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SHILAP REVISTA DE LEPIDOPTEROLOGIA

SUMARIO / *CONTENTS*

– **Organismo Rector de SHILAP /** *Officers and Board of SHILAP* 578
– **Cómo ser socio de la Sociedad Hispano-Luso-Americana de Lepidopterología /** *How to be membership of the Sociedad Hispano-Luso-Americana de Lepidopterología* 580
– **M. Pinzari & P. Pinzari.–** The genus *Hypsotropha* Zeller, 1848 in Italy and description of *H. aenigmatica* Pinzari & Pinzari, sp. n. (Lepidoptera: Pyralidae, Phycitinae, Peoriini) / *El género* Hypsotropha *Zeller, 1848 en Italia, con la descripción de* H. aenigmatica *Pinzari & Pinzari, sp. n. (Lepidoptera: Pyralidae, Phycitinae, Peoriini)* 581-588
– **Revisión de publicaciones /** *Book Reviews* 589-591
– **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* 592
– **A. Vives Moreno.–** Contribución al conocimiento de los Lepidoptera Heterocera en Guinea Ecuatorial. Dos géneros y tres especies nuevas para la fauna de este país (Lepidoptera: Nolidae, Hyblaeidae, Erebidae) / *Contribution to the knowledge of the Lepidoptera Heterocera in Equatorial Guinea. Two genera and three species new for the fauna of this country (Lepidoptera: Nolidae, Hyblaeidae, Erebidae)* 593-602
– **W. C. Li.–** A new species of *Crambus* Fabricius, 1798 from China (Lepidoptera: Crambidae) / *Una nueva especie de* Crambus *Fabricius, 1798 de China (Lepidoptera: Crambidae)* 603-607
– **Revisión de publicaciones /** *Book Reviews* 608
– **M. F. V. Corley, J. Numes, J. Rosete, R. Terry & S. Ferreira.–** New and interesting Portuguese Lepidoptera records from 2019 (Insecta: Lepidoptera) / *Novos e interessantes registos portugueses de Lepidoptera em 2019 (Insecta: Lepidoptera)* / Nuevas e interesantes citas portuguesas de Lepidoptera en 2019 (Insecta: Lepidoptera) 609-641
– **Revisión de publicaciones /** *Book Reviews* 642
– **A. E. Naydenov, I. A. Makhov, S. V. Vasilenko & R. V. Yakovlev.–** Checklist of the Geometridae of the Saur Mountains and adjacent territories (Eastern Kazakhstan) (Lepidoptera: Geometridae) / *Lista detallada de los Geometridae de las montañas del Saur y territorios adyacentes (Este de Kazajistán) (Lepidoptera: Geometridae)* 643-649
– **Lista de socios altas y bajas /** *List of membership join and cease* 650
– **S. Scalercio.–** Macroheterocera of a mixed Calabrian black pine-European beech forest of Sila Mountains (Italy) (Insecta: Lepidoptera) / *I Macroheterocera di una foresta mista di pino nero di Calabria e faggio dei monti della Sila (Italia) (Insecta: Lepidoptera)* / Los Macroheterocera de un bosque mixto de pino negro de Calabria y haya de los montes de Sila (Italia) (Insecta: Lepidoptera) 651-669
– **Normas para los autores que deseen publicar en** *SHILAP Revista de lepidopterología* 670
– **P. Falck, O. Karsholt & J. Rota.–** A new species of *Anthophila* Haworth, 1811 with variable male genitalia from the Canary Islands (Spain) (Lepidoptera: Choreutidae) / *Una nueva especie de* Anthophila *Haworth, 1811 con la variable genitalia del macho de las Islas Canarias (España) (Lepidoptera: Choreutidae)* 671-681
– **Instructions to authors wishing to publish in** *SHILAP Revista de lepidopterología* 682
– **R. Gaedike.–** New or poorly known West Palaearctic Meessiidae (Lepidoptera: Tineoidea) / *Meessiidae nuevos o pobremente conocidos del oeste Paleártico (Lepidoptera: Tineoidea)* 683-687
– **Revisión de publicaciones /** *Book Reviews* 688
– **A. Expósito-Hermosa.–** Una nueva especie del género *Naxa* Walker, 1856, de las montañas Arfak, Papúa Occidental (Indonesia) (Lepidoptera: Geometridae, Orthostixinae) / *A new species of the genus* Naxa *Walker, 1856 from the Arfak Mountains, West Papua (Indonesia) (Lepidoptera: Geometridae, Orthostixinae)* 689-691
– **Código Ético para la Revista Científica SHILAP Revista de lepidopterología** 692
– **I. G. López-Muraira, H. R. Iruegas-Buentello, H. Flores-Martínez & F. Gómez-Leyva.–** *Antispastis xylophragma* Meyrick, 1926 primera cita sobre *Solanum umbellatum* Mill. y nuevo para México (Lepidoptera: Glyphipterigidae, Acrolepiinae) / Antispastis xylophragma *Meyrick, 1926 first record on* Solanum umbellatum *Mill. New to Mexico (Lepidoptera: Glyphipterigidae, Acrolepiinae)* 693-697
– **Code of Ethics for the Scientific Journal SHILAP Revista de lepidopterología** 698
– **V. O. Becker.–** Notes and new species of the Neotropical genus *Nycterotis* Felder, 1874 (Lepidoptera: Notodontidae, Nystaleinae) / *Notas y especies nuevas del género Neotropical* Nycterotis *Felder, 1874 (Lepidoptera: Notodontidae, Nystaleinae)* .. 699-708
– **A. Moreno & A. Viloria.–** Variation in hindwing size and shape of *Plutella xylostella* (Linnaeus, 1758) (Lepidoptera: Plutellidae) / *Variación en el tamaño y la forma del ala posterior de* Plutella xylostella *(Linnaeus, 1758) (Lepidoptera: Plutellidae)* 709-716
– **A. Vives Moreno & J. Gastón.–** Cinco nuevas especies para la fauna de España y otras interesantes informaciones lepidopterológicas para España y Sudán (Insecta: Lepidoptera) / *Five new species for the fauna of Spain and other interesting lepidopterological information for Spain and Sudan (Insecta: Lepidoptera)* 717-731
– **Publicaciones disponibles en la Sociedad /** *Society available publications* 732
– **K. A. Efetov, E. E. Kucherenko & G. M. Tarmann.–** An application of the synthetic sex attractans from the series "EFE-TOV-2" for studying Procridinae in Italy (Lepidoptera: Zygaenidae) / *Una aplicación del atrayente sexual de la serie "EFE-TOV-2" para estudiar los Procridinae de Italia (Lepidoptera: Zygaenidae)* 733-749
– **Noticias Generales /** *General News* 750
– **V. O. Becker.–** The Brazilian species of the genus *Arhacia* Herrich-Schäffer, 1855 with description of a new species (Lepidoptera: Notodontidae, Dicranurinae) / *Las especies brasileñas del género* Arhacia *Herrich-Schäffer, 1855, con la descripción de una especie nueva (Lepidoptera: Notodontidae, Dicranurinae)* 751-756
– **A. O. Angulo & T. S. Olivares.–** Una nueva especie de *Copitarsia* Hampson, 1906 en América y consideraciones sobre *Copitarsia decolora* (Guenée, 1852) (Lepidoptera: Noctuidae, Cucullinae) / *A new species of* Copitarsia *Hampson, 1906 in America and some accounts on* Copitarsia decolora *(Guenée, 1852) (Lepidoptera: Noctuidae, Cucullinae)* 757-761
– **Sumario del Volumen 48 /** *Contents of Volume 48* 762-768

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The genus *Hypsotropa* Zeller, 1848 in Italy and description of *H. aenigmatica* Pinzari & Pinzari, sp. n. (Lepidoptera: Pyralidae, Phycitinae, Peoriini)

M. Pinzari & M. Pinzari

Abstract

A description of *Hypsotropa aenigmatica* Pinzari & Pinzari, sp. n., is given based on one male collected in Tuscany (Italy). A distribution review of the genus *Hypsotropa* Zeller, 1848 in Italy is presented: *Hypsotropa unipunctella* Ragonot, 1888 in North-East; *Hypsotropa limbella* Zeller, 1848, in the northern half of the peninsula; *Hypsotropa roseostrigella* Ragonot, 1901, in Sardinia; *Hypsotropa vulneratella* (Zeller, 1847) in the southern half of the peninsula, in Sicily and in Sardinia. Based on our study it follows that *Hypsotropa gallohispanicella* Leraut, 2019 = *H. roseostrigella* Ragonot, 1901, syn. n.
KEY WORDS: Lepidoptera, Pyralidae, Phycitinae, Peoriini, *Hypsotropa*, Italy.

El género *Hypsotropa* Zeller, 1848 en Italia, con la descripción de *H. aenigmatica* Pinzari & Pinzari, sp. n. (Lepidoptera: Pyralidae, Phycitinae, Peoriini)

Resumen

Se describe una nueva especie *Hypsotropa enigmatica* Pinzari & Pinzari, sp. n., basada sobre un macho encontrado en la Toscana (Italia). Se revisa la distribución del género *Hypsotropa* Zeller, 1848 en Italia: *Hypsotropa unipunctella* Ragonot, 1888 en el noreste; *Hypsotropa limbella* Zeller, 1848, en la mitad norte de la península; *Hypsotropa roseostrigella* Ragonot, 1901, en Cerdeña; *Hypsotropa vulneratella* (Zeller, 1847) en la mitad sur de la península, en Sicilia y en Cerdeña. Sobre la base de nuestro análisis, se concluye que *Hypsotropa gallohispanicella* Leraut, 2019 = *H. roseostrigella* Ragonot, 1901, syn. n.
PALABRAS CLAVE: Lepidoptera, Pyralidae, Phycitinae, Peoriini, *Hypsotropa*, Italia.

Introduction

Prior to the current study, the genus *Hypsotropa* in Italy included four species: *Hypsotropa unipunctella* Ragonot, 1888 in the North-East (DEUTSCH, 2006); *Hypsotropa limbella* Zeller, 1848 in the northern half of the peninsula (DELLA BEFFA, 1940; BALDIZZONE *et al*., 2013; HARTIG, 1958; PARENTI, 1962, 2000; TURATI, 1979) up to Umbria (PINZARI *et al*., 2016); *Hypsotropa vulneratella* (Zeller, 1847), in southern Latium (LERAUT, 2019), in Calabria (SCALERCIO *et al*., 2016), in Sicily (ZELLER, 1847; MARIANI, 1939; GASTÓN *et al*., 2016) and in Sardinia (GASTÓN *et al*., 2016; HARTIG & AMSEL, 1951), with *H. vulneratella* var. *roseostrigella* Ragonot, 1901 in Sicily (MARIANI, 1939) and in Sardinia (HARTIG & AMSEL, 1951); *H. roseostrigella* Ragonot, 1901 in Sardinia (GASTÓN *et al*., 2016).

In the context of an ongoing survey of the Lepidoptera fauna in Italy (PINZARI, 2016, 2019a, 2019b; PINZARI & PINZARI, 2019 a, 2019 b, 2019 c, 2020; PINZARI *et al*., 2016, 2018, 2019) we collected a moth that was previously determined as *Hypsotropa vulneratella* (Zeller, 1847) var.

roseostrigella Ragonot 1901. Successively, according to the recent taxonomic review of the genus *Hypsotropa* (GASTÓN *et al*., 2016) it was not possible to ascribe our finding to any species.

Materials and methods

Collecting site: The present study is based on the examinations of a male attracted by a lamp (Mixed Light 160 W) at Capalbio Scalo (GR) in Tuscany (Italy) and collected on 27-VI-2007 by Mario Pinzari (fig.1). The moth was collected from a small meadow at sea level placed among the dune, an artificial pine forest, a fish farm and a small reed swamp area of *Phragmites australis* (Cav.) Trin. ex Steud. The collecting site was visited by us for many years and although it is a anthropized and apparently degraded place, it is rich in interesting lepidopterans species including *Mythimna pudorina* ([Denis & Schiffermuller], 1775) (Noctuidae), *Laelia coenosa* (Hübner, [1808] 1796) (Erebidae) and *Cochylimorpha decolorella* (Zeller, 1839) (Tortricidae). A few hundred meters from this place in the driest areas, we also find *Coenonympha elbana* Staudinger, 1901 (Nymphalidae). Among vertebrates, in the study area the mammalian *Lutra lutra* Linnaeus 1758 also lives in the agricultural channels.

Genitalia dissection and preservation: The male genitalia were boiled in 10% potassium hydroxide solution for few minutes and mounted on a slide to make a photography. Successively, the slide was dismantled to preserve the genitalia. Genital parts were glycerol-preserved into microtubes. These were closed with vinyl glue that is easily soluble in water and put under the specimen itself. The specimen is deposited in the private collection of Mario Pinzari (Rome, Italy).

Species identification: The moth species was studied examining the external habitus and the genital features using the taxonomic characters reported by GASTÓN *et al*. (2016).

Abbreviations

BMNH collection - The Natural History Museum, London, Great Britain
ZMUC collection - Zoologisk Museum, Copenhagen, Denmark
MZUR Hartig collection - Museo Zoologico Università di Roma “La Sapienza”, Italy

Italian records of *Hypsotropa* species

To show an updated distribution of *Hypsotropa* group in Italy, we mapped the localities of Italian specimens cited in literature adding the records not reported by GASTÓN *et al*. (2016) and our collecting site. For the distribution map, we processed the figure 37 reported in GASTÓN *et al*. (2016) and we mapped only the records of *Hypsotropa* in Italy (fig. 2). Below we cited the Italian records that were not reported by GASTÓN *et al*. (2016).

Hypsotropa unipunctella Ragonot, 1888
Hypsotropa unipunctella Ragonot, 1888. *Nouv. Phycitidae*: 47
LT: Amour [Amur], CHINA

Friuli Venezia Giulia: Tagliamento River in the surroundings of Gradisca, Spilimbergo, (PD), 100 m, 17-VIII-1996, A. Mayr leg. (DEUTSCH, 2006).

Hypsotropa limbella (Zeller, 1848)
Anerastia limbella Zeller, 1848. *Isis von Oken*, **1848**(8): 591
LT: Schneeberge am Alpensteig, ALEMANIA

Piemonte: Alpi Marittime, Colle S. Bernardo (CU), VIII-1932, (DELLA BEFFA, 1940); woods below Cascina Bano (AL), 300 m, 12-VII-2005 (BALDIZZONE *et al*., 2013). Lombardia: Alzate Brianza (CO) (TURATI, 1879, in PARENTI, 1962); Trentino Alto Adige: San Vigilio-Gardole (BZ), 1 ♂, 2 ♀♀, 29-VII-1941, 2 ♀♀, 8-VIII-1942, 1 ♂, 23-VII-1943, Hartig leg. (MZUR), (HARTIG, 1958). Liguria: Sanremo (IM), (PARENTI, 1962); Toscana: Quercianella (LI), (PARENTI, 1962); Umbria: 1 ♂, Monte

Subasio, Cà Piombino (PG), 470 m, 1-VII-2006 (gen. praep. PIRA 295, M. Pinzari), Z. and I. Zerunian leg. (PINZARI *et al*., 2016); ABRUZZO: Vacri (CH), 300 m, 21-VII-1954, 2 ♂♂ (PARENTI, 1962, 2000).

Hypsotropa vulneratella (Zeller, 1847)
Epischnia vulneratella Zeller, 1847. *Isis von Oken*, **1847**(10): 769
LT: Syracus [Syracuse], Sicily, ITALY

SICILIA: 1 ♂ (Syntype), Messina, 11-VII-1847, Zeller leg., BMNH collection, 1 ♂, idem, 11-VII-1847, 1 ♂, idem, 12-VII-1847; as *H. ichorella* Lederer, 1855, Pizzo Assolicchiata at Pizzo dell'Aquila, Monreale (PA), (MARIANI, 1939). 1 ♂, Monte Etna, Milo, 650 m, 7-VI-2005, Peder Skou leg, ZMUC collection; 1 ♂, Siracusa, 21-VI-1847 (GASTÓN *et al*., 2006); as *H. ostrinella*, La Harpe, 1861 (LA HARPE, 1860). SARDEGNA: *Hypsotropa vulneratella* Z: Sa Casa (NU), 21-27-VII; Sadali (NU), 5-VII; Ortuabis (NU), 3.-III; Taccu Zippiri (NU), 5-VIII; Macomer (NU), 14-VIII (HARTIG & AMSEL, 1951). 1 ♂, Siniscola (NU), Tiliò, 3 m, 27-VI-2004 J. Skyva leg. and coll. (GASTÓN *et al*., 2006). CALABRIA: 2 ♂♂, Fiego di San Fili, San Fili (CS), Catena costiera, 720 m, 22-VII-2015; 1 ♂, Montagna Grande, San Giovanni in Fiore, Sila, 1355 m, 17-VII-2015, (SCALERCIO *et al*., 2016). LAZIO: 1 ♂, Anagni (LERAUT, 2019).

Hypsotropa roseostrigella Ragonot, 1901
Hypsotropa vulneratella var. *roseostrigella* Ragonot, 1901. *Rom. Mem*., **8**: 379, pl. 39, fig. 12
LT: Syrie [SYRIA]

SARDEGNA: *Hypsotropa vulneratella* forma *roseistrigella* Rag. Z: Sa Casa (NU), 21-27-VII; Sadali, (NU), 5-VII; Ortuabis (NU), 3-VIII; Taccu Zippiri (NU), 5-VIII; Macomer (NU), 14-VIII (HARTIG & AMSEL, 1951); 1 ♂, Aritzo, Sa Casa, 21-VII-1936, H. G. Amsel leg. (GASTÓN *et al*., 2016); SICILIA: "tutta", IV-VI, var. *roseistrigella* Rag. (MARIANI, 1939).

Material examined: SARDEGNA: Aritzo dint. Cant.sa Casa, 950 m, 4 ♂♂, 24-VII-1936, 2 ♂♂, 29-VII-1936, Conte Hartig leg. (MZUR); 1 ♂, Sardegna centr., Cant. Ortuabis 700 m, 30-VII-1936, 1 ♂, 31-VII-1936, 2 ♂♂, 3-VIII-1936, Conte Hartig leg. (MZUR).

Differences of *Hypsotropa* sibling species: In Italy the genus *Hypsotropa* included four species: *Hypsotropa unipunctella, Hypsotropa limbella*, *Hypsotropa vulneratella* and *H. roseostrigella*. *H. limbella* and *H. unipunctella* the species are easily distinguished from each other and from the other species by their typical habitus. *Hypsotropa vulneratella*, *H. roseostrigella* and *H. vazquezi* were considered as *vulneratella* before GASTÓN *et al*. (2016). Recently, these authors rearranged *Hypsotropa* species identifying those three different species according to their genital characters and habitus. As the habitus concerns, an important diagnostic feature is the area covered by purple pink-coloured scales of the upper surface of forewings. The characteristics of the habitus are common to both males and females (for details see in GASTÓN *et al*. (2016). Our diagnosis only refers to males because we never collected females.

H. vulneratella have slender, rather blunt, forewings with a reddish background colour, in which the pale yellow veins stand out in a very variable way. The yellow colour of the veins and their contrast of colour on the red background allow to distinguish *H. vulneratella* from the other two species *H. roseostrigella* and *H. vazquezi*. The most important genital feature in male of *H. vulneratella* is the shape of the valva that is triangular, with a wide base and pointed at the pollex, sometimes more rounded; near the base, the valva has a little saccular appendix with the lower outer margin of the valve clearly straight up to the apex. Moreover, the gnathos is very conspicuous, rectangular, with the top cap slightly pointed at its central part. In bilobar uncus, the arms are slightly curved, equal in width in all its extension, ending in an eagle peak form.

H. roseostrigella has pale yellow forewings and almost white hind wings. A characteristic of this species is the presence of three bands of pink-purple scales that splay longitudinally from the base to the outer edge of the wings. This wing peculiarity, which is clearly seen in fresh samples, allows to clearly distinguish *H. roseostringella* from congeneric species. As genitalia concern, *H. roseostrigella* shows a triangular valva, narrower than *H. vulneratella*, with its end finger shaped (rounded and not pointed); near the base it has a characteristic saccular appendix, larger than *H. vulneratella*, strongly sclerotized and pointed extended. The lower external margin of the valva presents an evident convexity

between the saccular process and the apex. The gnathos is small and pointed, unlike that of *H. vulneratella*, which is more evident and rectangular in shape.

H. vazquezi has the forewings with slightly rounded apices; straw yellow colour upper face of forewings, its colour varies slightly to a more tanned yellow, with no sign except the veins, covered by light coloured scales. The area of the wing included behind the discal cell at the dorsal margin is shaded in its entirety by a more or less variable diffusion of red-purple scales. The hindwings are almost white cream colour, with no evident spots. Genitalia fit the model described for the genus *Hypsotropa* with a bilobar uncus formed by two elongated arms, with pointed end and beak-shaped of eagle. The gnathos is very conspicuous and rectangular shaped with its top end straight or slightly lobed. The valve is simple, triangular shaped and slightly pointed. They do not have a clasper. They have a very sclerotized appendix or lobe in the shape of a pin at the edge of the sacculus, at its closest part to the vinculum. The costal margin is slightly convex.

Results

Hypsotropa aenigmatica Pinzari & Pinzari, sp. n.

Material examined: Holotype male: ITALY, TUSCANY, Capalbio Scalo (Grosseto), 1 ♂ (gen. praep. PIRA 574 M. Pinzari), 27-VI-2007, M. Pinzari leg. (deposited in the collection of second author, Rome, Italy) (fig. 1).

Description Male (figs 1a, b, c, d): Imago. Wingspan 18 mm. Antennae filiform, serrated, orange; head light yellow, forehead light yellow with longer orange scales towards the palps; palps straight, not curved at the tip, longer than the torax, yellow on the inside and on the outside yellow down and dark orange on the top. Torax yellow; tegulae yellow, slightly edged with orange externally. Forewings upperside (fig. 1a): upper edge of the wing red brown near the base; ground colour orange; veins of the upper part covered with yellow scales; in the lower half of the wings, three stripes (one on the lower edge) of darker almost purple orange scales, go through the wing longitudinally up to the outer edge, yellow fringes; hindwings, different colour from forewings, light brown, brownish, concolorous fringes. Underside (fig. 1c): forewings, yellowish at the top and at the base, brownish in the central longitudinal area; hindwings, brownish in the upper part that fades to yellow in the lower part, concolorous fringes. Four forelegs are red-brown; brighter two hind legs. Genitalia (figs 1b and 1d). Valvae are triangular (fig.1b) with wide base and narrow but rounded vertex; saccular appendix almost absent and not emerging, barely hinted and not very sclerified, towards the base on the posterior border; edeago with a wide break on one side of the crown; gnathos (fig. 1d) depressed at the tip, bilobed; long, double-lobed uncus with curved tips at the tip of an eagle's beak form. Female: unknown

Biology: unknown.

Etymology: The name of the new species derives from aenigma (mystery in Latin). The male, previously determined as *H. vulneratella* var. *roseostrigella*, after the clarifying work of GASTÓN *et al*. (2016) had remained enigmatic for a long time. Despite the research carried out since then in the same places, we have not been able to find other specimens and therefore, based on the clarity of the characters and biogeographical characteristics of the genus in Italy, we decided to describe the new species without delaying further.

Hypsotropha roseostrigella Ragonot, 1901
Hypsotropa vulneratella var. *roseostrigella* Ragonot, 1901. *Rom. Mem*., **8**: 379, pl. 39, fig. 12
LT: Syrie [SYRIA]
= *Hypsotropa gallohispanicella* Leraut, 2019. *Rev. Fr. Ent. Gén*, **1**(1): 27, figs 13, 17, 21), **syn. n.**
LT: Le Lavandou, Var, FRANCE

In 2019 *H. roseostrigella* Ragonot, 1901 has been placed into synonymy with *H. vulneratella* (Zeller, 1847). *Hypsotropa roseostrigella* Ragonot, 1901 sensu F. J. Gastón, R. Macià, J. Ylla & M. Huertas-Dionisio, 2016 was renamed as *Hypsotropa gallohispanicella* Leraut, 2019 designating it as the new holotype specimen for France (LERAUT, 2019).

But, in literature we found that *H. ichorella* Lederer, 1855 was collected in July in Monreale (PA) (MARIANI, 1939) and *H. ostrinella* La Harpe, 1861 (LA HARPE, 1860) was known for Syracuse, and these species are considered as synonyms of *vulneratella* by RAGONOT (1901), LERAUT (2014) and GASTÓN *et al*. (2016). Moreover, MARIANI (1939) cited *vulneratella* var. *roseostrigella* as is present from April to June in the whole Sicily. These records in Sicily for the genus *Hypsotropa* showed that both *H. vulneratella* and *H. roseostrigella* are present in the isle and GASTON *et al.* (2016) defined the novo status of *H. roseostrigella* Ragonot, 1901. Therefore, it follows that *Hypsotropha roseostrigella* Ragonot, 1901 = *Hypsotropa gallohispanicella* Leraut, 2019, **syn. n.**

Remarks

MORPHOLOGICAL DIFFERENCES: *H. AENIGMATICA* VERSUS *H. ROSEOSTRIGELLA*, *H. VULNERATELLA* AND *H. VAZQUEZI*

H. aenigmatica is very similar to the species of *Hypsotropa* genus and looks like a mosaic composed of pieces of the other three species. At a first macroscopic examination, the salient feature is represented by the three lines of pinkish scales of the upper surface of forewings, that are typical of *H. roseostrigella*. The specimens of *H. roseostrigella,* collected in Sardinia (N = 10 ♂) and preserved in Hartig's collection (MZUR), have a mean wing span equal to 17.8 mm (Range: 15 - 21 mm) and the stripes are much more defined than *aenigmatica*. On closer inspection, however, it is noted that in the upper half of the wing, the background is orange and veins covered with yellow scales emerge on it; this is a characteristic typical of *H. vulneratella*. Even the hindwings, although darker in the new species, have the same colour as *roseostrigella*. On the underside of forewings the new species, has even darker areas. Even the genitals do not have any characteristic typical of the species, but the specificity also is here in the presence of characters of all the other three sister species: the shape of the valves is clearly that of *H. vulneratella*, triangular, with a broad base, pointed but rounded at the top, devoid or almost of the saccular appendix, the edge from the appendix to the straight vertex; the well-pronounced and depressed bilobed gnathos is the same as *H. vazquezi*.

DISTRIBUTION: *H. AENIGMATICA* VERSUS *H. ROSEOSTRIGELLA*, *H. VULNERATELLA* AND *H. VAZQUEZI*

The finding of a new species in that area of the Tuscan coast (fig. 2) is not at all strange and the fact has encouraged us to describe it despite the uniqueness of the specimen. In fact, the Sardinian Corsican fauna and the fauna of our study area have in common at least two taxa, *Hipparchia neomiris* (Godart, 1822) and *Coenonympha corinna* (Hübner, [1804] 1796) (Nymphalidae), that are absent in the rest of Italy. *H. neomiris*, is an endemic species confined to the islands of Corsica, Sardinia, Elba and Tuscany; these populations, in addition to belonging to the same species, have the same habitus. Instead, *C. corinna*, present in Sardinia, is similar in habitus to *Coenonympha elbana* Staudinger, 1901 and for a long time considered as its sister species; *C. elbana* is also found in the same area where we collected *H. aenigmatica.*

In 2016 *H. vulneratella* was found in two locations in Calabria (SCALERCIO *et al*., 2016). The published photo of a perhaps not very fresh specimen seems to show a habitus characterized by veins covered by evident yellow scales on a dark red background, typical of *H. vulneratella*. Furthermore, LERAUT (2019) described the male genitalia of a moth, clearly attributable to *vulneratella*, which was collected at Anagni in southern Latium.

This finding is very interesting and could suggest a possible connection with the new species along the Italian Peninsula, but we consider this unlikely due to the numerous surveys have been carried out on Lepidoptera in central Italy. They were both widespread and concentrated and continuous in several sites, e.g. in Castelporziano (RM) (PINZARI *et al*., 2017) on the Lazio coast with habitats similar to that of finding of the new species; Assisi (PG) (PINZARI *et al*., 2016); Monte Cagno (RI) (PINZARI *et al*., 2010); La Maielletta (CH) (PARENTI, 1962). However, no species of the *H. vulneratella* group has been found.

H. aenigmatica is evidently a very localized species but it should take into account that the place of discovery is part of a larger area which has numerous, diverse and less altered habitats and ranges

from the Island of Elba to the Grosseto coast. This includes the vast protected area of the Orbetello lagoon where the new species could be present and more numerous.

Conclusions

The new species *Hypsotropa aenigmatica* Pinzari & Pinzari, sp. n. differs from the three similar and congeneric species, *H. roseostrigella*, *H. vulneratella* and *H. vazquezi* in having all together the specific and distinctive characteristics of these three species. In particular, the male of *Hypsotropa aenigmatica*, the only known specimen, has similar habitus of *H. roseostrigella*, i. e. it has the three bands of pink-purple scales that go longitudinally through the forewings, from the base to the outer edge, and it has the genitals with the valve of *H. vulneratella* and the gnathos of *H. vazquezi*. *H. aenigmatica* is only present in Tuscany, *H. vulneratella* in south-central part of the Italian peninsula and coexists in Sicily and Sardinia, but not in the same sites, with *H. roseostrigella.*

On the basis of our study, it follows that *Hypsotropa gallohispanicella* Leraut, 2019 is a new synonymy of *H. roseostrigella* Ragonot, 1901.

We deduced that the genus *Hypsotropa* is present in Italy with five species: *H. unipunctella* Ragonot, 1888, *H. limbella* Zeller, 1848, *H. roseostrigella* Ragonot, 1901, *H. vulneratella* (Zeller, 1847) and *H. aenigmatica* Pinzari & Pinzari, 2020. The latter two species are present in Europe only in Italy.

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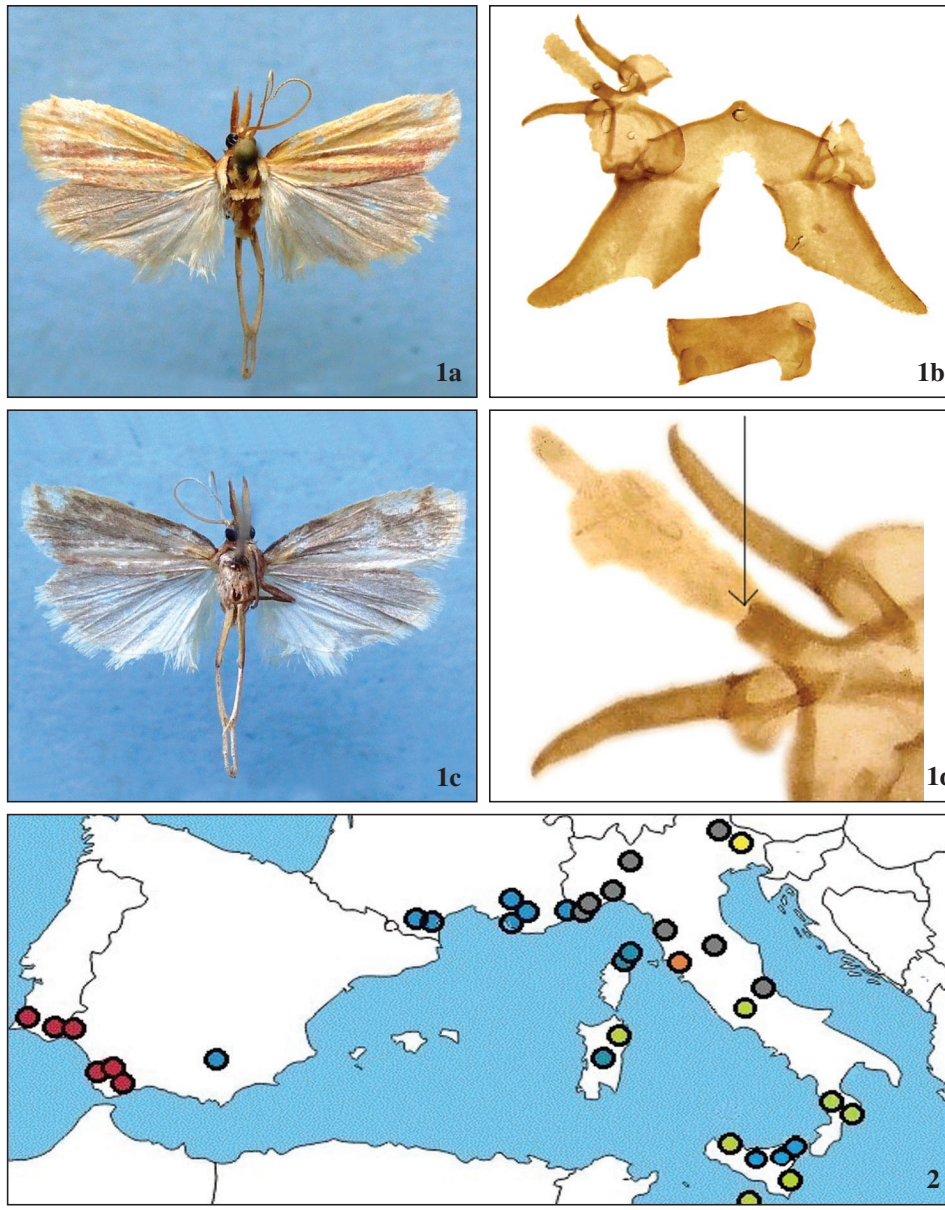

Figs 1-2.– 1. *Hypsotropa aenigmatica* Pinzari & Pinzari, sp. n., male, wing spans 18 mm, Tuscany, Capalbio Scalo (GR), 27-VI-2007, M. Pinzari leg.; **A**) front; **B**) male genitalia (gen. praep. PIRA 574 M. Pinzari); **C**) back; **D**) genital parts (gnathos) (gen. praep. PIRA 574, M. Pinzari). **2.** Distribution of the genus *Hypsotropa* in Italy: *H. unipunctella* (yellow); *H. limbella* (dark grey); *H. roseostrigella* (light blue); *H. vulneratella* (green); *H. aenigmatica* Pinzari & Pinzari, sp. n. (orange). In Portugal, Spain and France only *H. roseostrigella* and *H. vazquezi* (red) (GASTÓN *et al*., 2016) were shown.

