually 24-30mm), very similar to the difference between *N. simonyi simonyi* and *N. simonyi debilis*

In the present study we also compared the DNA barcodes of the two forms of *N. pinkeri*, and *N. simonyi simonyi* with of *N. simonyi debilis*.

The result of the molecular analysis of *N. pinkeri* is that all barcodes (n=6) fall within the same Barcode Index Number (BIN) BOLD: AEE9803, with maximum intraspecific variation of 0.8%, this supports the presumption of only one highly variable species.

The result of the molecular analysis of *N. simonyi simonyi* (n=3) from Tenerife and *N. simonyi debilis* (n=3) from Lanzarote is that all barcodes (n=6) fall within the same Barcode Index Number (BIN) BOLD: AEE9802. The maximum intraspecific variation in *N. simonyi simonyi* is 0.14%, and the maximum intraspecific variation in *N. simonyi debilis* is 0.17%. Diverging (minimum p-distance) by 0.82% between the two populations. This supports the assumption by BEHOUNEK & SPEIDEL (2013: 163) that the status of *N. debilis* as a separate species is unlikely.

Xyleninae

Caradrina rebeli Staudinger, 1901 (Figs 19, 20)
Caradrina rebeli Staudinger, 1901. *Cat. Lep. Pal.*: 196

The species is widespread in all of the larger Canary Islands and is often very common from sea level to mountain regions. It is highly variable both in adult appearance and in the genitalia. Males from La Palma, Tenerife and Gran Canaria have greyish brown ground colour of the forewing and almost solid dark grey hindwing with discal spot visible, whereas males from Lanzarote and Fuerteventura are more whitish grey in ground colour of the forewing and the hindwing is dark grey becoming almost white towards base, with discal spot and postmedian fascia visible, there are no clear differences in adult females from different islands. It is not surprising that more subspecies and one additional species have been described: *Caradrina lanzarotensis* Pinker, 1962, *C. rebeli grancanariae* Pinker, 1962, *C. rebeli lapalmae* Pinker, 1962, *C. rebeli hierrensis* Pinker, 1969 and *C. lanzarotensis fuerteventurensis* Pinker & Bacallado, 1975. In the revision of the genus *Caradrina* Ochsenheimer, 1816 the subspecies of *C. rebeli* and *C. lanzarotensis* were synonymized (HACKER, 2004: 380-384, figs 426-428, pls. 22). In this study we have examined the DNA barcode of specimens from La Palma, Tenerife, Gran Canaria, Lanzarote and Fuerteventura.

Molecular results (Fig. 39): We obtained DNA barcode fragments of 592 bp from one specimen from the island of La Palma, 587 bp and 586 bp from two specimens from the island of Tenerife, 598 bp and 622 bp from two specimens of the island of Gran Canaria, 598 bp and 688 bp from two specimens from the island of Lanzarote and 633 bp and 632 bp from two specimens from the island of Fuerteventura. The result of the molecular analysis is that all barcodes (n=5) from specimens from La Palma, Tenerife and Gran Canaria fall within the same Barcode Index Number (BIN) BOLD: AEE7063. The maximum intraspecific divergence in BIN (p-distance) is 0.52%, and it is between populations from La Palma and Tenerife. The barcode from the specimens (n=4) from Lanzarote and Fuerteventura fall within Barcode Index Number (BIN) BOLD: AEE7064. The maximum intraspecific divergence in BIN (p-distance) is 0%. Diverging (minimum p-distance) by 1.87% between the two populations from La Palma, Tenerife, Gran Canaria and Lanzarote, Fuerteventura. The results support the assumption by HACKER (2004: 383) that at least the subspecies *C. rebeli grancanariae* and *C. rebeli lapalmae* are synonyms of *C. rebeli rebeli* and *C. lanzarotensis fuerteventurensis* is a synonym of *C. rebeli lanzarotensis.* Based on adult appearance and DNA results it is concluded that the species occurs in two subspecies: *C. rebeli rebeli* Staudinger, 1901 and *C. rebeli lanzarotensis* Pinker, 1962.

Cosmia affinis (Linnaeus, 1767)
Noctua affinis Linnaeus, 1767. *Syst. Nat., ed.,* **12**: 848

The species is mentioned by VIVES MORENO (2014) as *Cosmia affinis canaria* (Pinker, 1974) by mistake, but it refers to *Cardepia affinis antinea* Rungs, 1972 (= *deserticola canaria* Pinker, 1974).

Cosmia affinis (Linnaeus, 1767) should be removed from the list of Lepidoptera found in the Canary Islands.

Polymixis aurora (Turati, 1924) (Fig. 21)
Pseudopolia aurora Turati, 1924. *Atti Soc. ital. Sci. nat*., **63**: 83

Material examined: SPAIN, Fuerteventura, Corralejo, 10 m, 13 ♂♂, 7-27-XI-2017, leg. P. Falck (PF). **New to the Canary Islands.**

Distribution: North Africa from Morocco to Egypt (FREINA & BEHOUNEK, 1996: 29).

Biology: Early stages unknown.

Remarks: The specimens from Fuerteventura belong to *P. aurora commixta* (Rungs, 1943). It is probably a migrant from Africa.

Nonagria typhae (Thunberg, 1784) (Fig. 22)
Noctua typhae Thunberg, 1784. *Diss. Ent. sistens Insecta Suecica*, (1): 3

Material examined: SPAIN, Gran Canaria, Barranco de Azuaje, 270 m, 1 ♂, 1 ♀, 8-20-VIII-2020, leg. P. Falck, genitalia slide 3486PF (PF). **New to the Canary Islands**.

Distribution: Europe, Turkey, Russia, Middle East, Iraq, Iran and Central Asia.

Biology: The larvae feeds on *Typha* sp. and *Schoenoplectus* sp. (ZILLI *et al.*, 2005: 86).

Remarks: *N. typha* is probably a resident of the Island of Gran Canaria.

Hadeninae

Mniotype loslobensis (Fischer, Saldaitis & Ivinskis, 2007) (Fig. 23)
Eremobastis loslobensis Fischer, Saldaitis & Ivinskis, 2007. *Atalanta*, **38**(3/4): 377, figs 1-2, pl. 21, fig. 1

Material examined: SPAIN, Lanzarote, Mojón Blanco, Orzolá, 20 m, 2 ♂♂, 5-XI-2018, leg. and coll. B. Skule and C. Hviid, same data but 10 ♂♂, 4 ♀♀, 21-X-10-XI-2019, leg. P. Falck, genitalia slide 3287PF, 3394PF, 3478PF, DNA samples Lepid Phyl 0596PF/CILEP595-20, 0596PF/CILEP595-20 (PF).

The species was described on the basis of three males from the island of Los Lobos 2 km NE of Fuerteventura (FISCHER *et al.*, 2007). *M. loslobensis* is very similar to *M. dimorpha* (Rungs, 1948)

from Morocco both in the appearance of the adults and in the male genitalia. It can be distinguished by the lack of the prominent basal streak in the forewing, and in the male genitalia by the lack of several small triangular spines in the phallus diverticulum.

Female genitalia (Fig. 38): Ostium narrow, funnel-shaped, membranous, laterally sclerotized. Ductus bursae relatively long, heavily spinulated and with longitudinal folds. Corpus bursae membranous and oval.

Remarks: We obtained DNA barcode fragments of 633bp and 635pb from two specimens, the barcodes fall within Barcode Index Number (BIN) BOLD: AEE1222. The p-distance to nearest neighbour *Mniotype fulva* (Rothschild, 1914) is 4.33%, with the Barcode Index Number (BIN) BOLD: AEC7959. It was not possible to compare the DNA barcode with *Mniotype dimorpha* as no barcode seems to exist so far.

The genus *Eremobastis* Pérez-López & Morente-Benítez, 1996 was synonymised with *Mniotype* Franclemont, 1941 by FIBIGER & HACKER (2007: 230).

Hecatera sancta (Staudinger, 1859)
Hadena sancta Staudinger, 1859. *Stettin. ent. Ztg*., **20**(7-9): 213

This species is mentioned by VIVES MORENO (2014) as *Hecatera sancta canaria* (Pinker, 1974) but by mistake, it actually refers to *Clytie sancta canaria* Pinker, 1974 (= *Clytie illunaris* (Hübner, [1816])).

Hecatera sancta (Staudinger, 1859) should be removed from the list of Lepidoptera found in the Canary Islands.

Mythimna languida (Walker, 1858) (Fig. 24)
Hadena languida Walker, 1858. *List. Spec. Lepid. Insects Colln Br. Mus*., **15**: 1728

Material examined: SPAIN, Gran Canaria, Los Tilos de Moya, 500 m, 3 ♂♂, 11-24-VI-2018, leg. P. Falck, same data but 1 ♀, 17-30-IX-2018; Carreteria, 455 m, 1 ♂, 2 ♀♀, 8-20-VIII-2020, leg. P. Falck; Barranco de Azuaje, 270 m, 5 ♂♂, 2 ♀♀, 8-20-VIII-2020, leg. P. Falck; San Filipe, 25 m, 1 ♂, 24-X-13-XI-2020, leg. P. Falck; Tenerife, Las Americas, 40 m, 1 ♀, 21-V-3-VI-2019, leg. P. Falck (all PF). **New to the Canary Islands**.

Distribution: Europe, Africa, Cape Verde, and along the southern border zone of the Palaearctic and the Oriental Regions eastwards to Nepal (HACKER *et al*., 2002: 188).

Biology: The larva and pupa are figured in LEPIFORUM (2008-2021).

Remarks. *M. languida* is a resident of the Canary Islands.

Leucania zeae (Duponchel, 1828) (Fig. 25)
Noctua zeae Duponchel, 1828. *Hist. nat. Lépid. Fr*., **7**(1): 363, pl. 122, fig. 4

Material examined: SPAIN, Fuerteventura, Caldereta, 120 m, 1 ♀, 27-II-19-III-2018, leg. P. Falck; Vega de Rio Palmas, 245 m, 3 ♀ ♂, 6-26-I-2020 leg. P. Falck; Gran Canaria, Pie de la Cuesta, 500 m, 1 ♀, 17-30-IX-2018, leg. P. Falck (all PF). **New to the Canary Islands**.

Distribution: Europe (surroundings of the Mediterranean Sea) and from North Africa through the south-western part of the Palaearctic region to Mongolia and Northwest China (HACKER *et al*., 2002: 201).

Biology: The larva feeds on *Phragmites* but is also regarded as a pest of *Zea mays* L. (HACKER *et al*., 2002: 201).

Remarks: *L. zeae* is a resident of the Canary Islands.

***Agrotis corralejoi* Falck & Karsholt, sp. n.** (Fig. 26)

Holotype ♂: SPAIN, Fuerteventura, Corralejo, 10 m, 7-27-XI-2017, leg. P. Falck, genitalia slide 3479PF, DNA sample Lepid Phyl 0763PF/CILEP762-21 (ZMUC).

Paratypes: SPAIN, Fuerteventura, Corralejo, 10 m, 3 ♂♂, 12-23-XI-1997, leg. N. M. Hall

(NHMUK), same data but 25 ♂♂, 29-XI-11-XII-2000, leg. N. M. Hall (NHMUK), same data but 23 ♂♂, 7-27-XI-2017, leg. P. Falck, genitalia slide 3477PF, 3480PF, 3481PF, DNA samples Lepid Phyl0764PF/CILEP763-21, 0765PF/CILEP764-21 (PF, MNCN).

Description: Wingspan 26.5-34 mm. Labial palp porrect, segment 2 whitish mottled with grey and with large, bushy scale tuft, segment 3 short, white. Antenna creamy white, strongly bipectinate. Head, neck, tegula and thorax light grey mottled with white and darker grey. Forewing ground colour pale grey mottled with white, especially along dorsum and costa, and with reddish brown between postmedian fascia and subterminal fascia and around the stigmae; orbicular-, reniform- and claviform stigma quite distinct creamy white, often more or less bordered with black, discal spot diffuse grey; postmedian fascia jagged, sometimes indistinct, subterminal fascia distinct, jagged, distally white. Fringe light grey. Hindwing whitish often with a darker, diffuse subterminal fascia: discal spot small and indistinct. Fringe grey.

Female unknown

Male genitalia (Figs 34, 34a, 34b): Uncus long slightly spatulate. Valva parallel sided, ventral- and dorsal edge almost straight, apex rounded; harpe with a broad base, tapering distally, apex almost pointed, length of sacculus and harpe about 2/3 the length of valva. Saccus rounded. Phallus straight; vesical with a smaller basal swelling, tapering towards apex.

Female genitalia unknown.

Molecular diagnosis: We obtained full lenght DNA barcodes (658 bp) from one specimen and DNA barcode fragments of 632 bp and 621 bp from two specimens. The barcodes fall within Barcode Index Number (BIN) BOLD: AEI1694

The maximum intraspecific distance is 0.32% (mean xx5%, n=3). The p-distance to nearest neighbour *Agrotis venerabilis* Walker, 1857 is 3.55%, with the Barcode Index Number (BIN) BOLD: ABZ1938. The minimum p-distance to *A. aistleitneri* is 7.94%, with the Barcode Index Number (BIN) BOLD: AEW1944 and the minimum p-distance to *A. boeticus* is 4.26%, with the Barcode Index Number (BIN) BOLD: AEF1653.

Diagnosis: Externally, *A. corralejoi* resembles *A. boeticus* (Boisduval, 1837) (Fig. 27) and *A. aistleitneri* Behounek & Speidel, 2009 (Fig. 28). It is distinguished by the pale grey ground colour, the distinct subterminal fascia and the white area distally; furthermore, it differs from *A. aistleitneri* by the much more strongly pectinate antenna. In the male genitalia *A. corralejoi* is distinguished from *A. boeticus* (Figs 35, 35a, 35b) by the slender and pointed harpe and by the lack of the small plate with cornuti in the phallus, and from *A. aistleitneri* by the longer and broader harpe and by the straight ventral and dorsal margin of the valva. The genitalia of *A. aistleitneri* are figured by BEHOUNEK & SEIDEL (2009: 127).

Biology: Early stages unknown. The adult is recorded from October to the beginning of February at light (HACKER *et al*., 1996: 207).

Distribution: *A. corralejoi* is only known from the island of Fuerteventura (Jandia, Costa Calma and Corralejo) (HACKER *et al*., 1996: 207; LEPIFORUM, 2021).

Etymology: The species is named after the town of Corralejo, situated at the northern tip of the island of Fuerteventura. The name was originally suggested by Michael Fibiger and Martin Honey.

Remarks: FIBIGER & SKULE (2004-2021) listed *Agrotis corralejoi* Fibiger & Honey, 2004 (a misspelling of *A. corralejoi*) as a valid species. In 2009 *A. aistleitneri* Behounek & Speidel, 2009 was described from the Cape Verde Islands and *A. corralejoi* was at that time erroneously regarded as conspecific with *A. aistleitneri* (LEPIFORUM, 2008-2021), so the taxon was never described or published in a scientific publication. *A. corralejoi* has also been confused with *A. boeticus*, due to misidentification (LEPIFORUM, 2008-2021).

Numerous males of *A. corralejoi* were attracted to light in the sand-dunes south of Corralejo, but no females were found, in spite of searching for it in the surroundings. We assume that the female is brachypterous, and it may hide in the loose sand, as it is known also from other species of Noctuidae occurring in deserts. Females of *A. aistleitneri* and *A. boeticus* (Boisduval, 1837) are fully winged.

A. boeticus (Boisduval, 1837) and *A. aistleitneri* Behounek & Speidel, 2009 should be removed from the list of Lepidoptera found in the Canary Islands.

Discussion

The Noctuidae are among the most popular groups of nocturnal Lepidoptera. This is both because of their relatively large size, their often-concealed way of life and the diversity of the group. With more than 40,000 species worldwide, the Noctuoidea are the most diverse superfamily of Lepidoptera. As it is often seen the diversity in oceanic islands is much lower and the most recent list of Canary Island Lepidoptera (VIVES MORENO, 2014) listed only 133 species of Noctuidae. This is certainly not due to under-sampling because the islands are, with their pleasant climate, a favourite holiday destination and lepidopterist from several European countries have undertaken fieldwork in the islands for more than 100 years.

In the present paper we add 15 species of Noctuoidea for the Canary Islands, three of which are described as new to science. The latter were previously found by other lepidopterists but were misidentified, and we regard all three to be endemic to the Canary Islands. Some of the newly recorded species are resident in the islands, and the occurrence of others are most likely the result of migration. It is assumed that some species arriving the Canary Islands as migrants, or introduced due to human activities, can establish temporary populations in the islands (sometimes for longer periods of time).

It is of course of high interest to record additions to the fauna of a certain area (here the Canary Islands), but it is also very important to keep the list of taxa occurring there updated. We have therefore critically assessed the current list of Canary Island Lepidoptera (VIVES MORENO, 2014), and we suggest that five species are removed from the list: 3 of them due to misidentifications and 2 of them due to nomenclatorial confusion. The list of Noctuoidea of the Canary Islands thus includes 143 species.

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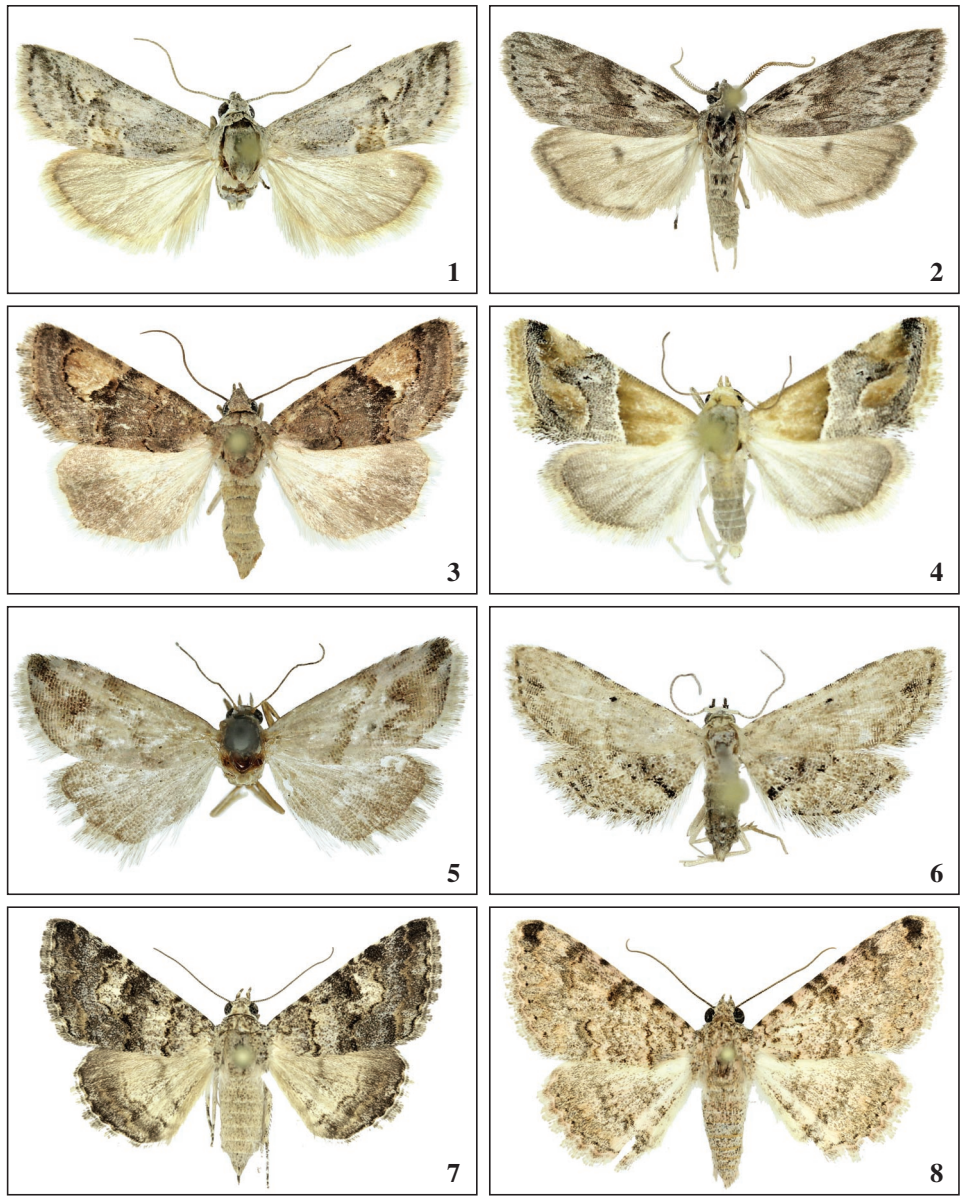
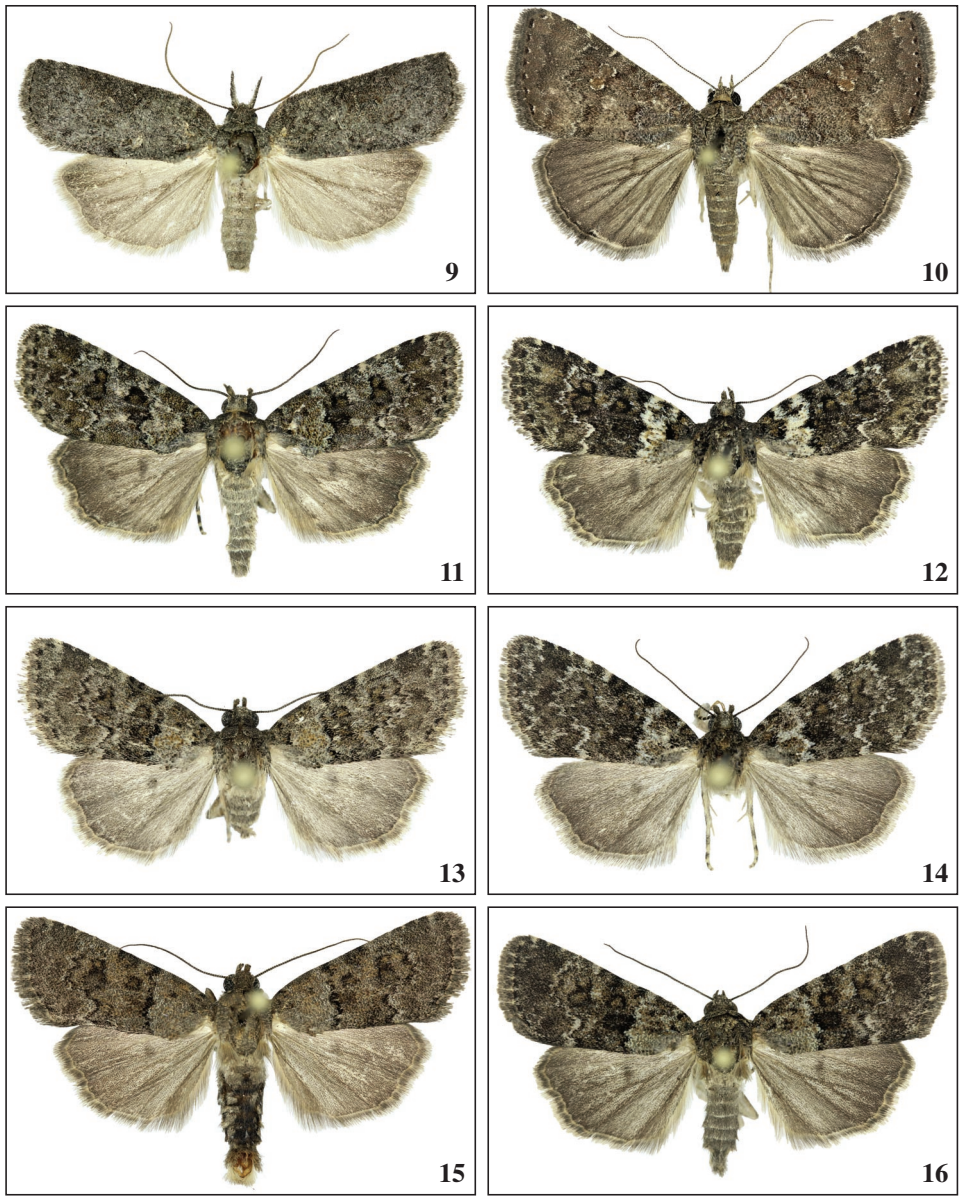
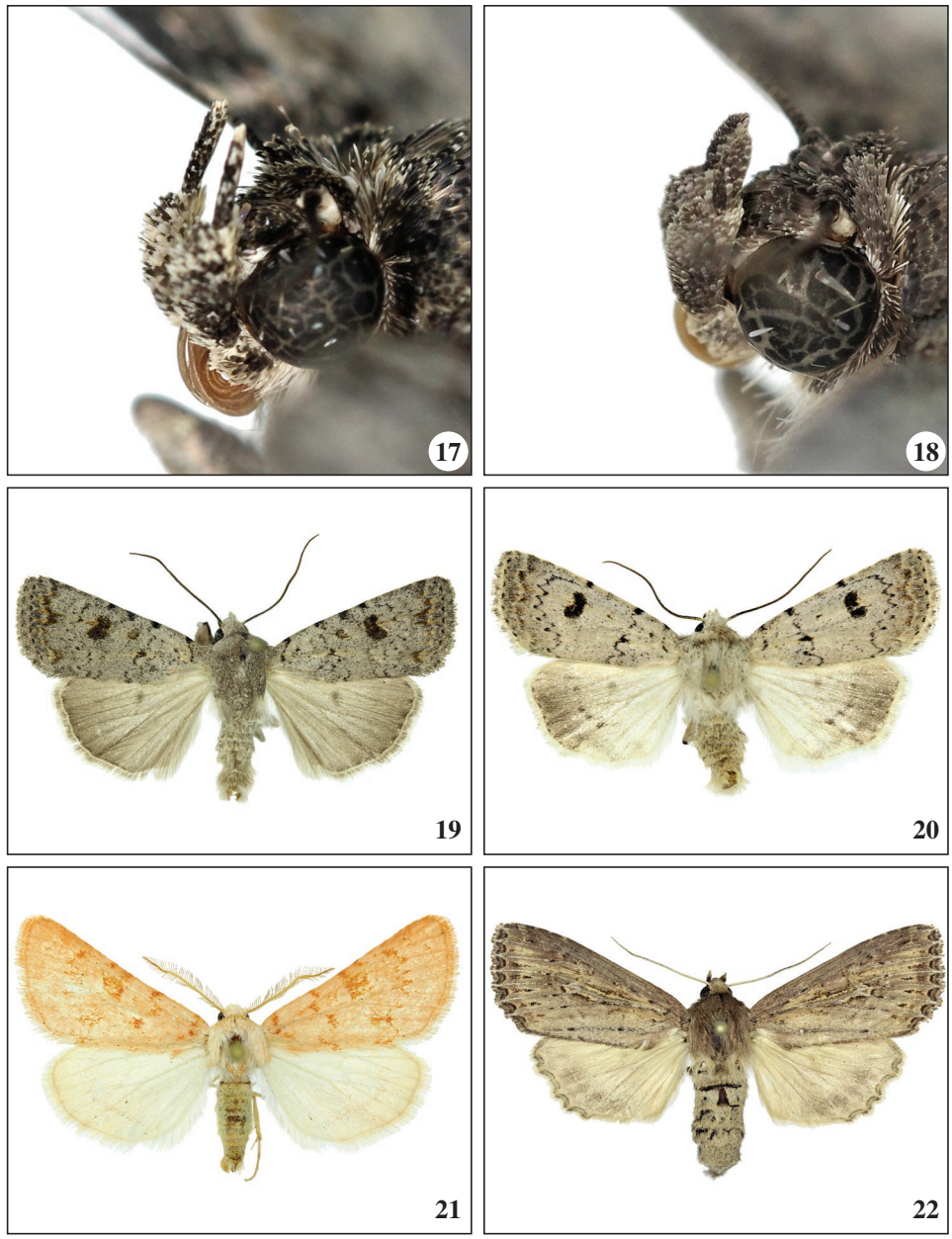