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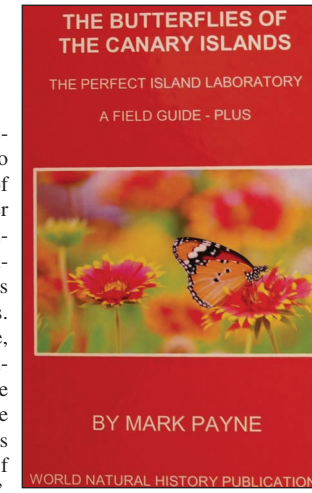
REVISIÓN DE PUBLICACIONES
BOOK REVIEWS

M. Payne
The butterflies of the Canary Islands – a field guide plus
417 pages
Format: 23,5 X 16 cm
World Natural History Publications, The Lake District, 2019



This is the third of four butterfly books from this author - a small fraction of the 28 titles, with a total of 5,680 pages, his self-promotion claims to have been published in 2019. This is not, by any criterion or the stretch of any imagination, a Field Guide, the purpose of which is to assist the reader to identify wildlife (butterflies in this case) seen in the field. As with the author's previous books, he arbitrarily cites the work of others on a monumental scale, belittles the work of respected colleagues and hugely praises his own "work", which largely consists of unfounded and unsupported ideas. Like previous volumes it opens with a quote from Alfred Russel Wallace, whose name is mis-spelled on every occasion the author has used it and continues with two pages of Payne's unsupported grand accomplishments (see TENNENT, 2020a). A pretentious preface concludes with the claim "There has never been a butterfly field guide like this one, for the Canary Islands or, for that matter, anywhere in the world. The planned global series of which it forms part makes all other such field guides obsolete at a stroke". The first of these claims is accurate, but not in the way the author intended: the only butterfly books the reviewer is aware of that are equally unutterably awful are the author's previous efforts on Cape Verde Islands and Azores butterflies.

Respected European entomologist Martin Wiemers receives a fulsome acknowledgement including a declaration that he "… not only supplied material and photographs for use in this book but also read the manuscript through prior to publication …". This is only partly true. The reviewer understands that Wiemers did exchange e-mails, allow use of his photographs, and read through a draft of Payne's first book but that he subsequently withdrew support. The author has used Wiemers' name and work to a disturbing degree, perhaps in the hope of giving himself a measure of credibility, but also to mask his own inadequacy.

Holt White's 1894 book "The Butterflies and Moths of Teneriffe [sic]", downloaded from the internet in its entirety (pp. 16-44), is followed (pp. 45-46) by a short "holiday" note published in the *Bulletin of the Amateur Entomologist's Society* in 2000, seemingly included to provide the author with the opportunity to append his own sarcastic and disparaging comments. Species accounts begin with the Lycaenidae; for example, the South African butterfly *Cacyreus marshalli* (pp. 76-81), although over six pages there is nothing about the characteristics of the adult butterfly, or its flight patterns, the essence of a Field Guide. Content is almost entirely the work of others, transcribed in bulk. It is not always clear where a quote finishes; whether this is deliberate or careless is hard to tell. Authors are usually named in the text but rarely acknowledged in the references.

The next species, probably not resident in the Canaries, is *Callophrys rubi* (p. 83-84). Of five paragraphs, text is largely copied verbatim from Wiemers (1st para), Holt White (2nd para), "South (1906)" (3rd and 4th paras), and "HENRIKSEN & KREUTZER (1982)" (final para). Neither South nor Henriksen & Kreutzer appear in the references. The former refers to Richard South's now very out-dated *Butterflies of the British Isles*, almost the only book available to a schoolboy of limited means when the reviewer was a boy. Henrikson & Kreutzer's *Butterflies of Scandinavia in Nature* describes butterflies occurring in a part of Europe about as far from the Ca-

naries as it is possible to get. Citing a quaint 116 year old book on British butterflies and a 40 year old Scandinavian butterfly book can hardly be considered adequate for a modern book on the Canary Islands.

For *Lampides boeticus* (85-91), following the usual tracts from Wiemers and Holt White, Payne moves east to the Indian sub-continent. Here he presents tabulated data relating to food consumption and utilisation efficiencies of laboratory reared *boeticus* larvae, including the weight of larval faeces, digestibility and other information irrelevant to the Canary Islands or to a Field Guide. The source is said to be "Padem [sic] et al. [sic] (2015)" (not in the references), but as the reviewer has already pointed out (TENNENT, 2002b), the first author's name is Palem, not Padem, or "Palim" (p. 86). Unfortunately for Mr Payne, although the authors believed they were dealing with *Lampides boeticus*, all photographs in their paper are of *Euchrysops cnejus*. This sets the standard for the author's work and illustrates the depressing fact that he cannot correctly identify one of the most easily recognisable butterflies in the Canary Islands and across much of the rest of the world. The section includes exactly the same entries from other Payne works: clumsy ("*Lampides boeticus* constitutes a genus by itself" [*i.e.* monotypic]: [p.88]); nugatory (tabulated larval and pupal duration pre- and post-monsoon: [p. 88]); and frankly silly ("In India, *Lampides boeticus* butterflies migrate annually from the heating-up plains to cooler hills in the early hot weather (Lefroy, 1909) [not in refs], with this movement occurring in the middle of March (Fletcher, 1930) [not in refs]. It is unknown if this behaviour also happens in the Canaries, but it would be surprising were it not so manifest. Simply, no-one has bothered to investigate its biology and life-cycle in the archipelago": p. 87). So far as *boeticus* is concerned, there appears to be nothing, in seven closely typed pages and tables, that relates directly to the species in the Canaries … and of course, *Euchrysops cnejus* does not occur there. Large scale regurgitation of exactly the same text used in previous books is dishonest and may be legally fraudulent since Mr Payne expects customers to purchase a series of books without acknowledging their common content.

The section on *Leptotes webbianus* includes reproduction (p. 100) of a colour plate depicting adult phenotypes from various islands taken from "Merit [sic], Manil, Vila & Wiemers" with all its very detailed data, presumably because his own illustrations (p. 369) consists of pictures from Wiemers and the author doesn't know which island form they represent.

A list of "doubtful species" [sic: recte doubtful records] do not include *Vanessa braziliensis* (166-167), which is given a full page of text ("until this matter is conclusively resolved, this author proposes to list *Vanessa braziliensis* as one of the species recorded from the Canary Islands") and a "known distribution" map of the whole of Tenerife. The author's maps serve little purpose; it would have been more useful to tabulate species/islands or to present a simple island distribution in the text for each species – although this would be challenging with the present chaotic layout.

Figures are of dubious or no relevance. Fig. 4 (p. 137) is a full page map of Africa with overlaid pictures of *Danaus chrysippus* phenotypes, acknowledged as "source: Herren et al [sic], 2007"; Herren is not in the references. The reviewer found the paper from which it is copied (HERREN *et al*., 2007) courtesy of the Oxford University Research Archive; the Canary Islands are not mentioned in the text. Fig. 5, on the following page, is clearly based on a similar but this time unattributed map. Elsewhere in the *D. chrysippus* section (p. 136), the author is critical of "Hassan *et al*. [sic] (2012)?. [sic]" (not in refs: see below) for not doing what he thought they should have done: "Given the tantalising glimpse of an explanation to [sic] a major problem that the authors came up with in 2012 it is a pity that (Majerus died that year) Hassan & Idris did not follow this up with rigorous experimentation and publish the results". Majerus is not mentioned in the text and this made no sense at all, until the reviewer found the original paper (HASSAN, IDRIS & MAJERUS, 2012) and realised the last author was afforded posthumous co-authorship. Mike Majerus died on the 27th of January 2009. The section concludes with a map with all islands except El Hierro shaded. The last paragraph is vintage Payne, who cannot resist a puerile and rather petulant jab at the entomological world in general (p. 139): "It seems to this author inconceivable that *D. chrysippus* [sic] has not occurred or does not occur in [sic] El Hierro …. Stray arrivals must over the years have come from other Canarian islands - just not to be noted by half-way competent entomologists present at the time".

Grammar, syntax and punctuation throughout the book are poor. The author has a grossly inflated idea of his own worth and ability, but unfamiliarity with his subject is transparent. For example (p. 98) "… eggs bear about 40 spiral ribs, half of them laevorotatory [sic: recte levorotatory], the other dextrorotatory towards the microplyle [sic: recte micropyle] zone." … and (p. 101) "South … described … the-then named *Herodes* [sic] *phlaeas* (*Chryspophanus*) [sic] in the UK". South (1906: 152) correctly (for his time) referred to "(*Heodes phlaeas* (*Chrysophanus*))". In places (*e.g*. p. 58), the author presses hard for acceptance of his term "Paynesian Shortfall", now mentioned in each of his books, apparently without any awareness of the obvious irony: a lack of basic knowledge; abysmal research; no understanding of the purpose of a Field Guide or references *etc*. Mr Payne's glaring shortfalls are there for all to see. There is no index.

Content depends wholly on what the author happens to have come across in his inadequate literature forages. Perhaps because he believes his own work is outstanding, he feels under no obligation to properly confer credit

where it's due - and when he does, he is often disparaging. For example (p. 225): "It is a mystery to this author why Higgins & Riley (1970, and subsequent editions) and Tolman & Lewington (1997) are so often quoted in the literature as authoritative sources, as their work … contained numerous errors even at the time of publication …". An astonishing statement from someone whose own work is so hideous. Totally unnecessary rudeness of some of his other comments is breathtaking. For example, with reference to an observation by Owen, Smith & Smith (1988) (p. 357): "… to this author this small piece of ad hoc [sic] work falls into the 'freak show' end of scientific experimentation, devoid as it was of meaningful science", and of Brian Gardiner "Gardiner's logic, work, efforts and conclusions were so deeply flawed as to have been just about irrelevant to meaningful scientific debate"; and so it continues.

As anyone who has visited the Canaries knows, the islands are wonderfully photogenic. Of a series of 18 photographs of the Canary Islands (pp. 61-69) Mr Payne acknowledges responsibility for five very ordinary pictures of Tenerife; the remaining 13, illustrating some superb views on Tenerife, La Palma, El Hierro, La Gomera, Gran Canaria, Fuerteventura and Lanzarote, were all taken by Martin Wiemers. Photographs of butterflies and a sparse, random sprinkling of early stages at the end of the book (pp. 364-401) perfectly mirror Mr Payne's input to his own book; of *ca* 235 pictures, *ca* 150 have been taken from Matt Rowlings internet website; almost 50, mainly of *Hipparchia* and *Gonepteryx* are attributed to Wiemers. The few remaining photographs were taken by others (*Hypolimnas misippus* pictures are from India), leaving a solitary picture taken by the author himself (p. 395): a mediocre photograph, possibly using a mobile telephone, of *Pieris rapae*, some distance away, sitting on a nasturtium leaf. A bleak illustration of Mr Payne's ability, engagement and interest.

Continued association of Pemberley Books with Mr Payne, regularly raised by European entomologists, is baffling. His publications cannot be taken seriously, and it is understood there are copyright and other issues pending; a search by the reviewer failed to identify any other reputable bookseller stocking or advertising his books. It is difficult to comprehend why, supported by risible knowledge of the new world he temporarily inhabits, the author has chosen to write in the most negative fashion imaginable. His perfidious narcissism does him no favours, and his egregious attempts at writing butterfly books are exceedingly thin gruel. In the opinion of the reviewer, there is nothing to recommend this dreadful book.

The price of this book is of 69 pounds and the interested ones can request it to:

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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.

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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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Contribución al conocimiento de los Lepidoptera Heterocera en Guinea Ecuatorial. Dos géneros y tres especies nuevas para la fauna de este país (Lepidoptera: Nolidae, Hyblaeidae, Erebidae)

A. Vives Moreno

Resumen

En el curso de la reorganización y catalogación del material de Lepidoptera que se encuentra depositado en las colecciones de Entomología del Museo Nacional de Ciencias Naturales (MNCN), en Madrid (España), con el nombre de "exótico", hemos revisado una especie del género *Earias*, otra del género *Hyblaea* y una tercera del género *Macella* Walker, 1859, de la Guinea Española, procedentes de las exploraciones realizadas por diferentes científicos españoles. La Guinea Española por entonces se encontraba dividida en dos provincias desde 1959, a saber: la de Fernando Póo, con las islas de Fernando Póo y Annobón y la de Río Muni, con el territorio continental de Río Muni y las islas de Corisco, Elobey Grande y Elobey Chico, pasando a ser un país independiente en 1968 tomando el nombre de República de Guinea Ecuatorial.

De acuerdo con nuestras investigaciones, del género *Hyblaea* Fabricius, 1793, hay dos especies que se encontrarían en Guinea Ecuatorial, *Hyblaea occidentalium* Holland, 1894 e *Hyblaea puera* (Cramer, 1777), resultando ésta última nueva para la fauna de este país. Igualmente hemos estudiado material del género *Earias* Hübner, [1825] 1816, con una especie *Earias biplaga* Walker, 1866 así como del género *Macella* Walker, 1859 con una especie *Macella euritiusalis* (Walker, 1859), resultando que tanto los géneros como las especies, resultan nuevos para la fauna de este país. En este trabajo hacemos una revisión de su distribución y realizamos un estudio de la genitalia de estas especies.

PALABRAS CLAVE: Lepidoptera, Nolidae, *Earias*, Hyblaeidae, *Hyblaea*, Erebidae, *Macella*, Guinea Ecuatorial.

Contribution to the knowledge of the Lepidoptera Heterocera in Equatorial Guinea. Two genera and three species new for the fauna of this country (Lepidoptera: Nolidae, Hyblaeidae, Erebidae)

Abstract

In the course of the reorganization and cataloguing of the Lepidoptera material deposited in the Entomology Collection of the Museo Nacional de Ciencias Naturales (MNCN), in Madrid, Spain, under the name "Exotic", we have revised one specie of the genus *Earias* Hübner, [1825] 1816, two species one of the genus *Hyblaea* Fabricius, 1793, and other of the genus *Macella* Walker, 1859, originating in exploratory work carried out by different Spanish Scientists. Spanish Guinea was divided into two provinces after 1959: Fernando Poo province, including Fernando Poo and Annobon Islands and Rio Muni province, including the continental territory of Rio Muni and the islands of Elobey Grande, Elobey Chico and Corisco. It became an independent country in 1968, taking the name of Republic of Equatorial Guinea.

According to our investigations, two species of the genus *Hyblaea* Fabricius, 1793 are present in Equatorial Guinea: *Hyblaea occidentalium* Holland, 1894 and *Hyblaea puera* (Cramer, 1777), this last are new for the fauna of this country. Equally we have studied material of the genus *Earias* Hübner, [1825] 1816 with one species *Earias*

biplaga Walker, 1866, and of the genus *Macella* Walker, 1859 with a species *Macella euritiusalis* (Walker 1859) and that as much the genus as the species, they are news for the fauna of this country. In this work we revise their distribution and carry out the study of the genital of these species.
KEY WORDS: Lepidoptera, Nolidae, *Earias*, Hyblaeidae, *Hyblaea*, Erebidae, *Macella*, Equatorial Guinea.

Introducción

Leyendo las Memorias de la Real Sociedad Española de Historia Natural y más concretamente, su primer volumen (1909-1910), fruto del esfuerzo organizador del Profesor Doctor Ignacio Bolívar, que, por aquel entonces, era Director del Museo de Ciencias Naturales (actualmente Museo Nacional de Ciencias Naturales), nos aportaron una serie de memorias científicas con las descripciones de nuevas especies de diferentes órdenes.

De la gran cantidad de material que se recogió del Muni, posteriormente provincia de Río Muni, se publicaron treinta memorias, para lo que se contó con la colaboración de Boulenger, Simon, D'Orbigny, Lesne, Pic, Grouvelle, Fauvel y R. Martín, de Francia; Bourgeois, Weise y Gebien, de Alemania; Kheil y Kapalek, de Austria-Hungría; Carl, de Suiza; Nobili, de Italia; así como los naturalistas españoles I. Bolívar, A. Cabrera, A. García Varela, J. González Hidalgo y también Beltrán Rózpide, que escribió el artículo sobre la descripción geográfica del territorio estudiado (BOLIVAR, 1910).

Para el estudio de los Lepidoptera, se encargó al checo Napoleón Manuel Kheil, a quién el Profesor Bolívar entregó un primer lote de doscientos cincuenta ejemplares de Rhopalocera y unos pocos Heterocera, recogidos por Manuel Martínez de la Escalera, durante el mes de agosto de 1901, concretamente en los alrededores del Cabo de San Juan, en la provincia Litoral del territorio continental del Muni, que formarían una colección de ciento diecinueve especies y que se describiría una nueva. Posteriormente, le remitió un segundo lote de ejemplares de Heterocera y unos pocos Rhopalocera, con el que se describirían otras cuatro nuevas especies, si bien en ninguno de los dos trabajos publicados sobre la fauna de la Guinea Española (KHEIL, 1905, 1909), no menciona ninguna especie de los géneros *Earias* Hübner, [1825] 1816, *Hyblaea* Fabricius, 1793 y *Macella* Walker, 1859.

Durante nuestros trabajos de reorganización y catalogación del material de Lepidoptera que se encuentra depositado en las colecciones de Entomología del Museo Nacional de Ciencias Naturales (MNCN), en Madrid (España), con el nombre de "exótico", hemos revisado una especie del género *Hyblaea* Fabricius, 1793, otra del género *Earias* Hübner, [1825] 1816 y otra del género *Macella* Walker, 1859, de la antigua Guinea Española, procedentes de las exploraciones realizadas por diferentes científicos españoles.

La Guinea Española por entonces se encontraba dividida en dos provincias desde 1959, a saber: la de Fernando Póo, con las islas de Fernando Póo y Annobón y la de Río Muni, con el territorio continental de Río Muni y las islas de Corisco, Elobey Grande y Elobey Chico, pasando a ser un país independiente en 1968 tomando el nombre de República de Guinea Ecuatorial.

De acuerdo con nuestras investigaciones, del género *Hyblaea* Fabricius, 1793, hay dos especies que se encuentran en Guinea Ecuatorial, *Hyblaea occidentalium* Holland, 1894 e *Hyblaea puera* (Cramer, 1777), ésta última resulta nueva para la fauna de este país; igualmente hemos estudiado material del género del género *Earias* Hübner, [1825] 1816, con una especie *Earias biplaga* Walker, 1866 y del género *Macella* Walker, 1859 con una especie *Macella euritiusalis* (Walker, 1859), que tanto estos dos últimos géneros como las dos especies, resultan también nuevos para la fauna de este país.

Material y métodos

El material utilizado para el estudio se ha obtenido de los fondos entomológicos del Museo Nacional de Ciencias Naturales en Madrid, España. Para su identificación nos hemos basado en el examen comparativo de los caracteres morfológicos externos y, sobre todo, en el análisis de la estructura genital de los ejemplares. La preparación de los órganos genitales se ha efectuado siguiendo a ROBINSON (1976), con modificaciones. Se han utilizado los microscopios Leica DMLB, Leica MZAPO, la cámara

digital Leica DFC550 y SONY α100 DSLR-A100K con objetivo AF 100 MACRO 1:2,8 (32), e igualmente para el retoque fotográfico, el programa de Adobe Photoshop ©.

Abreviaturas

AV	Antonio Vives
MNCN	Museo Nacional de Ciencias Naturales, Madrid, España
NHMO	Natural History Museum Oslo, Oslo, Noruega
prep. gen.	preparación de genitalia

Resultados

NOLIDAE

Earias Hübner, [1825] 1816
Earias Hübner, [1825] 1816. *Verz. bekannter Schmett*.: 393. Especie tipo: *Phalaena clorana* Linnaeus, [1760] 1761. *Fauna Suecica*: 343
= *Earis*; Stephens, 1834. *Illustr. Br. Ent.* (Haustellata), **4**: 67, *lapsus calami*
= *Aphusia* Walker, [1858] 1857. *List Spec. lepid. Insects Colln Br. Mus*., **12**: 766, 769. Especie tipo: *Aphusia speiplena* Walker, [1858] 1857
= *Digba* Walker, 1862. *J. Proc. Linn. Soc.* (Zool.), **6**: 197. Especie tipo: *Digba uninotata* Walker, 1862. *J. Proc. Linn. Soc.* (Zool.), **6**: 198
= *Cinciana* Strand, 1915. *Arkv. Natur*., **80** A (12): 96. Especie tipo: *Cinciana nubica* Strand, 1915. *Arkv. Natur*., **80** A (12): 96-97
= *Cincianella* Strand, 1928. *Arkv. Natur*., **92** A (8): 51, innecesario nombre de reemplazo de *Cinciana* Strand, 1928

Earias biplaga Walker, 1866 (fig. 1)
Earias biplaga Walker, 1866. *List Spec. lepid. Insects Colln Br. Mus*., **35**: 1773
LT: SIERRA LEONA
= *Earias fuscociliana* Snellen, 1872. *Tijdschr. Ent*., **15**: 36
LT: Neder-Guinea [CONGO]
= *Earias maculata* Snellen, 1872. *Tijdschr. Ent*., **15**: 36-37
LT: Neder-Guinea [CONGO]
= *Earias plaga* Felder & Rogenhofer, 1875. *Reis. Nov*., **2**(4): 8, pl. 108, fig. 20
LT: Knysa [SUDÁFRICA]
= *Earias citrina* Saalmüller, 1884. *Lep. Madag*., **1**: 178-179
LT: Isla de Nosy Be, MADAGASCAR
= *Earias crocea* Mabille, [1900] 1899. *Ann. Soc. Ent. Fr*., **68**(4): 727
LT: COMORES

Material estudiado: GUINEA ECUATORIAL, Guinea Española, 1 ♂, III-1933, F. Bonet & J. Gil leg. (prep. gen. 61733AV) (fig. 7).

Biología: Es considerada un grave plaga en las plantaciones de algodón (*Gossypium hirsutum* L.) (Malvaceae) y del cacao (*Theobrome cacao* L.) (Malvaceae). Siguiendo a LAMBORN (1914), también se han encontrado diferentes especies de plantas nutricias de las familia Fabaceae y Sterculiaceae. Se han encontrado las siguientes especies que la parasitan como: *Brachymeria olethria* (Waterson, 1914) (Chalcididae), *Anterhynchium synagroides* (Saussure, 1852) y *Tricarinodynerus ventralis* (Saussure, 1890) (Eumenidae), posteriormente, se han encontrado diferentes especies de la familia Braconidae.

Distribución: Por los datos que disponemos, se encontraría por la región Afrotropical, Madagascar, islas Comores y Mauricio, Arabia Saudí, región Indoaustraliana, también ha sido capturada en el

Reino Unido (BRADLEY & MERE, 1964: 73-74), Dinamarca (FIBIGER *et al*., 2009: 131) y también ha sido citada de Israel (KRAVCHENKO *et al*., 2009: 3) y ahora es **nueva para Guinea Ecuatorial**.

HYBLAEOIDEA

Según nuestra investigaciones, en el momento actual, la superfamilia Hyblaeoidea Hampson, 1903 (*Cat. Lepid. Phalaenae Br. Mus*., **4**: 4) fue originalmente incluida en los Noctuidae Latreille, 1809 (*Gén. crust. Ins*., **4**: 224), posteriormente en los Pyraloidea Latreille, 1809 (*Gén. crust. Ins*., **4**: 228) (FORBES, 1933: 490), después en los Sesioidea Boisduval, [1828] 1829 (*Eur. Lep. Ind. Meth*.: 29) (BROCK, 1971: 35) y separados como superfamilia por MINET (1983: 203), como actualmente se considera.

En la actualidad la superfamilia Hyblaeoidea se encuentra formada por dos familias Hyblaeidae Hampson, 1903 y Prodidactidae Epstein & Brown, 2003 (*Zootaxa*, **247**: 2).

HYBLAEIDAE

Hyblaea Fabricius, 1793
Hyblaea Fabricius, 1793. *Ent. Syst*., **3**(1): [vi]. Especie tipo: *Noctua saga* Fabricius, 1787. *Mantissa Insect*., **2**: 137
= *Nychophila* Billberg, 1820. *Enumeratio Insect. Mus. G. J. Billberg*: 86. Especie tipo: *Noctua saga* Fabricius, 1787. *Mantissa Insect*., **2**: 137
= *Aenigma* Strecker, 1876. *Lepid., Rhop. & Heter., indig. & exot.*: 122, *nec* Newman, 1836. *Ent. Mag.,* **3**: 499 (Coleoptera). Especie tipo: *Aenigma mirificum* Strecker, 1876. *Ibidem*: 122

Hyblaea occidentalium Holland, 1894 (figs. 2-3)
Hyblaea occidentalium Holland, 1894. *Psyche*, **7**: 33, pl. 1, figs. 25-29
LT: West Africa
= *Hyblaea flavipicta* Hampson, 1910. *Proc. zool. Soc. Lond*., **1910**: 451-452, pl. 38, fig. 19
LT: Katanga, Kambove [CONGO]
= *Hyblaea flavifasciata* Hampson, 1910. *Proc. zool. Soc. Lond*., **1910**: 452-453, pl. 38, fig. 16
LT: Valle de Chambezi, Rodesia [ZIMBABUE]
Hyblaea rosacea Gaede, 1917. *Dt. ent. Z*., **1917**(I-II): 23-24
LT: Dume, CAMERÚN
Hyblaea inferna Gaede, 1917. *Dt. ent. Z*., **1917**(I-II): 24
LT: Akoafim, CAMERÚN
Hyblaea dilata Gaede, 1917. *Dt. ent. Z*., **1917**(I-II): 25
LT: Nkolentangan, GUINEA ECUATORIAL

Material estudiado: TANZANIA, Morogoro, Distr. & Town, 500-600 m, 1 ♂ (prep. gen. NHMO3820) (fig. 8), 1 ♀ (prep. gen. NHMO3821) (fig. 11), 18-XII-1991, L. Aarvik leg.

Biología: Se desconoce su planta nutricia.

Distribución: Según nuestros datos, se la puede localizar en África y más concretamente en Camerún, Eritrea, Kenia, Guinea Ecuatorial, Malawi, Mozambique, República Democrática del Congo, Tanzania y Zambia.

Detalles: Esta especie fue citada por STRAND (1914: 88), quien menciona la captura de un macho en Nkolentangan el 29-XII-[19]08 y una hembra en Alen, 1-15-IX-[19]06, que supusieron las dos primeras citas de esta especie en la parte continental de la antigua Guinea Española, concretamente en la provincia del Muni. Posteriormente también volvería a ser citada de Nkolentangan, pero bajo el nombre de *Hyblaea dilata* Gaede, 1917 (GAEDE, 1917: 25), que actualmente es considerada sinonimia de *occidentalium* Holland, 1894.

Hyblaea puera (Cramer, 1777) (figs. 4-5)
Phal.[aena] Noct.[ua] puera Cramer, 1777. *Pap. Exot*., **2**: 10-11, pl. 103, figs D, E
LT: Surinamen [SURINAM]
N. [octua] saga Fabricius, 1787. *Mant. Insect*., 2: 137-138
LT: Coromandel [INDIA]
= *Noctua unxia* Hübner, [1813] 1796. *Samml. Eur. Schmett. Noct*.: fig. 513
LT: Desconocida
= *Heliothis apricans* Boisduval, 1833. *Fauna Ent. Madag*.: 98, pl. 15, fig. 7
LT: MADAGASCAR
= *Nabara limacodella* Walker, 1866. *List Spec. lepid. Insects Colln Br. Mus*., **35**: 1706
LT: Java [INDONESIA]
= *Aenigma mirificum* Strecker, 1876. *Lepid. Rhop. Het. indigenous & exotic*: 122
LT: Texas, EE.UU.
= *Hyblaea insulsa* Gaede, 1917. *Dt. ent. Z*., **1917**(I-II): 24
LT: Gabun, West-Africa [GABÓN]

Material estudiado: GUINEA ECUATORIAL, Guinea Española, Fernando Póo, St. Isabel, 7 ♀♀, IX-1928, T. Vives leg. (prep. gen. 61729AV, 61730AV, 61731AV, 61732AV) (fig. 12). KENIA, Rift Valley prov., Mt. Elgon, Nat. Park, Chorlim gate, Rongai camp., 2.206 m, 1 ♀, 17-21-XI-2006, L. Oven Hasen & K. Sund leg. (N 01º 01' 51.7" E 034º 46' 40.8") (prep. gent. NHMO3823). TANZANIA, Munfindi Distr.: Mufundi, 1.960 m, 1 ♂, 16-I-1993, L. Aarvik leg. (prep. gen. NHMO3822) (fig. 9).

Biología: Es una especie polífaga con más de 45 especies usadas como plantas nutricias, pertenecientes a las familias Araliaceae, Bignoniaceae, Juglandaceae, Lamiaceae, Oleaceae, Rhizophoraceae y Verbenaceae.

Distribución: Según nuestros datos es una especie que se conoce de las zonas tropicales del mundo localizándose en sudeste de Asia, llegando hasta Nueva Guinea y Australia, China, Taiwán, Filipinas, Japón, Samoa, América central y del sur llegando hasta Paraguay, sur y este de África, Madagascar, Islas Mauricio y ahora **nueva para Guinea Ecuatorial**.

EREBIDAE

Macella Walker, [1859] 1858
Macella Walker, [1859] 1858. *List Spec. lepid. Insects Colln Br. Mus*., **16**: 161. Especie tipo: *Macella euritiusalis* Walker, [1859] 1858. *Ibidem*, **16**: 161
= *Eucapnodes* Holland, 1894. *Psyche*, **7**: 110. Especie tipo: *Capnopdes sexmaculata* Walker, 1865. *List Spec. lepid. Insects Colln Br. Mus*., **33**: 1075

Macella euritiusalis Walker, [1859] 1858 (fig. 6)
Macella euritiusalis Walker, [1859] 1858. *List Spec. lepid. Insects Colln Br. Mus.,* **16**: 161
LT: SIERRA LEONA
= *Capnodes? consocia* Walker, 1865. *List Spec. lepid. Insects Colln Br. Mus.,* **33**: 1077
LT: SIERRA LEONA
= *Capnodes sexmaculata* Walker, 1865. *List Spec. lepid. Insects Colln Br. Mus.,* **33**: 1077
LT: SIERRA LEONA
= *Capnodes? trinotata* Walker, 1869. *Proc. Nat. Hist. Soc. Glasgow*, **1**(2): 365
LT: CONGO
= *Capnodes disticha* Saalmüller, 1891, *in* Saalmüller & Heyden. *Lepid. Madagascar,* (2): 248, pl. 10, fig. 176
LT: MADAGASCAR
= *Capnodes margineguttata* Heyden, 1891, *in* Saalmüller & Heyden. *Lepid. Madagascar,* (2): 248, pl. 11, fig. 197
LT: MADAGASCAR

= *Eucapnodes excentrica* Karsch, 1896. *Ent. Nachr*., **22**(15): 236
LT: Bismarchburg, TOGO
= *Eucapnodes megalosara* Bethune-Baker, 1911.- *Ann. Mag. Nat. Hist*., (8) **7**(41): 539
LT: Lagos, NIGERIA

Material estudiado: GUINEA ECUATORIAL, Guinea Española, Fernando Póo, Santa Isabel, 1 ♂, I-1935, F. Bonet & J. Gil leg.; Guinea Española, 1 ♂, (prep. gen. 61657AV) (fig. 10).

Biología: Desconocida.

Distribución: Según nuestros datos es una especie que se conoce de Camerún, Gambia, Nigeria, Congo, Sierra Leona, Togo y ahora **nueva para Guinea Ecuatorial**.

Agradecimientos

No podemos terminar este trabajo sin dar las gracias por la colaboración y la ayuda prestada por las siguientes personas e Instituciones a Francisco Javier Conde de Saro (Madrid, España), por su ayuda en la revisión lingüística del trabajo; a Javier Gastón (Getxo, España), por su ayuda en el reportaje fotográfico; a Leif Aarvik (Ås, Noruega) por el préstamo del material solicitado; al Dr. Ulf Buchsbaum (Múnich, Alemania) por la ayuda prestada en las consultas realizadas y a la Dra. Amparo Blay, conservadora de Entomología, en el Museo Nacional de Ciencias Naturales, en Madrid (España), que siempre ha estado dispuesta a ayudarnos en nuestras investigaciones de los fondos de esta Institución.