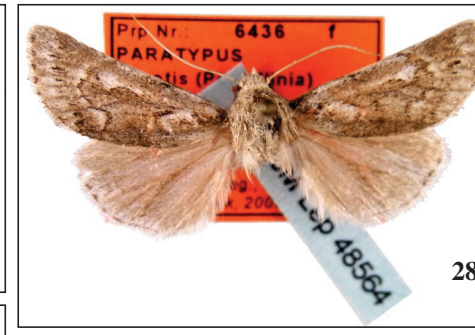
Figs 1-8.– 1. *Zebeeba orzolae* Falck & Karsholt, sp. n., ♂, Lanzarote, 14.5 mm. **2.** *Zebeeba poliotis* (Hampson, 1905), ♂, Tenerife, 22 mm. **3.** *Epharmottomena eremophila* (Rebel, 1895), ♀, Fuerteventura, 23 mm. **4.** *Eublemma thermobasis* Hampson, 1910, ♂, Gran Canaria, 11 mm. **5.** *Eublemma candidana* (Fabricius, 1794), ♀, Tenerife, 13.5 mm. **6.** *Araeopteron ecphaea* (Hampson, 1914), ♀, Gran Canaria, 11 mm. **7.** *Gnamptonyx innexa* (Walker, 1858), ♀, Gran Canaria, 28 mm. **8.** *Rhabdophera acrosticta* (Püngeler, 1904), ♂, Fuerteventura, 30 mm.

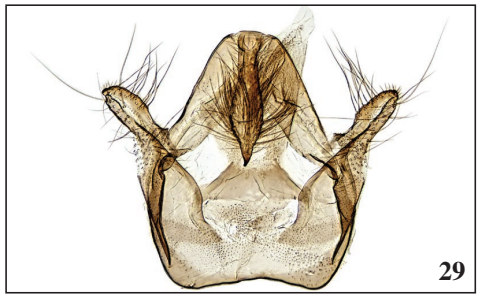


Figs 9-16.– 9. *Nycteola columbana* (Turner, 1925), ♂, Fuerteventura, 22 mm. **10.** *Amyna axis* Guenée, 1852, ♂, Lanzarote, 25 mm. **11.** *Nyctobrya vilfredi* Falck & Karsholt, sp. n., ♂, Gran Canaria, 28 mm. **12.** *Nyctobrya vilfredi* Falck & Karsholt, sp. n., ♀, Gran Canaria, 27 mm. **13.** *Nyctobrya canaria* (Alphéraky, 1890), ♂, Tenerife, 24 mm. **14.** *Nyctobrya canaria* (Alphéraky, 1890), ♀, Tenerife, 24 mm. **15.** *Nyctobrya pinkeri* Behounek & Speidel, 2013, ♂, Gran Canaria, 27 mm. **16.** *Nyctobrya pinkeri* Behounek & Speidel, 2013, ♀, Gran Canaria, 27 mm.

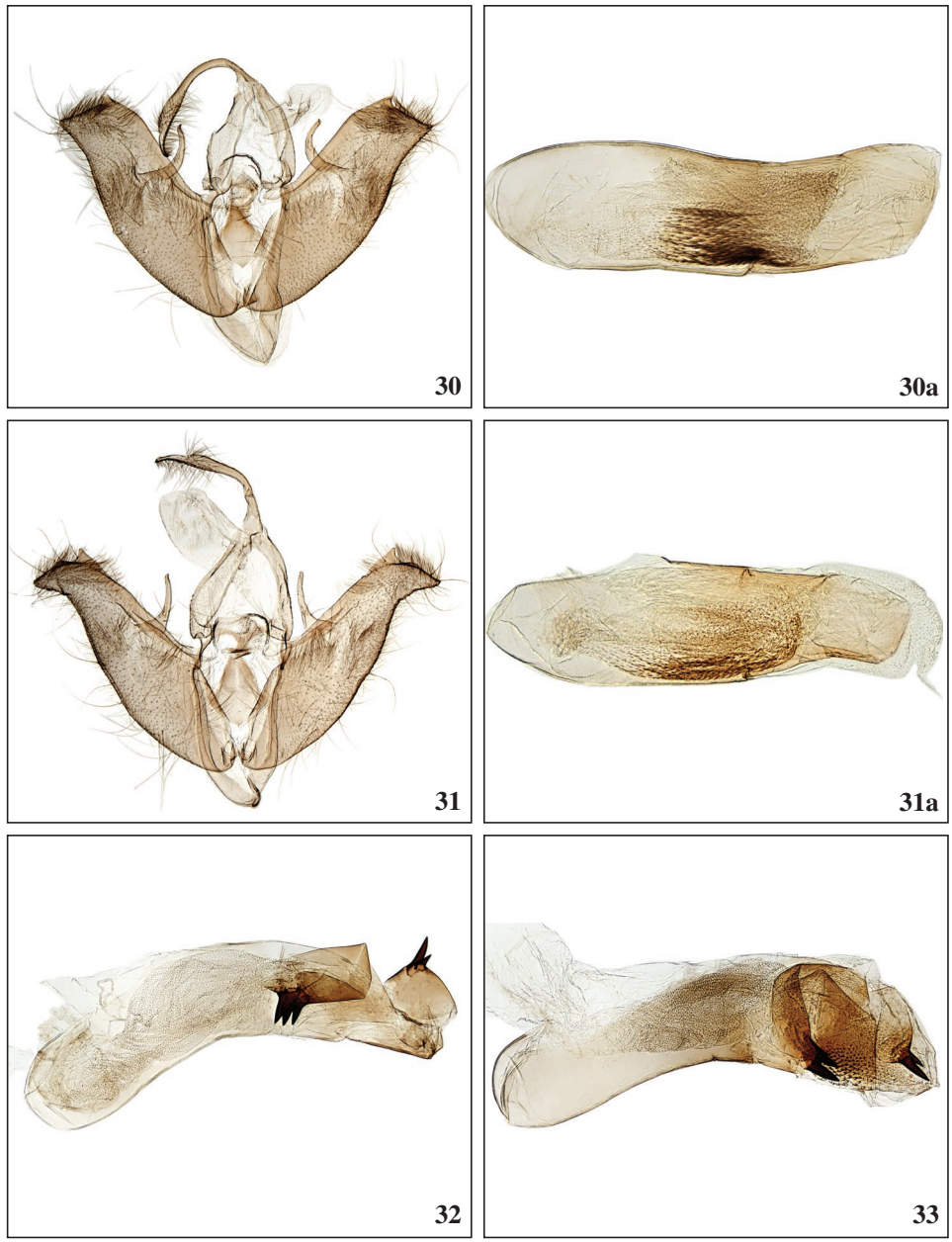


Figs 17-22.– 17. *Nyctobrya vilfredi* Falck & Karsholt, sp. n., palps, Gran Canaria. **18.** *Nyctobrya pinkeri* Behounek & Speidel, 2013, palps, Gran Canaria. **19.** *Caradrina rebeli rebeli* Staudinger, 1901, ♂, Tenerife, 31 mm. **20.** *Caradrina rebeli lanzarotensis* Pinker, 1962, ♂, Fuerteventura, 27.5 mm. **21.** *Polymixis aurora* (Turati, 1924), ♂, Fuerteventura, 31 mm. **22.** *Nonagria typhae* (Thunberg, 1784), ♀, Gran Canaria, 46 mm.

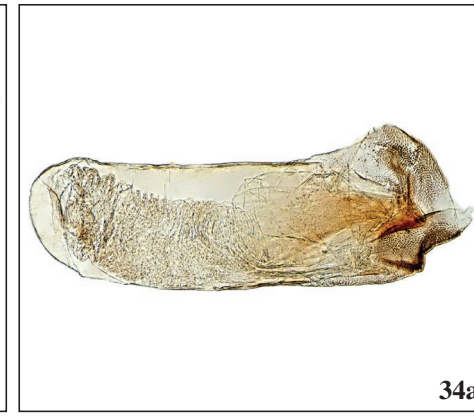


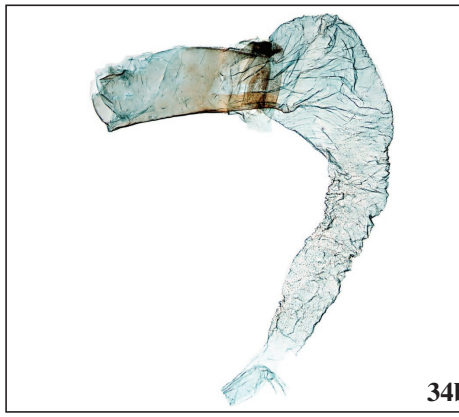


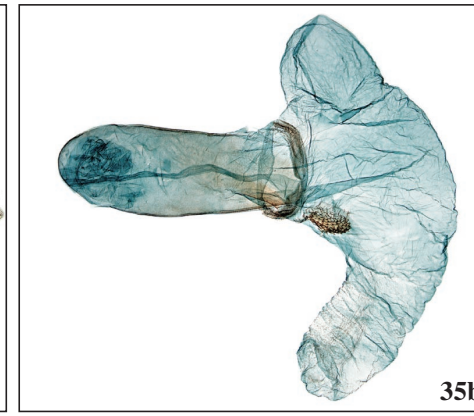
Figs 23-29.– 23. *Mniotype loslobensis* (Fischer, Salditis & Ivinskis, 2007), ♀, Lanzarote, 33.5 mm. **24.** *Mythimna languida* (Walker, 1858), ♂, Gran Canaria, 29 mm. **25.** *Leucania zeae* (Duponchel, 1828), ♂, Fuerteventura, 35 mm. **26.** *Agrotis corralejoi* Falck & Karsholt sp. n., ♂, Fuerteventura, 30 mm. **27.** *Agrotis boeticus* (Boisduval, 1837), ♂, Algarve, Portugal, 30 mm. **28.** *Agrotis aistleitneri* Behounek & Speidel, 2009, ♀, Cape Verde Islands. **29.** *Zebeeba orzolae* Falck & Karsholt, sp. n., ♂, Lanzarote, GP3473PF. **29a.** Phallus, Lanzarote, GP3473PF.



Figs 30-33.– 30. *Nyctobrya vilfredi* Falck & Karsholt, sp. n., ♂, Gran Canaria, GP3294PF. **30a.** Phallus, Gran Canaria, GP3462PF. **31.** *Nyctobrya canaria* (Alphéraky, 1890), ♂, Tenerife, GP3292PF. **31a.** Phallus, Tenerife, GP3292PF. **32.** *Mniotype loslobensis* (Fischer, Salditis & Ivinskis, 2007), phallus, Lanzarote, GP3287PF. **33.** *Mniotype dimorpha* (Rungs, 1948), phallus, Morocco, GP3385aPF.







Figs 34-35.– 34. *Agrotis corralejoi* Falck & Karsholt sp. n., ♂, Fuerteventura, GP3481PF. **34a.** Phallus, Fuerteventura, GP3481PF. **34b.** Phallus with everted vesica, GP3477PF. **35.** *Agrotis boeticus* (Boisduval, 1837), ♂, Algarve, Portugal, GP3484aPF. **35a.** Phallus, Algarve, Portugal, GP3484aPF. **35b.** Phallus with everted vesical, Algarve, Portugal, GP3475aPF.

Figs 36-38.– 36. *Nyctobrya vilfredi* Falck & Karsholt, sp. n., ♀, Gran Canaria, GP3300PF. **37.** *Nyctobrya canaria* (Alphéraky, 1890), ♀, Tenerife, GP3304PF. **38.** *Mniotype loslobensis* (Fischer, Salditis & Ivinskis, 2007), ♀, Lanzarote, GP3478PF.