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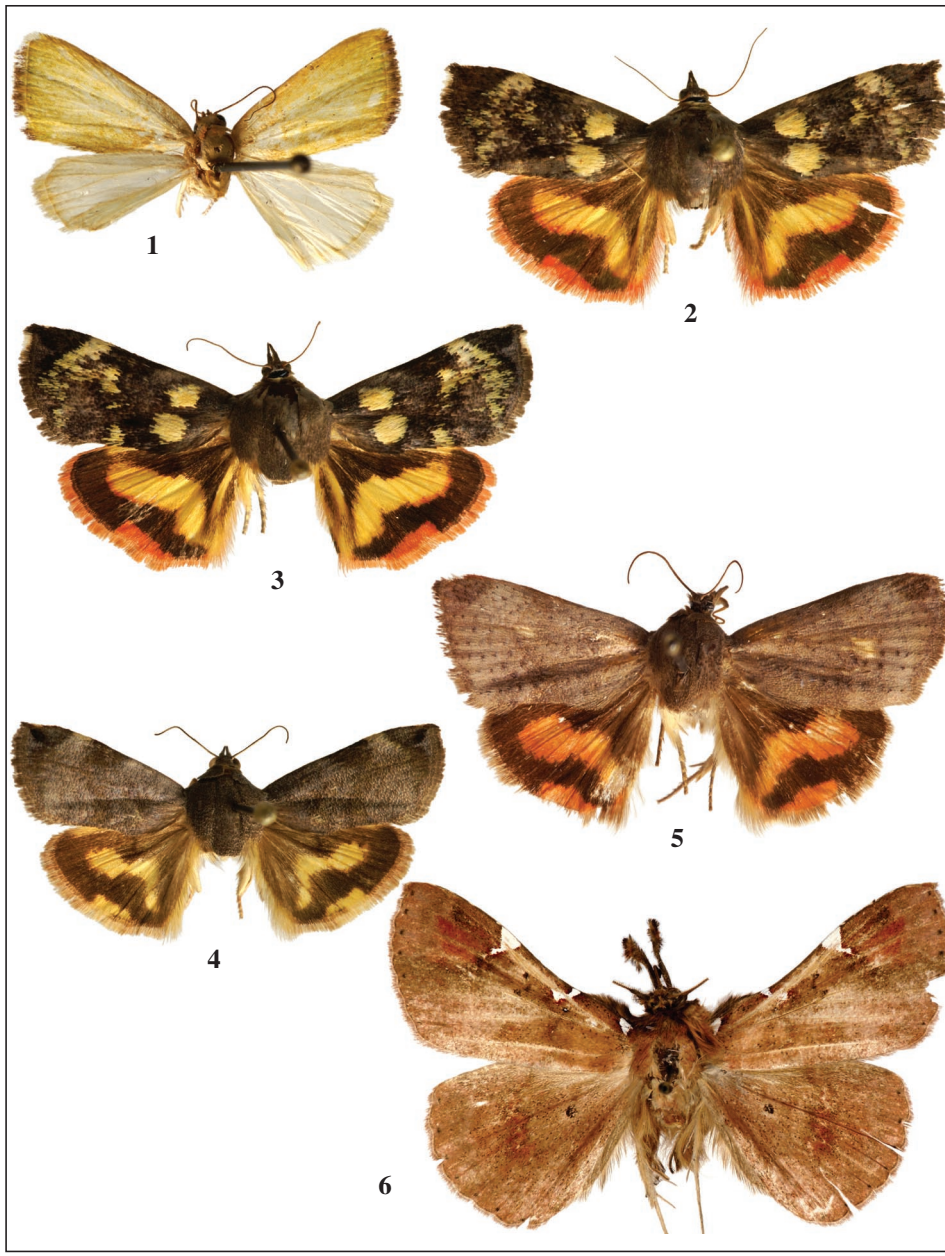
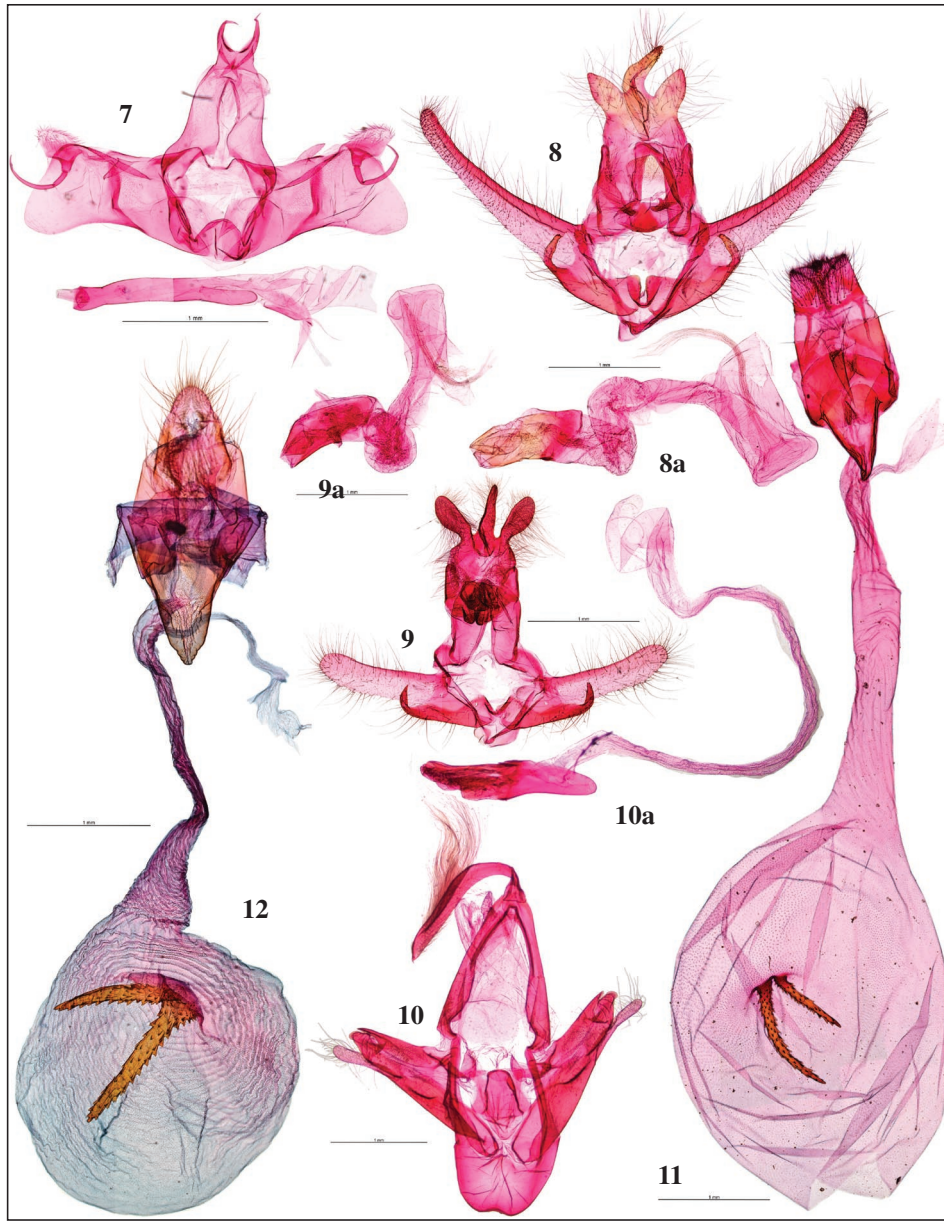


Figuras 1-6.– 1. *Earias biplaga* Wlk., ♂, Guinea Ecuatorial. **2.** *Hyblaea occidentalium* Holl., ♂, Tanzania. **3.** *H. occidentalium* Holl., ♀. **4.** *H. puera* (Cr.), ♂, Tanzania. **5.** *H. puera* (Cr.), ♀, Guinea Ecuatorial. **6.** *Macella euritiusalis* Wlk., ♂, Guinea Ecuatorial.



Figuras 7-12.– 7. *Earias biplaga* Wlk., andropigio, prep. gen. 61663AV. **8.** *Hyblaea occidentalium* Holl., andropigio, prep. gen. NHMO3820. **8a.** aedeagus del mismo. **9.** *H. puera* (Cr.), andropigio, prep. gen. NHMO3822. **9a.** aedeagus del mismo. **10.** *Macella euritiusalis* Wlk., andropigio, prep. gen. 61657AV. **10a.** aedeagus del mismo. **11.** *Hyblaea occidentalium* Holl., ginopigio, prep. gen. NMMO3821. **12.** *H. puera* (Cr.), ginopigio, prep. gen. 61729AV.

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A new species of *Crambus* Fabricius, 1798 from China (Lepidoptera: Crambidae)

W. C. Li

Abstract

Crambus duospineus Li, sp. n. is described from Jiangxi Province, China. The new species can be diagnosed by the sacculus of male genitalia with a strongly sclerotized apex, ending with two spine-like projections, and the well-developed apical spine of the phallus is approximate half as long as the phallus. Images of the head, habitus, and male genitalia of *Crambus bipartellus* South, 1901 are provided for comparison.
KEY WORDS: Lepidoptera, Crambidae, *Crambus,* new species, China.

Una nueva especie de *Crambus* Fabricius, 1798 de China (Lepidoptera: Crambidae)

Resumen

Se describe de la provincia de Jiangxi, China, *Crambus duospineus* Li, sp. n. La nueva especie puede ser diagnosticada por el sacculus de la genitalia del macho con una fuerte esclerotización en el apex, terminando con dos espinas en su parte final y la espina apical del phallus es, aproximadamente, la mitad de la longitud del phallus. Se proporcionan imágenes de la cabeza, habitus y de la genitalia del macho de *Crambus bipartellus* South, 1901 para comparación.
PALABRAS CLAVE: Lepidoptera, Crambidae, *Crambus*, nueva especie, China.

Introduction

The genus *Crambus* was erected by Fabricius in 1798 (FABRICIUS, 1798), and its type species *Phalaena pascuella* Linnaeus, 1758 was subsequently designated by CURTIS (1826). Most members of the genus have a white longitudinal stripe on the forewing that extends from the base to the apex of the discal cell or to the termen. In species delimitation, the male genitalia provide significant characters, especially the structures of the valva (costa, sacculus) and cornuti in the phallus. To date, the genus has 167 species worldwide and occurs in each biogeographical region (NUSS *et al*., 2020). Before this study, twenty-one species has been recorded in China (BŁESZYŃSKI & COLLINS, 1962; BŁESZYŃSKI, 1965; CHEN *et al*., 2005). In the present paper, a new species of the genus is added from China. All the specimens studied are deposited in the Insect Museum, Jiangxi Agricultural University, Nanchang, China (JXAUM).

***Crambus duospineus* Li, sp. n.** (Figs 1-4)

Material examined: Holotype (&&), China, Jiangxi Province: Wugong Mountain [27º27'N,

114º11'E], 1800 m, 13-IX-2014, Weichun Li, genitalia slide no. WD16076. Paratype, 1 (&&), same data as holotype.

Description Adult (Figs 1-2): Forewing length 10.5-11.0 mm. Frons and vertex ochre yellow. Labial palpus twice as long as diameter of compound eye, ocherous mixed with pale brown except basally white; first and second segments porrect, third segment slightly downward. Maxillary palpus slightly upright, basal white, ventrally ochre yellow mixed with pale yellow. Antenna scape dorsally white; flagellomere dorsally white, ventrally ochre yellow. Thorax blackish brown. Forewing scattered with pale brown and ochre yellow scales; longitudinal stripe white and lined with brown, extending from base to apical part of distal cell, its basal two-thirds gradually broadened and distal third narrowing to triangular apex; cilia pale brown. Hindwing greyish brown; cilia white. Abdomen pale brown.

Male genitalia (Figs 3-4): Uncus thin and long, tapering to point apex. Gnathos slightly longer than uncus, curved downward near apex, distally blunt. Tegumen as long as gnathos, with broad dorsal bridge. Valva gently broadened towards rounded apex. Sacculus well-developed, concave near middle, with distal one fourth gently broadened; apex strongly sclerotized, adorned with a spine-like projection on dorsal and ventral margin. Saccus broad, with concave distal margin medially. Phallus slightly shorter than valva, ventral wall with thickly sclerotized, slightly curved thin rod in apical half.

Female: Unknown.

Distribution: China (Jiangxi).

Diagnosis: The new species (Fig. 1) is similar in forewing pattern to *Crambus bipartellus* South, 1901 (Fig. 5), but it can be distinguished from the latter by the two spine-like projections at the apex of sacculus (Fig. 3b) and the phallus with the wall forming a thickly sclerotized thin rod in its apical half (Fig. 4b). In *C. bipartellus*, the sacculus has a single apical projection (Fig. 6) and the phallus is without apical spine but has two spine-like cornuti (Fig. 7).

Natural history: Unknown except that the moths fly near middle of September. The habitat in which this species has been collected is located at an altitude of 1800 m, on the south slop of Mount Wugong; and the vegetation at the collecting locality consists of *Miscanthus* sp. (Poaeceae).

Etymology: The specific name is derived from the Latin prefix *duo-* = double and the Latin *spineus* = spinous, in reference to the sacculus ending with two apical spines in male genitalia.

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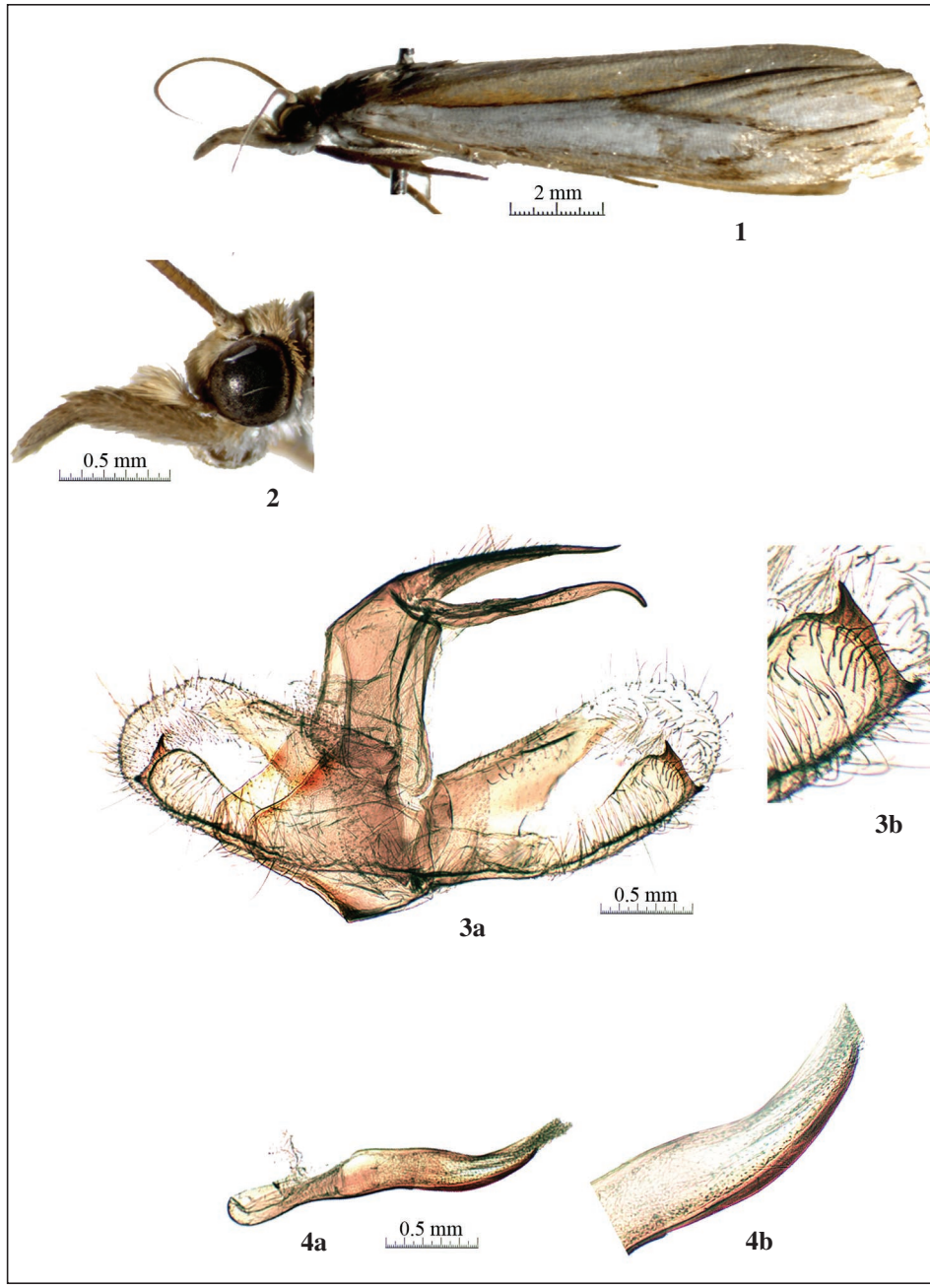

Figs 1-4.– *Crambus duospineus* Li, sp. n., holotype: **1.** Adult; **2.** Head on lateral view; **3a.** Male genitalia without phallus; **3b.** Apex of sacculus; **4a.** Phallus; **4b.** Apical spine of phallus.

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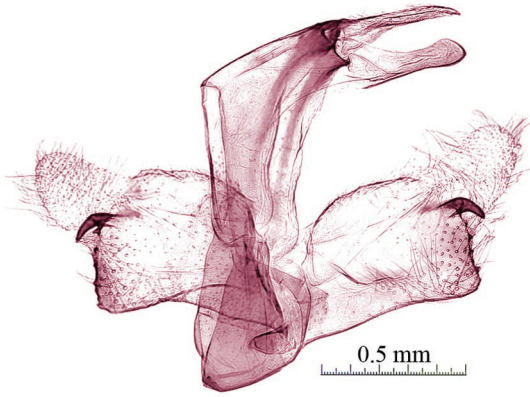

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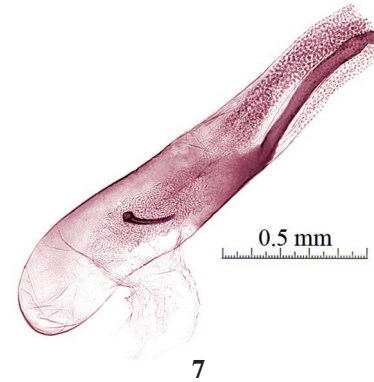

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Figs 5-6.– *Crambus bipartellus* South, 1901: **5.** Adult, male; **6.** Male genitalia without phallus; **7.** Phallus.

REVISIÓN DE PUBLICACIONES
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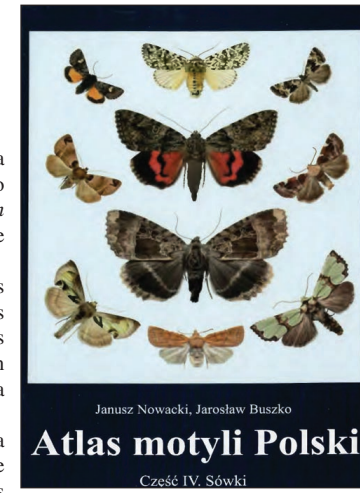

Aparece el volumen IV de esta serie sobre la fauna lepidopterológica presente en Polonia, escrita en polaco, que en el caso que nos ocupa, se tratan las familias Erebidae Leach, [1815], *in* Brewster, Euteliidae Grote, 1882, Nolidae Bruand, 1847 y Noctuidae Latreille, 1809.

Comienza la obra hablando de los principales trabajos publicados durante el siglo XX, en los que se mantenían estudios sobre las especies de las diferentes familias consideradas en esta obra; sobre las características, sobre los movimientos migratorios y continuando con una lista de todas las especies polacas conocidas de los Noctuoidea Latreille, 1809.

Ya dentro de la parte principal de la obra, se tratan todas y cada una de las 506 especies conocidas de estas cuatro familias, sobre las que se dan datos sobre su morfología, período de vuelo, aspectos medioambientales, sobre las plantas nutricias y su distribución geográfica, presentando un pequeño resumen en inglés.

Finaliza la obra con cuarenta y siete láminas, a todo color, de las especies consideradas, de una bibliografía específica, de un índice específico y de un índice con los nombres científicos de las especies trataban y otro índice con los nombres en polaco de las mismas.

No podemos terminar estas líneas, sin felicitar a los autores, por este trabajo que nos permite conocer la interesante fauna polaca y a la Editorial por realizar un buen trabajo.

El precio de este libro es de 120 zlotys y los interesados deben dirigirse a:

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New and interesting Portuguese Lepidoptera records from 2019 (Insecta: Lepidoptera)

M. F. V. Corley, J. Nunes, J. Rosete, R. Terry & S. Ferreira

Abstract

Fourteen species are added to the Portuguese Lepidoptera fauna, of which three are new for the Iberian Peninsula, and two species deleted, mainly as a result of fieldwork undertaken by the authors and others in 2019. In addition, second and third records for the country, new province records and new food-plant data for a number of species are included. A summary of recent papers affecting the Portuguese fauna is included.
KEY WORDS: Insecta, Lepidoptera, distribution, Portugal.

Novos e interessantes registos portugueses de Lepidoptera em 2019 (Insecta: Lepidoptera)

Resumo

Como resultado do trabalho de campo desenvolvido pelos autores e outros, principalmente no ano de 2019, são adicionadas quatorze espécies de Lepidoptera à fauna de Portugal, das quais três são novas para a Península Ibérica, e duas são retiradas. Adicionalmente, são apresentados segundos e terceiros registos de espécies previamente conhecidas, bem como novas plantas alimentícias para algumas espécies. É apresentado um sumário dos mais recentes trabalhos relevantes para a fauna portuguesa.
PALAVRAS CHAVE: Insecta, Lepidoptera, distribuição geográfica, Portugal.

Nuevas e interesantes citas portuguesas de Lepidoptera en 2019 (Insecta: Lepidoptera)

Resumen

Con el trabajo de campo efectuado por los autores y otros, principalmente durante el año de 2019, se añaden catorce especies de Lepidoptera a la fauna de Portugal, tres de las cuales son nuevas para la Península Ibérica y se elimina dos especies. Adicionalmente, se muestran segundos y terceros registros de especies ya conocidas, así como nuevas plantas nutricias de algunas otras especies. Finalmente, se presenta un resumen de los trabajos más recientes que son relevantes para la fauna portuguesa.
PALABRAS CLAVE: Insecta, Lepidoptera, distribución geográfica, Portugal.

Introduction

This paper is the fourteenth in the series of annual summaries of new knowledge of Portuguese Lepidoptera. It gives records of species of Lepidoptera added to the Portuguese fauna in 2019, together with new province records not included in the checklist (CORLEY, 2015). Additional data include new

data on larval food-plants within the country and second and third records of species for the country, which are only indicated when they are not in new provinces. Papers published in 2019 and part of 2020 that relate to the Portuguese Lepidoptera fauna are listed and briefly summarised. Finally, an Appendix lists the new species for Portugal separately, with numbers indicating their position in the checklist; new genera for Portugal have author and year of publication given.

Fourteen species new for Portugal are listed below, of which three are new for the Iberian Peninsula. Two species are removed from the Portuguese list. A few of the new species listed here have been previously listed for Portugal, but the records were rejected in CORLEY (2015), as being erroneous or unsubstantiated.

In CORLEY *et al*. (2019) the number of Lepidoptera species recognised from Portugal was 2709. With the current paper and other papers mentioned herein, this total has risen to 2723.

Material and Methods

Most species were captured at light in traps of various kinds, or over or beside a white sheet. For specimens not taken at light, the means of capture is given. Specimens are retained in the collections of the original recorders, unless otherwise stated. However, a few records are based only on photographic evidence.

The number of new district records in 2019 is unusually high, partly due to fieldwork carried out in the relatively poorly worked districts of Baixo Alentejo and Ribatejo, but also to records received from the project Invertebrates Red List of Continental Portugal. This involved a series of fieldwork sessions from March to August, each several days long, moving to a new locality each day, with four workers from a team of thirteen in the field in each session. In the list of records below, records from this source have the recorder given as "Tagis". The full Tagis team is given below following Recorders.

The order and nomenclature of families and species has been revised in accordance with the Portuguese list (CORLEY, 2015). The nomenclature of plant names follows the EURO+MED PLANT-BASE where possible.

The entry for species new for Portugal concludes with a summary of the known European distribution, and available information on the larval food-plant, given in square brackets if the information comes from outside Portugal.

Localities with UTM squares and altitude: (District in brackets)

Abiúl (Pombal)	NE3913	180 m
Alfambras (Aljezur)	BB1624	75 m
Alto das Velhas, Serra do Marão (Amarante)	NF9070	1020 m
Alto de Ciradelhe (Vinhais)	PG6735	930 m
Amorim (Póvoa de Varzim)	NF2083	20 m
Ansião, 2 km E. of,	NE5019	250 m
Arrimal, Lagoa Pequena (Sesimbra)	ND1071	3 m
Ave Casta (Ferreira do Zêzere)	ND5199	230 m
Azelha, São Bento (Porto de Mós)	ND1675	480 m
Balsamão, by Rio Azibo (Macedo de Cavaleiros)	PF7993	355 m
Buracas de Casmilo (Penela)	NE4333	300 m
Cabo de São Vicente (Vila do Bispo)	NA0198	75 m
Cabranosa, Sagres (Vila do Bispo)	NA0499	60 m
Campo de Viboras, 2 km S. of, (Vimioso)	QF0398	640 m
Cântaro Raso, road tunnel, Serra da Estrela, (Covilhã)	PE1964	1710 m
Canto Mosqueiro (Sines)	NC1102	0 m

Carrazedo, 1 km S.W. of, (Bragança)	PG7425	890 m
Carvalho, Ribalonga (Alijó)	PF2678	700 m
Castelo Bom, 1.5 km W.S.W., (Almeida)	PE7697	600 m
Ceira (Coimbra)	NE5247	100 m
Chão do Ulmeiro, Serra de Sicó (Pombal)	NE3717	350 m
Cigadonhe, Gestosa (Vinhais)	PG5438	500 m
Colos, Alcanede (Alcanena)	ND1565	170 m
Convento de Arrábida (Setúbal)	NC0058	245 m
Corte de Pero Jaques(Aljezur)	NB1917	250 m
Cortes de Meio (Covilhã)	PE1960	580 m
Couce (Valongo)	NF4356	50 m
Covão da Ametade, Serra da Estrela (Manteigas),	PE1965	1420 m
Covão da Ponte, Serra da Estrela (Manteigas),	PE2678	980 m
Curras Grandes, Serra de Arga (Caminha)	NG2131	560 m
Entrevinhas (Sardoal)	ND7477	250 m
Escalhão (Figueira de Castelo Rodrigo)	PF7538	600 m
Estevais (Torre de Moncorvo)	PF6267	450 m
Faia Brava reserve, Algodres (Figueira de Castelo Rodrigo)	PF6135	450 m
Figueiró do Campo (Soure)	NE3644	35 m
Foros da Quinta, Santo André (Santiago de Cacém)	NC2015	35 m
Fráguas (Vila Nova de Paiva)	PF0222	680 m
França, 5 km west of, (Bragança)	PG8241	750 m
Golegã, bridge over R. Tejo (Golegã)	ND4659	18 m
Guadramil (Bragança)	QG0144	700 m
Jafafe de Cima (Águeda)	NF4502	14 m
Lagoa Comprida, 3 km N. of, (Seia)	PE1470	1450 m
Lagoa de Albufeira (Sesimbra)	MC8763	3 m
Lagoa de Santo André, N. end (Santiago de Cacém)	NC1817	5 m
Lagoa de São José, Mata do Urso, Carriço (Pombal)	NE1128	45 m
Lama Grande, turning to, (Bragança)	PG8348	1310 m
Lordelo (Vila Real)	PF0475	420 m
Madriz (Soure)	NE3141	8 m
Marão, Serra do Marão (Peso da Régua)	NF9367	1380 m
Marateca (Palmela)	NC2770	20 m
Marco, Esperança (Arronches)	PD5838	375 m
Mata do Desterro (Seia)	PE1172	570 m
Minhota (Marvão)	PD3863	650 m
Moinhos de Paneiro (Santiago de Cacém)	NB2795	210 m
Moura da Serra, Mata da Margaraça (Arganil)	NE9252	500 m
Monte Velho, Lagoa de Santo André (Santiago de Cacém)	NC1613	7 m
Mosteiro de São João de Arga (Caminha)	NG2232	440 m
Noudar (Barrancos)	PC6927	255 m
Nodar, Serra de Montemuro (São Pedro do Sul)	NF7930	245 m
Outeiro, Alcobertas (Rio Maior)	ND0864	140 m
Outeiro dos Gamanhos (Alvaiázere)	NE5109	350 m
Parque Campismo de Pião (Covilhã)	PE2560	1020 m
Peixeiro (Condeixa-a-Velha)	NE4236	220 m
Penelas, Ermida (Santa Marta de Penaguião)	PF0566	280 m
Penhas Douradas, Serra da Estrela (Manteigas)	PE2175	1450 m
Picão, 2 km S. of, (Castro Daire)	NF8732	700 m

Pitões das Júnias (Montalegre)	NG8731	1100 m
Poço (Condeixa-a-Nova)	NE4406	220 m
Praia do Cabedelo (Figueira da Foz)	NE1143	3 m
Praia do Malhão (Odemira)	NB1782	22 m
Praia dos Aivados, Malpensado (Odemira)	NB1884	15 m
Quintã (Vila Real)	NF9671	720 m
Quinta do Canal, Bizorreiro (Figueira da Foz)	NE1639	3 m
Quinta do Pisão, Malveira da Serra (Cascais)	MC6389	150 m
Regoufe (Arouca)	NF7325	600 m
Relvas (Alvaiázere)	NE5401	230 m
Rio Mira at Zambujeira (Odemira)	NB2274	5 m
Rua do Furo, Moleanos (Alcobaça)	ND0774	150 m
Safara (Moura)	PC5620	200 m
Santa Bárbara, S.E. of São Teotónio (Odemira)	NB3348	130 m
Santo André, 1 km N. of, (Montalegre)	PG1036	790 m
São Martinho da Angueira (Miranda do Douro)	QG2015	710 m
São Romão (Vagos)	NE8528	15 m
Sargaçal (Lagos)	NB2710	30 m
Sentieiras, Sardoal (Abrantes)	ND6976	200 m
Serra de Arga: Parque Eólico (Caminha)	NG2330	750 m
Serra do Larouco (Montalegre)	PG0636	1320 m
Singeverga (Santo Tirso)	NF5277	200 m
Três Figos, Corsino (Monchique)	NB2422	100 m
Trinta, 1 km N. of, (Guarda)	PE3986	710 m
Vale da Cabeceira (Sintra)	MC5991	320 m
Vale da Couda (Alvaiázere)	NE4810	255 m
Vale de Branco, Cabreiro (Arcos de Valdevez)	NG4844	150 m
Vale de Gomes, Algoceira (Odemira)	NB2563	10 m
Vale do Cuco, Aboim (Fafe)	NF7699	600 m
Valongo	NF4159	200 m
Vale Quente, Serra do Marão (Amarante)	NF9070	900 m
Valverde (Santarém)	ND1269	350 m
Vargens, Ribeira de Vascão (Mértola)	PB1352	105 m
Vila Nova de Milfontes (Odemira)	NB1975	10 m
Vilar de Amargo (Figueira de Castelo Rodrigo)	PF6536	620 m
Vimioso	QG0606	700 m

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Abbreviations and symbols

coll.	collection
comm	communicated by
conf	confirmed by
det.	determined by
SMNK	Staatliches Museum für Naturkunde, Karlsruhe, Germany
*	New for Portugal, i.e. not listed for Portugal in CORLEY (2015).
**	New for the Iberian Peninsula.

Provinces:

AAL	Alto Alentejo
ALG	Algarve
BA	Beira Alta
BAL	Baixo Alentejo
BB	Beira Baixa
BL	Beira Litoral
DL	Douro Litoral
E	Estremadura
M	Minho
R	Ribatejo
TM	Trás-os-Montes

List of families and species

MICROPTERIGIDAE

Micropterix herminiella Corley, 2007
E: Vale da Cabeceira, on flowers of *Oenanthe crocata* L. by day, 25-V-2019, Corley.

Micropterix ibericella Caradja, 1920
R: Valverde, by day, 24-V-2019, S. Ferreira.

NEPTICULIDAE

Stigmella basiguttella (Heinemann, 1862)
DL: Couce, leafmine on *Quercus róbur* L., 18-XI-2019, Nunes.

Stigmella atricapitella (Haworth, 1828)
TM: Lordelo, 11-VII-2019, Gonzalez, det. Corley.

Trifurcula orientella Klimesch, 1953
BL: Outeiro dos Gamanhos, 28-VI-2019, Rosete, det. Corley.

Bohemannia pulverosella (Stainton, 1849)
Second Portuguese record. TM: Dine, empty leafmine on *Malus sp.*, 20-IX-2019, Corley and Nunes.

Ectoedemia suberis (Stainton, 1869)
DL: Valongo, leafmine on *Quercus suber* L., 1-III-2019, Nunes, det. Corley from reared adult.

TISCHERIIDAE

Coptotriche marginea (Haworth, 1828)
BAL: Moinhos de Paneiro, 16-IV-2019, Nunes, Silva and Jesus.

ERIOCOTTIDAE

Eriocottis hispanica Zagulajev, 1988
BA: Faia Brava, 10-V-2019, Nunes, Silva and Jesus.

PSYCHIDAE

Placodoma calpella Sobczyk, 2013
BAL: Rio Mira at Zambujeira, 29-V-2019, Corley and S. Ferreira, det. Arnscheid.

Ptilocephala albida (Esper, 1786)
BL: Buracas de Casmilo, 1-V-2019, by day, Rosete.

Delete *Phalacropterix graminifera* (Fourcroy, 1785) from Portuguese list. A specimen in SMNK collected by T. Monteiro and determined as the synonym *constancella* Bruand, 1853 by Sieder is *P. fritschi* Hättenschwiler, 2003 (W. Arnscheid, pers. comm.). Other Monteiro specimens of *P. graminifera* can be assumed to belong to *P. fritschi*, see below.

Phalacropterix fritschi Hättenschwiler, 2003
= *constancella sensu* Monteiro, 1956
DL: Singeverga, VI-1948, Monteiro (SMNK). Monteiro's other records of *constancella* from Mosteiro de Singeverga, Citânia de Sanfins, Santa do Amparo, Azurara and Pedras Rubras (MONTEIRO, 1956) are all from Douro Litoral. As Monteiro would have named these by comparison with the Singeverga specimen named by Sieder, there can be little doubt that all belong to *P. fritschi*. This is a considerable extension of range for the Portuguese endemic *P. fritschi*, previously known only from Algarve.

TINEIDAE

Morophaga morella (Duponchel, 1838)
BAL: Rio Mira at Zambujeira, 29-V-2019, Corley and S. Ferreira.

Nemapogon agenjoi Petersen, 1959
R: Colos, 13-VI-2019, Terry.

Triaxomasia caprimulgella (Stainton, 1851)
BAL: Rio Mira at Zambujeira, 29-V-2019, Corley and S. Ferreira.

Neurothaumasia ankerella (Mann, 1867)
BAL: Rio Mira at Zambujeira, 29-V-2019, Corley and S. Ferreira.

Reisserita zernyi Petersen, 1957
R: Entrevinhas, Sardoal, 25-VII-2019, Rosete and Lameirinhas.

Monopis obviella (Denis & Schiffermüller, 1775)
TM: Guadramil, 20-IX-2019, Corley, Nunes and S. Ferreira.

Crassicornella agenjoi Petersen, 1957
R: Valverde, 24-V-2019, Corley and S. Ferreira.

Ateliotum petrinella (Herrich-Schäffer, 1854)
ALG: Corte de Pero Jaques, 24-VIII-2019, Rosete, det. Corley.

BUCCULATRICIDAE

Bucculatrix albedinella (Zeller, 1839)
Second Portuguese record. TM: Guadramil, leafmines on *Ulmus minor* Mill., 20-IX-2019, Corley and Nunes.

Bucculatrix diffusella Menhofer, 1943
BL: Praia do Cabedelo, 16-VII-2019, Rosete, det. Corley.

GRACILLARIIDAE

Parectopa ononidis (Zeller, 1839)
BAL: Canto Mosqueiro, 28-V-2019, Corley and S. Ferreira.

Micrurapteryx kollariella (Zeller, 1839)
BA: Covão da Ponte, 16-VIII-2019, Rosete.

Euspilapteryx auroguttella Stephens, 1835
R: Colos, 10-VI-2019, Terry.

Spulerina simplonia (Fischer von Röslerstamm, 1840)
R: Colos, 10-VI-2019, Terry.

Phyllonorycter mespilella (Hübner, 1805)
M: Curras Grandes, leafmine on *Pyrus cordata* Desv., 3-VI-2019, Corley.

Phyllonorycter floridae Laštůvka & Laštůvka, 2012
TM: Vimioso, 8-VIII-2019, Gonzalez, det. Corley.

***** *Phyllonorycter comparella* (Duponchel, 1843)
TM: R. Angueira below Castelo de Algoso, leafmines on *Populus canescens* (Aiton) Sm., 24-IX-2019, Corley. Widespread in central Europe, also present in a few countries further north and south and in some Mediterranean Islands. [Also recorded from *Populus alba* L. and *P. nigra* L.].