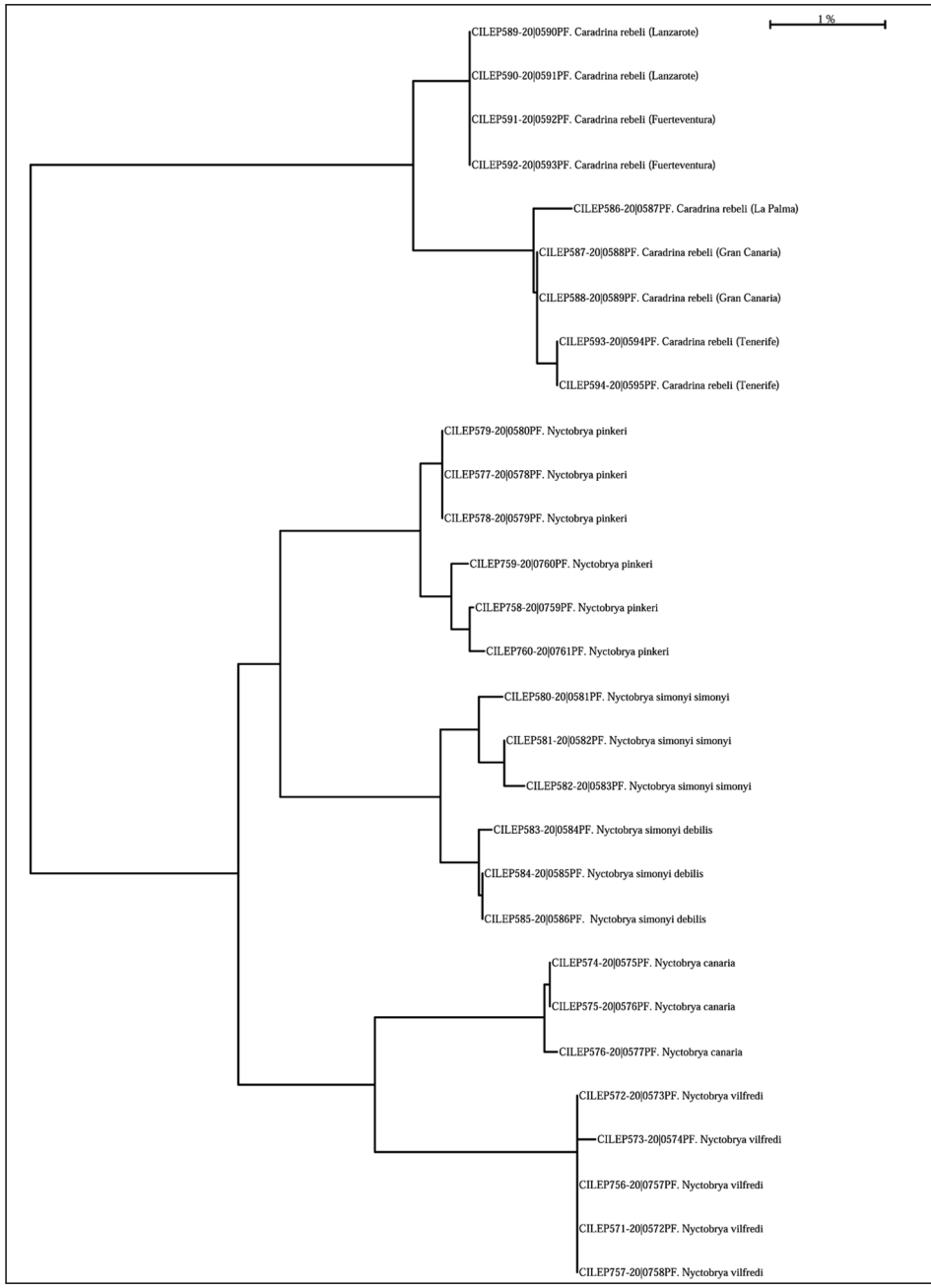


Fig. 39.– Neighbour-joining tree of *Nyctobrya vilfredi* Falck & Karsholt, sp. n., related *Nyctobrya* species and *Caradrina rebeli.*

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REVISIÓN DE PUBLICACIONES
BOOK REVIEWS

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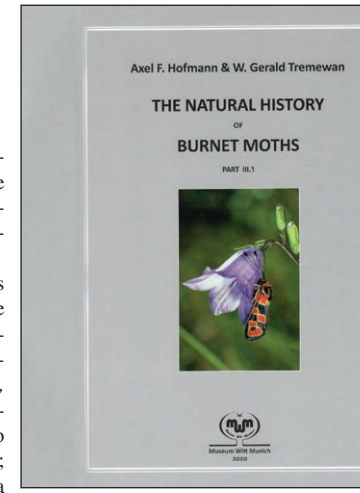

Tenemos en nuestras manos el segundo volumen, en realidad la parte III-1, de esta monografía de primer nivel sobre la fauna de Zygaenidae de la Región Paleártica, de la mano de los destacados especialistas de referencia mundial en esta familia como son Axel Hofmann y W. Gerald Tremewan, que constituye su obra cumbre.

Esta tercera parte está dividida en dos subpartes, en el caso que nos ocupa, después de la introducción y los agradecimientos, nos hablan sobre la vida y bionomía de las especies del género *Zygaena*, a continuación empiezan a tratrase las diferentes especie agrupadas en el subgénero *Mesembrynus* Hübner, [1819] 1816, como en las especies-grupo de *manlia,* con 21 especies restringidas a zonas altas y con especies en estudio de especies gemelas, posiblemente con nuevas especie; en las especies-grupo de *graslini*, con una especie, restringida a partes de Turquía y Asia Menor; en las especies- grupo de *cynarae* con una especie, desde el sur de Francia hasta el Altai; en las especies-grupo de *centaurae*, con tres especies, extremadamente variable; en las especies-grupo de *corsica*, con una especie, endémica de Córcega y Cerdeña; en las especies-grupo de *zuleima*, con una especie, endémica del Norte de África; en las especies-grupo de *favonia*, con seis especies, distribuidas por el sudoeste de Europa y norte de África; en el subgénero *Agrumenia* Hübner, [1819] 1816, en las especies-grupo de *fausta*, con cinco especies, distribuidas por el sudoeste de Europa y norte de África; en las especies-grupo de *hilaris*, con cuatro especies, grupo de especies bien definidas, distribuidas por el sudoeste de Europa y norte de África y en las especies-grupo de *cocandica*, con nueve especies, restringidas desde el este de Irán, por Asia central y hasta el oeste de Pakistán.

De todas las especies consideradas nos dan información sobre su descubrimiento, conceptos generales sobre su variabilidad y su distribución localizada en mapas generales y detallados, datos sobre su biología desde el huevo hasta el adulto, todo ello profusamente ilustrado a todo color, tanto de los adultos, como su variabilidad larval, biotopos más característicos y finalizando con un índice.

No podemos terminar estas líneas, sin felicitar a los autores por un trabajo colosal, así como a la Editorial que continúa apoyando la publicación de estas obras, con una calidad excelente, por lo que recomendamos su adquisición y no pudiendo faltar en cualquier biblioteca de todos los interesados en Zygaenidae. El precio de este libro es de 150 euros y los interesados deben dirigirse a:

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Laetilia coccidivora (Comstock, 1879) preying on *Coccus pseudomagnoliarum* (Kuwana, 1914) in Mexico, first record of Association prey-predator host plant (Lepidoptera: Pyraloidea)

C. Lázaro-Castellanos, N. S. Gómez-Domínguez & J. M. Vanegas-Rico

Abstract

The association between the entomophagous Lepidoptera *Laetilia coccidivora* (Comstock, 1879) is recorded for the first time with the species of Coccoidea *Coccus pseudomagnoliarum* (Kuwana, 1914). This phytophagous insect also represents the first record for Mexico. The material was obtained from the municipality of Cortazar, Guanajuato, Mexico. The host plant, *Acacia farmesiana* (L.) Willd. & Arn., is a new record as a host for the scale insect. The voracity of the larvae of this lepidopteran considerably reduced the individuals collected.
KEY WORDS: Lepidoptera, Pyraloidea, *Laetilia coccidivora*, entomophagous, Fabaceae, Coccoidea, *Coccus pseudomagnoliarum*, Mexico.

Laetilia coccidivora **(Comstock, 1879) alimentándose sobre** *Coccus pseudomagnoliarum* **(Kuwana, 1914) en México, primer registro de asociación presa-depredador planta alimenticia (Lepidoptera: Pyraloidea)**

Resumen

La asociación entre el Lepidoptera entomófago *Laetilia coccidivora* (Comstock, 1879) se registra por primera vez con la especie de Coccoidea *Coccus pseudomagnoliarum* (Kuwana, 1914). Dicho insecto fitófago representa también el primer registro para México. El material se obtuvo del municipio de Cortazar, Guanajuato, México. La planta alimenticia, *Acacia farmesiana* (L.) Willd. & Arn., es un registro nuevo como hospedante del Coccoidea. La voracidad de las larvas de este Lepidoptera redujo considerablemente los individuos recolectados.
PALABRAS CLAVE: Lepidoptrera Pyraloidea, *Laetilia coccidivora*, entomófago, Fabaceae, Coccoidea, *Coccus pseudomagnoliarum*, México.

Introduction

The entomophagous dietary is a quality of some species of subfamily Phycitinae (SOLIS, 2008). Among these organisms, *Laetilia coccidivora* (Comstock, 1879), a predator located from the south of the USA to Central America, is reported (MANN, 1969). Studies on this moth refer mainly to its association with *Opuntia ficus-indica* (L.) Miller, where it feeds on prickly pear cochineal and occasionally on other sessile insects (PORTILLO & VIGUERAS, 2006; SOLIS, 2008; VANEGAS-RICO *et al*., 2010). The ability of this lepidopteran to tolerate the deterrent substance known as

carminic acid has contributed to being considered a potential agent of classic biological control on *Dactylopius coccus* Costa, 1829 in Africa (BARRETO-GARCÍA *et al*., 2020).

One of the relevant aspects in the development of biological control programs is to know the possible non-target of the released species. Therefore, the present work had the objective of determining the species of scale insects' prey of *L. coccidivora* in a locality of the Guanajuato state, Mexico.

Materials and Methods

In October 2018, sampling of Fabaceae (branch of 40 cm) infested with scale insects, was done at the municipality of Cortazar, Guanajuato (20º29'31.02"N, 100º55'23.59"O, 1744 m). A few coccids showed dorsal damage from bites of predatory larvae and silk tunnels. The branches were cut and placed in 20 cm tricot-nylon fabric bags for review in a personal laboratory at room temperature. Preserving some specimens of coccids in ethanol 70%, and the rest in the fabric cage with predaceous larvae. Emerged adult of moth were cold sacrificed in a domestic refrigerator, mounted and compared with *L. coccidivora* collection in 2018. The scale insect specimens were processed in 2019 with the technique of HAMON & KOSZTARAB (1979). Determination was made in 2020, by the first author, with the keys of GILL (1988), It would be deposited some Voucher specimens in the authors' personal collections and in the Coccoidea collection of the Faculty of Higher Studies Iztacala (UNAM). The Fabaceae were determinate with a visual guide of native Flora and de keys of RICO (2001).

Results and Discussion

The Lepidoptera *L. coccidivora* is a widely distributed entomophagous in the prickly pear areas of Mexico. Among these places, there are some municipalities of Guanajuato, where it occurs in wild *Opuntia* infested with *Dactylopius opuntiae* (Cockerell, 1896) and *Dactylopius confusus* (Cockerell, 1893) (unpublished data). Two adults of *L. coccidivora* were got, also observed three larvae and one pupa with evidence of cannibalism, a phenomenon recorded in other populations of *L. coccidivora* (VANEGAS-RICO *et al*., 2018).

The closest specimens of these Pyraloidea larvae, were in *Opuntia*, almost 2 km on the same road. It is probable that its adults moved through the air currents and reached the Fabaceae *Acacia farmesiana* (L.) Willd. & Arn., a common plant in the state, rather tolerated in the marginal areas of crops and on the roadside, site where it was collected.

The soft scale corresponds to *Coccus pseudomagnoliarum* (Kuwana, 1914) (Fig. 1), parthenogenetic species (GARCÍA-MORALES *et al*., 2016) that presents one generation per year, individuals of the same stage of development are generally found in the population, nymphs and adult females are mainly found on twigs (GILL, 1988); mainly attacks citrus species, although it also others plants (GILL *et al*., 1977) such as pomegranate, walnut, laurel rose, feijoa, and others; depending on the country, it can be a pest of economic and minor importance in citrus crops (GARCÍA-MORALES *et al*., 2016); in these, it causes tree decline and low fruit production due high removal of sap, in addition to the production of honeydew that causes the appearance of sooty mold on fruits (GILL, 1988); insecticides have been used to manage this Coccoidea, and several species of entomophagous have been registered as natural enemies, mainly parasitoids, as possible biological agents control (GARCÍA-MORALES *et al*., 2016).

Voracity of *L. coccidivora* on the adult populations of this scale was high, registering that over 95% of them had the ventral part total consumed, leaving only the dorsal cover adhered to each other with other scales by silk tunnels. *C. pseudomagnoliarum* is recorded from 22 countries. In the American continent USA were recorded (GARCÍA-MORALES *et al*., 2016), although GILL *et al*. (1977) and GILL (1988) report the presence of the species in Mexico but without indicating hosts and collection sites. So, this is the first record for Mexico. In Guanajuato, there are native species of the genera *Berberis*, *Celtis*, *Juglans* and *Rhamnus*, as well as other urbanized ones such as *Nerium oleander* L. and *Citrus* sp. which are mentioned as hosts of this insect (GARCÍA-MORALES *et al*., 2016) and could be

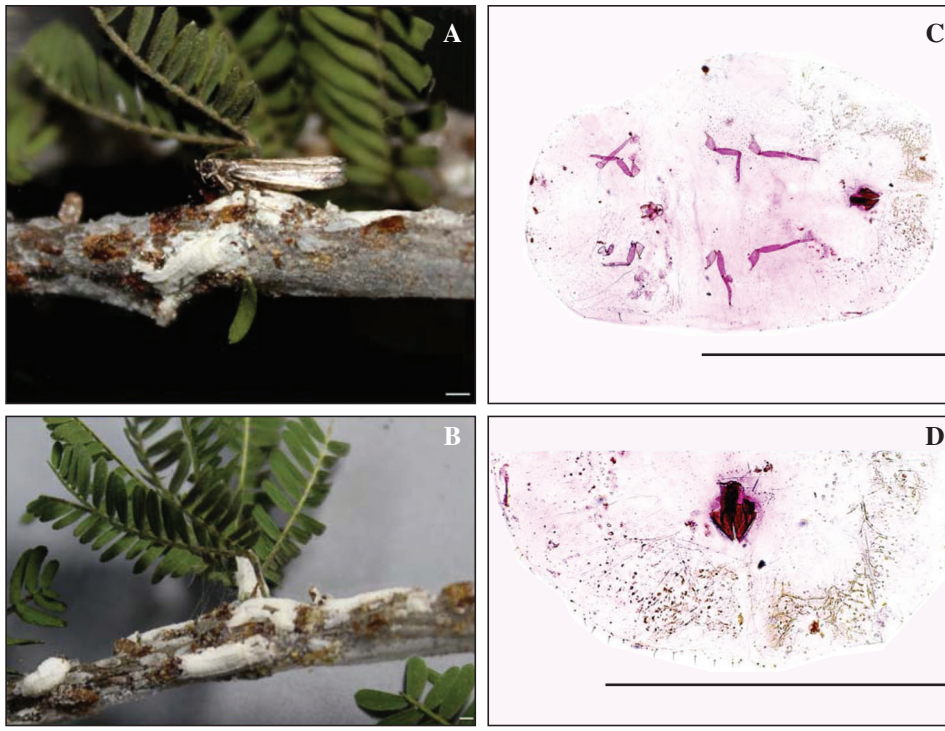

Fig. 1.– Association *Laetilia coccidivora-Coccus pseudomagnoliarum-Acacia farmesiana*. **1a.** emerged *L. coccidivora* adult. **1b.** *C. pseudomagnoliarum* predated and linked with silk. **1c.** Complete body of *C. pseudomagnoliarum*. **1d.** Detail of pygidium. Scale 1 mm.

the sources of dispersal, but it is probable that due to the action of this predator, the populations of the scale are regulated and do not cause significant damage.

Presence of *L. coccidivora* on the Coccoidea *C. pseudomagnoliarum* is a fortuitous event probably caused by the ability to feed on more than 24 prey species, some of this related to *Opuntia* sp. (PORTILLO & VIGUERAS, 2006; SOLIS, 2008; VANEGAS-RICO *et al*., 2010; VANEGAS-RICO *et al*., 2018; BARRETO-GARCÍA *et al*., 2020), which suggests a high capacity for adaptation to other food resources. Mexico is the second country in America with the presence of *C. pseudomagnoliarum*, its development on *A. farmesiana* represents a new record of the association between predator-phytophagous-plant.

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Primer registro de *Streblote panda* Hübner, [1820] 1816 para Ceuta, España (Lepidoptera: Lasiocampidae)

J. Gómez-Fernández

Resumen

Se presenta el primer registro conocido del Lasiocampidae *Streblote panda* Hübner, [1820] 1816 para Ceuta (España).
PALABRAS CLAVE: Lepidoptera, Lasiocampidae, *Streblote panda*, Ceuta, España.

First record of *Streblote panda* Hübner, [1820] 1816 from Ceuta, Spain (Lepidoptera: Lasiocampidae)

Abstract

The first know record of the Lasiocampidae *Streblote panda* Hübner, [1820] 1816 from Ceuta (Spain) is presented.
KEY WORDS: Lepidoptera, Lasiocampidae, *Streblote panda*, Ceuta, Spain.

Introducción

Dentro de la familia Lasiocampidae Harris, 1841, el género *Streblote* Hübner, [1820] 1816 tiene una gran distribución Afrotropical con un grupo de especies que se encuentran en la región Paleártica e Indo-malaya (ZOLOTUHIN, 2015).

En la región Paleártica, *Streblote panda* Hübner, [1820] 1816 se distribuye por el sur de Europa (España, Italia, Portugal) y en el norte de África, donde está presente desde la franja litoral atlántica de Marruecos, continuando por todo el litoral mediterráneo hasta Libia (LERAUT, 2006; ZOLOTUHIN, 2015). Ya en Egipto la especie *Streblote aegyptiaca* (Bang-Haas, 1906) se considera como válida, antes se la consideraba una subespecie de *S. panda* (ZOLOTUHIN, 2015).

Desde el Algarve, en Portugal (MARABUTO & CARDOSO, 2009), ocupa una ancha franja costera atlántica, a lo largo del estrecho de Gibraltar, continuando ampliamente por todo el litoral mediterráneo, llegando hasta Tarragona (GÓMEZ-BUSTILLO & FERNÁNDEZ-RUBIO, 1978; REDONDO *et al*., 2015), estando presente en España en las regiones de Andalucía, Murcia, Comunidad Valenciana y Cataluña (REDONDO *et al*., 2015).

Su hábitat es principalmente cercano a la costa, en ambientes halófilos y biotopos arenosos (DE FREINA & WITT, 1987; PÉREZ DE-GREGORIO *et al*., 2001; REDONDO *et al*., 2015).

Su biología está estudiada en numerosas publicaciones de forma monotemática con fines agrícolas de manejo y control de plagas (CALVO, 2004; CALVO & MOLINA, 2004, 2005a, 2005b, 2005c), ya que ocasionalmente puede serlo en los cultivos y frutales del sur de la Península Ibérica.

Esta especie presenta unas antenas fuertemente bipectinadas curvadas hacia atrás, desde la base hasta la mitad de su longitud, y en la mitad frontal los dientes del peine se acortan abruptamente, siendo la terminación corta y con forma de muñón. La cabeza y el tórax son de color gris rojizo, el abdomen gris amarillento y, en el extremo abdominal, presenta un mechón más oscuro (DE FREINA & WITT, 1987). Las alas anteriores son de un color marrón rojizo con una fina línea blanca que separa el borde exterior de la mediana, es más oscura desde esta línea hacia la basal, las posteriores son enteramente marrón rojizo (GÓMEZ DE AIZPÚRUA, 2002). Las tégulas de color marrón oscuro, bien marcadas y diferenciadas. *S. panda* tiene un gran dimorfismo sexual en el tamaño de los imagos, los machos poseen una envergadura alar de 30-40 mm, mientras que las hembras de 45-70 mm (DE FREINA & WITT, 1987), presentando además éstas una ornamentación alar menos destacada y con las antenas mucho más finamente pectinadas (PÉREZ DE-GREGORIO *et al*., 2001).

Las larvas son invernantes, de tamaño grande, con un color gris ocráceo, con líneas blancas y pinaculum dorsales amarillos, con dos trazos negros sobre el tórax (GÓMEZ DE AIZPÚRUA, 2002), donde albergan sus pelos urticantes. Las plantas nutricias de sus larvas son Asteraceae, Cistaceae, Cupressaceae, Cupuliferaceae, Ericaceae, Fabaceae, Geraniaceae, Malvaceae, Myrtaceae, Rosaceae, Rutaceae, Salicaceae, Sapindaceae, Sapotaceae, Tamaricaceae, Terebinthaceae y Pinaceae (ZOLOTUHIN, 2015).

El capullo es fusiforme, de color marrón, apergaminado, abierto por ambos extremos y muy firmemente sujeto a una rama, de modo que es prácticamente imperceptible entre el ramaje (DÍAZ, 1998).

S. panda tiene de dos a cuatro generaciones anuales, en el periodo comprendido entre enero y noviembre (DE FREINA & WITT, 1987; LERAUT, 2006), aunque si el clima es más rudo puede invernar como pupa (PÉREZ DE-GREGORIO *et al*., 2001).

Material y métodos

Para la determinación y clasificación, se ha seguido en la nomenclatura a VIVES MORENO (2014).

Para su identificación nos hemos basado en el examen comparativo de los caracteres morfológicos externos, ya que además es una especie fácilmente reconocible por fotografía o de visu, no hay otra similar con la que se pueda confundir (PÉREZ DE-GREGORIO *et al*., 2001).

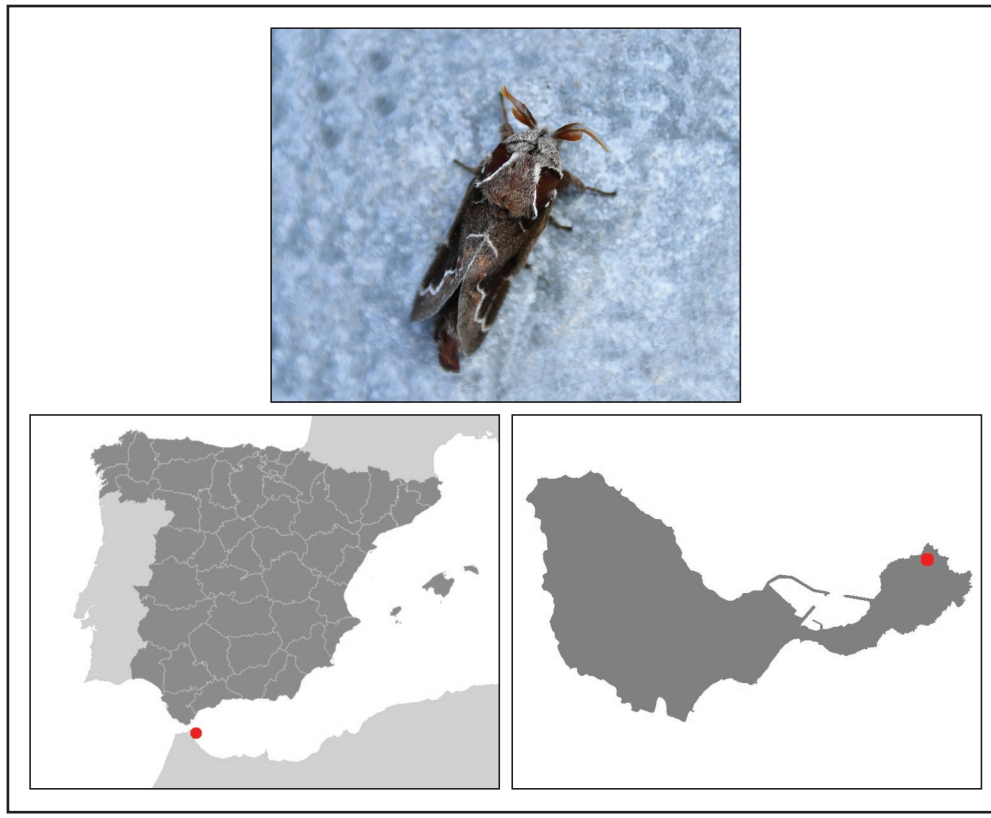
Las fotografías fueron realizadas con una cámara Nikon D500 con objetivo Sigma 18-300 mm, tiempo de exposición 1/1600 s, velocidad ISO-3200 y con una resolución de 3088 X 2059 píxeles.

Resultados

El ejemplar, un imago en perfecto estado, fue observado y fotografiado en Ceuta, el 18 de abril de 2021, a las 18:26 h., posado sobre el pie vertical de una farola metálica en el aparcamiento al aire libre del Parque de Santa Catalina, lugar que se corresponde con el extremo nororiental de la Península Tingitana, en una zona cercana al borde del mar y despejada prácticamente de vegetación, registrándose los siguientes datos de observación: Coordenadas GPS 35º54’15.4”N, 5º17’21.0”W. 19 m. altitud. Sistema MGRS y Datum ETRS89 30STE9375 (correspondiente a esa cuadrícula de 1 X 1 km de lado).

El imago es un ejemplar macho de *S. panda* Hübner, [1820] 1816, siendo el único observado en la zona, no fue capturado. Probablemente, después de haber sido atraído lumínicamente (ambos sexos son atraídos por la luz artificial, pero especialmente los machos, como se indica en PÉREZ DE-GREGORIO *et al*., 2001) y de haber tenido una noche de actividad intensa eligió ese lugar para posarse y descansar durante el día, esperando a que de nuevo llegase el anochecer para emprender vuelo reproductivo. Dado el carácter polífago de las larvas de esta especie, es posible que este ejemplar pertenezca a una población establecida en Ceuta. No hay que olvidar tampoco la abundancia

de *Cupressus sempervirens* L. plantados ornamentalmente en el cercano cementerio de Santa Catalina, así como otras plantas nutricias en el Monte Hacho, que pudieran favorecer la colonización de toda esa zona por esta especie.



Se ha demostrado que hay diferencias de hasta un COI 4,2 % en la línea de polimorfismo genético en las poblaciones de Marruecos de *S. panda* con respecto a poblaciones europeas y que, probablemente, estemos ante una especie diferenciada (ZOLOTUHIN, 2015). Tan sólo, hasta ahora, se han basado en los rasgos y caracteres externos de los ejemplares en todos los trabajos realizados, sería deseable poder analizar las diferentes poblaciones existentes para establecer sus diferencias y poder asignar a cada territorio monotípico correspondiente.

Streblote panda está ampliamente distribuida en Marruecos (RUNGS, 1981) llegando hasta el Sahara Occidental (RUNGS, 1992), donde cohabita con *Streblote acaciae* (Klug, 1829), pero no hay posibilidad de confusión entre ambas, siendo esta última de tonos blancos y grisáceos.

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Communities of Lepidoptera along an elevational gradient in the Brazilian Atlantic Forest (Lepidoptera: Papilionoidea)

L. R. Vieira, N. R. Henriques & M. M. de Souza

Abstract

The diversity and composition of Lepidoptera communities vary along an elevational gradient, with richness and abundance generally decreasing as elevation increases. In Brazil, however, there is a lack of data on the topic and many elevation zones remain unexplored. This study aimed to examine the effect of elevation variation on the richness, frequency, abundance, and composition of Lepidoptera in an Atlantic Forest region in southern Minas Gerais State, Brazil, and we also present the first species list of Lepidoptera of the Fernão Dias Environmental Protection Area. The study was conducted between October 2019 and March 2020, and sampling was performed with the same sampling effort at three elevation levels by active (nets) and passive (bait trap) methods. A total of 622 Lepidoptera individuals, belonging to 154 species, were sampled. The family Nymphalidae exhibited the highest richness and abundance. The highest elevation zone showed the greatest number of exclusive species. Richness and abundance were highest at middle elevation, but differences between elevation zones were not statistically significant. Richness estimators indicated a mean sampling efficiency of 64.97%. In contrast to the expected pattern, species richness was highest in middle and high elevation zones, which might reflect the greater degree of conservation of these areas. The findings reported here contribute to a better understanding of the diversity of Lepidoptera in higher elevation zones of Atlantic Forest regions in Brazil.
KEY WORDS: Lepidoptera, Papilionoidea, altitude, insect conservation, inventory, biodiversity, species richness, Brazil.