YPONOMEUTIDAE

Zelleria oleastrella (Millière, 1864)
BAL: Rio Mira at Zambujeira, 29-V-2019, Corley and S. Ferreira; R: Colos, 8-VI-2019, Terry.

Swammerdamia pyrella (Villers, 1789)
M: Curras Grandes, larva on *Pyrus cordata* Desv., 3-VI-2019, Corley.

PRAYDIDAE

Prays oleae (Bernard, 1788)
R: Outeiro, Alcobertas, 23-V-2019, Corley.

DOUGLASIIDAE

Tinagma ocnerostomella (Stainton, 1850)
E: Rua do Furo, 23-V-2019, Corley and S. Ferreira.

AUTOSTICHIDAE

Arragonia punctivittella (Zerny, 1927)
TM: Guadramil, 17-VIII-2019, Nunes, Silva and Jesus.

Oegoconia novimundi (Busck, 1915)
TM: São Martinho de Angueira, 23-IX-2019, Corley and S. Ferreira.

** *Apatema apolausticum* Gozmány, 1996
ALG: Serra de Monte Figo, 19-V-2002, Corley. South-east Europe from Italy and Slovakia to Romania. [Host-plant unknown but probably feeds on plant detritus].

Symmocoides oxybiella (Millière, 1872)
BL: Ansião, 16-VII-2019, Rosete.

Stibaromacha ratella (Herrich-Schäffer, 1854)
R: Colos, 10-VI-2019, Terry.

LECITHOCERIDAE

Homaloxestis briantiella (Turati, 1879)
BL: Ansião, 16-VII-2019, Rosete, det. Corley.

Eurodachtha pallicornella (Staudinger, 1859)
R: Colos, 13-VI-2019, Terry.

OECOPHORIDAE

Kasyniana griseosericeella (Ragonot, 1879)
BAL: Vale de Gomes, 27-V-2019, Corley and S. Ferreira.

Alabonia herculeella Walsingham, 1903
E: Quinta do Pisão, 12-V-2019, Tagis, det. Corley.

Pleurota andalusica Back, 1973
BAL: Rio Mira at Zambujeira, 29-V-2019, Corley and S. Ferreira; R: Colos, 10-VI-2019, Terry; BL: Ansião, 16-VII-2019, Rosete, det. Corley.

Pleurota planella (Staudinger, 1859)
BL: Abiúl, 31-V-2019, Corley and Rosete.

DEPRESSARIIDAE

Agonopterix nodiflorella (Millière, 1866)
E: Convento de Arrábida, 30-V-2019, Corley and S. Ferreira.

Agonopterix umbellana (Fabricius, 1794)
BL: Buracas de Casmilo, 2-VIII-2019, Rosete.

Agonopterix heracliana (Linnaeus, 1758)
E: Vale da Cabeceira, larvae on flowers of *Oenanthe crocata* L., 25-V-2019, Corley.

Agonopterix thapsiella (Zeller, 1847)
R: Valverde, 24-V-2019, Corley and S. Ferreira.

Agonopterix alstromeriana (Clerck, 1759)
DL: Valongo, 24-I-2019, Nunes.

Agonopterix subpropinquella (Stainton, 1849)
R: Valverde, larvae on *Leuzea conifera* (L.) DC, 24-V-2019, Corley.

Exaeretia lutosella (Herrich-Schäffer, 1854)
BAL: Rio Mira at Zambujeira, 29-V-2019, Corley and S. Ferreira; R: Colos, 8-VI-2019, Terry.

Depressaria daucella (Denis & Schiffermüller, 1775)
E: Vale da Cabeceira, larvae on flowers of *Oenanthe crocata* L., 25-V-2019, Corley.

COSMOPTERIGIDAE

Eteobalea intermediella (Riedl, 1966)
R: Colos, 8-VI-2019, Terry.

Vulcaniella fiordalisa (Petry, 1904)
BAL: Vale de Gomes, 27-V-2019, Corley and S. Ferreira.

GELECHIIDAE

Aproaerema sangiella (Stainton, 1863)
E: Azelha, 13-VI-2019, Terry; BAL: Canto Mosqueiro, 28-V-2019, Corley and S. Ferreira.

Mesophleps oxycedrella (Millière, 1871)
E: Azelha, 13-VI-2019, Terry.

Nothris congressariella (Bruand, 1858)
BL: Abiúl, 31-V-2019, Corley and Rosete.

Neofaculta ericetella (Geyer, 1832)
R: Valverde, 24-V-2019, Corley and S. Ferreira.

Dichomeris acuminatus (Staudinger, 1876)
BAL: Canto Mosqueiro, 28-V-2019, Corley and S. Ferreira.

Dichomeris limbipunctella (Staudinger, 1859)
R: Valverde, 24-V-2019, Corley and S. Ferreira.

Catatinagma agenjoi (Gozmány, 1954)
Coloptilia conchylidella (Hofmann, 1898) was recorded in Algarve in CARVALHO & CORLEY (1995), but subsequently excluded from the Portuguese fauna in CORLEY (2015) without a correct identification for the specimen being provided. Recent re-examination shows that it belongs to *Catatinagma agenjoi.*

Bryotropha terrella (Denis & Schiffermüller, 1775)
E: Rua do Furo, 23-V-2019, Corley and S. Ferreira.

Aristotelia subdecurtella (Stainton, 1859)
BAL: Lagoa de Santo André, 26-V-2019, Corley.

Aristotelia brizella (Treitschke, 1833)
BAL: Lagoa de Santo André, 26-V-2019, Corley.

Isophrictis anthemidella (Wocke, 1871)
E: Vale da Cabeceira, 25-V-2019, Corley; BA: Fráguas, 23-VII-2019, Tagis, det. Corley.

Metzneria aestivella (Zeller, 1839)
R: Colos, 8-VI-2019, Terry.

Metzneria littorella (Douglas, 1850)
BL: Peixeiro, 4-V-2019, Rosete, det. Corley.

Metzneria tristella Rebel, 1901
BL: Abiúl, 22-VI-2019, Rosete, det. Corley.

Ptocheuusa paupella (Zeller, 1847)
R: Colos, 8-VI-2019, Terry.

Oxypteryx immaculatella (Douglas, 1850)
R: Colos, 10-VI-2019, Terry.

Oxypteryx helotella (Staudinger, 1859)
BAL: Lagoa de Santo André, 26-V-2019, Corley.

* *Gladiovalva rumicivorella* (Millière, 1881)
M: Serra de Arga, 3-VIII-2019, Silva and Jesus (fig. 1). Spain to Germany, Switzerland and Italy. [*Rumex scutatus* L.].

Mirificarma denotata Pitkin, 1984
E: Convento de Arrábida, 30-V-2019, Corley and S. Ferreira.

Psoricoptera gibbosella (Zeller, 1839)
TM: Carrazedo, 18-IX-2019, Corley, Nunes & S. Ferreira.

Scrobipalpa acuminatella (Sircom, 1850)
BL: Madriz, 5-VII-2019, Rosete, det. Corley.

Scrobipalpa vasconiella (Rössler, 1877)
R: Colos, 9-VI-2019, Terry.

Scrobipalpa artemisiella (Treitschke, 1833)
TM: Guadramil, 17-VIII-2019, Nunes, Silva and Jesus, det. Corley.

Scrobipalpa salinella (Zeller, 1847)
BAL: Rio Mira at Zambujeira, 29-V-2019, Corley and S. Ferreira.

Tuta absoluta (Meyrick, 1917)
R: Valverde, 24-V-2019, Corley and S. Ferreira; E: Vale da Cabeceira, 25-V-2019, Corley.

Klimeschiopsis terroris (Hartig, 1938)
TM: Estevais, 24-IX-2019, Corley and S. Ferreira.

Teleiodes albidorsella Huemer & Karsholt, 1999
M: Vale de Branco, 27-VIII-2019, Tagis, det. Corley.

Teleopsis diffinis (Haworth, 1828)
R: Colos, 10-VI-2019, Terry; E: Convento de Arrábida, 30-V-2019, Corley and S. Ferreira.

Pseudotelphusa scalella (Scopoli, 1763)
R: Valverde, 24-V-2019, Corley and S. Ferreira.

Pseudotelphusa occidentella Huemer & Karsholt, 1999
BAL: Moinhos de Paneiro, 16-IV-2019, Nunes, Silva and Jesus.

Recurvaria leucatella (Clerck, 1759)
BL: Buracas de Casmilo, 2-VIII-2019, Rosete.

ELACHISTIDAE

Elachista hispanica Traugott-Olsen, 1992
R: Colos, 10-VI-2019, Terry.

Elachista obliquella Stainton, 1854
E: Vale da Cabeceira, 25-V-2019, Corley.

Haplochrois ochraceella (Rebel, 1903)
E: Convento de Arrábida, 30-V-2019, Corley and S. Ferreira.

COLEOPHORIDAE

Coleophora conyzae Zeller, 1868
R: Colos, 10-VI-2019, Terry.

Coleophora acrisella Millière, 1872

Recorded feeding on *Coronilla glauca* (CORLEY, 2015), but these records are misidentifications of *Coleophora sisteronica* Toll, 1961. Other records are correct.

Coleophora sisteronica Toll, 1961

ALG: Silves, cases on *Coronilla glauca* L., 9-XI-2000, 18-III-2011, Corley; third record, BL: Abiúl, cases on *Coronilla repanda* (Poir.) Guss., 31-V-2019, Corley and Rosete.

Coleophora deauratella Lienig & Zeller, 1846

R: Colos, 13-VI-2019, Terry.

Coleophora amethystinella Ragonot, 1885

BA: Vilar do Amargo, 11-V-2019, Nunes, det. Corley.

** *Coleophora currucipennella* Zeller, 1839

TM: Pitões das Júnias, 24-VII-2019, Nunes and Jesus, det. Corley (fig. 2). Middle latitudes of Europe, reaching north to southern parts of Scandinavia and south to a few Mediterranean countries, including Greece. [*Quercus sp.*, *Salix sp.*, *Carpinus sp.*].

Coleophora helichrysiella Krone, 1909

BAL: Monte Velho, 26-V-2019, Corley and S. Ferreira.

Coleophora albicosta (Haworth, 1828)

E: Rua do Furo, 23-V-2019, Corley and S. Ferreira.

Coleophora pennella (Denis & Schiffermüller, 1775)

R: Valverde, 24-V-2019, Corley and S. Ferreira.

Coleophora alticolella Zeller, 1849

BA: Covão da Ametade, 9-VII-2019, Rosete, det. Corley.

Coleophora maritimella Newman, 1863

BAL: Rio Mira at Zambujeira, 29-V-2019, Corley and S. Ferreira.

* *Coleophora ribasella* Baldizzone, 1982

BL: Praia do Cabedelo, 31-VIII-2017, reared from case on *Artemisia campestris maritima* (DC) Arcag, Rosete, det. S. Ferreira and Corley. [Spain, France].

SCYTHRIDIDAE

Scythris subseliniella (Heinemann, 1876)

BA: Lagoa Comprida, 9-VII-2019, Rosete, det. Corley.

Scythris potentillella (Zeller, 1847)

BA: Vilar de Amargo, 11-V-2019, Nunes, Silva and Jesus, det. Corley; TM: Turning to Lama Grande, 14-VIII-2019, Tagis, det. Corley.

Scythris cistorum (Millière, 1876)

BAL: Foros da Quinta, 26-V-2019, Corley and S. Ferreira.

Scythris scopolella (Linnaeus, 1767)
BAL: Rio Mira at Zambujeira, 29-V-2019, Corley and S. Ferreira.

Scythris lafauryi Passerin d'Entrèves, 1986
TM: Santo André, 16-IX-2019, Corley, Nunes and S. Ferreira.

Episcythris triangulella (Ragonot, 1874)
BL: Relvas, 26-VII-2019, Rosete, det. Corley.

BLASTOBASIDAE

Blastobasis phycidella (Zeller, 1839)
DL: Vila Nova de Gaia, 25-VI-2010, Corley.

* *Hypatopa segnella* (Zeller, 1873)
TM: Alto de Ciradelhe, 10-VIII-2019, Tagis, det. Corley. Distribution very scattered from South Russia and Finland to France and Spain, but absent from many countries. [Larva on plant detritus].

MOMPHIDAE

Mompha miscella (Denis & Schiffermüller, 1775)
BAL: Foros da Quinta, 26-V-2019, Corley and S. Ferreira.

Mompha propinquella (Stanton, 1851)
BA: Covão da Ponte, 16-VIII-2019, Rosete.

PTEROLONCHIDAE

Pterolonche lutescentella Chrétien, 1922
BL: Buracas de Casmilo, 2-VIII-2019, Rosete, det. Corley.

LYPUSIDAE

Agnoea amparoella (Vives, 1986)
BAL: Vale de Gomes, 27-V-2019, Corley and S. Ferreira; E: Convento de Arrábida, 30-V-2019, Corley and S. Ferreira.

ALUCITIDAE

Alucita hexadactyla Linnaeus, 1758
BAL: Rio Mira at Zambujeira, 29-V-2019, Corley and S. Ferreira.

Alucita huebneri Wallengren, 1859
BL: Ansião, 20-V-2017, Rosete, det. Corley.

PTEROPHORIDAE

Agdistis meridionalis (Zeller, 1847)
BAL: Rio Mira at Zambujeira, 29-V-2019, Corley and S. Ferreira.

Stenoptilia pelidnodactyla (Stein, 1857)
BB: Cântaro Raso, 24-VI-2010, Corley.

Stenoptilia zophodactylus (Duponchel, 1840)
R: Colos, 8-VI-2019, Terry.

Merrifieldia tridactyla (Linnaeus, 1758)
R: Valverde, 24-V-2019, Corley and S. Ferreira.

Merrifieldia baliodactylus (Zeller, 1841)
BL: Chão do Ulmeiro, 27-VI-2019, Rosete, det. Corley.

Merrifieldia malacodactylus (Zeller, 1847)
BAL: Rio Mira at Zambujeira, 29-V-2019, Corley and S. Ferreira.

SCHRECKENSTEINIIDAE

* *Schreckensteinia festaliella* (Hübner, 1796)
E: Vale da Cabeceira, 25-V-2019, Corley. Almost all Europe, but absent from Mediterranean islands and some countries in the south-east. [*Rubus fruticosus* L., *R. idaeus* L.].

EPERMENIIDAE

Epermenia aequidentellus (E. Hofmann, 1867)
E: Convento de Arrábida, 30-V-2019, Corley and S. Ferreira; R: Colos, 8-VI-2019, Terry.

Epermenia ochreofasciella (Millière, 1854)
Third and fourth records. TM: Balsamão, 22-IX-2019, Corley and S. Ferreira; São Martinho da Angueira, 23-IX-2019, Corley and S. Ferreira.

CHOREUTIDAE

Tebenna micalis (Mann, 1857)
R: Colos, 9-VI-2019, Terry.

Choreutis nemorana (Hübner, 1799)
BA: Penhas Douradas, 16-VIII-2019, Rosete.

TORTRICIDAE

Isotrias penedana Trematerra, 2013
TM: Marão, netted by day, 15-VI-2019, Nunes, Silva and Jesus (fig. 3). This male differs from those found in the Castro Laboreiro area (TREMATERRA, 2013) in having indications of the yellow transverse markings that are found in the females (CORLEY & FERREIRA, 2017), although still with a reticulate pattern over the whole forewing. Male genitalia show no differences from those figured by TREMATERRA (2013).

Paramesia alhamana (Schmidt, 1933)
E: Convento de Arrábida, 30-V-2019, Corley and S. Ferreira; BL: Abiúl, 31-V-2019, Corley and Rosete.

Avaria joannisiana (Ragonot, 1888)
ALG: Sargaçal, 13-XI-2019, Valadares, det. Corley.

Syndemis musculana (Hübner, 1799)
DL: Vale Quente, Serra do Marão, 15-VI-2019, Nunes, Silva and Jesus.

Lozotaenia cupidinana (Staudinger, 1859)
R: Valverde, 24-V-2019, Corley and S. Ferreira.

Clepsis coriacana (Rebel, 1894)
BAL: Canto Mosqueiro, larva on *Lotus creticus*, 28-V-2019, Corley and S. Ferreira.

Clepsis peritana (Clemens, 1860)
BAL: Canto Mosqueiro, 28-V-2019, Corley and S. Ferreira; BL: Figueiró do Campo, 31-VIII-2019, I. Ferreira.

Tortricodes alternella (Denis & Schiffermüller, 1775)
BA: Picão, 4-I-2019, Nunes, Silva and Jesus.

Cnephasia stephensiana (Doubleday, 1849)
E: Rua do Furo, 23-V-2019, Corley and S. Ferreira.

Cnephasia longana (Haworth, 1811)
E: Berlenga,14-V-2019, Tagis, det. Corley; BL: Buracas de Casmilo, 1-V-2019, Rosete, det. Corley; Curras Grandes, 3-VI-2019, Corley.

Cnephasia ecullyana Réal, 1951
BAL: Vale de Gomes, 27-V-2019, Corley and S. Ferreira.

Tortrix viridana Linnaeus, 1758
BAL: Rio Mira at Zambujeira, 29-V-2019, Corley and S. Ferreira.

Aleimma loeflingiana (Linnaeus, 1758)
R: Outeiro, Alcobertas, 23-V-2019, Corley.

Acleris schalleriana (Linnaeus, 1761)
BAL: Rio Mira at Zambujeira, 29-V-2019, Corley and S. Ferreira; BL: Abiúl, 31-V-2019, Corley and Rosete.

Cochylimorpha elongana (Fischer von Röslerstamm, 1839)
BAL: Lagoa de Santo André, 26-V-2019, Corley and S. Ferreira.

Agapeta angelana (Kennel, 1919)
Second Portuguese record. BL: São Romão, Vagos, 10-VI-2019, Tagis, det. Corley.

Eugnosta lathoniana (Hübner, 1800)
TM: Guadramil, 17-VIII-2019, Nunes, Silva and Jesus (fig. 4). Only one previous record MENDES (1910).

Aethes beatricella (Walsingham, 1898)
BL: Ansião, 16-VII-2019, Rosete, det. Corley.

Aethes bilbaensis (Rössler, 1877)
R: Colos, 9-VI-2019, Terry.

* *Aethes mauritanica* (Walsingham, 1898)

BAL: Vila Nova de Milfontes, 27-V-2019, Corley and S. Ferreira. South Europe from Spain and Corsica to Greece and Bulgaria. [*Elaeoselinum meoides* (Desf.) W. D. J. Koch ex DC].

Diceratura infantana (Kennel, 1899)

BAL: Monte Velho, Lagoa de Santo André, 26-V-2019, Corley and S. Ferreira.

** *Neocochylis millierana* (Peyerimhoff, 1877)

TM: Cigadonhe, Gestosa, 16-VIII-2019, Nunes, Silva and Jesus, det. Corley (fig. 5). NEL & VARENNE (2017) show that *millierana* is not synonymous with *salebrana*, which has one record from Algarve (CORLEY, 2005), but with *Cochylis sannitica* Trematerra, 1995, known from France and Italy. Host-plant unknown.

Neocochylis molliculana (Zeller, 1847)

BAL: Lagoa de Santo André, 26-V-2019, Corley.

Brevicornutia pallidana (Zeller, 1847)

BAL: Lagoa de Santo André, 26-V-2019, Corley.

Piniphila bifasciana (Haworth, 1811)

R: Valverde, 24-V-2019, Corley and S. Ferreira.

Lobesia bicinctana (Duponchel, 1844)

BAL: Rio Mira at Zambujeira, 29-V-2019, Corley and S. Ferreira.

Lobesia artemisiana (Zeller, 1847)

E: Berlenga,14-V-2019, Tagis, det. Corley.

Endothenia gentianaeana (Hübner, 1799)

BA: Nodar, Serra de Montemuro, 22-VII-2019, Tagis, det. Corley.

Endothenia marginana (Haworth, 1811)

BAL: Lagoa de Santo André, 26-V-2019, Corley.

Ancylis obtusana (Haworth, 1811)

DL: Vale Quente, Serra do Marão, 15-VI-2019, Nunes, Silva and Jesus.

Thiodia trochilana (Frölich, 1828)

E: Berlenga,14-V-2019, Tagis, det. Corley.

Acroclita subsequana (Herrich-Schäffer, 1851)

R: Outeiro, Alcobertas, 23-V-2019, Corley.

Epinotia bilunana (Haworth, 1811)

Third Portuguese locality. TM: Quintã, 20-V-2016, Fernandes and Gonzalez, det. Corley.

Zeiraphera isertana (Fabricius, 1794)

BAL: Rio Mira at Zambujeira, 29-V-2019, Corley and S. Ferreira.

Gypsonoma imparana Müller-Rutz, 1914

M: Serra de Arga: Parque Eólico, larva on *Salix atrocinerea*, 3-VI-2019, Corley.

Notocelia incarnatana (Hübner, 1800)
BAL: Foros da Quinta, 26-V-2019, Corley and S. Ferreira.

Notocelia trimaculana (Haworth, 1811)
E: Rua do Furo, 23-V-2019, Corley and S. Ferreira.

* *Pseudococcyx friedmariana* Larsen, 2020
AAL: Minhota, 5-VI-1996, Corley; Marco, E. of Esperança, 12-V-1999, Corley; BL: Ceira, 25-V-2006, Pires, det. Corley; Poço, 7-VI-2016, Rosete, det. Corley (fig. 6); BAL: Praia do Malhão, 12-V-2017, Marabuto, Grundy, Nunes, Silva and Jesus, det. Corley; Lagoa de Santo André, 26-V-2019 Corley and S. Ferreira. The species was recently described from two localities in Spain, based on two male specimens (LARSEN, 2020). In Portugal only females have been found. These have been barcoded but barcodes are not available for Spanish material. The conspecificity of Spanish and Portuguese material is therefore not proven, but we consider it probable. Host-plant unknown.

Delete *Retinia resinella* (Linnaeus, 1758) from Portuguese list. The record and photo from BAL: Praia do Malhão in CORLEY *et al*. (2018) clearly belong to *Pseudococcyx friedmariana* (above). *R. resinella* has only two other Portuguese records: BL: Mata de Leiria, A. F. de Seabra (SEABRA, 1939) and ALG: São Romão, V-1982, J. Passos de Carvalho (MONTEIRO & CARVALHO, 1984). Without supporting evidence and in view of the possibility of confusion of this species with *P. friedmariana*, these two isolated records must be considered doubtful. The species should therefore be removed from the Portuguese list.

Clavigesta sylvestrana (Curtis, 1850)
R: Valverde, 24-V-2019, Corley and S. Ferreira.

Rhyacionia buoliana (Denis & Schiffermüller, 1775)
BAL: Rio Mira at Zambujeira, 29-V-2019, Corley and S. Ferreira.

Cydia gilviciliana (Staudinger, 1859)
BAL: Canto Mosqueiro, 28-V-2019, Corley and S. Ferreira.

BRACHODIDAE

Brachodes gaditana (Rambur, 1866)
BL: Poço, 18-VII-2019, Rosete.

COSSIDAE

Dyspessa ulula (Borkhausen, 1790)
BAL: Noudar, Barrancos, 10-IV-2019, Tagis; R: Colos, 10-VI-2019, Terry.

SESIIDAE

Bembecia ichneumoniformis (Denis & Schiffermüller, 1775)
R: Golegã, 12-VI-2019, Terry.

Bembecia uroceriformis (Treitschke, 1834)
BL: Outeiro dos Gamanhos, 29-VI-2019, Rosete, det. Corley; TM: Guadramil, 17-VIII-2019, Nunes, Silva and Jesus.

Pyropteron meriaeformis (Boisduval, 1840)
E: Marateca, 5-VI-2019, Tagis, det. Corley.

PYRALIDAE

Pyralis lienigialis (Zeller, 1843)
BAL: Vale de Gomes, 27-V-2019, Corley and S. Ferreira; E: Convento de Arrábida, 30-V-2019, Corley and S. Ferreira.

Bostra obsoletalis (Mann, 1864)
R: Colos, 8-VI-2019, Terry.

Stemmatophora combustalis (Fischer von Röslerstamm, 1842)
R: Colos, 13-VI-2019, Terry.

Stemmatophora rungsi (Leraut, 2000)
DL: Regoufe, 21-VII-2019, Tagis, det. Corley.

Synaphe moldavica (Esper, 1794)
BL: Chão do Ulmeiro, 27-VI-2019, Rosete.

Cryptoblabes gnidiella (Millière, 1867)
TM: Alto de Ciradelhe, 10-VIII-2019, Tagis, det. Corley.

Bradyrrhoa cantenerella (Duponchel, 1837)
BL: Vale da Couda, 4-VII-2019, Rosete.

Pempelia palumbella (Denis & Schiffermüller, 1775)
R: Colos, 10-VI-2019, Terry.

Asalebria florella (Mann, 1862)
E: Rua do Furo, 23-V-2019, Corley and S. Ferreira; R: Colos, 9-VI-2019, Terry.

Dioryctria sylvestrella (Ratzeburg, 1840)
TM: Lordelo, 2-IX-2016, Fernandes and Gonzalez, det. Corley.

Dioryctria mendacella (Staudinger, 1859)
R: Colos, 12-VI-2019, Terry.

Epischnia prodromella (Hübner, 1799)
M: Mosteiro de São João de Arga, 25-IX-2019, Corley and S. Ferreira.

Elegia fallax (Staudinger, 1881)
= *fallaximima* Nel & Mazel, 2011; *fallax sensu* Slamka, 2019
BAL: Vale de Gomes, 27-V-2019, Corley and S. Ferreira; E: Convento de Arrábida, 30-V-2019, Corley and S. Ferreira.

Elegia similella (Zincken, 1818)
TM: Pitões das Júnias, 24-VII-2019, Nunes and Jesus.

Pima boisduvaliella (Guenée, 1845)
BAL: Praia dos Aivados, 10-III-2019, Tagis, det. Corley.

Melathrix coenulentella (Zeller, 1846)
R: Colos, 13-VI-2019, Terry.

Delplanqueia dilutella (Denis & Schiffermüller, 1775)
DL: Regoufe, 21-VII-2019, Tagis, det. Corley.

Delplanqueia inscriptella (Duponchel, 1836)
R: Valverde, 24-V-2019, Corley and S. Ferreira.

Pempeliella ardosiella (Ragonot, 1887)
BAL: Foros da Quinta, 26-V-2019, Corley and S. Ferreira.

Psorosa mediterranella Amsel, 1953
BL: Quinta do Canal, 14-IX-2019, Corley, Rosete, Nunes and S. Ferreira.

Acrobasis obliqua (Zeller, 1847)
R: Outeiro, Alcobertas, 23-V-2019, Corley.

Acrobasis consociella (Hübner, 1813)
R: Valverde, 24-V-2019, Corley and S. Ferreira.

Acrobasis suavella (Zincken, 1818)
R: Colos, 10-VI-2019, Terry; BL: Ansião, 16-VII-2019, Rosete.

Acrobasis marmorea (Haworth, 1811)
R: Colos, 9-VI-2019, Terry; BA: Vilar de Amargo, 11-V-2019, Nunes, Silva and Jesus.

Myelois circumvoluta (Fourcroy, 1785)
R: Colos, 13-VI-2019, Terry.

Apomyelois ceratoniae (Zeller, 1839)
R: Ave Casta, 21-V-2019, Tagis, det. Corley.

Eccopisa effractella Zeller, 1848
E: Vale da Cabeceira, 25-V-2019, Corley.

Euzophera fuliginosella (Heinemann, 1865)
BAL: Rio Mira at Zambujeira, 29-V-2019, Corley and S. Ferreira.

Nyctegretis ruminella La Harpe, 1860
BAL: Vale de Gomes, 27-V-2019, Corley and S. Ferreira.

Ancylosis cinnamomella (Duponchel, 1836)
R: Outeiro, Alcobertas, 23-V-2019, Corley.

Ancylosis sareptalla (Herrich-Schäffer, 1861)
BAL: Vila Nova de Milfontes, 28-V-2019, Corley and S. Ferreira.

Ancylosis arenosella (Staudinger, 1859)
BAL: Praia dos Aivados, 10-III-2019, Tagis, det. Corley.

Phycitodes inquinatella (Ragonot, 1887)
R: Colos, 10-VI-2019, Terry.

Ephestia welseriella (Zeller, 1848)
R: Colos, 12-VI-2019, Terry.

CRAMBIDAE

Pyrausta sanguinalis (Linnaeus, 1767)
R: Outeiro, Alcobertas, 23-V-2019, Corley.

Pyrausta neglectalis Caradja, 1916
R: Colos, 9-VI-2019, Terry.

Pyrausta despicata (Scopoli, 1753)
R: Colos, 12-VI-2019, Terry.

Anania terrealis (Treitschke, 1829)
TM: Serra do Larouco, 15-IX-2019, Corley, Nunes and S. Ferreira.

Anania verbascalis (Denis & Schiffermüller, 1775)
BAL: Rio Mira at Zambujeira, 29-V-2019, Corley and S. Ferreira.

Udea ferrugalis (Hübner, 1796)
R: Colos, 8-VI-2019, Terry.

Udea numeralis (Hübner, 1796)
R: Colos, 8-VI-2019, Terry.

Mecyna asinalis (Hübner, 1819)
R: Valverde, 24-V-2019, Corley and S. Ferreira.

Agrotera nemoralis (Scopoli, 1763)
ALG: Alfambras, 7-VIII-2019, Valadares.

Palpita vitrealis (Rossi, 1794)
R: Valverde, 24-V-2019, Corley and S. Ferreira.

Dolicharthria aetnealis (Duponchel, 1833)
R: Valverde, 24-V-2019, Corley and S. Ferreira.

Cynaeda dentalis (Denis & Schiffermüller, 1775)
R: Colos, 13-VI-2019, Terry; E: Berlenga,14-V-2019, Tagis, det. Corley.

Evergestis politalis (Denis & Schiffermüller, 1775)
R: Outeiro, Alcobertas, 23-V-2019, Corley.

Scoparia pyralella (Denis & Schiffermüller, 1775)
DL: Vale Quente, Serra do Marão, 15-VI-2019, Nunes, Silva and Jesus.

Scoparia staudingeralis (Mabille, 1869)
BAL: Safara, 12-IV-2019, Tagis, det. Corley.

Eudonia angustea (Curtis, 1827)
R: Olhos de Água de Alviela, 18-V-2019, Tagis, det. Corley.

Eudonia lineola (Curtis, 1827)
R: Outeiro, Alcobertas, 23-V-2019, Corley.

Eudonia delunella (Stainton, 1849)
R: Valverde, 24-V-2019, Corley and S. Ferreira.

Heliothela wulfeniana (Scopoli, 1763)
BB: Cortes de Meio, 22-VI-2019, Tagis, det. E. Marabuto.

Chrysoteuchia culmella (Linnaeus, 1758)
BAL: Lagoa de Santo André, 26-V-2019, Corley.

Agriphila deliella (Hübner, 1813)
M: Mosteiro de São João de Arga, 25-IX-2019, Corley and S. Ferreira.

Agriphila tersellus (Lederer, 1855)
BL: Quinta do Canal, 14-IX-2019, Corley, Rosete, Nunes and S. Ferreira.

* *Catoptria lythargyrella* (Hübner, 1796)
TM: Montesinho, 19-IX-2019, Corley, Nunes and S. Ferreira. Middle latitudes of Europe, absent from several countries in north and south and some Mediterranean islands. [Grasses].

Mesocrambus tamsi Błeszyński, 1960
BA: Escalhão, 10-VII-2019, Tagis, det. Corley.

Hyperlais siccalis (Guenée, 1854)
R: Outeiro, Alcobertas, 23-V-2019, Corley; E: Convento de Arrábida, 30-V-2019, Corley and S. Ferreira.

Elophila nymphaeata (Linnaeus, 1758)
BA: Vilar de Amargo, 11-V-2019, Nunes, Silva and Jesus.

LASIOCAMPIDAE

Macrothylacia digramma Meade-Waldo, 1905
R: Valverde, 24-V-2019, Corley and S. Ferreira.

SATURNIIDAE

Saturnia pavonia (Linnaeus, 1758)
BAL: Praia dos Aivados, 10-III-2019, Tagis.

SPHINGIDAE

Marumba quercus (Denis & Schiffermüller, 1775)
BAL: Rio Mira at Zambujeira, 29-V-2019, Corley and S. Ferreira.

Mimas tiliae (Linnaeus, 1758)
E: Sintra (CARNEIRO MENDES, 1951). Accidentally omitted by CORLEY (2015).

Sphinx ligustri Linnaeus, 1758
R: Sentieiras, 20-V-2019, Érica Brunheta, comm. A. Lameirinhas.

Hyles euphorbiae (Linnaeus, 1758)
R: Valverde, 24-V-2019, Corley and S. Ferreira.

Deilephila porcellus (Linnaeus, 1758)
BB: Parque Campismo de Pião, 10-VI-2019, Nunes, Silva and Jesus.

GEOMETRIDAE

Idaea sardoniata (Homberg, 1912)
R: Colos, 8-VI-2019, Terry; E: Convento de Arrábida, 30-V-2019, Corley and S. Ferreira.

Idaea consanguiberica Rezbanyai-Reser & Expósito, 1992
BA: Castelo Bom, 12-VIII-2019, Skou.

Idaea mustelata (Gumppenberg, 1892)
BAL: Vila Nova de Milfontes, 28-V-2019, Corley and S. Ferreira.

Idaea efflorata Zeller, 1849
BAL: Rio Mira at Zambujeira, 29-V-2019, Corley and S. Ferreira.

Idaea incisaria (Staudinger, 1892)
BA: Vilar de Amargo, 11-V-2019, Nunes, Silva and Jesus.

Idaea robiginata (Staudinger, 1863)
DL: Vale Quente, Serra do Marão, 15-VI-2019, Nunes, Silva and Jesus.

Idaea bigladiata Herbulot, 1975
R: Outeiro, Alcobertas, 23-V-2019, Corley; BA: Faia Brava Reserve, 10-V-2019, Nunes, Silva and Jesus.

Idaea carvalhoi Herbulot, 1979
R: Colos, 8-VI-2019, Terry.

Idaea dimidiata (Hufnagel, 1767)
E: Rua do Furo, 23-V-2019, Corley and S. Ferreira.

Idaea ostrinaria (Hübner, 1813)
R: Valverde, 24-V-2019, Corley and S. Ferreira.

Idaea dromikos Hausmann, 2004
BA: Covão da Ponte, 16-VIII-2019, Rosete.

Idaea straminata (Borkhausen, 1794)
R: Colos, 10-VI-2019, Terry.

Anthometra plumularia Boisduval, 1840
ALG: Alfambras, 2-VII-2016, 28-VI-2018, Valadares; R: Colos, 9-VI-2019, Terry.

Catarhoe rubidata (Denis & Schiffermüller, 1775)
TM: Pitões das Júnias, 15-VII-2019, Nunes and Pires.

Larentia clavaria (Haworth, 1809)
BL: Moura da Serra, 26-X-2019, Rosete.

Euphyia unangulata (Haworth, 1809)
Second Portuguese record. M: Mosteiro de São João de Arga, 3-VI-2019, Corley and S. Ferreira.

Thera obeliscata (Hübner, 1787)
DL: Vale Quente, Serra do Marão, 15-VI-2019, Nunes, Silva and Jesus.

Chloroclysta miata (Linnaeus, 1758)
TM: Montesinho, 19-IX-2019, Corley, Nunes and S. Ferreira.

Asthena albulata (Hufnagel, 1767)
BL: Moura da Serra, 15-V-2016, Rosete. The record for BL given in CORLEY (2015) belongs to DL.

Chloroclystis v-ata (Haworth, 1809)
E: Rua do Furo, 23-V-2019, Corley and S. Ferreira.

*Eupithecia coccifera*ta Millière, 1864
BAL: Moinhos de Paneiro, 16-IV-2019, Nunes, Silva and Jesus.

Eupithecia abbreviata Stephens, 1831
E: Quinta do Pisão, 12-V-2019, Tagis, det. Corley.

Eupithecia dodoneata Guenée, 1858
R: Colos, 9-VI-2019, Terry.

Eupithecia massiliata Millière, 1863
BAL: Moinhos de Paneiro, 16-IV-2019, Nunes, Silva and Jesus.

Eupithecia scopariata (Rambur, 1833)
R: Colos, 9-VI-2019, Terry.

Eupithecia breviculata (Donzel, 1837)
BAL: Foros da Quinta, 26-V-2019, Corley and S. Ferreira; R: Colos, 8-VI-2019, Terry.

* *Eupithecia assimilata* Doubleday, 1856
TM: Penelas, Ermida, larva on *Humulus lupulus* L., 8-X-2016, Nunes, conf. Townsend (fig. 7). Almost all Europe, absent from some countries in south-east. [Larva also on *Ribes sp.*].

Aplocera efformata (Guenée, 1858)
BAL: Vila Nova de Milfontes, 28-V-2019, Corley and S. Ferreira.

Chesias rufata (Fabricius, 1775)
BAL: Moinhos de Paneiro, 16-IV-2019, Nunes, Silva and Jesus.

Acasis viretata (Hübner, 1799)
BAL: Santa Bárbara, 11-III-2019, Tagis.

Lomaspilis marginata (Linnaeus, 1758)
BL: Jafafe de Cima, 12-VI-2019, Tagis.

Acanthovalva inconspicuaria (Hübner, 1819)
E: Convento de Arrábida, 30-V-2019, Corley and S. Ferreira.

Neognopharmia stevenaria (Boisduval, 1840)
BAL: Noudar, Barrancos, 10-IV-2019, Tagis.

Petrophora chlorosata (Scopoli, 1763)
BB: Parque Campismo de Pião, 10-VI-2019, Nunes, Silva and Jesus.

Selenia lunularia (Hübner, 1788)
BAL: Rio Mira at Zambujeira, 29-V-2019, Corley and S. Ferreira.

Tephronia espaniola Schawerda, 1931
Second Portuguese record. TM: Cigadonhe, Gestosa, 16-VIII-2019, Nunes, Silva and Jesus (fig. 8).

Hylaea fasciaria (Linnaeus, 1758)
DL: Vale Quente, Serra do Marão, 15-VI-2019, Nunes, Silva and Jesus.

Charissa crenulata avilarius (Reisser, 1936)
BB: Parque Campismo de Pião, 10-VI-2019, Nunes, Silva and Jesus.

Thalera fimbrialis (Scopoli, 1763)
R: Colos, 8-VI-2019, Terry.

NOTODONTIDAE

Stauropus fagi (Linnaeus, 1758)
BAL: Santa Bárbara, 11-III-2019, Tagis.

Notodonta dromedarius (Linnaeus, 1767)
DL: Vale Quente, Serra do Marão, 15-VI-2019, Nunes, Silva and Jesus.

Ptilodon capucina (Linnaeus, 1758)
Third Portuguese record. M: Mosteiro de São João de Arga, 3-VI-2019, Corley and S. Ferreira.

EREBIDAE

Orgyia aurolimbata Guenée, 1835
M: Serra de Arga: Parque Eólico, larva on *Salix atrocinerea* Brot., 3-VI-2019, Corley.

Orgyia trigotephras Boisduval, 1829
ALG: Cabranosa, Sagres, larva on *Quercus rotundifolia* L., 10-IV-2019, Fritsch; E: Convento de Arrábida, 30-V-2019, Corley and S. Ferreira.

Callimorpha dominula (Linnaeus, 1758)
DL: Alto das Velhas, 3-VII-2011, Silva.

Coscinia chrysocephala (Hübner, 1804)
BAL: Vargens, Ribeira de Vascão, 24-III-2019, Tagis; R: Colos, 8-VI-2019, Terry.

Lygephila craccae (Denis & Schiffermüller, 1775)
R: Outeiro, Alcobertas, 23-V-2019, Corley.

Tathorhynchus exsiccata (Lederer, 1855)
BL: Lagoa de São José, 26-XII-2019, Rosete.

Parascotia nisseni Turati, 1905
E: Quinta do Pisão, 12-V-2019, Tagis, det. Corley.

Rhypagla lacernaria (Hübner, 1813)
R: Ave Casta, 21-V-2019, Tagis.

Catephia alchymista (Denis & Schiffermüller, 1775)
R: Ave Casta, 21-V-2019, Tagis; E: Lagoa Pequena, Arrimal, 20-VII-2019, Tagis.

Catocala mariana Rambur, 1858
R: Colos, 8-VI-2019, Terry.

Catocala nymphagoga (Esper, 1787)
ALG: Cabranosa, Sagres, larva on *Quercus rotundifolia* L., 9-IV-2019, Fritsch.

Catocala promissa (Denis & Schiffermüller, 1775)
ALG: Cabo de São Vicente, larva on *Quercus rotundifolia* L., 10-IV-2019, Fritsch.

Minucia lunaris (Denis & Schiffermüller, 1775)
BAL: Moinhos de Paneiro, 16-IV-2019, Nunes, Silva and Jesus; BA: Faia Brava Reserve, 10-V-2019, Nunes, Silva and Jesus.

NOCTUIDAE

Chrysodeixis acuta (Walker, 1858)
ALG: Sargaçal, 29-X-2019, Valadares, conf. Yela from photo.

Aedia leucomelas (Linnaeus, 1758)
M: Mosteiro de São João de Arga, 3-VI-2019, Corley and S. Ferreira.

Acronicta megacephala (Denis & Schiffermüller, 1775)
BB: Cortes de Meio, 22-VI-2019, Tagis; BA: Mata do Desterro, 30-VI-2019, Tagis.

Synthimia fixa (Fabricius, 1787)
BAL: Moinhos de Paneiro, 16-IV-2019, Nunes, Silva and Jesus.

Calophasia almoravida Graslin, 1863
BL: Barra de Mira, 3-VI-2019, Tagis.

Omphalophana serrata (Trteitschke, 1835)
BAL: Safara, 12-IV-2019, Tagis.

Lophoterges millierei (Staudinger, 1871)
BAL: Rio Mira at Zambujeira, 29-V-2019, Corley and S. Ferreira; R: Colos, 12-VI-2019, Terry.

Amphipyra tetra (Fabricius, 1787)
TM: Carrazedo, 18-IX-2019, Corley, Nunes and S. Ferreira; São Martinho de Angueira, 23-IX-2019, Corley and S. Ferreira.

Valeria jaspidea (de Villers, 1789)
ALG: Três Figos, Corsino, 13-III-2019, Tagis; BAL: Santa Bárbara, 11-III-2019, Tagis.

Meganephria bimaculosa (Linnaeus, 1767)
Second to fourth Portuguese records. TM: Carrazedo, 18-IX-2019, Corley, Nunes and S. Ferreira; Guadramil, 20-IX-2019, Corley, Nunes and S. Ferreira; São Martinho de Angueira, 23-IX-2019, Corley and S. Ferreira.

Caradrina selini Boisduval, 1840
ALG: Três Figos, Corsino, 13-III-2019, Tagis.

Caradrina noctivaga Bellier, 1863
R: Colos, 9-VI-2019, Terry.

Hoplodrina octogenaria (Goeze, 1781)
E: Vale da Cabeceira, 25-V-2019, Corley.

Polyphaenis sericata (Esper, 1787)
R: Colos, 8-VI-2019, Terry.

Nonagria typhae (Thunberg, 1784)
TM: Campo de Viboras, 12-VII-2019, Tagis.

Lateroligia ophiogramma (Esper, 1794)
Fourth Portuguese record. DL: Amorim, Póvoa de Varzim, 2-VI-2019, Corley and S. Ferreira.

Mesapamea secalis (Linnaeus, 1758)
BB: Cortes de Meio, 22-VI-2019, Tagis.

Oligia strigilis (Linnaeus, 1758)
BB: Parque Campismo de Pião, 10-VI-2019, Nunes, Silva and Jesus.

Episema grueneri Boisduval, 1837
TM: Estevais, 24-IX-2019, Corley and S. Ferreira.

Spudaea ruticilla (Esper, 1791)
ALG: Cabranosa, Sagres, larva on *Quercus rotundifolia* L., 14-IV-2019, Fritsch.

Conistra haleae Fibiger & Top-Jenen, 2010
DL: Valongo, 15-II-2019, Nunes.

Scotochrosta pulla (Denis & Schiffermüller, 1775)
TM: São Martinho de Angueira, 23-IX-2019, Corley and S. Ferreira.

Atethmia centrago (Haworth, 1809)
Second Portuguese record. TM: Carrazedo, 18-IX-2019, Corley, Nunes and S. Ferreira.

Polymixis lichenea (Hübner, 1813)
BL: Moura da Serra, 26-X-2019, Rosete.

Lacanobia blenna (Hübner, 1824)
Third Portuguese locality. BL: Quinta do Canal, 1-VI-2019, Corley and Rosete.

Melanchra persicariae (Linnaeus, 1761)
TM: Pitões das Júnias, 24-VII-2019, Nunes and Jesus.

Conisania andalusica (Staudinger, 1859)
R: Valverde, 24-V-2019, Corley and S. Ferreira.

Hadena magnolii (Boisduval, 1829)
BA: Covão da Ametade, 8-VII-2019, Rosete.

Hadena sancta (Staudinger, 1859)
BL: Barra de Mira, 3-VI-2019, Tagis.

Mythimna straminea (Treitschke, 1825)
E: Lagoa de Albufeira, 10-V-2019, Tagis.

Dichagyris forcipula (Denis & Schiffermüller, 1775)
TM: Lamas de Olo, 2-VIII-2018, Gonzalez and Fernandes, det. Corley; Pitões das Júnias, 15-VII-2019, Nunes and Pires.

* *Euxoa nigricans* (Linnaeus, 1761)
TM: França, 19-IX-2019, Corley, Nunes and S. Ferreira. Almost all Europe. [Polyphagous on herbaceous plants].

Euxoa obelisca (Denis & Schiffermüller, 1775)
TM: Guadramil, 17-VIII-2019, Nunes, Silva and Jesus.

Axylia putris (Linnaeus, 1761)
E: Vale da Cabeceira, 25-V-2019, Corley.

Noctua fimbriata (Schreber, 1759)
BAL: Lagoa de Santo André, 26-V-2019, Corley.

Noctua tirrenica Biebinger, Speidel & Hanigk, 1983
E: Convento de Arrábida, 30-V-2019, Corley and S. Ferreira.

* *Naenia typica* (Linnaeus, 1758)

M: Ponte da Cavada Velha, Assureira, Castro Laboreiro, 3-VIII-2018, Jesus and Silva, conf. J. Yela. Widespread in middle latitudes of Europe, but absent from far north and areas with Mediterranean climate. [Polyphagous on herbaceous plants].

NOLIDAE

Nola infantula Kitt, 1926

M: Vale do Cuco, 25-VII-2019, Nunes and Jesus.

Nola tutulella Zerny, 1927

BA: Vilar de Amargo, 11-V-2019, Nunes, Silva and Jesus.

Nycteola columbana (Turner, 1925)

BL: Abiúl, 22-VI-2019, Rosete.

Earias insulana (Boisduval, 1833)

BL: Quinta do Canal, 14-IX-2019, Corley, Rosete, Nunes and S. Ferreira.

Recent literature

BROWN *et al*. (2019) performed a genetic analysis on a significant number of species of Cochylina (Tortricidae). The main result of this is break up of the polyphyletic genus *Cochylis* into a number of smaller genera. Details are given below:

Thyraylia Walsingham, 1897
nana (Haworth, 1811)

Cochylis epilinana remains in genus *Cochylis* for the moment but is not closely related to other *Cochylis sensu stricto* species (of which there are none in Portugal).

Neocochylis Razowski, 1960
hybridella (Hübner, 1813)
salebrana (Mann, 1862)
dubitana (Hübner, 1799)
molliculana (Zeller, 1847)

Cochylichroa Obraztsov & Swatschek, 1958
atricapitana (Stephens, 1852)

Brevicornutia Razowski, 1960
pallidana (Zeller, 1847)

Pontoturania Obraztsov, 1943
posterana (Zeller, 1847)

CORLEY *et al*. (2020) describe *Mondeguina atlanticella* Corley & Rosete, 2020, a new species of Gelechiidae in a new genus from localities near the coast in Beira Litoral and Algarve. *Apatetris agenjoi* is transferred to genus *Catatinagma*.

CORLEY & FERREIRA (2019) place *Cacochroa rosetella* Corley, 2018 in a new genus *Rosetea* Corley & Ferreira.

CORLEY & FERREIRA (2020) justify the resurrection from synonymy of *Cochylimorpha punctiferana* (Ragonot, 1881) already proposed in CORLEY (2015).

GAEDIKE (2019) refers Portuguese records of *Ceratuncus dzhungaricus* to *C. maroccanella* (Amsel, 1951).

HUEMER (2020) has revised the *Caryocolum schleichi* species complex. The taxon occurring in Portugal, *C. schleichi* subspecies *dianthella* (Chrétien, 1925) is restored to species rank.

LAŠTŮVKA & LAŠTŮVKA (2020) add *Bohemannia pulverosella* (Stainton, 1849) to the Portuguese fauna.

MARABUTO *et al*. (2020) study the phylogeography of *Euchloe tagis* in great detail, relating genetic divergence in this species to refugia in the Western Mediterranean area and geological events over more than five million years. There are no resulting taxonomic changes at species or genus level.

ROSETE *et al*. (2019) present a list of records from Constância, many of them new records for Ribatejo province.

SLAMKA (2019) makes several nomenclatural changes in the Phycitinae: *Neurotomia* is synonymised with *Melathrix* Ragonot, 1893, *Moitrelia* is synonymised with *Uncinus* Amsel, 1951 and in genus *Elegia* the species that has been referred until now as *fallax* is synonymised with *atrifasciella;* confusingly *fallax* is the correct name for *fallaximima*.

ZLATKOV & HUEMER (2019) raise *Clepsis eatoniana* (Ragonot, 1881) from synonymy with *C. consimilana* and demonstrate that it is the oldest name for the recently described *C. razowskii* Gastón, Vives & Revilla, 2017.

Appendix: Changes to the Portuguese fauna list

Species added to the Portuguese fauna listed in this and other papers are summarised here, each with a number indicating their placement in the checklist (CORLEY, 2015). New genera for the Portuguese fauna show the author and year of publication of the genus.

Name changes resulting from changes at genus level or to new synonymy are given, with each species retaining its list number. In a case where a new name is provided for a previously misidentified species, the new species retains the number of the misidentified species. Thus, *Ceratuncus maroccanella* (Amsel, 1951) replaces *Ceratuncus dzhungaricus* Zagulajev, 1971, which was previously misidentified, but the species retains the number 0177 in the checklist.

0063.2 *Bohemannia pulverulentella* (Stainton, 1849)
0141 *Phalacropterix graminifera* (Fourcrtoy, 1785) is deleted
0177 *Ceratuncus maroccanella* (Amsel, 1951) (*Ceratuncus dzhungaricus* sensu auct. *nec* Zagulajev, 1971)
0294.1 *Phyllonorycter comparella* (Duponchel, 1843)
0378.1 *Apatema apolausticum* Gozmány, 1996
Rosetea Corley & Ferreira, 2019
0579.1 *Rosetea rosetella* (Corley, 2018) (*Cacochroa rosetella* Corley, 2018)
Catatinagma Rebel, 1903
0551 *Catatinagma agenjoi* (Gozmány, 1954) (*Apatetris agenjoi* Gozmány, 1954)
Mondeguina Corley & Rosete, 2020
0551.1 *Mondeguina atlanticella* Corley & Rosete, 2020
0626.1 *Gladiovalva rumicivorella* (Millière, 1881)
0684 *Caryocolum dianthella* (Chrétien, 1925) (*Caryocolum schleichi* ssp. *dianthella* (Chrétien, 1925))
0792.1 *Coleophora currucipennella* Zeller, 1839
0850.1 *Coleophora ribasella* Baldizzone, 1982
0897.1 *Hypatopa segnella* (Zeller, 1873)
SCHRECKENSTEINIOIDEA
SCHRECKENSTEINIIDAE
Schreckensteinia Hübner, 1825
0967.2 *Schreckensteinia festaliella* (Hübner, 1796)
1006.1 *Clepsis eatoniana* (Ragonot, 1881) (*Clepsis razowskii* Gastón, Vives & Revilla, 2017)
1078.1 *Aethes mauritanica* (Walsingham, 1898)
Thyraylia Walsingham, 1897

1085 *Thyraylia nana* (Haworth, 1811) (*Cochylis nana* (Haworth, 1811))
Neocochylis Razowski, 1960
1087 *Neocochylis hybridella* (Hübner, 1813) (*Cochylis hybridella* (Hübner, 1813))
1088 *Neocochylis salebrana* (Mann, 1862) (*Cochylis salebrana* (Mann, 1862))
1088.1 *Neocochylis millierana* (Peyerimhoff, 1877)
1089 *Neocochylis dubitana* (Hübner, 1799) (*Cochylis dubitana* (Hübner, 1799))
1090 *Neocochylis molliculana* (Zeller, 1847) (*Cochylis molliculana* (Zeller, 1847))
Cochylichroa Obraztsov & Swatschek, 1958
1091 *Cochylichroa atricapitana* (Stephens, 1852) (*Cochylis atricapitana* (Stephens, 1852))
Brevicornutia Razowski, 1960
1092 *Brevicornutia pallidana* (Zeller, 1847) (*Cochylis pallidana* (Zeller, 1847))
Pontoturania Obraztsov, 1943
1093 *Pontoturania posterana* (Zeller, 1847) (*Cochylis posterana* (Zeller, 1847))
1166.1 *Pseudococcyx friedmariana* Larsen, 2020
1480 *Elegia atrifasciella* Ragonot, 1887 (*Elegia fallax sensu auct. nec* Staudinger, 1881)
1481 *Elegia fallax* (Staudinger, 1881) (*Elegia fallaximima* Nel & Mazel, 2011)
Melathrix Ragonot, 1893
1485 *Melathrix coenulentella* (Zeller, 1846) (*Neurotomia coenulentella* (Zeller, 1846))
Uncinus Amsel, 1951
1486 *Uncinus obductella* (Zeller, 1839) (*Moitrelia obductella* (Zeller, 1839))
1487 *Uncinus hispanella* (Staudinger, 1859) (*Moitrelia hispanella* (Staudinger, 1859))
1662.1 *Catoptria lythargyrella* (Hübner, 1796)
1921.1 *Eupithecia assimilata* Doubleday, 1856
2518.1 *Euxoa nigricans* (Linnaeus, 1761)
Naenia Stephens, 1827
1570.1 *Naenia typica* (Linnaeus, 1758)

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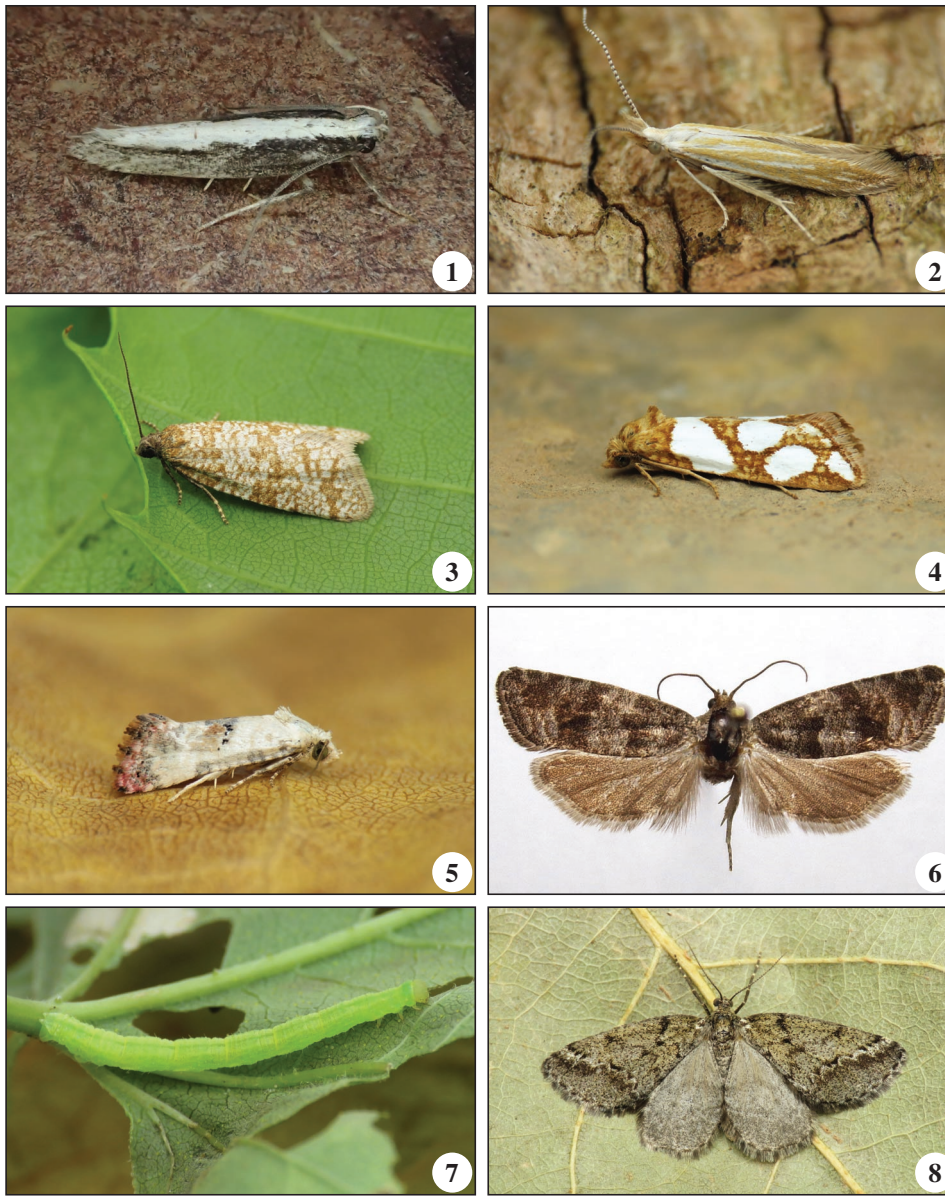

Figures 1-8.– 1. *Gladiovalva rumicivorella* (Millière, 1881), Serra de Arga (C. Silva). **2.** *Coleophora currucipennella* Zeller, 1839, Pitões das Júnias (J. Nunes). **3.** *Isotrias penedana* Trematerra, 2013, Serra do Marão (J. Nunes). **4.** *Eugnosta lathoniana* (Hübner, 1800), Guadramil (J. Nunes). **5.** *Neocochylis millierana* (Peyerimhoff, 1877), Cigadonhe, Gestosa (J. Nunes). **6.** *Pseudococcyx friedmariana* Larsen, 2020, Poço (J. Rosete). **7.** *Eupithecia assimilata* Doubleday, 1856, Penelas, Ermida, larva on *Humulus lupulus* L. (J. Nunes). **8.** *Tephronia espaniola* Schawerda, 1931, Cigadonhe, Gestosa (J. Nunes).

REVISIÓN DE PUBLICACIONES
BOOK REVIEWS

L. Aarvick, B. Å. Bengtsson, H. Elven, P. Ivinski, U. Jürivete, O. Karsholt, M. Mutanen & N. Savenko
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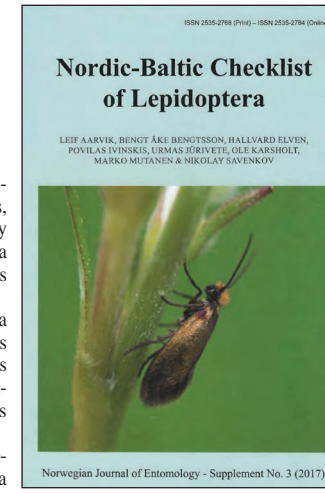

En el suplemento número 3 de la revista *Norwegian Journal of Entomolgy*, aparece esta lista comentada de los Lepidoptera que están presentes en los países nórdicos, concretamente en Dinamarca, Estonia, Finlandia, Islandia, Letonia, Lituania, Noruega y Suecia; si bien a lo largo de la historia han ido apareciendo catálogos individuales para estos países, es la primera vez que se tratan conjuntamente y para ello ha contado con los mejores especialistas conocedores de sus respectivas faunas.

La obra comienza con una Introducción, seguida de la sistemática y taxonomía, la filogenia y las altas categorías de los Lepidoptera. Nos hablan de los grandes naturalistas nórdicos en los siglos XVIII empezando por Linnaeus (1707-1771) y seguidos por sus discípulos y colaboradores como Clerck (1710-1765), Thunberg (1743-1828) y Fabricius (1745-1808), continuando con los principales trabajos publicados en los diferentes países nórdicos.

La parte principal del libro es el listado de toda la fauna conocida de los Lepidoptera, presentes en cada uno de los países considerados, así tenemos que en Dinamarca hay 2.583 especies, Estonia con 2.454 especies, Finlandia con 2.588 especies, Islandia con 96 especies, Letonia con 2.556 especies, Lituania con 2.423 especies, Noruega con 2.286 especies y Suecia con 2.804 especies, teniendo un total de 3.259 especies que se encontraría en el área de estudio.

Con motivo de la elaboración de esta lista, se aportan los siguientes resultados, con las siguientes nuevas sinonimias: *Phyllonorycter heringiella* (Grønlien, 1932) de *P. salictella* (Zeller, 1846) y *P. brevilineatella* (Benander, 1944) de *P. salicicolella* (Sircom, 1848); *Syncopacma* Meyrick, 1925 es sinonimia de *Aproaerema* Durrant, 1897. Con las consiguientes nuevas combinaciones: *Caryocolum arenariella* (Benander, 1937) se considera como una subespecie de *C. schleichi* (Christoph, 1872); *Entephria byssata* (Aurivillius, 1891) se considera como una especie válida distinta de la especie Neártica *E. punctipes* (Curtis, 1835) y *Cosmia contusa* (Freyer, 1849) es transferida desde el género *Ipimorpha* Hübner, [1821] a *Cosmia* Ochsenheimer, 1816.

La obra termina con unos e interesantes comentarios aclaratorios sobre las especies o el estatus más problemático, seguido de una detallada bibliografía y de un índice.

No podemos terminar estas líneas, sin felicitar a los autores por un detallado y excelente resultado fruto de una muy buena colaboración entre los autores de los diferentes países involucrados, así como felicitar también a la *Norwegian Entomological Society*, por haber llevado a buen fin este proyecto.

Este libro se puede obtener electrónicamente (http://www.entomologi.no) y en soporte papel y los interesados deben dirigirse a:

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Checklist of the Geometridae of the Saur Mountains and adjacent territories (Eastern Kazakhstan) (Lepidoptera: Geometridae)

A. E. Naydenov, I. A. Makhov, S. V. Vasilenko & R. V. Yakovlev

Abstract

A checklist of the Geometridae of the Saur Mountains is presented with 109 species (Ennominae: 29; Geometrinae: 10; Sterrhinae: 23 and Larentiinae: 47).
KEY WORDS: Lepidoptera, Geometridae, fauna, entomology, Tarbagatai, Zaisan, Kazakhstan.

Lista detallada de los Geometridae de las montañas del Saur y territorios adyacentes (Este de Kazajistán) (Lepidoptera: Geometridae)

Resumen

Se presenta una lista de los Geometridae de las montañas del Saur con 109 especies (Ennominae: 29; Geometrinae: 10; Sterrhinae: 23 y Larentiinae: 47).
PALABRAS CLAVE: Lepidoptera, Geometridae, fauna, entomología, Tarbagatai, Zaisan, Kazajistán.

Introduction

The Saur is one of the mountain ranges in the Tarbagatai mountain system. It is located on the border between Eastern Kazakhstan and China south-eastwards from Zaisan lake and the Black Irtysh River (Fig. 1). To the north it is bordered by the Zaisan depression, and the Chilikty depression separates it from the Tarbagatai in the south. The Saur stretches 140 km from the west to the east and reaches an altitude of 3816 m (Muztau Mt.). In the Saur the snow line is situated at an altitude of 3300 m. The north foot of the Saur up to 700 m belongs to the semi-desert zone where semidesert plants grow on solonetzic chestnut soil. South expositions are covered by mountain steppes and semi-deserts. Alpine meadows, stony mountain tundras and glaciers are situated on the crests. The hydrographic network is developed well; the main rivers are Zhemenei and Uidene.

In the beginning of the XX century the Saur was regarded as part of Dzhungaria and even Tien-Shan. Later MALOLETKO (1999) argued that the Saur and the Tarbagatai belong to the system of the Altai mountains and this view was held by leading Russian botanists (KAMELIN, 2005) who included these ridges within the Altai-Dzhungarian biogeographical region. Later some entomologists working on the fauna of the Altai mountain system (VOLYNKIN & MATOV, 2011; YAKOVLEV, 2012) accepted the demarcation of the Altai as suggested by phytogeographs (RUBIN & YAKOVLEV, 2013).

The fauna of diurnal butterflies of Saur Mountains is the most studied. The most complete review of butterflies is presented in the work of RUBIN and YAKOVLEV (2013), in which 159 species are listed. Also 216 species of the noctuid moths were listed for the Saur Mountains (VOLYNKIN *et al*., 2016).

Material and methods

The article is based on the materials collected by the authors in territory of the Saur Mountains and adjoining areas in the period 20-VI-27-VI-2018 and collected by V. V. Doroshkin and R. V. Yakovlev in this area in the period 17-VII-23-VII-2011. The Geometridae were collected by the following methods: mowing with a butterfly net; night catching on light. These specimens are kept in the personal collection of A. E. Naydenov (Novoaltaysk, Russia). Also materials for the publication were collection of Zoological Institute, Russian Academy of Sciences, St. Petersburg, Russia (ZISP); presumably, it is material from expeditions lead by S. Tshetverikov and P. Sushkin in 1904.

The Geometridae fauna was examined in 24 localities of this territory (Fig. 2):

1. E. Kazakhstan, Saur Mts, 20 km SEE Zaisan, 47º22'N; 85º09'E, H-1225-1250 m, 20-VI-2018, R. Yakovlev, V. Doroshkin, V. Rudoj & A. Naydenov leg. (Fig. 3);
2. E. Kazakhstan, Saur Mts, Tas Mt. (northern slope), 47º16'N; 85º04'E, H-2230-2400 m, 21-23-VI-2018, R. Yakovlev, V. Doroshkin, V. Rudoj & A. Naydenov leg. (a); 20-22-VII-2011, V. Doroshkin, R. Yakovlev leg. (b) (Fig. 4);
3. E. Kazakhstan, Saur Mts, Kenderlik river Valley (left bank), 2 km W Kenderlik village, 24-VI-2018. 47º28'N; 85º12'E, H-740 m, R. Yakovlev, V. Doroshkin, V. Rudoj & A. Naydenov leg. (Fig. 5);
4. E. Kazakhstan, Saur Mts, 15 km SSW Karabulak Village, 47º24'N; 84º38'E, H-800 m, 26-VI-2018, R. Yakovlev, V. Doroshkin, V. Rudoj & A. Naydenov leg. (Fig. 6);
5. E. Kazakhstan, Saur Mts, 7 km NE Chagan-Obo, 47º06'N; 84º53'E, H-2300 m, 27-VI-2018, R. Yakovlev, V. Doroshkin, V. Rudoj & A. Naydenov leg. (Fig. 7);
6. E. Kazakhstan, Zaisan distr., Saur Mts., 24 km S Zaisan, upper stream Bolshoi Zhemenei riv., 1650 m, 47º14'N; 84º56'E, 17-19-VII-2011, V. Doroshkin, R. Yakovlev leg. (Fig. 8);
7. E. Kazakhstan, Zaisan distr., Saur Mts., Alatai pass, 2010 m, 47º18'N; 85º08'E, 23-VII-2011, V. Doroshkin, R. Yakovlev leg.;
8. E. Kazakhstan, Zaisan distr., Saur Mts. (N slopes near Kenderlyk vill.), 1200 m, 47º21'N; 85º15'E, 23-VII-2011, V. Doroshkin, R. Yakovlev leg.;
9. Tarbagatai, Saur, estuary of Temir-Su river, 18-V-1904;
10. Tarbagatai, Zaisan village, 21-V-1904 (a); 23-25-VI-1904(b); 16-IX-1904(c);
11. Tarbagatai, Zaisan, estuary of Kenderlik river, 24-26-V-1904;
12. Tarbagatai, Saur, foothills of Kishkine-Tau, 28-V-1904;
13. Tarbagatai, Saur, Kishkine-Tau pass, 29-30-V-1904;
14. Tarbagatai, Saur, Terekty river, below the mountains, 31-V-1904;
15. Tarbagatai, Saur, Sary-Bulak, in Saikan, 3-VI-1904;
16. Tarbagatai, Saur, Sarytylogai, Mustau foothills, 6-7-VI-1904;
17. Tarbagatai, Saur, Maishat, Mustau foothills, 11-15-VI-1904;
18. Tarbagatai, Saur, Kenderlik river, coal mines, 16-VI-1904;
19. Tarbagatai, Saur, headwaters of Terekty river, 17-20-VI-1904;
20. Headwaters of Uidene river, Saur, Tarbagatai, 21-VI-1904(a); 1-VII-1904(b);
21. Bolshoi Zhemenei, exit from Saur, Tarbagatai, 22-25-VI-1904;
22. Kl. Tick Bulak, South slope of Saur, Tarbagatai, 7-VII-1904;
23. Chiliktin Valley, Tarbagatai, 8-VII-1904;
24. Tarbagatai, Zaisan lake, cape Topolevyy, 22-VIII-1904.