Comunidades de Lepidoptera a lo largo de un gradiente de elevación en el bosque atlántico brasileño (Lepidoptera: Papilionoidea)

Resumen

La diversidad y composición de las comunidades de Lepidoptera varían a lo largo de un gradiente de elevación y, la riqueza y abundancia, generalmente disminuyen a medida que aumenta la elevación. En Brasil, sin embargo, hay una falta de datos sobre el tema y muchas zonas de elevación permanecen sin explorar. Este estudio tuvo como objetivo examinar el efecto de la variación de elevación sobre la riqueza, frecuencia, abundancia y composición de los Lepidoptera en una región del bosque atlántico en el sur del Estado de Minas Gerais, Brasil, y también presentamos la primera lista de especies de Lepidoptera de Fernão Dias Ambiental Área de Protección. El estudio se realizó entre octubre de 2019 y marzo de 2020 y el muestreo se realizó con el mismo esfuerzo de muestreo en tres niveles de elevación por métodos activos (redes) y pasivos (trampa de cebo). Se muestrearon un total de 622 individuos de Lepidoptera, pertenecientes a 154 especies. La familia Nymphalidae exhibió la mayor riqueza y abundancia. La zona de mayor elevación mostró el mayor número de especies exclusivas. La riqueza y abundancia fueron más altas en la elevación media, pero las diferencias entre las zonas de elevación no fueron estadísticamente significativas. Los estimadores de riqueza indicaron una eficiencia muestral media del 64,97%. En contraste con el patrón esperado, la riqueza de especies fue mayor en las zonas de elevación media y alta, lo que podría reflejar el mayor grado de conservación de estas áreas. Los hallazgos indicados aquí, contribuyen a una

mejor comprensión de la diversidad de Lepidoptera en zonas de mayor elevación de las regiones del Mata Atlántica en Brasil.
PALABRAS CLAVE: Lepidoptera, Papilionoidea, altitud, conservación de insectos, inventario, biodiversidad, riqueza de especies, Brasil.

Introduction

Butterflies, together with moths, belong to the order Lepidoptera and are represented in Brazil by about 3,487 described species (CASAGRANDE & DUARTE, 2021), currently grouped into seven families (Hesperiidae, Lycaenidae, Nymphalidae, Papilionidae, Pieridae, Riodinidae, and Hedylidae) (MITTER *et al.*, 2017). These insects are considered excellent biological indicators because they have short life cycle, show high sensitivity to environmental changes, are easy to sample at all times of the year, and are well known taxonomically (BROWN, 1991; FREITAS *et al.*, 2006; BOGIANI *et al.*, 2012). Lepidoptera are also important pollinators, sometimes more efficient than bees in high-altitude environments (GIULIETTI *et al.*, 1987; MOTA *et al.*, 2016; PIRES *et al.*, 2020), being used as flag species for biodiversity conservation (HENRIQUES *et al.*, 2019).

The composition, diversity, and distribution of Lepidoptera communities vary along environmental gradients and are influenced by several environmental factors, including elevation (LIEN & YUAN, 2003; FREITAS *et al.*, 2007; FERNANDES *et al.*, 2016). An increase in elevation influences abiotic conditions such as temperature, humidity, atmospheric pressure, solar radiation, wind speed and direction, among others, affecting the development, feeding, and general behaviour of insects (HODKINSON, 2005). The most commonly observed pattern for insect communities is a reduction in richness and abundance at higher elevations, with greater diversity in low or mid zones (FERNANDES *et al.*, 2016; PIRES *et al.*, 2020), and such trend also applies to Lepidoptera. Studies carried out in different environments demonstrated that low elevations host a greater diversity of Lepidoptera, with more uniform species distribution (SPARROW *et al.*, 1994; ISMAIL *et al.*, 2018). Other investigations found greater diversity in mid-elevation zones, where temperature and rainfall levels were within the optimal range for butterfly survival (STEFANESCU *et al.*, 2004; ILLÁN *et al.*, 2010; ABRAHAMCZYK *et al.*, 2011).

Previous studies evaluated the composition and diversity of Lepidoptera along elevational gradients in Brazil (CARNEIRO *et al.*, 2014; FERNANDES *et al.*, 2016; PEREIRA *et al.*, 2017; HENRIQUES *et al.*, 2019; BEIRÃO *et al.*, 2020; PIRES *et al.*, 2020). However, data related to the influence of elevation on Lepidoptera communities in Brazil are still scarce and many elevation zones remain to be studied (HENRIQUES *et al.*, 2019), especially considering its large territorial extension. From this perspective, this study aimed to examine the effects of elevation variation on the richness, frequency, abundance, and composition of a butterfly community in an Atlantic Forest region in southern Minas Gerais State, Brazil. It was hypothesized that species richness and abundance are lower at higher elevations, with richness decreasing as elevation increases or diversity peaking at mid-elevation, following the commonly observed pattern of species distribution for Lepidoptera and other terrestrial insects (FERNANDES *et al.*, 2016; PIRES *et al.*, 2020). This study also includes the first species list of Lepidoptera of the Fernão Dias Environmental Protection Area, Minas Gerais State, Brazil.

Material and methods

Study area

This study was conducted in the Fernão Dias Environmental Protection Area, located in the municipality of Gonçalves (22º30’13”S 45º31’24”W, Fig. 1), southmost part of Minas Gerais State, Mantiqueira Mountain region, Brazil. The area is covered by semideciduous and mixed seasonal forest formations, typical phytophysionomies of the Atlantic Forest domain (OLIVEIRA FILHO, 2006). The

climate is temperate rainy (Köppen classification: Cwb), the average annual rainfall is approximately 1500 mm, the average temperature is 14-19 ºC, and elevations range from 880 to 1670 m (MELO & SALINO, 2007).

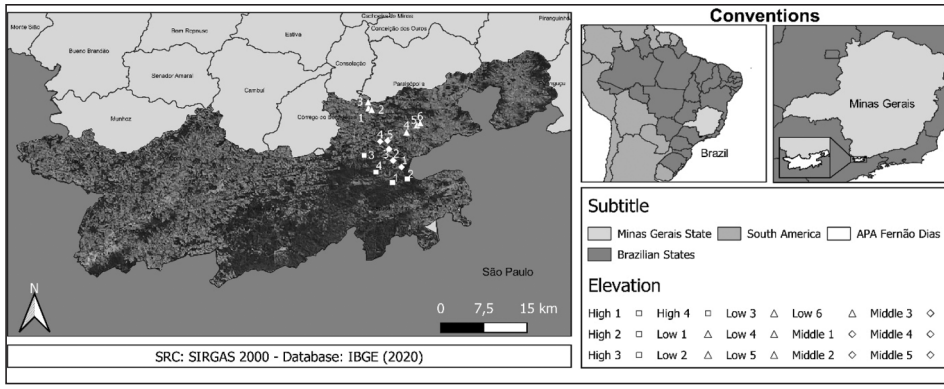

Figure 1.– Map of the location of the Fernão Dias Environmental Protection Area, southern Minas Gerais State, Brazil, and the location of the sampling sites along the elevational gradient, at every 160 meters of altitude.

DATA SAMPLING

Sampling was carried out in the rainy season during four campaigns (October and December 2019 and January and March 2020) of four consecutive days each at 160 m elevation increments in three (low, middle, and high) elevation zones ranging from 880 to 1670 m above sea level. Elevation zones were associated with different plant covers and degrees of conservation, which were assessed by field observation (for example, presence of Bromeliaceae and pasture). Characterization was also performed on the basis of information provided by the municipality of Gonçalves (presence of hiking trails, waterfalls, and tourist accommodation) (Table I). Google Earth satellite images were used to determine the degree of habitat fragmentation.

Table I.– Ecological, social, and economic characteristics of the three elevational zones in the Fernão Dias Environmental Protection Area, southern Minas Gerais State, Brazil.

Variable	Low elevation	Middle elevation	High elevation
Elevation	880 to 1090 m	1250 to 1410 m	1570 to 1670 m
Phytophysiognomy	Semideciduous forest	Mixed and semideciduous forest	Mixed forest
Fragmentation	More fragmented	Moderately fragmented	Less fragmented
Regeneration stage	Early and intermediate	Intermediate	Advanced
Canopy formation	Rare	Less frequent	More frequent
Pasture areas	Many	Few	Few
Eucalyptus cultivation	Present	Present	Present
Ecotourism	Low	High	High
Riparian zone width	<5 m	5–10 m	>10 m
Residential areas	Many	Many	Few

Sampling was performed by passive and active methods. Passive sampling consisted of the use of three van Someren-Rydon traps baited with banana and sugarcane broth fermented for 48 h per

elevation zone (UEHARA-PRADO *et al.*, 2009). Nine baited traps were kept in the field for 4 consecutive days (96 h) during each campaign, totaling 1,632 h of trap sampling. Active sampling was performed for 17 days by using entomological nets during the same period of the day, between 8:00 and 16:00 h (8 h/day), with sampling times distributed equally between elevation zones, totaling 136 net-hours and a sampling effort of 1,738 h.

All sampled individuals were sacrificed in the field and stored in entomological envelopes labeled with locality, date, collector's name, type of collection, and elevation zone. Subsequently, samples were sent to the Laboratory of Butterfly Ecology and Systematics of the University of Campinas (LABBOR/UNICAMP) for identification. One part of the material was deposited in the collection of butterflies and moths of the Museum of Zoology of the University of Campinas (ZUEC-LEP, UNICAMP) and the other in the collection of the Laboratory of Zoology of the Federal Institute of Education, Sciences, and Technology of Southern Minas Gerais (IFSULDEMINAS), Inconfidentes campus, Brazil.

Data analysis

The frequency distribution of butterfly species was assessed by classifying rare species as singletons (only one individual recorded in one sample), doubletons (two individuals recorded), unique (species recorded in only one sample), and duplicates (species recorded in two samples). Differences in richness and abundance between elevation zones were tested by generalized linear models, using richness and abundance as response variables and elevation as an explanatory variable. The diversity of each zone was measured by Shannon's diversity (H'), Pielou's evenness (J, calculated from H'), and Simpson's dominance (D) indices. Sampling efficiency and the total number of butterfly species in the experimental area were estimated from the mean values of Jackknife 1, Jackknife 2, and Chao 2 estimators, with 1000 randomizations. Analyses were performed using PAST software version 3.24 (HAMMER *et al*., 2001) and R software (R Development Core Team, 2017).

Results

In this study, we recorded 622 butterfly individuals, distributed in 154 species belonging to 6 families (Table II). Nymphalidae was the family with the highest species richness (89 species, 57.79% of the species sampled, Fig. 2), followed by Hesperiidae (31 species, 20.13%), Pieridae (15 species, 9.74%), Papilionidae (7 species, 4.55%), and Lycaenidae and Riodinidae (6 species each, 3.9% each). Nymphalidae was also the most abundant family, accounting for well over half of the collected individuals (n = 438, 70.42%, Fig. 2), followed by Pieridae (n = 66, 10.61%), Hesperiidae (n = 63, 10.13%), Papilionidae (n = 26, 4.18%), Lycaenidae (n = 15, 2.41%), and Riodinidae (n = 14, 2.25%). Of the 89 butterfly species belonging to the family Nymphalidae, 14 (15.7%) were sampled exclusively by using attractive traps.

The most abundant species were *Hermeuptychia* sp. (Nymphalidae: Satyrinae, n = 54), *Forsterinaria necys* (Godart, [1824]) (Nymphalidae: Satyrinae, n = 30), *Tegosa* sp. (Nymphalidae: Nymphalinae, n = 20), *Mechanitis lysimnia* (Fabricius, 1793) (Nymphalidae: Danaine, n = 19), and *Anartia amathea roeselia* (Eschscholtz, 1821) (Nymphalidae: Nymphalinae, n = 17), which together accounted for 22.5% of the sampled Lepidoptera. *M. lysimnia* (Fabricius, 1793) was the most frequent species, collected on 11 of the 17 days of sampling. A total of 20 species were found in all elevation zones (13.64% of the sampled community). Furthermore, 60 species were represented by only one individual (singletons) and 28 species by two individuals (doubletons), indicating that more than half of the recorded species (57.14%) can be classified as rare, 70 as unique (captured once), and 28 as duplicates (captured twice).

In comparing elevation zones (Fig. 2), it was found that the middle elevation had the highest richness (n = 91, 59%), abundance (n = 268, 48%), and diversity (H' = 4.084), whereas the high elevation zone showed the highest number of exclusive species (n = 37, 24%); however, differences

between elevation zones were not significant for richness ($P = 0.46$, $R^2 = 0.56$) or abundance ($P = 0.58$, $R^2 = 0.38$). All zones exhibited higher evenness than dominance, with the low elevation having the highest evenness ($J = 0.9462$) and the high elevation having the highest dominance ($D = 0.03409$) (Table II). Middle and high elevations had the greatest number of species in common (n = 25, 16%), whereas low and high elevations exhibited a lower number of common species (n = 4, 3%) (Fig. 3). Moreover, 16 species from the low elevation zone, 18 from the middle elevation zone, and 26 from the high elevation zone were singletons.