Species list

Subfamily Ennominae Duponchel, 1845

Stegania dalmataria Guenée, 1857 - 3

Lomographa temerata ([Denis & Schiffermüller], 1775) - 1
Cabera exanthemata (Scopoli, 1763) -1
Selenia lunularia (Hübner, [1788]) - 1
Odontopera bidentata (Clerck, 1759) - 1, 5
Opisthograptis luteolata (Linnaeus, 1758) - 1
Ourapteryx purissima Thierry-Meig, 1905 - 3
Pseudopanthera macularia (Linnaeus, 1758) - 1, 2a
Macaria alternata ([Denis & Schiffermüller], 1775) - 1
Macaria liturata (Clerck, 1759) - 1
Macaria shanghaisaria Walker, 1861 - 3
Heliomata glarearia ([Denis & Schiffermüller], 1775) - 1
Chiasmia clathrata (Linnaeus, 1758) - 1, 2a
Digrammia rippertaria (Duponchel, 1830) - 1, 2b, 3
Perconia strigillaria (Hübner, [1787]) - 1
Siona lineata (Scopoli, 1763) - 1
Synopsia sociaria (Hübner, [1799]) - 3, 4
Megalycinia strictaria (Lederer, 1853) - 1
Aspitates (Megaspilates) mundataria (Stoll, 1782) - 3, 4
Aspitates (Aspitates) gilvaria ([Denis & Schiffermüller], 1775) - 23
Charissa (Kemtrognophos) ambiguata (Duponchel, 1830) - 1
Gnophopsodos stemmataria (Eversmann, 1848) - type locality: Kazakhstan, Noor Saisan. Deposition of holotype: Zoological Institute, Russian Academy of Sciences, St. Petersburg, Russia (ERLACHER & ERLACHER, 2016).
Ematurga atomaria (Linnaeus, 1758) - 1, 2a, 3
Angerona prunaria (Linnaeus, 1758) - 1, 3
Alcis extinctaria (Eversmann, 1851) - 1, 6
Megametopon grisolaria (Eversmann, 1848) - 24
Cleora cinctaria ([Denis & Schiffermüller], 1775) - 1
Jankowskia bituminaria (Lederer, 1853) - 3, 4
Biston betularia (Linnaeus, 1758) - 1, 3

Subfamily Geometrinae Leach, 1815

Geometra papilionaria Linnaeus, 1758 - 3
Thetidia smaragdaria anomica Prout, 1935 - 1, 3, 4, 14
Thetidia correspondens (Alpheraky, 1883) - 3, 4
Hemistola chrysoprasaria lissas Prout, 1912 - 3
Thalera fimbrialis (Scopoli, 1763) - 3, 4
Dyschloropsis impararia (Guenée, [1858]) - 1, 3
Hemithea aestivaria (Hübner, [1799]) - 3
Chlorissa viridata (Linnaeus, 1758) - 1, 3, 4
Phaiogramma etruscaria (Zeller, 1849) - 1
Microloxia herbaria (Hübner, [1813]) - 4

Subfamily Sterrhinae Meyrick, 1892

Idaea aureolaria ([Denis & Schiffermüller], 1775) - 1, 5, 12, 13, 19, 22
Idaea aversata (Linnaeus, 1758) - 1, 3, 21
Idaea dimidiata (Hufnagel, 1767) - 3
Idaea nitidata (Herrich-Schäffer, 1861) - 3, 4, 5, 21
Idaea rusticata ([Denis & Schiffermüller], 1775) - 3

Idaea sericeata (Hübner, [1813]) - 3
Idaea rufaria (Hübner [1799]) - 3, 5
Idaea ossiculata (Lederer, 1870) - 4
Scopula beckeraria (Lederer, 1853) - 4, 10, 11
Scopula dignata (Guenée, [1858]) - 1, 4
Scopula immorata (Linnaeus, 1758) - 1, 17, 19, 20
Scopula incanata (Linnaeus, 1758) - 15, 19, 21
Scopula halimodendrata (Erschoff, 1874) - 11
Scopula marginepunctata (Goeze, 1781) - 1
Scopula ornata (Scopoli, 1763) - 1, 15
Scopula tessellaria (Boisduval, 1840) - 1, 3
Scopula umbelaria (Hübner, [1813]) - 1, 3
Scopula virgulata ([Denis & Schiffermüller], 1775) - 1, 3
Rhodostrophia jacularia (Hübner, [1813]) - 11, 18
Rhodostrophia vibicaria (Clerck, 1759) - 1, 3, 5, 13, 19
Timandra comae Schmidt, 1931 - 1
Lythria purpuraria (Linnaeus, 1758) - 2a, 4
Lythria venustata Staudinger, 1882 - type locality: Zaisan. The holotype is currently housed at the Museum für Naturkunde, Humboldt-Universität, Berlin, Germany (ÕUNAP *et al*., 2009).

Subfamily Larentiinae Duponchel, 1845

Aplocera plagiata (Linnaeus, 1758) - 1
Scotopteryx chenopodiata (Linnaeus, 1758) - 6
Scotopteryx sp. - 1
Remarks: Only one specimen was collected. The species is most similar to *S. pseudoburgaria* Vasilenko, 2018, however, it has differences in the genital structures. A series of specimens is required to accurately identify the species.
Phibalapteryx virgata (Hufnagel, 1767) - 2a
Cataclysme riguata (Hübner, [1813]) - 1, 3, 4
Xanthorhoe asiatica (Staudinger, 1882) - 1
Xanthorhoe decoloraria (Esper, [1806]) - 6
Xanthorhoe fluctuata (Linnaeus, 1758) - 1
Xanthorhoe sajanaria (Prout, 1914) - 3
Xanthorhoe spadicearia ([Denis & Schiffermüller], 1775) - 1
Juxtephria consentaria (Freyer, [1846]) - 1
Catarhoe cuculata (Hufnagel, 1767) - 1
Catarhoe rubidata ([Denis & Schiffermüller], 1775) - 1
Epirrhoe alternata (Müller, 1764) - 1, 2a
Epirrhoe pupillata (Thunberg, 1788) - 1, 2a
Epirrhoe tristata (Linnaeus, 1758) - 1
Pseudentephria lamata (Staudinger, 1897) - 3, 5
Photoscotosia palaearctica (Staudinger, 1882) - 1, 6
Hydriomena ruberata (Freyer, [1831]) - 1
Cidaria fulvata (Forster, 1771) - 1
Dysstroma truncata (Hufnagel, 1767) - 1
Cosmorhoe ocellata (Linnaeus, 1758) - 1
Lampropteryx suffumata ([Denis & Schiffermüller], 1775) - 1
Stamnodes pauperaria (Eversmann, 1848) - 2a, 5
Eupithecia assimilata Doubleday, 1856 - 1
Eupithecia bastelbergeri Dietze, 1910 - 5

Eupithecia centaureata ([Denis & Schiffermüller], 1775) - 1, 10c, 21
Eupithecia exiguata (Hübner, [1813]) - 1
Eupithecia extensaria (Freyer, 1845) - 1, 9, 14
Eupithecia extraversaria Herrich-Schäffer, 1852 - 3
Eupithecia holti Viidalepp, 1973 - 2a
Eupithecia icterata (De Villers, 1789) - 1, 6
Eupithecia ochridata Schutze & Pinker, 1968 - 1
Eupithecia olgae Mironov, 1986 - 1
Eupithecia parallelaria Bohatsch, 1893 - 9
Eupithecia pygmaeata (Hübner, [1799]) - 2a
Eupithecia satyrata (Hübner, [1813]) - 1, 16, 17
Eupithecia simpliciata (Haworth, 1809) - 10b
Eupithecia subfuscata (Haworth, 1809) - 1, 3, 16
Eupithecia subumbrata ([Denis & Schiffermüller], 1775) - 1, 16, 21
Eupithecia uliata Staudinger, 1897 - 1, 21
Eupithecia virgaureata Doubleday, 1861 - 1
Horisme aemulata (Hübner, [1813]) - 1
Horisme incurvaria (Erschoff, 1877) - 1
Horisme plurilineata (Moore, 1888) - 3
Horisme tersata ([Denis & Schiffermüller], 1775) - 1, 3, 4
Horisme vitalbata ([Denis & Schiffermüller], 1775) - 1, 3

Discussion

Altogether 109 geometer moths species (Ennominae: 29; Geometrinae: 10; Sterrhinae: 23; Larentiinae: 47) have been recorded in the Saur Mountains and adjacent territories.

The fauna of Geometridae of the Saur comprises the following elements: Transpalaearctic, West Palaearctic, Siberian and Central Asian species.

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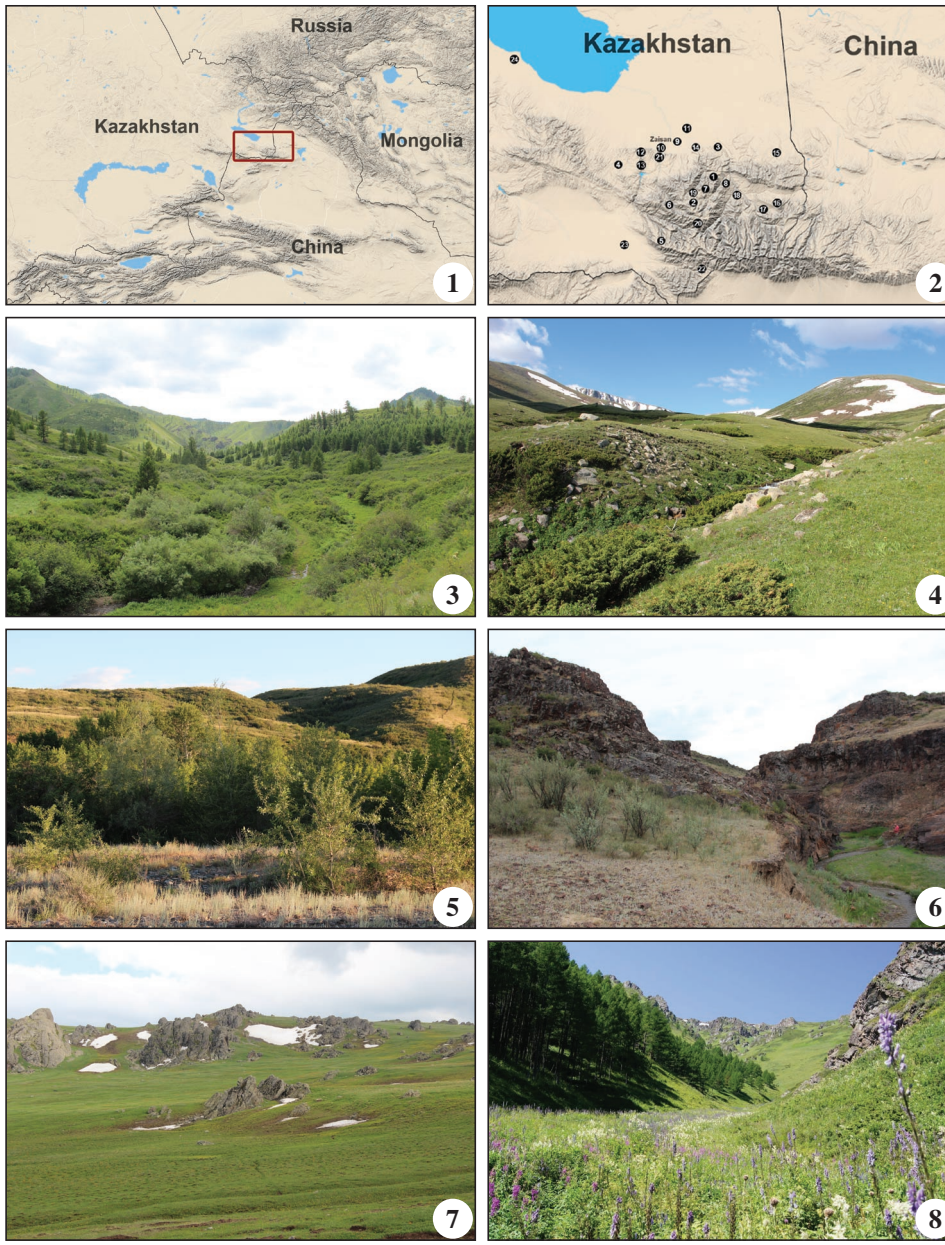

Figures 1-8.– 1. Location of the Saur Mountains. **2.** Map of the Saur Mountains with points of collecting localities. **3-8.** Photos of collecting localities in the Saur Mountains (photo: A. Naydenov & V. Doroshkin). **3.** 20 km SEE Zaisan. **4.** Tas Mt. (northern slope). **5.** Kenderlik river Valley (left bank). **6.** 15 km SSW Karabulak Village. **7.** 7 km NE Chagan-Obo. **8.** upper stream Bolshoi Zhemenei riv.

Lista de socios altas y bajas
List of members join and cease

La Sociedad da la bienvenida a las siguientes personas que han sido elegidas como nuevos socios recientemente. Deseamos que sea por mucho tiempo y que realicen una productiva actividad científica con la Sociedad:

The Society extends a warn welcome to the following persons who have been elected to the membership recently. We wish them all a long, hapy and productive association with the Society:

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La Sociedad da de baja, por no pagar la Cuota Anual en el tiempo fijado por la Junta Directiva, a los siguientes socios:

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Macroheterocera of a mixed Calabrian black pine-European beech forest of Sila Mountains (Italy) (Insecta: Lepidoptera)

S. Scalercio

Abstract

In this paper, we surveyed for the first time the Macroheterocera fauna of mixed forests, mainly favored by human activities, composed by *Pinus nigra laricio* Maire and *Fagus sylvatica* L., a largely artificial association of two tree species with very different ecology. We found 312 species representing a perfect mix of moth species found in pure forests with only few changes in the ranking of tree feeding species and with evidences of the natural evolution of most forest woodlots toward mixed European beech-silver fir forests. We added seven species to the fauna of Sila Mountains, one of them deserving more accurate taxonomic studies. Furthermore, we fixed some mistakes reported in literature for the Sila fauna.
KEY WORDS: Insecta, Lepidoptera, *Pinus nigra laricio*, *Fagus sylvatica*, Calabria, Italy.

I Macroeterocera di una foresta mista di pino nero di Calabria e faggio dei monti della Sila (Italia) (Insecta: Lepidoptera)

Riassunto

In questo lavoro si descrive per la prima volta la fauna a Macroeterocera di una foresta mista formata da *Pinus nigra laricio* Maire e *Fagus sylvatica* L., una associazione largamente artificiale di due specie di alberi con una ecologia molto differente, favorita dalle attività antropiche. Sono state raccolte 312 specie che rappresentano una perfetta miscela dei Macroeterocera trovati nelle foreste pure, con piccoli cambiamenti solo nei rapporti di abbondanza di alcune specie troficamente legate agli alberi, e che mostrano evidenze di una naturale evoluzione di alcune porzioni di foresta verso una foresta mista di faggio e abete bianco. Si aggiungono sette specie alla fauna della Sila delle quali una merita approfondimenti tassonomici. Vengono corretti alcuni errori presenti in lavori dedicati alla fauna dei monti della Sila.
PAROLE CHIAVE: Insecta, Lepidoptera, *Pinus nigra laricio*, *Fagus sylvatica*, Calabria, Italia.

Los Macroheterocera de un bosque mixto de pino negro de Calabria y haya de los montes de Sila (Italia) (Insecta: Lepidoptera)

Resumen

En este trabajo se describe, por primera vez, la fauna de Macroheterocera de un bosque mixto de *Pinus nigra laricio* Maire y *Fagus sylvatica* L., una asociación largamente artificial de dos especies de árboles con una ecología muy diferente, favorita de la actividad antrópica. Se han recogido 312 especies que representan una perfecta mezcla

de Macroheterocera encontradas en bosque puro, sólo con pequeños cambios en relación con la abundancia de algunas especies tróficamente asociadas a los árboles y muestran evidencias de una natural evolución de algunas porciones de bosque mixto de haya y abeto blanco, Se añaden siete especies a la fauna del Sila, de los que una merecen mención taxonómica. Se corrigen algunos errores presentes en trabajos anteriores dedicados a la fauna de los montes de Sila.
PALABRAS CLAVE: Insecta, Lepidoptera, *Pinus nigra laricio*, *Fagus sylvatica*, Calabria, Italia.

Introduction

In Sila Mountains (Calabria, southern Italy) forest cover above 1,000 meters of altitude is mainly composed by *Pinus nigra* subsp. *laricio* Maire and *Fagus sylvatica* L. These tree species have a very different ecology and growth in very different edaphic conditions (NICOLACI *et al.*, 2014). However, natural and anthropogenic perturbations have greatly complicated the relationships between these plants and in some places created mixed forests which are actually an artifact and are naturally evolving towards beech forests (NICOLACI *et al.*, 2014). In some cases very old pine woodlots growth near the beech forest (PLUTINO *et al.*, 2018).

Previous studies in southern Italy described moth communities inhabiting pure beech (INFUSINO & SCALERCIO, 2018a) and pine (SCALERCIO & GRECO, 2018) forests allowing us to easy recognize moths preferably associated to one of this forest type, not only those linked to the presence of dominant trees because of foodplant for their larvae but also those favored by more complex ecological relationships. Anyway, species trophically linked to the canopy layer are the most representative of these forest types. Beech forests inhabit a well characterized moth fauna in southern Italy, enriched by the presence of several species of great biogeographic and conservation interest (INFUSINO *et al.*, 2016; INFUSINO & SCALERCIO, 2018). The most characteristic is *Operophtera fagata* (Scharfenberg, 1805) (Geometridae) very abundant and present everywhere the beech growths, but also *Watsonalla cultraria* (Fabricius, 1775) (Drepanidae) and *Ennomos quercinaria* (Hufnagel, 1767) (Geometridae) are strictly linked to this forest type (INFUSINO & SCALERCIO, 2018). Calabrian black pine forests inhabit a very different moth fauna, also very interesting from a biogeographic and conservation point of view. The most characteristic species are *Thaumetopoea pityocampa* ([Denis & Schiffermüller], 1775) (Notodontidae), *Pennitera firmata* (Hübner, [1822]) and *Eupithecia indigata* (Hübner, [1813]) (Geometridae) all with larvae feeding on *Pinus* and commonly found in this forest type (SCALERCIO & GRECO, 2018), to which can be linked also *Dendrolimus pini* (Linnaeus, 1758) (Lasiocampidae) and *Sphinx pinastri* (Linnaeus, 1758) (Sphingidae) with larvae feeding also on other conifers (BERTACCINI *et al.*, 1995).

In this study we explored composition and diversity of moths in such mixed forests to provide a dataset useful to carry out deep ecological investigations on the relationships between biocoenoses that are potentially very different and therefore forced to coexist in a given area. This study assumes a particular relevance as we described for the first time a moth community resulting from a seminatural habitat of which evolutionary trajectory was largely determined by human activities.

Material and methods

The study area was located at the western margin of the Sila Mountains, Calabria, South Italy (Fig. 1). In order to minimize the effects of any variable linked to large spatial scales, we selected an area of approx. 7 square kilometers only, where pine and beech forests are strictly intermingled and, in some places, equally compose the tree layer. Within this area we selected three localities and in each of them we selected one stand with pine dominant, one with beech dominant, and one mixed for a total of nine stands (Table 1).

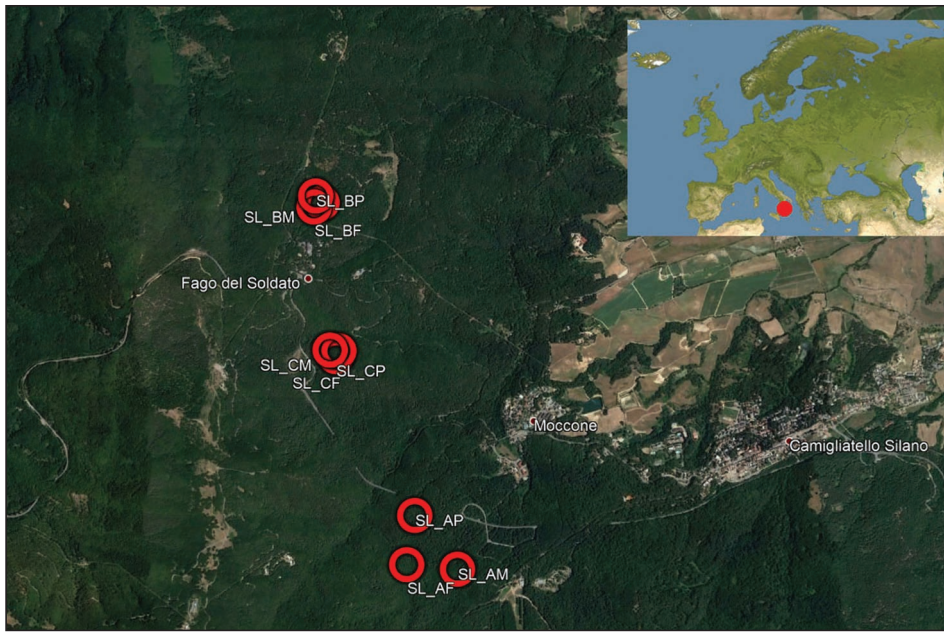

Fig. 1.– Location of study area.

Table 1.– Synthetic description of sampled stands.

Locality	Stand	Concise description	Coordinates (lat., long)	Altitude (m a.s.l.)
Vallone Tasso	SL_AP	Pine dominant	39.3359N, 16.4151E	1410
Vallone Tasso	SL_AM	Mixed stand	39.3323N, 16.4185E	1375
Vallone Tasso	SL_AF	Beech dominant	39.3328N, 16.4142E	1405
Fago del Soldato	SL_BP	Pine dominant	39.3569N, 16.4079E	1405
Fago del Soldato	SL_BM	Mixed stand	39.3565N, 16.4084E	1400
Fago del Soldato	SL_BF	Beech dominant	39.3561N, 16.4078E	1395
Serra Cannile	SL_CP	Pine dominant	39.3465N, 16.4091E	1435
Serra Cannile	SL_CM	Mixed stand	39.3468N, 16.4093E	1435
Serra Cannile	SL_CF	Beech dominant	39.3469N, 16.4086E	1430

One UV LED light trap (INFUSINO *et al.*, 2017a) was positioned in selected stands twice per month from May to November 2018, and precisely 9 and 17-V, 7 and 12-VI, 9 and 16-VII, 6 and 13-VIII, 3 and 10-IX, 1 and 8-X, and 8 and 14-XI. One additional trapping night was carried out the 24-XI-2017. Trapping nights were chosen according to weather conditions favorable to the activity of moths, i.e. with low moonlight, low wind speed, temperature near to the mean of the period, with no or light rain.

Specimens has been identified at species level and counted in laboratory. Some specimens were dissected and identified on the basis of genitalia. Few specimens were submitted to DNA barcoding following the Canadian Centre for DNA Barcoding protocol (http://www.boldsystems.org/index.php/resources/handbook?chapter=1_gettingstarted.html), and sequences has been deposited in the

Barcoding of Life Database (BOLD) platform. Nomenclature follows KARSHOLT & NIEUKERKEN (2013). Voucher specimens are deposited in the Lepidoptera Collection of the Research Centre for Forestry and Wood, Rende, Italy.

Results and discussions

Community composition

We found 11,967 specimens belonging to 312 species (Appendix 1). The family of Noctuidae was the most species rich, but Geometridae were largely the most abundant (Table 2). Remarkable was the high richness of Notodontidae, trophically related to deciduous trees, and the low richness of Erebidae, mostly represented here by lychenophagous taxa. The thirteen most abundant species represent the 50% of the total abundance, whilst 73 species were singletons and 29 doubletons (Fig. 2). The most abundant species was *Operophtera fagata* (*n*=1313), characteristic for beech forests, followed by *Alcis repandata* (*n*=722), common in mountain forests, *Lymantria monacha* (*n*=539), usually associated to beeches, and *Dendrolimus pini* (*n*=398), associated to conifer woodlots.

Table 2.– Number of species and individuals belonging to moth families collected in a mixed pine-beech forest of the Sila Mountains.

Family	Species	Individuals
Geometridae	120	6,533
Noctuidae	134	3,532
Erebidae	25	1,005
Notodontidae	16	115
Lasiocampidae	4	448
Drepanidae	4	176
Nolidae	3	24
Sphingidae	2	55
Limacodidae	1	73
Cossidae	1	3
Endromiidae	1	1
Brahmaeidae	1	2
TOTAL	**312**	**11,967**

Eight species (*n*=2,237), representing the 18.7% of the whole community, are strictly linked to the dominant tree species, but with those linked to beeches (*Opeophtera fagata*, *Ennomos quercinaria*, *Watsonalla cultraria*, *Cyclophora linearia*) more abundant (*n*=1806) than those feeding on pines (*n*=431), namely, listed according to their abundance, *Pennithera firmata*, *Eupithecia indigata*, *Thaumetopoea pityocampa*, and *Panolis flammea*. This can be due to the climatic and edaphic conditions of the study area which tend to be more favorable to the beech than to the pine as demonstrated by the presence of beech renewal also in pine-dominated sites that probably will tend to naturally evolve towards a beech forest (NICOLACI *et al*., 2014), explaining also the absence of pine feeding moths among the top four species.

In pure Calabrian black pine forests SCALERCIO & GRECO (2018) reported 11 species with conifer feeding larvae. In mixed forests we found all these species, three of which primarily feeding on *Abies alba* Mill., two on other conifers, *Lymantria monacha* feeding primarily on beeches, and *Eupithecia subfuscata*, a species erroneously reported as a conifer feeder as it is polyphagous on several herbaceous plants (MIRONOV, 2003). However, the abundance of pine feeding species was quite different in pure forests as *T. pityocampa* and *P. flammea* were more abundant than in the mixed forest (Fig. 3). Although comparisons of moth abundances between different years can be affected by their

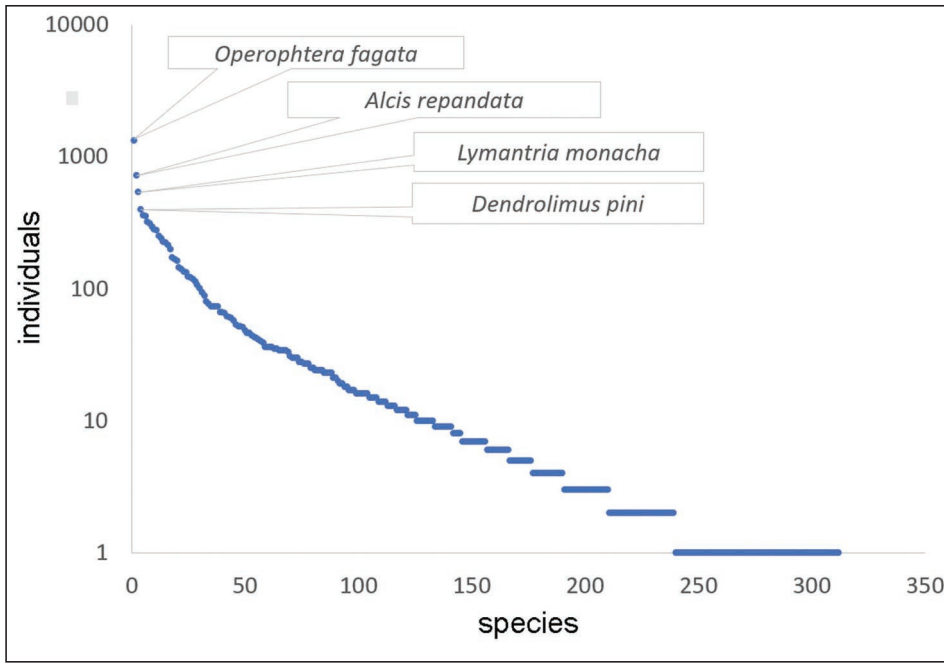

Fig. 2.– Logarithmic abundance of moth species in a mixed pine-beech forest of the Sila Mountains. The name of the four most abundant taxa is reported.

natural population dynamic (BERRYMAN, 1996), we can in any case argue that probably *T. pityocampa* in the studied mixed forest can be disadvantaged by lower temperatures and greater canopy shadowing than in pure pine forests, both known to be detrimental for larval development (BUFFO *et al*., 2007).

In mixed forests we found all the species typically linked to pure beech forests previously observed in the Calabria region (INFUSINO & SCALERCIO, 2018a), with small changes of their ranking. *O. fagata* was always the most abundant, whilst only *C. linearia* showed a significantly lower abundance (Fig. 3). In definitive, in mixed forests we found a perfect mix of the species trophically linked to the pure forests, with adjustment of their abundance according to local abiotic parameters. Interestingly we found five species that we can consider characteristics of the silver fir woodlots of the Serre Mountains (INFUSINO & SCALERCIO, 2018b), namely *Thera britannica*, *T. variata*, *Peribatodes secundaria*, *Pungeleria capreolaria*, and *Macaria liturata*. These species, feeding on *Abies alba*, cannot be considered as occasionally present in the study area because we observed young silver fir trees in beech woodlots. However, their presence led us to suppose a natural evolution of the forest cover, at least in some places and in absence of perturbations, towards a mixed forest with *Abies alba* Mill. and *Fagus sylvatica* because of edaphic and microclimatic conditions, a forest habitat of community interest listed in the Habitat Directive (9220* Apennine beech forests with *Abies alba* and beech forests with *Abies nebrodensis* (Lojac) Mattei).

We found that several species with larvae trophically linked to the undergrowth flora (e.g. *Mesotype parallelolineata*, *Diarsia mendica*, *Gnophos furvata*) were more abundant in mixed than in beech forests (Fig. 3). This is probably due to the higher cover and diversity of herbs and shrubs growing in pine than in beech forests that is partially preserved in mixed forests. On the opposite, the more mesophilic microclimate of mixed forests compared to pine woodlots led to a strong decrease of

thermophilic species such as *Tephronia sepiaria* and *Colostygia sericeata* (Fig. 3). Mixed forests appeared to be the optimal habitat for seven species that here were more abundant than in both pure forests (Fig. 3). It is also interesting to underline that no species was lesser abundant in mixed than in both pure forest types prevailing in mixed forests an additive process for the fauna.

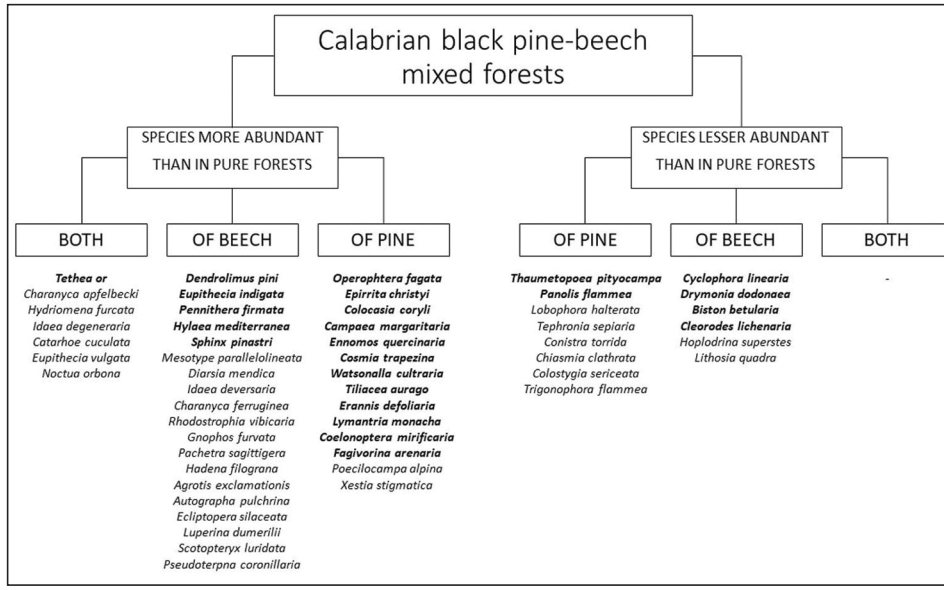

Fig. 3.– Main observed differences of the abundance of individual species between pure and mixed forests of Calabrian black pines and beeches. In bold the species with larvae having foodplants in the tree layer.

Among species found with few individuals a large ecologically homogeneous group is composed by *Cyclophora ruficiliaria*, *C. porata*, *C. suppunctaria*, *Adactylotis contaminaria*, *Catocala nymphagoga*, and *Lasiocampa quercus* feeding mainly on *Quercus* that likely are sporadically present in the surroundings of sampled sites. With clear affinity to warmer places are *Xanthia ruticilla*, *Rodostrophia calabra*, *Hypena lividalis*, *Agrotis trux*, *Synopsia sociaria*, and *Trigonophora flammea*, the last of which has been found in more sites and with more individuals in pure pine forests (SCALERCIO & GRECO, 2018).

We recognized 34 ubiquist species composing the 10.9% of the total abundance. Most abundant were *Peribatodes rhomboidaria* (*n*=360), *Noctua pronuba* (*n*=214) and *Idaea degeneraria* (*n*=141), accompanied by several species belonging to the genera *Agrotis*, *Noctua*, *Mythimna*, *Idaea* and *Scopula*.

Seasonal changes in community composition

In April dominant species were *Cerastis rubricosa*, *Orthosia cerasi* and *O. incerta* (Fig. 4), accompanied by some individuals of *O. gothica* and *Panolis flammea*, few overwintering *Conistra vaccinii* and *C. rubiginea*, and other early-spring active species. Remarkable was the presence of several *O. populeti* in areas were some trees of *Populus tremula* are present. As the season proceeded, *Eupithecia indigata*, *Agrotis cinerea* and *Colocasia coryli* replaced previously dominant species, some of which are still present with few individuals. *Diarsia mendica* characterized late spring communities dominated also by some species that we found for a long period such as *Peribatodes rhomboidaria* and

Epirrhoe galiata. The highest species richness was found during the first half of the summer when most abundant species were *Fagivorina arenaria*, showing a long fly period, and *Dendrolimus pini* that was among the most abundant also in mid-Summer together with *Lymantria monacha* and *Ennomos quercinaria* (Fig. 4). Communities sampled in September were characterized by *Mesotype parallelolineata* and started to be abundant also *Pennithera firmata* that was the dominant species in October with *Tiliacea aurago*. Late Autumn was characterized by *Epirrita christyi* and by *Operophtera fagata*, the most abundant species of mixed Calabrian black pine-beech forest (Fig. 4).

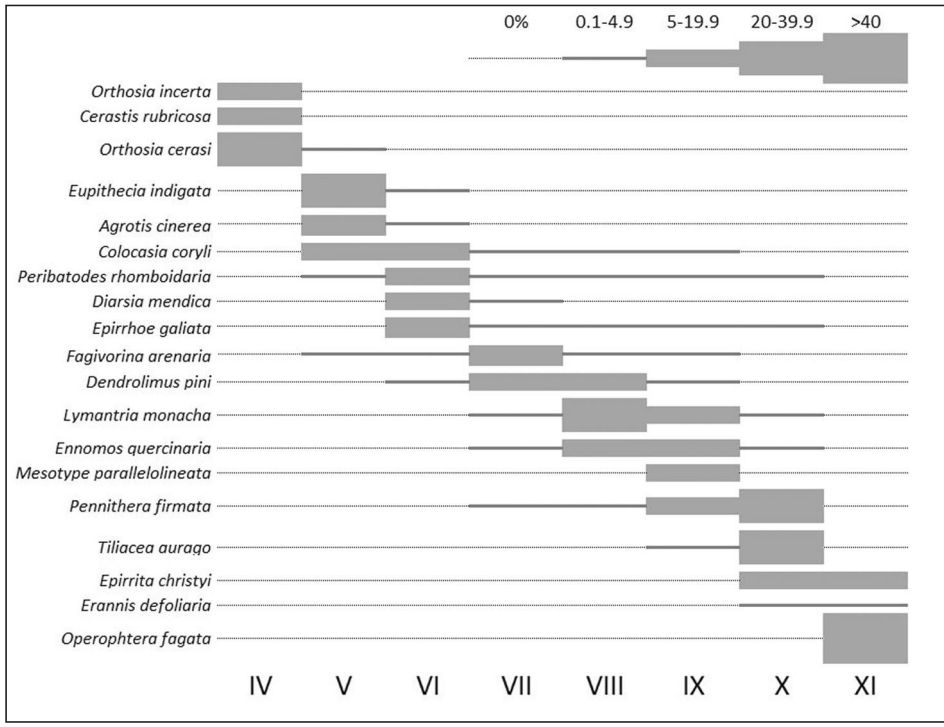

Fig. 4.– Phenological diagram of moth communities in the mixed Calabrian black pine-beech forest of the Sila Mountains. Roman numbers indicate the months.

Faunistic insights

In the study area we confirmed the presence of some very interesting species, known in the Peninsular Italy only for Sila Mountains or in very few additional localities. *Acossus terebra* was recently confirmed in only two localities (SCALERCIO & GRECO, 2018; LEONETTI *et al.*, 2019) 40 years after the first finding (PARENZAN, 1982). Our new findings in the western borders of the Sila Grande, the northern part of the Sila Mountains, significantly extended the range of this species as previous localities were located near the eastern (SCALERCIO & GRECO, 2018) and northern (PARENZAN, 1982; LEONETTI *et al.*, 2019) borders of this geographic area. Very interesting were also the following species: *Alsophila aceraria*, known in Calabria only in the study area (GRECO *et al.*, 2018); *Itame messapiaria*, endemic of the Sila, found in several places above the 1100 meters of altitude; *Metachrostis dardouini*, rare in the Alps and previously known in only two localities of the

Calabria region and in few additional localities of the Apennines (ZANGHERI, 1963; PARENZAN & PORCELLI, 2006); *Dichagyris* (*Dichagyris*) *signifera*, in Italy known only for the Alps and the Sila Mountains (SCALERCIO & GRECO, 2018), but recently found also in the Aspromonte Massif (locality Tre Limiti, 25-VII-2018, Francesco Parisi, Elvira Castilione and Francesco Manti legit); *Eupithecia indigata*, characteristic species for Calabrian black pine forests known with certitude in Italy only for the Alps and the Calabria region (MIRONOV, 2003; SCALERCIO & GRECO, 2018).

Although recent studies significantly improved the knowledge on the moth fauna of the Sila Mountains (SCALERCIO & GRECO, 2018; LEONETTI *et al.*, 2019), we added 7 species not recorded so far: *Eumannia lepraria* (Rebel, 1909), *Hydrelia flammeolaria* (Hufnagel, 1767), *Pasiphila rectangulata* (Linnaeus, 1758), and *Polyphaenis sericata* (Esper, 1787) previously found in few Calabrian localities; *Eupsilia transversa* (Hufnagel, 1766) and *Noctua orbona* (Hufnagel, 1766) not found southward of the Polino Massif so far; *Autophila* (*Autophila*) cfr. *dilucida* (Hübner, [1808]), found in only one specimen that showed a great COI divergence (3.53%) (BOLD sequence ID: BCLEP459-18) from the other European populations belonging to this species, deserving deep taxonomic investigations.

In this paper we also correct some mistakes present in literature concerning the fauna of Sila Mountains. *Ligdia adustata* has been erroneously reported for Vivaio Sbanditi (INFUSINO *et al.*, 2017), these specimens belonging to *Lomaspilis marginata*. *Pterostoma palpina* has not been found in Fallistro and Vivaio Sbanditi (LEONETTI *et al.*, 2019), these records refer to *Poecilocampa alpina*. *Apamea ferrago* has been erroneously listed in LEONETTI *et al.* (2019), but these data refer to *Mythimna ferrago*. *Mesogona oxalina* is absent in the Sila as the records in SCALERCIO & GRECO (2018) must be attributed to *M. acetosellae*. *Dryobotodes eremita* has been erroneously reported for the locality Fossiata (LEONETTI *et al.*, 2019), the correct name for these specimens is *Hada plebeja*. *Scotopteryx mucronata* reported in LEONETTI *et al.* (2019) is *S. chenopodiata*.

Conclusions

In this paper we described the moth community of mixed Calabrian black pine-European beech forests, analyzing the community from a functional point of view. We found that mixed Calabrian black pine-beech forests of Sila Mountains inhabit a perfect mix of moth species characteristic of the pure forest types, but probably this is only a temporary situation. Based on observed moth species and their distribution, we can corroborate the natural evolution of the mixed pine-beech forests of anthropogenic origin towards beech forests associated to silver fir in most humid and cold places as predicted by NICOLACI *et al.* (2014). In fact, we found evidences that moth species usually found in beech forests are more common and diverse than those having functional relationships with Calabrian black pines, and that a relevant portion of species characteristic of silver fir forests have been found. Furthermore, this study added seven species to the fauna of the Sila Mountains, underlying also the presence of taxa that deserve accurate taxonomic studies.

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ANEXO

	SL_AP	SL_BP	SL_CP	SL_AM	SL_BM	SL_CM	SL_AF	SL_BF	SL_CF	TOTAL	Phenology
Operophtera fagata (Scharfenberg, 1805)	390	35	109	288	73	107	180	53	78	1313	XI
Alcis repandata (Linnaeus, 1758)	118	38	36	110	90	53	81	141	55	722	VII-VIII
Lymantria monacha (Linnaeus, 1758)	14	5	15	145	17	40	249	9	45	539	VII-X
Dendrolimus pini (Linnaeus, 1758)	62	35	42	73	56	28	46	10	46	398	VI-IX
Peribatodes rhomboidaria ([Denis & Schiffermüller], 1775)	30	51	26	28	66	39	39	47	34	360	V-X
Ennomos quercinaria (Hufnagel, 1767)	11	12	6	96	23	64	82	38	24	356	VII-X
Colocasia coryli (Linnaeus, 1758)	13	18	12	89	27	22	94	24	19	318	V-IX
Campaea margaritaria (Linnaeus, 1767)	11	6	10	75	23	37	88	36	25	311	V-X
Pennithera firmata (Hübner, [1822])	90	16	52	22	41	31	13	13	13	291	VII-X
Epirrhoe galiata ([Denis & Schiffermüller], 1775)	46	33	37	18	36	24	16	29	41	280	VI-X
Fagivorina arenaria (Hufnagel, 1767)	13	8	17	76	21	32	69	26	16	278	V-IX
Idaea aversata (Linnaeus, 1758)	9	18	16	35	22	37	41	36	37	251	VI-IX
Epirrita christyi (Allen, 1906)	34	15	20	50	30	23	24	18	25	239	X-XI
Eilema lurideola (Zincken, 1817)	11	14	7	61	43	11	25	29	24	225	VII-VIII
Diarsia mendica (Fabricius, 1775)	25	11	6	33	32	9	38	52	16	222	VI-VII
Noctua pronuba Linnaeus, 1758	12	8	21	47	11	16	58	18	23	214	IV-X
Cosmia (Calymnia) trapezina (Linnaeus, 1758)	8	2	5	25	31	48	27	33	19	198	VI-X
Charanyca (Rusina) apfelbecki (Rebel, 1901)	5	28	22	2	31	15	3	41	25	172	VI-VII
Tiliacea aurago ([Denis & Schiffermüller], 1775)	6	5	7	20	25	41	17	31	15	167	IX-X
Scotopteryx luridata (Hufnagel, 1767)	25	39	15	13	32	6	4	16	11	161	VI-VII
Pachetra sagittigera (Hufnagel, 1766)	15	29	24	3	22	9	7	13	23	145	V-VI
Idaea degeneraria (Hübner, [1799])	6	24	9	10	22	8	31	21	10	141	V-VIII, X
Apamea monoglypha (Hufnagel, 1766)	11	4	3	40	9	9	39	9	11	135	VI-VIII
Orthosia (Monima) cerasi (Fabricius, 1775)	8	9	10	40	23	10	23	4	6	133	IV-V
Agrotis segetum ([Denis & Schiffermüller], 1775)	6	0	3	32	30	6	15	16	15	123	V-VII, X
Mesotype parallelolineata (Retzius, 1783)	36	16	14	5	13	10	10	9	8	121	IX-X
Scotopteryx angularia (de Villers, 1789)	12	3	13	6	22	13	6	19	24	118	VII-VIII
Watsonalla cultraria (Fabricius, 1775)	8	14	5	17	19	8	10	26	6	113	V-IX
Idaea deversaria (Herrich-Schäffer, 1847)	9	14	6	7	31	4	4	24	7	106	VI-VII
Cosmorhoe ocellata (Linnaeus, 1758)	12	11	15	4	11	12	8	16	12	101	V-IX
Eupithecia indigata (Hübner, [1813])	15	13	11	2	23	16	4	2	7	93	V-VI

Orthosia (Orthosia) incerta (Hufnagel, 1766)	4	6	8	18	10	8	13	10	11	88	IV
Hoplodrina octogenaria (Goeze, 1781)	11	6	4	11	15	6	13	11	3	80	VI-VIII
Peridroma saucia (Hübner, [1808])	8	4	4	10	16	8	10	9	8	77	V-VII, IX-X
Apoda limacodes (Hufnagel, 1766)	2	3	0	21	9	7	13	8	10	73	VI-VIII
Erannis defoliaria (Clerck, 1759)	6	3	4	14	8	4	21	7	6	73	X-XI
Pseudoterpna coronillaria (Hübner, [1817])	5	9	16	2	7	5	2	11	16	73	VI-VIII, X
Xestia (Megasema) triangulum (Hufnagel, 1766)	15	5	0	25	9	2	6	9	2	73	VI-VIII
Hypena proboscidalis (Linnaeus, 1758)	4	7	5	9	11	1	9	13	7	66	VI-X
Charanyca (Rusina) ferruginea (Esper, 1785)	9	7	4	13	11	3	10	7	2	66	VII
Hylaea mediterranea Sihvonen, Skou, Flamigni, Fiumi & Hausmann, 2014	6	5	9	5	7	8	10	5	10	65	VI-VII, IX-X
Calliteara pudibunda (Linnaeus, 1758)	2	5	0	9	7	8	16	4	11	62	V-VI
Tethea or ([Denis & Schiffermüller], 1775)	9	3	5	8	5	9	4	11	7	61	V-IX
Amphipyra (Amphipyra) tragopoginis (Clerck, 1759)	11	5	9	6	11	6	6	2	4	60	VI-X
Gandaritis pyraliata ([Denis & Schiffermüller], 1775)	7	13	5	2	5	4	1	13	7	57	VII
Agrotis exclamationis (Linnaeus, 1758)	3	3	8	19	10	1	3	4	2	53	VI
Hydriomena furcata (Thunberg, 1784)	3	4	1	24	0	2	12	3	3	52	VII
Cerastis rubricosa ([Denis & Schiffermüller], 1775)	21	4	1	2	11	9	2	1	1	52	IV
Thera britannica (Turner, 1925)	4	3	5	10	3	7	8	5	6	51	V-VI, X
Noctua interposita (Hübner, 1790)	4	0	1	3	3	12	11	3	11	48	VI-IX
Sphinx pinastri (Linnaeus, 1758)	6	3	1	6	5	3	8	5	9	46	VI-VIII
Poecilocampa alpina (Frey & Wullschlegel, 1874)	3	2	2	10	3	4	13	4	5	46	XI
Colostygia pectinataria (Knoch, 1781)	8	1	0	8	2	4	7	7	7	44	VII-VIII
Orthosia (Semiophora) gothica (Linnaeus, 1758)	3	9	5	5	10	2	1	7	1	43	IV
Hadena (Hadena) filograna (Esper, 1788)	4	10	5	0	15	1	0	3	4	42	VI
Eupithecia vulgata (Haworth, 1809)	1	5	5	2	3	7	2	4	12	41	VI
Aplocera plagiata (Linnaeus, 1758)	4	7	6	3	9	3	1	6	1	40	V-VII, IX-X
Xestia (Xestia) stigmatica (Hübner, [1813])	6	2	4	2	6	6	1	10	2	39	VIII-IX
Agrochola (Leptologia) macilenta (Hübner, [1809])	8	0	1	9	7	2	3	3	3	36	X-XI
Opisthograptis luteolata (Linnaeus, 1758)	7	6	5	2	2	2	6	2	4	36	VI-IX
Hoplodrina ambigua ([Denis & Schiffermüller], 1775)	0	2	4	11	5	2	6	0	6	36	VI
Spodoptera exigua (Hübner, [1808])	0	1	2	17	8	1	0	6	1	36	VII, X
Catarhoe cuculata (Hufnagel, 1767)	2	6	11	2	6	2	0	4	2	35	VI
Oligia versicolor (Borkhausen, 1792)	0	2	3	4	5	8	3	8	2	35	VII
Gnophos (Gnophos) furvata ([Denis & Schiffermüller], 1775)	2	8	4	0	2	3	2	11	2	34	VII-VIII

Conistra (Conistra) vaccinii (Linnaeus, 1761)	6	1	1	5	6	6	3	4	2	34	IV, X-XI
Stilbia faillae Püngeler, 1918	3	9	5	1	9	0	0	5	2	34	VIII-IX
Mythimna (Hyphilare) l-album (Linnaeus, 1767)	0	4	1	5	10	0	6	5	3	34	V-VI, VIII
Aplocera praeformata (Hübner, [1826])	5	12	7	0	2	3	0	0	4	33	VII
Dysstroma truncata (Hufnagel, 1767)	4	0	1	10	3	1	2	7	3	31	V-X
Ptilodon capucina (Linnaeus, 1758)	3	0	2	11	3	1	6	2	2	30	VI-VIII
Celonoptera mirificaria Lederer, 1862	4	1	1	5	4	3	2	5	5	30	VI-VIII
Eilema caniola (Hübner, [1808])	0	7	1	1	14	0	1	4	2	30	VI-VIII
Ecliptopera silaceata ([Denis & Schiffermüller], 1775)	3	0	1	2	0	0	19	2	1	28	VI-VIII
Epirrhoe alternata (Müller, 1764)	2	7	2	3	0	3	2	4	5	28	VI-IX
Cyclophora (Cyclophora) puppillaria (Hübner, [1799])	2	4	0	1	9	2	3	2	4	27	VI-VIII
Hadena (Hadena) albimacula (Borkhausen, 1792)	3	3	7	0	3	3	1	4	3	27	VI, VIII
Oligia strigilis (Linnaeus, 1758)	1	1	3	2	6	8	0	3	3	27	VI-VII
Rhodostrophia vibicaria (Clerck, 1759)	2	0	6	4	3	1	0	6	3	25	VII-VIII
Noctua janthe (Borkhausen, 1792)	1	0	1	3	3	4	5	6	2	25	VI-IX
Cyclophora (Codonia) linearia (Hübner, [1799])	2	2	1	4	3	3	4	4	1	24	V-VIII
Thaumetopoea pityocampa ([Denis & Schiffermüller], 1775)	2	7	5	0	2	3	5	0	0	24	VII-VIII
Mesapamea secalella Remm, 1983	2	0	2	4	1	4	3	2	6	24	VI-IX
Noctua comes Hübner, [1813]	2	4	1	2	4	1	2	2	6	24	VI-X
Panolis flammea ([Denis & Schiffermüller], 1775)	2	1	4	0	8	3	0	3	2	23	IV-V
Itame messapiaria Sohn-Rethel, 1929	4	0	2	3	3	2	3	3	3	23	VI-VIII
Agrotis cinerea ([Denis & Schiffermüller], 1775)	2	4	1	1	11	0	0	4	0	23	V-VI
Polia nebulosa (Hufnagel, 1766)	1	0	0	14	1	0	3	0	4	23	VI-VII
Nothocasis rosariae Scalercio, Infusino, Hausmann, 2016	3	4	0	2	4	2	0	4	2	21	IX-XI
Lygephila craccae ([Denis & Schiffermüller], 1775)	1	5	0	2	3	6	2	1	1	21	VI-IX
Selenia lunularia (Hübner, 1788)	1	1	2	3	2	4	3	2	2	20	V-VI, VIII-IX
Colotois pennaria (Linnaeus, 1761)	0	6	1	2	1	2	1	5	1	19	X-XI
Caradrina (Paradrina) flavirena Guenée, 1852	1	3	1	2	3	1	3	3	2	19	IV-VII, IX
Arctia villica (Linnaeus, 1758)	1	2	1	0	7	1	0	3	3	18	VI
Conistra (Dasycampa) rubiginea ([Denis & Schiffermüller], 1775)	2	2	2	2	1	4	1	3	1	18	IV-V, X-XI
Colostygia olivata ([Denis & Schiffermüller], 1775)	4	0	0	0	1	2	2	4	4	17	VII-IX
Larentia clavaria (Haworth, 1809)	2	4	0	3	2	2	0	4	0	17	X
Mesapamea secalis (Linnaeus, 1758)	0	0	2	0	1	8	4	1	1	17	VI-IX
Furcula furcula (Clerck, 1759)	0	0	4	0	3	6	0	0	3	16	VI-VII

Camptogramma bilineata (Linnaeus, 1758)	3	1	1	2	2	2	2	3	0	16	VI-X
Apamea syriaca (Osthelder, 1933)	1	1	0	3	1	0	5	4	1	16	VI-VII
Luperina dumerilii (Duponchel, 1826)	1	6	1	0	7	0	1	0	0	16	IX
Gymnoscelis rufifasciata (Haworth, 1809)	1	1	3	1	4	0	1	2	3	16	VI-VII
Xestia (Megasema) c-nigrum (Linnaeus, 1758)	0	0	2	1	4	0	4	3	2	16	V-VIII
Lycia hirtaria (Clerck, 1759)	1	0	1	1	2	6	1	1	2	15	IV-V
Caradrina (Platyperigea) aspersa Rambur, 1834	1	0	1	1	5	0	2	3	2	15	VI-VIII
Nola confusalis (Herrich-Schäffer, 1847)	0	0	0	12	1	1	1	0	0	15	V-VI
Rhodometra sacraria (Linnaeus, 1767)	0	2	2	5	1	1	0	3	1	15	IV, VIII-X
Agriopis marginaria (Fabricius, 1776)	3	1	3	2	0	4	1	0	0	14	IV-V
Charissa (Kemtrognophos) onustaria (Herrich-Schäffer, 1852)	0	5	0	0	3	1	1	1	3	14	V-VI, IX-X
Lomaspilis marginata (Linnaeus, 1758)	0	3	1	0	2	1	0	3	4	14	VI-VIII
Chersotis margaritacea (Villers, 1789)	0	0	4	0	1	4	0	3	2	14	VII-IX
Conisania (Luteohadena) luteago ([Denis & Schiffermüller], 1775)	0	1	1	1	6	1	0	2	1	13	V-VI
Conistra (Peperina) torrida (Lederer, 1857)	1	0	3	0	3	2	3	1	0	13	IV, XI
Orthosia (Monima) cruda ([Denis & Schiffermüller], 1775)	3	2	0	0	5	1	2	0	0	13	IV
Autographa gamma (Linnaeus, 1758)	0	0	2	0	4	2	0	3	2	13	V-VII
Peribatodes secundaria ([Denis & Schiffermüller], 1775)	1	0	0	4	2	1	2	1	1	12	VI-IX
Thera variata ([Denis & Schiffermüller], 1775)	1	2	2	0	2	1	1	2	1	12	VI
Xanthorhoe fluctuata (Linnaeus, 1758)	0	2	1	2	2	0	1	2	2	12	V-VIII, X
Dichagyris (Dichagyris) signifera ([Denis & Schiffermüller], 1775)	0	1	1	0	2	2	0	5	1	12	VII
Hoplodrina blanda ([Denis & Schiffermüller], 1775)	0	1	1	1	1	3	2	2	1	12	VII-VIII
Charissa (Charissa) obscurata ([Denis & Schiffermüller], 1775)	0	2	0	0	1	5	0	2	1	11	VI, VIII
Chesias rufata (Fabricius, 1775)	0	2	0	2	2	0	1	4	0	11	IV-V
Drymonia velitaris (Hufnagel, 1766)	0	0	3	0	2	3	0	1	2	11	VI-VII
Amphipyra (Amphipyra) pyramidea (Linnaeus, 1758)	0	0	0	4	2	1	3	0	1	11	VII-X
Autographa pulchrina (Haworth, 1809)	3	0	0	2	0	0	3	1	1	10	VII
Charanyca (Charanyca) trigrammica (Hufnagel, 1766)	0	1	2	1	3	0	1	0	2	10	VI-VII
Epilecta linogrisea ([Denis & Schiffermüller], 1775)	1	1	2	0	1	1	0	3	1	10	VII-IX
Hadena (Hadena) magnolii (Boisduval, 1829)	2	4	0	0	1	0	0	2	1	10	V-VI
Noctua fimbriata (Schreber, 1759)	1	0	0	2	3	1	2	1	0	10	VII-IX
Orthosia (Monima) populeti (Fabricius, 1775)	0	0	0	0	0	2	0	0	8	10	IV
Mythimna (Pseudaletia) unipuncta (Haworth, 1809)	0	0	0	2	5	0	2	1	0	10	VI, VIII-X
Noctua tirrenica Biebinger, Speidel & Hanigk, 1983	1	0	0	4	1	1	3	0	0	10	VI-IX

Laothoe populi (Linnaeus, 1758)	2	0	2	1	2	1	1	0	0	9	V, VII-VIII
Eupithecia haworthiata Doubleday, 1856	0	2	0	0	4	0	0	2	1	9	VI-VII
Xanthorhoe montanata ([Denis & Schiffermüller], 1775)	0	0	0	1	0	1	5	2	0	9	VI-VII
Cryphia (Euthales) algae (Fabricius, 1775)	0	2	1	0	1	1	0	2	2	9	VII
Xanthia (Cirrhia) icteritia (Hufnagel, 1766)	0	1	0	0	6	0	1	1	0	9	IX-X
Caradrina (Paradrina) clavipalpis Scopoli, 1763	0	3	1	1	1	1	1	1	0	9	VI-VIII
Mythimna (Hyphilare) albipuncta ([Denis & Schiffermüller], 1775)	0	0	2	1	2	0	2	0	2	9	VI, IX
Phlogophora meticulosa (Linnaeus, 1758)	2	0	1	2	3	0	1	0	0	9	IV, VI-VII, IX
Eupithecia subfuscata (Haworth, 1809)	1	1	1	1	1	0	1	2	0	8	V-VI
Pheosia tremula (Clerck, 1759)	0	0	1	2	2	1	1	0	1	8	V, VIII
Catocala fraxini (Linnaeus, 1758)	0	1	3	1	1	0	2	0	0	8	IX-X
Mythimna (Mythimna) vitellina (Hübner, [1808])	0	0	1	0	0	1	5	0	1	8	V-VI
Solitanea mariae (Stauder, 1921)	0	1	0	1	2	0	2	1	0	7	VI-VIII
Tephronia sepiaria (Hufnagel, 1767)	4	0	0	0	1	0	0	1	1	7	VII-VIII
Callimorpha dominula (Linnaeus, 1758)	0	1	0	3	3	0	0	0	0	7	VII
Eilema complana (Linnaeus, 1758)	0	3	0	0	3	0	0	1	0	7	VI-VIII
Chersotis rectangula ([Denis & Schiffermüller], 1775)	0	1	0	2	1	1	1	0	1	7	VI-VIII
Hadena (Hadena) bicruris (Hufnagel, 1766)	0	0	2	1	2	0	0	0	2	7	VI-IX
Litoligia literosa (Haworth, 1809)	0	0	0	0	1	0	2	4	0	7	VII
Oligia latruncula ([Denis & Schiffermüller], 1775)	0	1	0	0	1	3	0	2	0	7	VI
Xestia (Xestia) baja ([Denis & Schiffermüller], 1775)	0	0	1	1	1	0	0	2	2	7	VIII-IX
Agrotis ipsilon (Hufnagel, 1766)	0	0	0	1	0	2	4	0	0	7	V-VI, IX-X
Noctua janthina ([Denis & Schiffermüller], 1775)	0	0	0	0	1	2	2	1	1	7	VI-IX
Stauropus fagi (Linnaeus, 1758)	1	0	0	2	2	0	0	1	0	6	V-VII
Chloroclysta siterata (Hufnagel, 1767)	1	0	2	1	0	2	0	0	0	6	IV-V, IX-X
Coenotephria ablutaria (Boisduval, 1840)	0	2	1	0	1	1	0	1	0	6	IV, X
Pungeleria capreolaria ([Denis & Schiffermüller], 1775)	3	0	0	1	0	0	2	0	0	6	IX-X
Xanthorhoe vidanoi Parenzan & Hausmann, 1994	1	0	0	1	0	1	0	2	1	6	VI-VII, IX
Euxoa (Euxoa) nigricans (Linnaeus, 1761)	0	0	0	0	3	1	0	1	1	6	VIII-IX
Mythimna (Mythimna) conigera ([Denis & Schiffermüller], 1775)	0	3	0	0	0	1	0	1	1	6	VII-VIII
Xestia (Xestia) castanea (Esper, 1798)	1	1	0	0	0	1	1	0	2	6	VIII-X
Nycteola revayana (Scopoli, 1772)	0	0	0	0	3	1	0	2	0	6	VI-VII, X
Scopula (Calothysanis) imitaria (Hübner, [1799])	0	1	0	1	0	1	0	3	0	6	VI-VII
Crocallis elinguaria (Linnaeus, 1758)	1	0	1	0	1	0	0	1	1	5	VIII-IX

Megalycinia serraria (A. Costa, 1882)	0	1	2	0	1	1	0	0	0	5	VIII-IX
Menophra abruptaria (Thunberg, 1792)	2	1	0	0	1	1	0	0	0	5	IV-VII
Perizoma flavofasciata (Thunberg, 1792)	0	1	0	0	2	0	0	1	1	5	VI
Phigalia pilosaria ([Denis & Schiffermüller], 1775)	0	0	1	1	0	1	2	0	0	5	IV
Amphipyra (Amphipyra) tetra (Fabricius, 1787)	1	0	1	0	3	0	0	0	0	5	VIII-IX
Atypha pulmonaris (Esper, 1790)	0	0	0	0	1	0	1	1	2	5	VII
Euplexia lucipara (Linnaeus, 1758)	1	0	0	3	0	0	0	1	0	5	VI
Luperina testacea ([Denis & Schiffermüller], 1775)	1	1	1	0	0	0	2	0	0	5	VIII-IX
Noctua interjecta Hübner, [1803]	0	0	0	0	1	0	4	0	0	5	VII-VIII
Ptilodon cucullina ([Denis & Schiffermüller], 1775)	0	0	1	1	0	0	1	1	0	4	VI-VII
Chiasmia clathrata (Linnaeus, 1758)	1	0	1	0	1	1	0	0	0	4	VI-VII
Hypomecis roboraria ([Denis & Schiffermüller], 1775)	0	1	0	3	0	0	0	0	0	4	VI-VII
Idaea mutilata (Staudinger, 1876)	0	0	0	0	0	1	0	3	0	4	VI-VII
Macaria liturata (Clerck, 1759)	0	0	0	2	0	0	1	1	0	4	VII
Eugnorisma (Metagnorisma) depuncta (Linnaeus, [1761])	1	0	1	0	0	0	1	1	0	4	VIII-IX
Lacanobia (Lacanobia) w-latinum (Hufnagel, 1766)	1	1	2	0	0	0	0	0	0	4	VI
Noctua orbona (Hufnagel, 1766)	1	0	0	1	0	0	0	2	0	4	VI-VIII
Ochropleura plecta (Linnaeus, 1761)	0	1	0	1	0	0	1	0	1	4	VI-VII
Thalpophila matura (Hufnagel, 1766)	0	2	0	0	1	0	0	0	1	4	VIII-IX
Xanthia (Xanthia) togata (Esper, 1788)	0	0	0	0	1	0	0	2	1	4	X
Pachycnemia hippocastanaria (Hübner, [1799])	0	0	1	3	0	0	0	0	0	4	VI-VII, X
Scopula (Calothysanis) marginepunctata (Goeze, 1781)	0	3	0	0	1	0	0	0	0	4	VI, IX
Mythimna (Hyphilare) ferrago (Fabricius, 1787)	0	0	0	2	0	0	2	0	0	4	VII
Acossus terebra ([Denis & Schiffermüller], 1775)	0	0	0	0	0	1	0	1	1	3	VI, VIII
Malacosoma (Clisiocampa) neustria (Linnaeus, 1758)	0	0	0	0	0	2	0	1	0	3	VII
Coenotephria tophaceata ([Denis & Schiffermüller], 1775)	0	0	0	0	0	0	1	0	2	3	VII-VIII
Comibaena bajularia ([Denis & Schiffermüller], 1775)	0	0	0	0	2	0	1	0	0	3	VI-VII
Epione repandaria (Hufnagel, 1767)	0	0	0	0	0	0	0	2	1	3	VII-VIII
Horisme tersata ([Denis & Schiffermüller], 1775)	0	1	0	0	2	0	0	0	0	3	VII
Perconia strigillaria (Hübner, 1787)	1	1	0	0	1	0	0	0	0	3	VI
Clostera pigra (Hufnagel, 1766)	0	1	0	0	0	0	1	1	0	3	VII-VIII
Phalera bucephala (Linnaeus, 1758)	1	0	0	0	0	0	2	0	0	3	VII
Idia calvaria ([Denis & Schiffermüller], 1775)	0	0	0	2	0	1	0	0	0	3	VI-VII
Leucoma salicis (Linnaeus, 1758)	1	0	0	1	0	1	0	0	0	3	VII

Agrochola (Sunira) circellaris (Hufnagel, 1766)	1	0	0	1	2	0	0	0	0	3	X-XI
Allophyes corsica (Spuler, 1905)	1	0	0	0	0	0	0	1	1	3	X
Caradrina (Platyperigea) kadenii Freyer, 1836	0	0	0	1	1	0	0	1	0	3	VI
Luperina rubella (Duponchel, 1835)	0	0	0	0	0	2	0	0	1	3	IX
Macdunnoughia confusa (Stephens, 1850)	0	0	1	0	1	0	0	1	0	3	VI
Meganola strigula ([Denis & Schiffermüller], 1775)	0	0	0	1	0	0	0	0	2	3	VI-VII
Xanthia (Spudaea) ruticilla (Esper, 1791)	1	0	0	0	2	0	0	0	0	3	IV
Helicoverpa armigera (Hübner, [1808])	0	1	0	0	1	0	0	1	0	3	VI-VII, X
Ochropleura leucogaster (Freyer, 1831)	0	0	0	3	0	0	0	0	0	3	V-VI
Cabera pusaria (Linnaeus, 1758)	0	0	0	1	0	0	0	0	1	2	VII
Eupithecia icterata (de Villers, 1789)	1	0	0	0	0	1	0	0	0	2	VIII
Eupithecia pyreneata Mabille, 1871	0	1	0	0	0	1	0	0	0	2	VI
Idaea fuscovenosa (Goeze, 1781)	0	1	0	0	0	0	0	1	0	2	VII
Idaea humiliata (Hufnagel, 1767)	0	1	0	0	1	0	0	0	0	2	VI
Idaea straminata (Borkhausen, 1794)	1	0	0	0	0	0	1	0	0	2	VII
Odontopera bidentata (Clerck, 1759)	1	0	0	0	0	0	0	1	0	2	V
Ourapteryx sambucaria (Linnaeus, 1758)	1	0	0	1	0	0	0	0	0	2	VII
Thetidia (Antonechloris) smaragdaria (Fabricius, 1787)	1	0	0	0	0	0	0	0	1	2	VII
Xanthorhoe designata (Hufnagel, 1767)	0	0	0	0	1	0	0	1	0	2	VI
Notodonta tritophus ([Denis & Schiffermüller], 1775)	0	0	0	0	0	0	0	0	2	2	VII
Notodonta ziczac (Linnaeus, 1758)	0	0	0	0	0	0	0	0	2	2	V
Pterostoma palpina (Clerck, 1759)	0	1	0	0	1	0	0	0	0	2	VI
Catocala nupta (Linnaeus, 1767)	0	0	0	0	1	0	0	1	0	2	IX
Orgyia (Orgyia) antiqua (Linnaeus, 1758)	0	0	0	0	0	0	0	1	1	2	X
Acronicta (Viminia) rumicis (Linnaeus, 1758)	0	0	0	0	2	0	0	0	0	2	VI
Agrotis clavis (Hufnagel, 1766)	0	0	0	0	1	1	0	0	0	2	VII
Apamea illyria Freyer, 1846	1	0	0	1	0	0	0	0	0	2	VI
Apamea lithoxylaea ([Denis & Schiffermüller], 1775)	0	0	0	0	0	0	1	0	1	2	VI-VII
Conistra (Orrhodiella) ragusae (Failla-Tedaldi, 1890)	0	2	0	0	0	0	0	0	0	2	XI
Hoplodrina superstes (Ochsenheimer, 1816)	0	0	1	0	0	0	1	0	0	2	VII
Lacanobia (Dianobia) contigua ([Denis & Schiffermüller], 1775)	2	0	0	0	0	0	0	0	0	2	VII
Polymixis (Polymixis) polymita (Linnaeus, 1761)	0	0	0	0	1	0	0	1	0	2	IX
Rhodostrophia calabra (Petagna, 1786)	0	0	0	0	0	0	1	1	0	2	VI
Lemonia taraxaci ([Denis & Schiffermüller], 1775)	1	1	0	0	0	0	0	0	0	2	IX