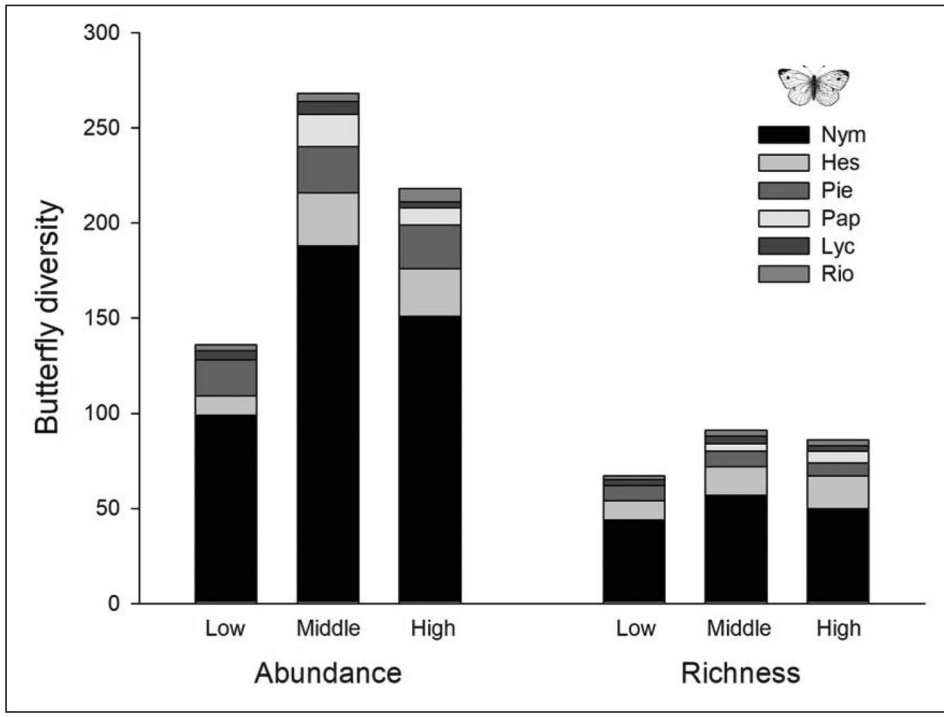

Figure 2.– Abundance and richness of the butterfly community, separated by families, in three elevational zones (low, middle and high) of the Fernão Dias Environmental Protection Area, southern Minas Gerais State, Brazil. Nym = Nymphalidae, Hes = Hesperiidae, Pie = Pieridae, Pap = Papilionidae, Lyc = Lycaenidae, Rio = Riodinidae.

Richness estimators indicated that 237 species of Lepidoptera could be found in this mountainous region (83 more than were sampled), corresponding to a sampling efficiency of 64.97%. Analysis by elevation zone revealed that low, middle, and high elevations had 111, 143, and 163 butterfly species, respectively, and sampling efficiencies of 60.97, 63.36, and 52.76%, respectively (Table II).

Discussion

The richness of butterfly species in the Atlantic Forest region of the Fernão Dias Environmental Protection Area was higher than that observed in some studies (RITTER *et al.*, 2011; BORDIN *et al.*, 2019; BERTINOTI *et al.*, 2020; SILVA *et al.*, 2020) and lower than that reported in others (BONFANTTI *et al.*, 2011; BELLAVER *et al.*, 2012; VIEIRA *et al.*, 2020). Nevertheless, results

were within the expected range for forest regions in Brazil, given the differences in the size of experimental sites, sampling methods and efforts between studies. It is expected that the species accumulation curve will not reach the asymptote in studies with insects, even when small areas are sampled, because this group is extremely diverse (BEUTEL *et al.*, 2017). The Jackknife 1 richness estimator showed that the sample included 70.03% of the butterfly species occurring in the Environmental Protection Area; this result is in line with previous studies assessing forest regions, which found sampling efficiencies greater than 60% by using the same estimator as that used here (BORDIN *et al.*, 2019; MELO *et al.*, 2019; GUERATTO *et al.*, 2020; BERTINOTI *et al.*, 2020; VIEIRA *et al.*, 2020; ARAÚJO *et al.*, 2021).

Nymphalidae was the richest and most abundant family (see Fig. 2), as also observed in previous surveys carried out in southern Minas Gerais (ANDRADE & TEIXEIRA, 2017; OLIVEIRA *et al.*, 2018; VIEIRA *et al.*, 2020), followed by Hesperiidae. Nymphalidae are found in almost all ecosystems (DEVRIES, 1987), have several food niches (BROWN JUNIOR *et al.*, 1999), and can be efficiently captured by baited traps (FREITAS *et al.*, 2003; UEHARA-PRADO *et al.*, 2007; VIEIRA *et al.*, 2020), which may explain its numerous captures. In addition to Nymphalidae, it was expected that a large number of Hesperiidae individuals would be sampled, as these families have some of the highest species' richness in Brazil (BONFANTTI *et al.*, 2009).

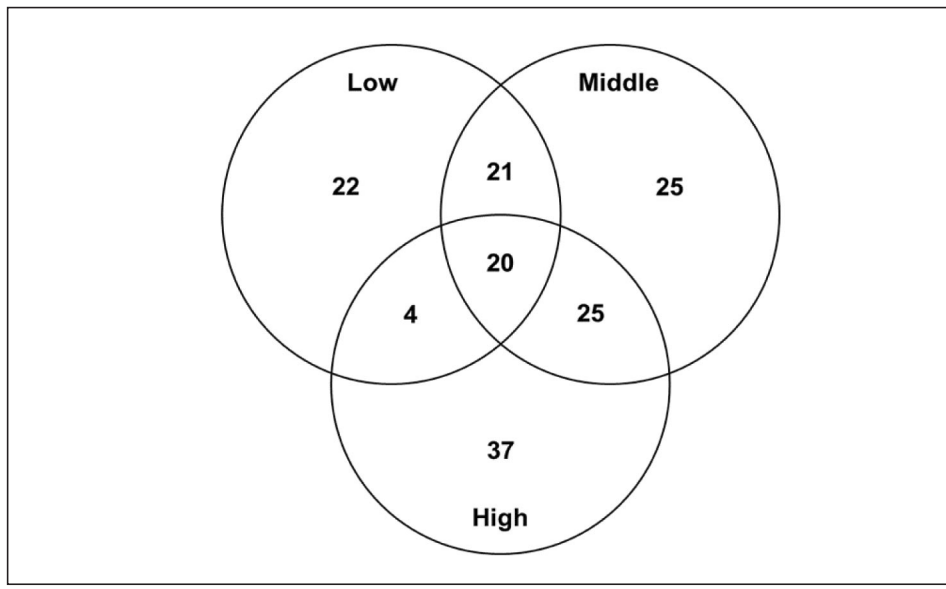

Figure 3.– Venn diagram of the butterfly community in three elevational zones (low, middle and high) of the Fernão Dias Environmental Protection Area, southern Minas Gerais State, Brazil.

F. necys (Godart, [1824]), *M. lysimnia* (Fabricius, 1793), and *A. amathea roeselia* (Eschscholtz, 1821), belonging to the family Nymphalidae, were the most abundant species in the Environmental Protection Area. These Lepidoptera are predominantly found in secondary forests, disturbed habitats, and anthropic environments (DEVRIES, 1987; BROWN, 1992), suggesting that the study area has been negatively affected by human action and is undergoing a process of regeneration. According to BROWN (1992), *F. necys* (Godart, [1824]) inhabits forests at elevations above 900 m and its larvae are associated with grasses, which are common in the study area. *A. amathea roeselia* (Eschscholtz, 1821)

shows a preference for humid environments, such as bogs and river banks. The three butterfly species are common in *Eucalyptus* and *Pinus* forests (BROWN, 1992), trees found at the sampling sites, which may be related to the abundance of these Lepidoptera. *M. lysimnia* (Fabricius, 1793) is found at different elevations, most commonly in the forest canopy (BROWN, 1992). In the current study, the species was sampled along the entire elevational gradient, exhibiting greater abundance at low and middle elevations.

Contrary to our expectation, the low elevation zone had a lower number of butterfly species and individuals than the other elevation zones, although differences in richness or abundance were not significant. Several studies found a decrease in richness with increasing elevation or a peak in diversity at mid-elevations (CARNEIRO *et al.*, 2014; FERNANDES *et al.*, 2016; PIRES *et al.*, 2020 and references therein), but there are also some studies that found greater diversity in high elevation zones (SHRESTHA *et al.*, 2020). In the current study, forests in middle and high elevation zones were more continuous, less fragmented, and at more advanced stages of regeneration than forest fragments occurring at low elevation (Table I), having greater availability of resources, which probably exerts a strong influence on the foraging and nesting activity of the butterfly community and may explain the observed patterns of species diversity.

The high elevation zone had a greater number of singletons and unique species than the other elevations, suggesting that the composition of the butterfly community is different at the mountain top, more represented by unique species than by common ones. These results may be related to differences in conservation level, given that high elevation zones are less influenced by anthropogenic activities such as pasturing and cropping (see Table I).

Elevation alone has no significant effect on insect populations; therefore, other biotic and abiotic factors should be considered when trying to understand the occurrence of species along an elevational gradient (SABU *et al.*, 2008; FERNANDES *et al.*, 2016). Several environmental conditions, such as temperature, wind speed, atmospheric pressure, and vegetation cover, exert a great influence on the distribution of insect communities in mountainous environments (HODKINSON, 2005; FERNANDES *et al.*, 2016). The richness of butterfly communities is strongly influenced by the diversity of host plants, and weather conditions and elevation may act as secondary factors in defining community structure (PIRES *et al.*, 2020). Thus, it is believed that the vegetation cover of middle and high elevation zones provided more favorable conditions for the growth and survival of these Lepidoptera.

Minas Gerais State has a large territory covered by three different biomes: Caatinga, Cerrado, and Atlantic Forest (DRUMONND *et al.*, 2005). Few butterfly inventories have been undertaken in the state, despite its great biodiversity and numerous Conservation Units. Some studies focused on Cerrado regions (SILVA *et al.* 2007; PASETO *et al.*, 2014; LUCENA *et al.*, 2018; HENRIQUES *et al.*, 2019), others on areas of transition from Caatinga to different phytophysionomies (GOZZI, 2012; NERY *et al.*, 2014; BEIRÃO *et al.*, 2017), and some on the Atlantic Forest (ANDRADE & TEIXEIRA, 2017; OLIVEIRA *et al.*, 2018; VIEIRA *et al.*, 2020). This study contributed to reducing the knowledge gap regarding butterfly diversity along elevational gradients in protected forest areas in Brazil, acting as a basis for the development of conservation strategies for butterfly communities in the Fernão Dias Environmental Protection Area.

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Table II.– List of butterfly species from the elevational gradient of the Fernão Dias Environmental Protection Area, southern Minas Gerais State, Brazil, and ecological indices.

FAMILY/Subfamily (number of species)	Species	Low elevation	Middle elevation	High elevation
HESPERIIDAE (31)				
	Hesperiidae sp. 1	0	0	1
	Hesperiidae sp. 2	0	0	1
	Hesperiidae sp. 3	0	1	0
	Hesperiidae sp. 4	0	0	1
	Hesperiidae sp. 5	0	0	1
HESPERIINAE (5)				
	Anthoptus epictetus (Fabricius, 1793)	0	3	1
	Polites vibex catilina (Plötz, 1886)	0	2	0
	Vettius diversa lyrcea (Plötz, 1882)	0	1	1
	Vehilius clavicula (Plötz, 1884)	1	0	0
	Vettius ploetzii (Capronnier, 1874)	0	0	1
PYRGINAE (20)				
	Autochton integrifascia (Mabille, 1891)	0	1	0
	Autochton zarex (Hübner, 1818)	1	1	1
	Celaenorrhinus eligius punctiger (Burmeister, 1878)	0	1	0
	Chioides catillus (Cramer, 1779)	0	1	0
	Diaeus lacaena (Hewitson, 1869)	0	0	1
	Heliopetes omrina (A. Butler, 1870)	1	2	0
	Nisoniades bipuncta (Schaus, 1902)	0	1	0
	Nisoniades macarius (Herrich-Schäffer, 1870)	1	0	0
	Noctuana diurna (A. Butler, 1870)	0	0	1
	Phocides pialia maximus (Mabille, 1888)	0	0	5
	Polythrix octomaculata (Sepp, [1844])	1	0	0
	Pyrgus orcus (Stoll, 1780)	1	5	3
	Pythonides lancea (Hewitson, 1868)	0	1	1
	Staphylus ascalon (Staudinger, 1876)	1	0	0
	Staphylus cf. *coecatus*	0	0	2
	Theagenes dichrous (Mabille, 1878)	0	0	1
	Urbanus dorantes (Stoll, 1790)	1	1	0
	Urbanus simplicius (Stoll, 1790)	1	1	0
	Urbanus teleus (Hübner, 1821)	0	6	2
	Xenophanes tryxus (Stoll, 1780)	1	0	0
PYRRHOPYGINAE (1)				
	Mimoniades versicolor (Latreille, [1824])	0	0	1
LYCAENIDAE (6)				
POLYOMMATINAE (1)				
	Elkalyce cogina (Schaus, 1902)	1	4	1
THECLINAE (5)				
	Arawacus meliboeus (Fabricius, 1793)	3	1	1
	Atlides cosa (Hewitson, 1867)	0	0	1
	Contrafacia imma (Prittwitz, 1865)	0	1	0
	Strymon astiocha (Prittwitz, 1865)	1	0	0
	Strymon rana (Schaus, 1902)	0	1	0
NYMPHALIDAE (89)				
BIBLIDINAE (7)				
	Diaethria candrena (Godart, [1824])	2	0	1
	Diaethria eluina (Hewitson, [1855])	0	0	2
	Ectima thecla (Fabricius, 1796)	2	0	0
	Epiphile orea (Hübner, [1823])	0	0	2

	Eunica margarita (Godart, [1824])	2	0	0
	Hamadryas epinome (C. Felder & R. Felder, 1867)	3	1	0
	Hamadryas fornax (Hübner, [1823])	0	0	1
Charaxinae (8)				
	Archaeoprepona chalciope (Hübner, [1823])	0	3	8
	Archaeoprepona demophoon antimache (Hübner, [1819])	1	0	0
	Fountainea ryphea phidile (Geyer, 1837)	2	1	1
	Hypna clytemnestra huebneri A. Butler, 1866	1	0	0
	Memphis acidalia victoria (H. Druce, 1877)	0	1	0
	Memphis appias (Hübner, [1825])	1	2	1
	Memphis otrere (Hübner, [1825])	0	0	7
	Zaretis strigosus (Gmelin, [1790])	0	2	0
Cyrestinae (1)				
	Marpesia chiron marius (Cramer, 1779)	1	0	0
Danainae (19)				
	Aeria olena olena Weymer, 1875	2	0	0
	Danaus erippus (Cramer, 1775)	1	1	1
	Danaus gilippus (Cramer, 1775)	1	1	0
	Dircenna dero (Hübner, [1823])	2	1	0
	Episcada striposis Haensch, 1909	0	0	1
	Epityches eupompe (Geyer, 1832)	2	2	4
	Hypothyris euclea laphria (E. Doubleday, 1847)	1	0	0
	Hypothyris ninonia daeta (Boisduval, 1836)	6	5	0
	Ithomia agnosia zikani d'Almeida, 1940	2	0	0
	Ithomia drymo Hübner, 1816	7	0	1
	Lycorea halia discreta Haensch, 1909	1	0	0
	Lycorea ilione (Cramer, 1775)	0	1	0
	Mechanitis lysimnia (Fabricius, 1793)	7	9	3
	Mechanitis polymnia casabranca Haensch, 1905	3	0	1
	Methona themisto (Hübner, 1818)	0	0	2
	Placidina euryanassa (C. Felder & R. Felder, 1860)	2	2	0
	Pseudoscada acilla quadrifasciata Talbot, 1928	2	1	0
	Pseudoscada erruca (Hewitson, 1855)	0	2	3
	Pteronymia carlia Schaus, 1902	1	0	1
Heliconiinae (14)				
	Actinote canutia (Hopffer, 1874)	0	2	0
	Actinote carycina Jordan, 1913	0	2	5
	Actinote conspicua Jordan, 1913	0	0	1
	Actinote genitrix d'Almeida, 1922	0	0	1
	Actinote pellenea Hübner, [1821]	1	2	3
	Actinote pyrrha (Fabricius, 1775)	2	3	1
	Actinote sp.	3	4	7
	Agraulis vanillae maculosa (Stichel, [1908])	1	1	0
	Dryadula phaetusa (Linnaeus, 1758)	2	0	0
	Dryas iulia alcionea (Cramer, 1779)	1	0	0
	Eueides aliphera (Godart, 1819)	0	1	0
	Heliconius besckei (Ménétriés, 1857)	0	4	1
	Heliconius erato phyllis (Fabricius, 1775)	2	6	1
	Heliconius ethilla narcaea (Godart, 1819)	0	2	3
Limenitidinae (2)				
	Adelpha serpa (Boisduval, 1836)	0	0	1
	Adelpha syma (Godart, [1824])	0	6	4
Nymphalinae (12)				
	Anartia amathea roeselia (Eschscholtz, 1821)	5	12	0

	Anartia jatrophae (Linnaeus, 1763)	3	1	0
	Eresia lansdorfi (Godart, 1819)	0	1	0
	Hypanartia bella (Fabricius, 1793)	1	1	0
	Hypanartia lethe (Fabricius, 1793)	0	1	0
	Junonia sp.	0	4	0
	Ortilia sejona (Schaus, 1902)	0	1	0
	Ortilia velica (Hewitson, 1864)	0	1	0
	Smyrna blomfildia (Fabricius, 1781)	1	2	0
	Tegosa sp.	1	12	7
	Telenassa teletusa (Godart, [1824])	0	2	1
	Vanessa braziliensis (Moore, 1883)	0	5	0
SATYRINAE (26)				
	Blepolenis batea (Hübner, [1821])	0	1	1
	Caligo arisbe fulgens Rothschild, 1916	0	0	2
	Carminda griseldis (Weymer, 1911)	0	1	0
	Cissia eous (A. Butler, 1867)	4	2	0
	Cissia phronius (Godart, [1824])	3	2	1
	Eryphanis reevesii (E. Doubleday, [1849])	0	0	2
	Eteona tisiphone (Boisduval, 1836)	0	4	2
	Forsterinaria necys (Godart, [1824])	1	10	19
	Forsterinaria pronophila (A. Butler, 1867)	0	0	4
	Forsterinaria quantius (Godart, [1824])	0	2	1
	Godartiana muscosa (A. Butler, 1870)	0	0	1
	Hermeuptychia atalanta (A. Butter, 1867)	0	2	5
	Hermeuptychia fallax marinha Anken, 1994	0	1	0
	Hermeuptychia gisella (Hayward, 1957)	0	0	1
	Hermeuptychia sp.	5	25	24
	Moneuptychia castrensis (Schaus, 1902)	1	1	0
	Moneuptychia cf. *viviana* (Romieux, 1927)	0	0	1
	Moneuptychia soter (A. Butler, 1877)	0	7	1
	Moneuptychia vitellina Freitas & Barbosa, 2015	0	0	1
	Morpho helenor achillides C. Felder & R. Felder, 1867	5	2	0
	Morpho portis kaysi Le Moult & Réal, 1962	0	1	1
	Opoptera syme (Hübner, [1821])	0	0	1
	Pseudodebis ypthima (Hübner, [1821])	0	2	2
	Taydebis peculiaris (A. Butler, 1874)	1	10	1
	Taygetis laches (Fabricius, 1793)	0	1	0
	Yphthimoides ochracea (A. Butler, 1867)	1	3	4
PAPILIONIDAE (7)				
PAPILIONINAE (7)				
	Eurytides bellerophon (Dalman, 1823)	0	2	3
	Eurytides dolicaon deicoon (C. Felder & R. Felder, 1864)	0	0	1
	Heraclides hectorides (Esper, 1794)	0	0	2
	Mimoides lysithous (Hübner, [1821])	0	3	1
	Parides bunichus (Hübner, [1821])	0	7	0
	Parides proneus (Hübner, [1831])	0	5	1
	Pterourus cleotas (G. Gray, 1832)	0	0	1
PIERIDAE (15)				
COLIADINAE (8)				
	Colias lesbia mineira J. Zikán, 1940	0	0	12
	Eurema agave pallida (Chavannes, 1850)	4	2	0
	Eurema albula sinoe (Godart, 1819)	5	4	1
	Eurema deva (E. Doubleday, 1847)	3	1	0
	Eurema elathea flavescens (Chavannes, 1850)	3	2	0
	Phoebis sennae marcellina (Cramer, 1777)	1	0	0

	Pyrisitia leuce (Boisduval, 1836)	1	0	0
	Pyrisitia nise tenella (Boisduval, 1836)	1	0	0
DISMORPHIINAE (2)				
	Dismorphia thermesia (Godart, 1819)	0	1	4
	Enantia lina psamathe (Fabricius, 1793)	1	1	0
PIERINAE (5)				
	Catasticta bithys (Hübner, [1831])	0	0	1
	Leptophobia aripa balidia (Boisduval, 1836)	0	8	0
	Pereute antodyca (Boisduval, 1836)	0	0	1
	Pereute swainsoni (G. Gray, 1832)	0	0	1
	Theochila maenacte itatiayae (Foetterle, 1902)	0	5	3
RIODINIDAE (6)				
RIODININAE (6)				
	Charis cadytis Hewitson, 1866	0	2	3
	Emesis ocypore zelotes Hewitson, 1872	0	1	3
	Eurybia pergaea (Geyer, 1832)	0	0	1
	Panara soana bacana Callaghan, 1997	1	0	0
	Stichelia bocchoris (Hewitson, 1876)	0	1	0
	Synargis paulistina (Stichel, 1910)	2	0	0
ECOLOGICAL INDICES				
	Richness	67	91	86
	Abundance	136	268	218
	Exclusive species	22	25	37
	Dominance (D)	0.02325	0.02592	0.03409
	Shannon's diversity (H')	3.978	4.084	3.94
	Pielou's evenness (J)	0.9462	0.9053	0.8845
	Jackknife 1	102,667	135,571	138
	Jackknife 2	123,879	158,516	174,132
	Chao 2	108,059	134,643	175,375

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NOTICIAS GENERALES / *GENERAL NEWS*

CORRECCIÓN / *CORRECTION*.– In the paper: "New species and new records of Palaearctic Meessiidae and Tineidae (Lepidoptera: Tineoidea).– *SHILAP Revista de lepidopterología*, **49**(196): 627-639", was overlooked a mistake on page 631. The chapter Diagnosis must be changed into: "Superficially distinguishable from the other known members of the genus by the upwards-directed third segment of labial palpus, and the relatively broad wings. In the genitalia structure are some similarities to *N. tenuipennella* and *tunesiella* (the lack of gnathos), but the socii are longer and narrower, the shape of valva is more or less triangular and the phallus is longer than the valva in *tenuipennella*, the saccus and apodeme are longer, the phallus without broader base in *tunesiella*, but both these species have narrower wings.– **DETALLES / *DETAILS*:** Dr. Reinhard Gaedike; Florusstrasse, 5; D-53225 Bonn; ALEMANIA / *GERMANY* (E-mail: paratinea@outlook.de).

SHILAP REVISTA DE LEPIDOPTEROLOGÍA* EN LOS ÍNDICES DE IMPACTO INTERNACIONALES 2020 / SHILAP REVISTA DE LEPIDOPTEROLOGIA *IN THE INTERNATIONAL IMPACT INDEXES 2020*.–** Según SCOPUS (ELSEVIER) en su Índice SJR 2020 de *SCImago Journal Rank*, aparecemos con un **Indicador SJR de 0,338** FI, **Índice H: 12**, **Categoría: 101/145 (Q3, Ciencia de los Insectos)**. Según WEB OF SCIENCES (CLARIVATE ANALYTICS) en su Índice JCR 2020 de *Journal Citation Reports*, aparecemos con un **Índice de Impacto de 0,438** FI, **Categoría: 97/104 (Q4, Entomología)**, el **Índice de Inmediatez de 0,155**, el **Eigenfactor de 0,00015** y la **Categoría Eigenfactor: Ecología y Evolución. /** *According to SCOPUS (ELSEVIER) in their Index SJR 2020 of* SCImago Journal Rank*, we appear with a* ***SJR Indicator of 0,338 *FI,* ***H Index: 12***, ***Rank: 101/145 (Q3, Insect Science)***. *According to WEB OF SCIENCE (CLARIVATE ANALYTICS) in their Index JCR 2020 of* Journal Citation Reports, *we appear with an* ***Impact Index of 0,438*** *FI,* ***Rank: 97/104 (Q4, Entomology)***, *the* ***Inmediacy Index of 0,155***, *the* ***Eigenfactor of 0,00015*** *and the* ***Eigenfactor Category: Ecology and Evolution***.– **DETALLES / *DETAILS*:** SHILAP; Apartado de correos, 331; E-28010 Madrid; ESPAÑA / *SPAIN* (E-mail: avives1954@outlook.es).

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REVISORES 2020-2021 / *REFEREES 2020-2021*.– Los siguientes revisores colaboraron en la evaluación de los manuscritos durante el año 2020-2021. Expresamos nuestros más sinceros agradecimientos a estas personas por el tiempo y energía que dedicaron a sus evaluaciones, de las cuales dependen los estándares de calidad y la puntualidad de la revista SHILAP Revista de lepidopterología (SHILAP Revta. lepid.) / *The following referees collaborated on the evaluation of manuscripts during 2020-2021. We express our sincerest thanks to them for the time and energy devoted to their evaluations, since the standards of quality and timeliness of the journal SHILAP Revista de lepidopterologia (SHILAP Revta. lepid.) depend on them*: Dr. Kesran Akin (Turquía / *Turkey*); Prof. Dr. Vasilii V. Anikin (Rusia / *Russia*); Dr. Elias Araujo (Brasil / *Brazil*); Ing. Ernst Arenberger (Austria / *Austria*); Mr. Wilfried Arnscheid (Alemania / *Germany*); Mr. Jan E. F. Asselbergs (Países Bajos / *The Netherlands*); Dr. Giorgio Baldizzone (Italia / *Italy*); Dr. Edward Baraniak (Polonia / *Poland*); Dr. Francesca Barbero (Italia /

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SHILAP REVISTA DE LEPIDOPTEROLOGÍA, RENUEVA LA EXCELENCIA 2021-2022 / *SHILAP REVISTA DE LEPIDOPTEROLOGIA, RENOVATES THE EXCELLENCE* 2021- 2022.– Tenemos el placer de anunciar que nuestra publicación *SHILAP Revista de lepidopterología* ha superado el proceso de evaluación de calidad de las revistas científicas españolas que la Fundación Española para la Ciencia y la Tecnología (FECYT) ha llevado a cabo durante el año 2021. Después de este arduo

proceso, la resolución definitiva de la convocatoria establece que *SHILAP Revista de lepidopterología* ha logrado superar los indicadores de calidad y ha obtenido la certificación de FECYT que selecciona y califica nuestra publicación como **EXCELENTE**. / *We have the pleasure of announcing that our publication* SHILAP Revista de lepidopterología *has successfully passed the quality evaluation process of Spanish scientific magazines carried out by the Spanish Foundation for Science and Technology (FECYT) during 2021. After this complicated process, the final finding establishes that* SHILAP Revista de lepidopterología *has passed the indicators of quality and obtained the certificate of FECYT that selects and qualifies our publication as* ***EXCELLENT***.– **DETALLES / *DETAILS*:** SHILAP, Apartado de correos, 331; E-28010 Madrid, ESPAÑA / *SPAIN* (E-mail: avives1954@outlook.es).

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