Cyclophora (Codonia) suppunctaria (Zeller, 1847)	0	0	1	0	0	0	1	0	0	2	VI-VII
Dasypolia (Dasypolia) templi (Thunberg, 1792)	0	0	0	1	0	0	0	0	1	2	XI
Polyphaenis sericata (Esper, 1787)	0	0	0	0	2	0	0	0	0	2	VII
Lithosia quadra (Linnaeus, 1758)	0	0	1	0	1	0	0	0	0	2	VII
Agriopis aurantiaria (Hübner, [1799])	0	0	0	1	0	0	0	0	0	1	XI
Cleorodes lichenaria (Hufnagel, 1767)	0	0	0	0	0	1	0	0	0	1	VIII
Drymonia dodonaea ([Denis & Schiffermüller], 1775)	0	0	0	1	0	0	0	0	0	1	VII
Alsophila aceraria ([Denis & Schiffermüller], 1775)	0	0	1	0	0	0	0	0	0	1	XI
Biston strataria (Hufnagel, 1767)	0	0	0	0	0	0	1	0	0	1	IV
Endromis versicolora (Linnaeus, 1758)	0	0	0	1	0	0	0	0	0	1	IV
Chloroclystis v-ata (Haworth, 1809)	0	0	1	0	0	0	0	0	0	1	VII
Thyatira batis (Linnaeus, 1758)	0	0	0	0	0	1	0	0	0	1	VI
Watsonalla binaria (Hufnagel, 1767)	0	1	0	0	0	0	0	0	0	1	VIII
Colostygia sericeata (Schwingenschuss, 1926)	0	0	0	0	1	0	0	0	0	1	XI
Dysstroma citrata (Linnaeus, 1761)	0	0	0	0	0	0	1	0	0	1	IX
Earophila badiata ([Denis & Schiffermüller], 1775)	0	0	0	0	1	0	0	0	0	1	IV
Eumannia lepraria (Rebel, 1909)	0	0	0	1	0	0	0	0	0	1	VII
Eupithecia schiefereri Bohatsch, 1893	0	1	0	0	0	0	0	0	0	1	VI
Eupithecia venosata (Fabricius, 1787)	0	0	0	0	1	0	0	0	0	1	VI
Hydrelia flammeolaria (Hufnagel, 1767)	0	0	0	0	1	0	0	0	0	1	VII
Hydriomena sanfilensis (Stauder, 1915)	0	0	0	0	0	0	1	0	0	1	VI
Idaea dilutaria (Hübner, [1799])	0	0	0	0	1	0	0	0	0	1	VII
Lampropteryx suffumata ([Denis & Schiffermüller], 1775)	1	0	0	0	0	0	0	0	0	1	V
Pasiphila rectangulata (Linnaeus, 1758)	0	0	0	0	0	1	0	0	0	1	VI
Scotopteryx chenopodiata (Linnaeus, 1758)	0	0	0	0	1	0	0	0	0	1	VII
Thalera fimbrialis (Scopoli, 1763)	0	0	0	0	0	1	0	0	0	1	VI
Cerura (Cerura) vinula (Linnaeus, 1758)	0	0	0	0	1	0	0	0	0	1	VI
Notodonta dromedarius (Linnaeus, 1758)	0	0	0	1	0	0	0	0	0	1	VII
Dysauxes ancilla (Linnaeus, 1767)	0	0	0	0	1	0	0	0	0	1	VII
Euproctis (Euproctis) chrysorrhoea (Linnaeus, 1758)	0	0	0	0	0	1	0	0	0	1	VII
Ocneria rubea ([Denis & Schiffermüller], 1775)	0	0	0	0	0	0	0	1	0	1	VII
Parascotia fuliginaria (Linnaeus, 1761)	0	0	0	0	1	0	0	0	0	1	VIII
Agrochola (Anchoscelis) litura (Linnaeus, 1758)	0	0	0	0	0	0	0	0	1	1	X
Agrochola (Anchoscelis) pistacinoides (d'Aubuisson, 1867)	0	0	0	0	1	0	0	0	0	1	X

Agrochola (Leptologia) lota (Clerck, 1759)	0	0	0	1	0	0	0	0	0	1	X
Agrotis catalaunensis (Millière, 1873)	0	0	0	0	1	0	0	0	0	1	IX
Antitype chi (Linnaeus, 1758)	0	0	0	0	1	0	0	0	0	1	IX
Apamea sordens (Hufnagel, 1766)	0	0	1	0	0	0	0	0	0	1	VI
Aporophyla (Phylapora) lutulenta ([Denis & Schiffermüller], 1775)	0	0	0	0	0	1	0	0	0	1	X
Chloantha hyperici ([Denis & Schiffermüller], 1775)	0	0	0	0	1	0	0	0	0	1	VI
Dichagyris (Dichagyris) nigrescens (Höfner, 1888)	0	0	0	0	0	1	0	0	0	1	VII
Eupsilia transversa (Hufnagel, 1766)	0	0	0	0	1	0	0	0	0	1	X
Hadena (Hadena) compta ([Denis & Schiffermüller], 1775)	0	0	0	0	0	1	0	0	0	1	VI
Lithophane (Lithophane) ornitopus (Hufnagel, 1766)	0	0	1	0	0	0	0	0	0	1	XI
Subacronicta megacephala ([Denis & Schiffermüller], 1775)	0	0	0	0	0	0	0	0	1	1	VII
Valeria oleagina ([Denis & Schiffermüller], 1775)	0	0	0	1	0	0	0	0	0	1	IV
Xylena (Xylena) exsoleta (Linnaeus, 1758)	0	0	0	0	0	0	1	0	0	1	XI
Metachrostis dardouini (Boisduval, 1840)	0	0	0	0	1	0	0	0	0	1	VI
Lasiocampa (Lasiocampa) quercus (Linnaeus, 1758)	0	0	0	1	0	0	0	0	0	1	VII
Adactylotis contaminaria (Hübner, [1813])	0	0	1	0	0	0	0	0	0	1	V
Cyclophora (Codonia) porata (Linnaeus, 1767)	0	0	0	0	1	0	0	0	0	1	VI
Cyclophora (Cyclophora) ruficiliaria (Herrich-Schäffer, 1855)	0	0	0	0	0	1	0	0	0	1	VI
Idaea ostrinaria (Hübner, [1813])	0	0	0	0	0	0	0	1	0	1	VI
Nychiodes (Nychiodes) ragusaria Millière, 1884	0	1	0	0	0	0	0	0	0	1	VIII
Autophila (Autophila) cfr. *dilucida* (Hübner, [1808])	0	0	0	0	1	0	0	0	0	1	VI
Catocala nymphagoga (Esper, 1787)	0	1	0	0	0	0	0	0	0	1	VI
Eublemma viridula (Guenée, 1841)	0	0	0	0	0	0	1	0	0	1	VI
Hypena lividalis (Hübner, 1796)	0	0	0	0	0	0	1	0	0	1	VII
Lygephila procax (Hübner, [1813])	1	0	0	0	0	0	0	0	0	1	VI
Agrotis trux (Hübner, [1824])	0	0	0	0	0	1	0	0	0	1	X
Bryophila (Bryoleuca) raptricula ([Denis & Schiffermüller], 1775)	0	0	0	0	0	1	0	0	0	1	VIII
Cucullia (Shargacucullia) caninae Rambur, 1833	0	0	0	0	1	0	0	0	0	1	VI
Diachrysia chrysitis (Linnaeus, 1758)	0	1	0	0	0	0	0	0	0	1	VI
Dypterygia scabriuscula (Linnaeus, 1758)	0	0	0	0	0	0	0	0	1	1	V
Episema glaucina (Esper, 1789)	0	0	0	1	0	0	0	0	0	1	IX
Hada plebeja (Linnaeus, 1761)	0	0	0	0	1	0	0	0	0	1	VI
Leucania (Acantholeucania) loreyi (Duponchel, 1827)	0	0	0	1	0	0	0	0	0	1	VI
Mesogona acetosellae ([Denis & Schiffermüller], 1775)	0	0	0	0	1	0	0	0	0	1	IX

Mormo maura (Linnaeus, 1758)	0	0	0	1	0	0	0	0	0	1	VII
Synopsia sociaria (Hübner, [1799])	0	1	0	0	0	0	0	0	0	1	VI
Trigonophora (Trigonophora) flammea (Esper, 1785)	0	0	0	0	1	0	0	0	0	1	X
Drymonia querna ([Denis & Schiffermüller], 1775)	0	0	0	0	1	0	0	0	0	1	VIII
Mythimna (Mythimna) impura (Hübner, [1808])	0	0	0	0	1	0	0	0	0	1	VI
Timandra comae A. Schmidt, 1931	0	0	0	0	0	1	0	0	0	1	VII
Idaea rubraria (Staudinger, 1901)	0	0	0	0	0	1	0	0	0	1	VIII
Idaea subsericeata (Haworth, 1809)	0	1	0	0	0	0	0	0	0	1	VI
Lacanobia (Diataraxia) oleracea (Linnaeus, 1758)	0	0	0	1	0	0	0	0	0	1	VII

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Artículo en volumen colectivo:

REBEL, H., 1901.- Famil. Pyralidae-Micropterygidae. 2 Theil.- *In* O. STAUDINGER & H. REBEL. *Catalog der Lepidopteren des palaeartischen Faunengebietes*: 368 pp. R. Friedlander & Sohn, Berlin.

Libro:

HIGGINS, L. G., 1975.- *The Classification of European Butterflies*: 320 pp. Collins, London.

Internet:

DE PRINS, J. & DE PRINS, W., 2011.- *Global taxonomic database of Gracillariidae (Lepidoptera).* Disponible en http://www.gracillariidae.net (accedido el 14 de diciembre de 2011).

Las citas bibliográficas se relacionarán siguiendo el orden alfabético de los autores. Cuando se haga referencia a más de un trabajo de un mismo autor, las citas bibliográficas correspondientes se relacionarán en orden de antigüedad de los trabajos.

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A new species of *Anthophila* Haworth, 1811 with variable male genitalia from the Canary Islands (Spain) (Lepidoptera: Choreutidae)

P. Falck, O. Karsholt & J. Rota

Abstract

We describe and illustrate *Anthophila variabilis* Falck, Karsholt & Rota, sp. n. (Choreutidae) from Tenerife (Canary Islands, Spain). The new species is outstanding due to the variability of its male genitalia. It is closely related to *A. fabriciana* (Linnaeus, 1767), and more distantly related to *Anthophila threnodes* (Walsingham, 1910), which is endemic to Madeira. Based on the DNA barcode, the new species is molecularly very distinct from its closest relative, *A. fabriciana*, with a pairwise K2P distance of more than 6.5%. The previous record of *A. fabriciana* from the Canary Islands is based on misidentification, and the species should be removed from the list of Lepidoptera found in the Canary Islands.
KEY WORDS: Lepidoptera, Choreutidae, *Anthophila*, new species, Canary Islands, Spain.

Una nueva especie de *Anthophila* Haworth, 1811 con la variable genitalia del macho de las Islas Canarias (España) (Lepidoptera: Choreutidae)

Resumen

Describimos e ilustramos *Anthophila variabilis* Falck, Karsholt & Rota, sp. n. (Choreutidae) de Tenerife (Islas Canarias, España). La nueva especie se destaca por la variabilidad de la genitalia del macho. Es relativamente próxima a *A. fabriciana* (Linnaeus, 1767) y relativamente más distante de *Anthophila threnodes* (Walsingham, 1910), la cual es endémica de Madeira. Basándose sobre el AND código de barras genético, la nueva especie es, a nivel molecular, muy distinta de su pariente más próximo, *A. fabriciana*, con dos parámetros K2P y con una distancia mayor del 6.5%. Los registros previos de *A. fabriciana* de las Islas Canarias están basados sobre malas identificaciones y la especie debería se retirada de la lista de Lepidoptera encontradas en las Islas Canarias.
PALABRAS CLAVE: Lepidoptera, Choreutidae, *Anthophila*, nueva especie, Islas Canarias, España.

Introduction

Choreutidae are a small family of usually diurnal and often brightly coloured moths, with 414 described species in 20 genera (ROTA, unpublished). Most choreutids are found in the tropics, and a comparatively large number occur on oceanic islands (ROTA *et al*., 2016). So far five species of Choreutidae have been recorded from the Canary Islands (Spain): *Anthophila fabriciana* (Linnaeus, 1767), *Choreutis nemorana* (Hübner, 1799), *C. pariana* (Clerck, 1759), *Tebenna micalis* (Mann, 1857)

and *T. bjerkandrella* (Thunberg, 1784) (BÁEZ & MARTÍN, 2001: 237; VIVES MORENO, 2014: 201-203). However, records of *T. bjerkandrella* are due to misidentification of *T. micalis*, and the species has already been removed from the list of Lepidoptera found in the Canary Islands (VIVES MORENO, 2014: 202; ROTA *et al*., 2014: 100), and also *A. fabriciana* should be removed from the list (see Discussion below). While Madeira, the closest archipelago to the Canary Islands, shares some of the species with the Canary Islands (*C. nemorana*, and *T. micalis*), it also has an endemic species of *Anthophila* - *A. threnodes* (Walsingham, 1910).

During field work in Tenerife in 2016 the first author collected a few specimens of an *Anthophila* species, believed to belong to *A. fabriciana* (L.). The specimens flew in numbers around *Urtica morifolia* Poir. (MUER *et al*., 2016: 247). Dissection of the genitalia revealed a possible new species, and during 2017-2019 more larvae and adult specimens were collected for studying. Because of considerable variation in the adult habitus, and especially in the male genitalia, at some point it was assumed that there might be two separate species. The results from DNA barcoding showed no genetic difference between the two forms, and therefore this hypothesis was rejected.

In this study we describe the new species, we carry out a phylogenetic analysis including all of the sequenced species of *Anthophila* to try to infer the placement of the new species within the genus and especially its sister lineage, and we comment on the possible historical biogeography.

Material and methods

A part of the material was subjected to DNA barcoding (sequencing of the 658 bp fragment of the mitochondrial COI gene; HEBERT *et al*., 2003) for detection of genetically distinct taxa and for obtaining molecular data for the new species. DNA barcodes for some of the specimens were sequenced at the University of Guelph, Canada; some of the sequences were downloaded from online databases such as GenBank and BOLD systems (RATNASINGHAM & HEBERT, 2013); while laboratory work for other specimens was done at Lund University (Table 1). The laboratory protocols followed WAHLBERG & WHEAT (2008).

In addition to sequencing the DNA barcode region (first half of the COI gene, what we refer to as COI-begin), we also sequenced the second half of the mitochondrial COI gene (COI-end), as well as seven nuclear genetic loci (WAHLBERG & WHEAT, 2008) (Table 1). The sequenced nuclear loci are the following: CAD, EF1alpha, GAPDH, IDH, MDH, RpS5, and wingless. The list of specimens with sequences, including their basic geographical data and collection year where known, is provided in Table 1. The molecular data were analyzed with maximum likelihood implemented in RAxML (STAMATAKIS *et al*., 2014) with GTR+G model as a concatenated and unpartitioned dataset. The final dataset had 6404 base pairs and 30 taxa, two of which were outgroups (Chroeutidae: Brenthinae: *Brenthia hexaselena* and Choreutidae: Choreutinae: *Choreutis pariana*). Branch support was calculated using bootstrapping (100 replicates); values below 70 are omitted from branches as they signify lack of statistical support. The K2P divergences between the examined taxa were calculated using analytic tools in BOLD systems.

The photographs of specimens were taken with Canon EOS700D camera. Those of the genitalia by using a Soptop CX40T Trinocular microscope and a Toup Tek P10500A-E3 / E3ISPM05000KPA-E3 / 5.0MP USB3 camera.

Abbreviations used

GP	Genitalia preparation
PF	Collection of Per Falck, Neksø, Denmark
MNCM	Collection A. Vives, Museo Nacional de Ciencias Naturales, Madrid, Spain

MZLU Entomology Section, Biological Museum, Department of Biology, Lund University, Lund, Sweden
ZMUC Zoological Museum, Natural History Museum of Denmark, Copenhagen, Denmark

Results

Eleven specimens of the newly discovered species were successfully sequenced. The new species is genetically distinct (BIN BOLD:ADZ8341; RATNASINGHAM & HEBERT, 2013) from morphologically similar *Anthophila* species. The average corrected pairwise distance between the specimens of the new species is 0.17% and the average distance between the new species and its nearest neighbor (*A. fabriciana*, BIN BOLD:AAC8582) is 6.58%. In the DNA barcode tree (Fig. 1), the new species is sister to *A. fabriciana*, but in the tree based on the expanded molecular dataset including the nuclear gene fragments (Fig. 2), it is sister to a clade consisting of *A. alpinella*, a North American species, and *A. fabriciana*. However, bootstrap values for these branches are very low: a bootstrap of 50 in the DNA barcode tree and only 38 in the full dataset.

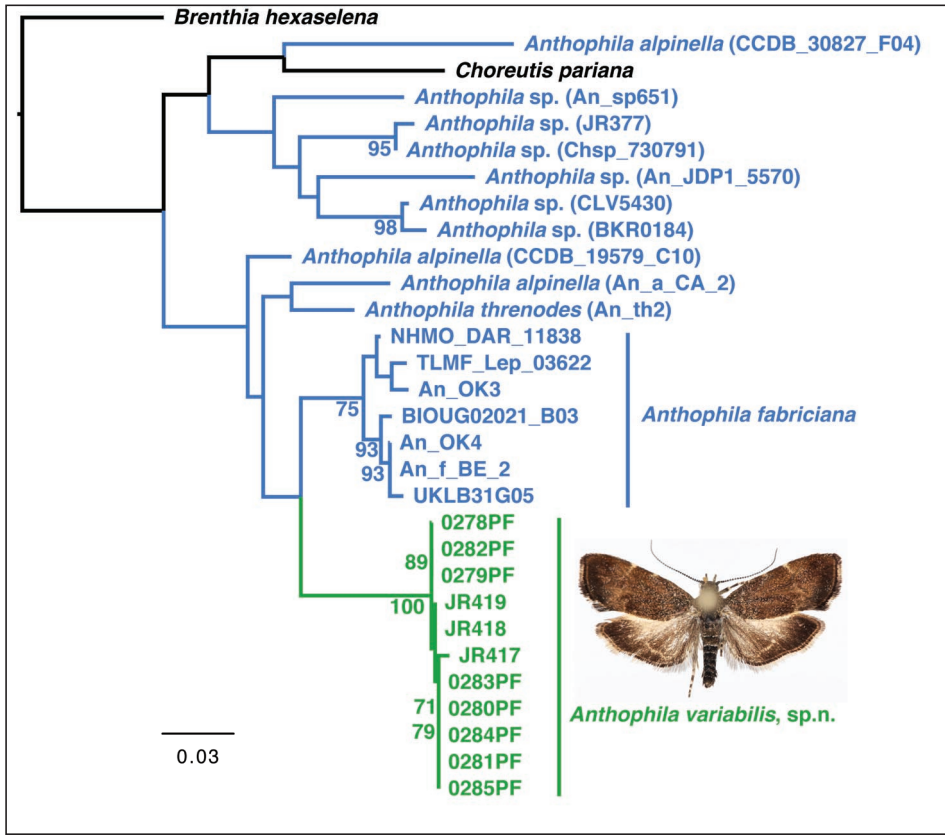

Figure 1.– A maximum likelihood tree of *Anthophila* based on the DNA barcode sequences. The numbers on branches are bootstrap values.

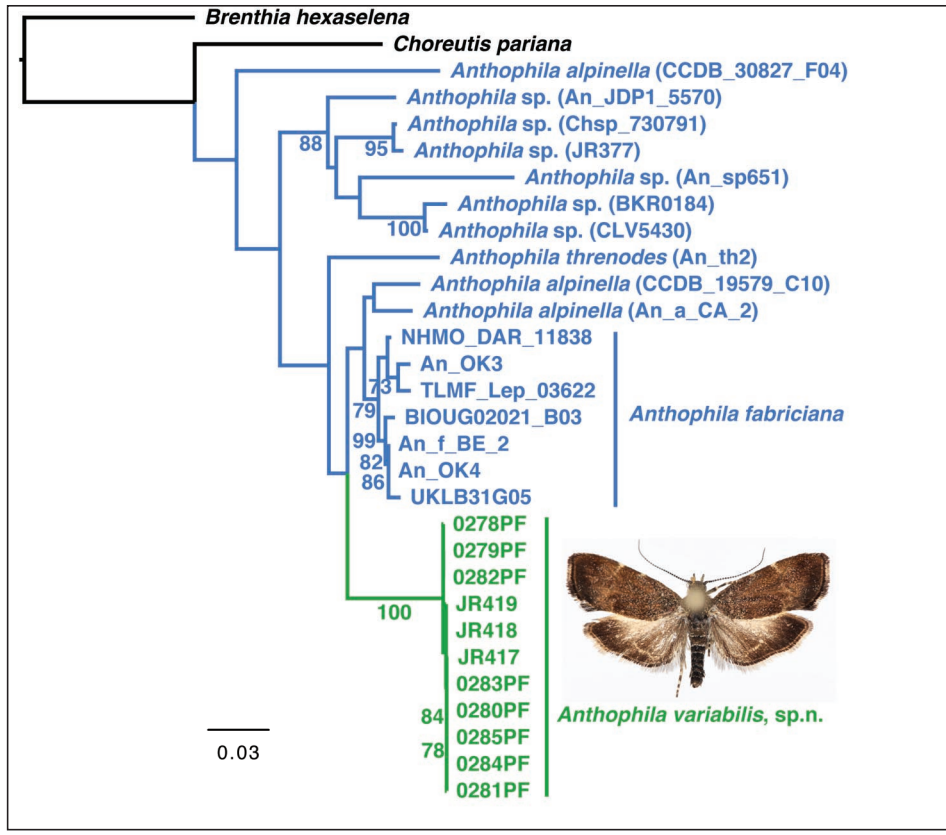

Figure 2.– A maximum likelihood tree of *Anthophila* based on seven nuclear genes as well as the entire COI gene. The numbers on branches are bootstrap values.

***Anthophila variabilis* Falck, Karsholt & Rota, sp. n.** (Figs 3-6)

Holotype ♂: SPAIN, Tenerife, Aguamansa, 1050 m, 21-V-3-VI-2019, leg. P. Falck, genitalia slide 3109PF, DNA sample Lepid Phyl 0285PF (ZMUC).

Paratypes: SPAIN, Tenerife, Aguamansa, 1050 m, 4 ♂♂, 3 ♀♀, 8-22-XI-2016, leg. P. Falck; 4 ♂♂, 1 ♀, ibidem, 1-20-III-2017, leg. P. Falck; 7 ♂♂, 3 ♀♀, ibidem, ex. larvae in spun shots (*Urtica morifolia* Poir), 6-III-2017, leg. P. Falck; 2 ♂♂, 1 ♀, ibidem, ex. larvae in spun shots (*Urtica morifolia* Poir), 18-XI-8-XII-2018, leg. P. Falck; 7 ♂♂, 5 ♀♀, ibidem, 21-V-3-VI-2019, leg. P. Falck; 6 ♂♂, 4 ♀♀, ibidem, 13-26-VIII, leg. P. Falck; genitalia slides 2484PF, 2501PF, 2502PF, 2503PF, 2504PF, 2505PF, 2506PF, 2526PF, 2527PF, 2528PF, 3281PF, 3282PF, 3283PF,3284PF, DNA samples Lepid Phyl 0278PF, 0279PF, 0280PF, 0281PF, 0282PF, 0283PF, 0284PF, JR417, JR418, JR419 (PF, MNCN, MZLU).

Description male: Wingspan 11-13 mm. Head and neck blackish brown with creamy white-tipped scales; labial palpus creamy white, second segment with scattered blackish brown scales, third segment ringed dark basally and with dark tip. Antenna dark grey ringed white, scapula with a few creamy white scales. Thorax blackish brown, with scattered creamy white scales. Forewing blackish brown, scattered with white-tipped scales, especially in basal part and apically to transverse fascia; costa with a creamy

white diffuse mark just beyond 1/3, and a creamy white comma-shaped mark before 2/3, continued by a diffuse creamy white zigzag line across the wing to dorsum well before tornus; fringe-line black, fringes black and creamy white. Hindwing blackish brown, a white irregular streak from above tornus to about middle of termen. Abdomen blackish brown.

Description female: Wingspan 12-14.5 mm. Wing-pattern and coloration as in male, but mixture with white-tipped scales in basal part and distally to transverse fascia more pronounced, giving these areas a dusty appearance; zigzag line more distinct.

Variation: The mixture of white-tipped scales on the forewing can be very pronounced giving adult a speckled appearance, other times the white-tipped scales are nearly absent giving the specimen a more uniform appearance. Hindwing sometimes becoming gradually paler towards costa.

Genitalia ♂ (Figs 9-13): Tegumen triangular, uncus small and rounded. Papillae anales elongate, somewhat elliptical patches with long hairs. Gnathos well developed, curved, hook-like with pointed apex. Vinculum ventrally rounded with a small triangular saccus. Valva broad, somewhat oval, with a pointed costal process and an unsclerotized rounded distal extension; distally and ventrally covered with hairs. Harpe rounded, apically covered with spines. Juxta a hood-shaped plate. Phallus shorter than valva, slightly sigmoidal, with a small, sometimes rounded spine at one-third from apex.

Variation: The pointed costal process varies from well developed (Fig. 9) to totally absent (Fig. 11). The spine on the phallus varies from a small, sharp spine (Fig. 12) to a nearly absent, rounded process (Fig. 13).

Genitalia ♀ (Fig. 18): Posterior apophysis slender, slightly broader at base, about 1.5 times as long as anterior apophysis. Anterior apophysis greatly enlarged from 1/3, tapering slightly towards apex, being about twice as thick in distal 2/3 as in basal 1/3. Ostium on segment VIII. Ductus bursae slightly widening into corpus bursae, heavily twisted with about eight revolutions. Corpus bursae rounded, small; signum as small patch of dentations.

Molecular variability: Among the DNA barcode sequences from 11 specimens there are four haplotypes, which differ from one another by between one and four bases. One haplotype is shared by specimens 0278PF, 0279PF, and 0282PF; one haplotype is shared by JR418 and JR419; one haplotype is shared by 0280PF, 0281PF, 0283PF, 0284PF, and 0285PF; and the fourth haplotype is found in JR417.

Differential diagnosis: *Anthophila variabilis* Falck, Karsholt & Rota, sp. n., resembles *A. fabriciana* (Fig. 7) and *A. threnodes* (Fig. 8). It is characterized by its blackish brown wings, but the adult cannot be distinguished from *A. fabriciana* with certainty. From *A. threnodes* it differs by the distinct white streak on the hindwing. In the male genitalia it differs from *A. fabriciana* (Figs 14, 15) by having a much shorter spine on the phallus. From *A. threnodes* (Figs 16, 17) it differs by the shorter and less pointed spine on the phallus. In the female genitalia it differs from *A. fabriciana* (Fig. 19) by the thick distal part of the anterior apophyses, and the shorter ductus bursae with fewer revolutions (about twelve revolutions in *A. fabriciana*). From *A. threnodes* (Fig. 20) it differs by the apparent spiralization of ductus bursae and the rounded corpus bursae.

Biology: The larva is off-white with dark brown spots and brownish head. It lives under a spun web on or around the young leaves on which it feeds. The hostplant is *Urticae morifolia* Poir. The larvae have been found in March and late November. The adults have been collected from March to late November, probably in several broods, flying actively especially in late afternoon sunshine. The type locality is situated at the north-facing slopes of Tenerife at an altitude of 1050 m a.s.l.

Distribution: Known only from the type-locality Canary Islands (Spain): Tenerife, Aguamansa. The species is most likely an endemic species.

Etymology: The species is named after the variable male genitalia.

Discussion

The corrected pairwise genetic distances within *Anthophila variabilis* Falck, Karsholt & Rota, sp. n. and between *A. variabilis* and its nearest neighbor *A. fabriciana* display a typical barcoding gap (MEYER & PAULAY, 2005), demonstrating that this species is genetically a well-separated lineage

from the other known species of *Anthophila*. With our molecular dataset we cannot answer the question of which species is the sister group to *A. variabilis* with great certainty due to low branch support, but it does appear, as suggested also by the morphological similarity, that *A. variabilis* is the sister species of *A. fabriciana*. We were somewhat surprised that *A. variabilis* is not so closely related to *A. threnodes*, the Madeiran endemic.

Although *A. fabriciana* is a common species in mainland Europe, its occurrence in the Canary Islands is "based on a single specimen ("61978"), taken in April 1884 [in Tenerife], by the late Mr. J. H. Leech" (WALSINGHAM, 1908: 989). The Lepidoptera fauna of the Canary Islands (and especially Tenerife) is relatively well studied, and it is surprising that *A. fabriciana* has not been found again in the islands. REBEL (1911: 349) suggested that the single specimen might have resulted from an accidental importation.

We have not been able to examine the above mentioned specimen but considering that *A. fabriciana* externally is hardly separable from *A. variabilis* we find it most likely that the specimen collected by Leech belonged to the latter. As the record of *A. fabriciana* in the Canary Islands is based on that specimen it should be removed from the list of Canary Island Lepidoptera and replaced by *A. variabilis*.

Interestingly J. H. Leech also collected a specimen of *Anthophila* in Madeira on which WALSINGHAM (1910: 257) based the description of the endemic *A. threnodes* (ROTA *et al*., 2014: 93).

Based on our phylogenetic hypothesis, it appears that the colonization of Madeira by the ancestor of *A. threnodes* happened earlier than the colonization of the Canary Islands by the ancestor of *A. variabilis*. *Anthophila* larvae are Urticaceae specialists and therefore one can imagine that the establishment of a species of *Anthophila* on these islands is not too difficult once gravid females arrive. It is a little less clear how exactly such small moths that are relatively poor fliers can cross hundreds of kilometers from mainland to oceanic islands, but choreutids are apparently good at that given that a number of oceanic island endemics are known in this family (ROTA *et al*., 2016 and references therein). One possibility is that storm systems facilitate such dispersal. One should also consider the possibility that more volcanic islands may have existed in this part of the Atlantic oceans during the last millions of years, and as "stepping stones" thereby having facilitated distribution of the biota from the continent to the Macaronesian Islands.

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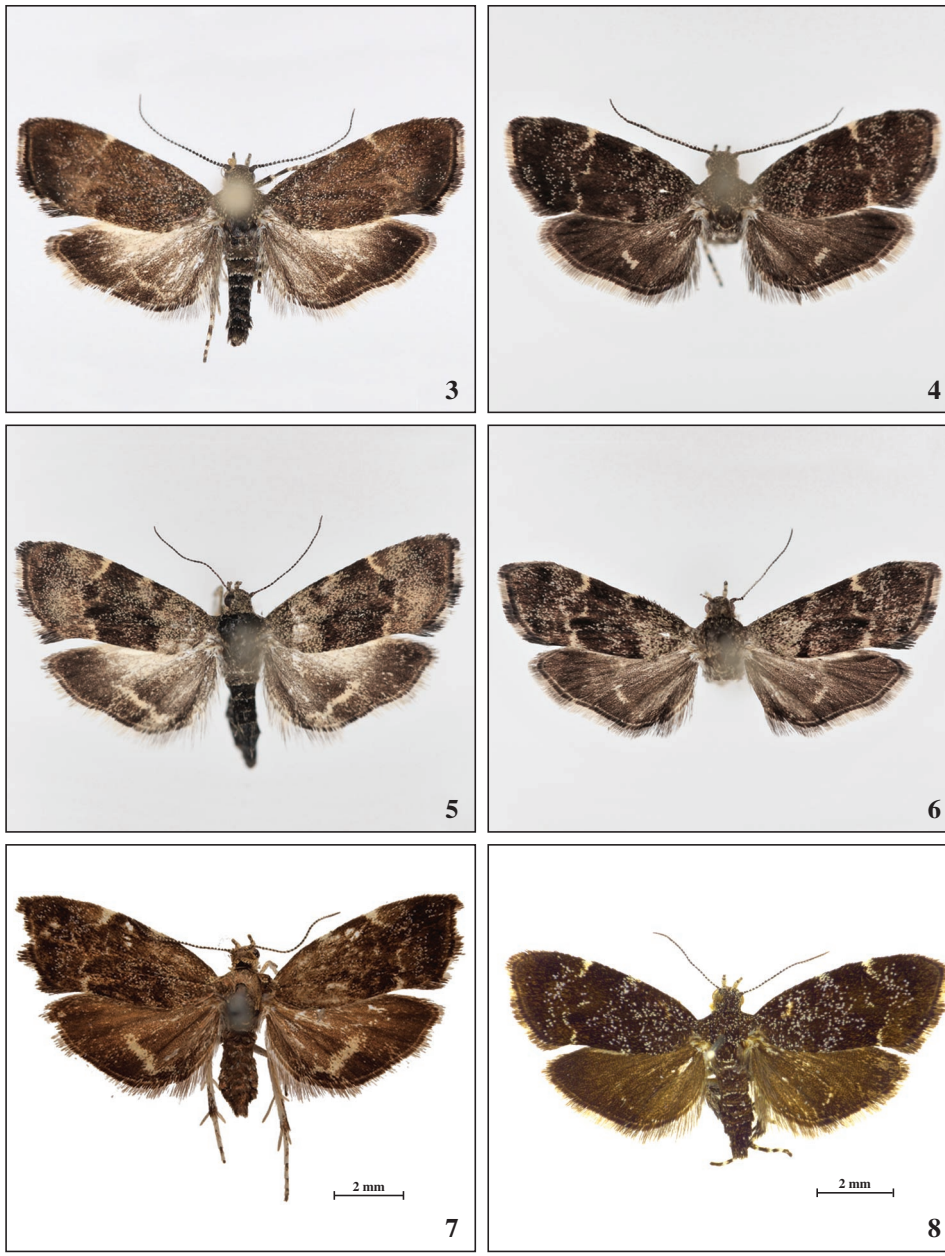
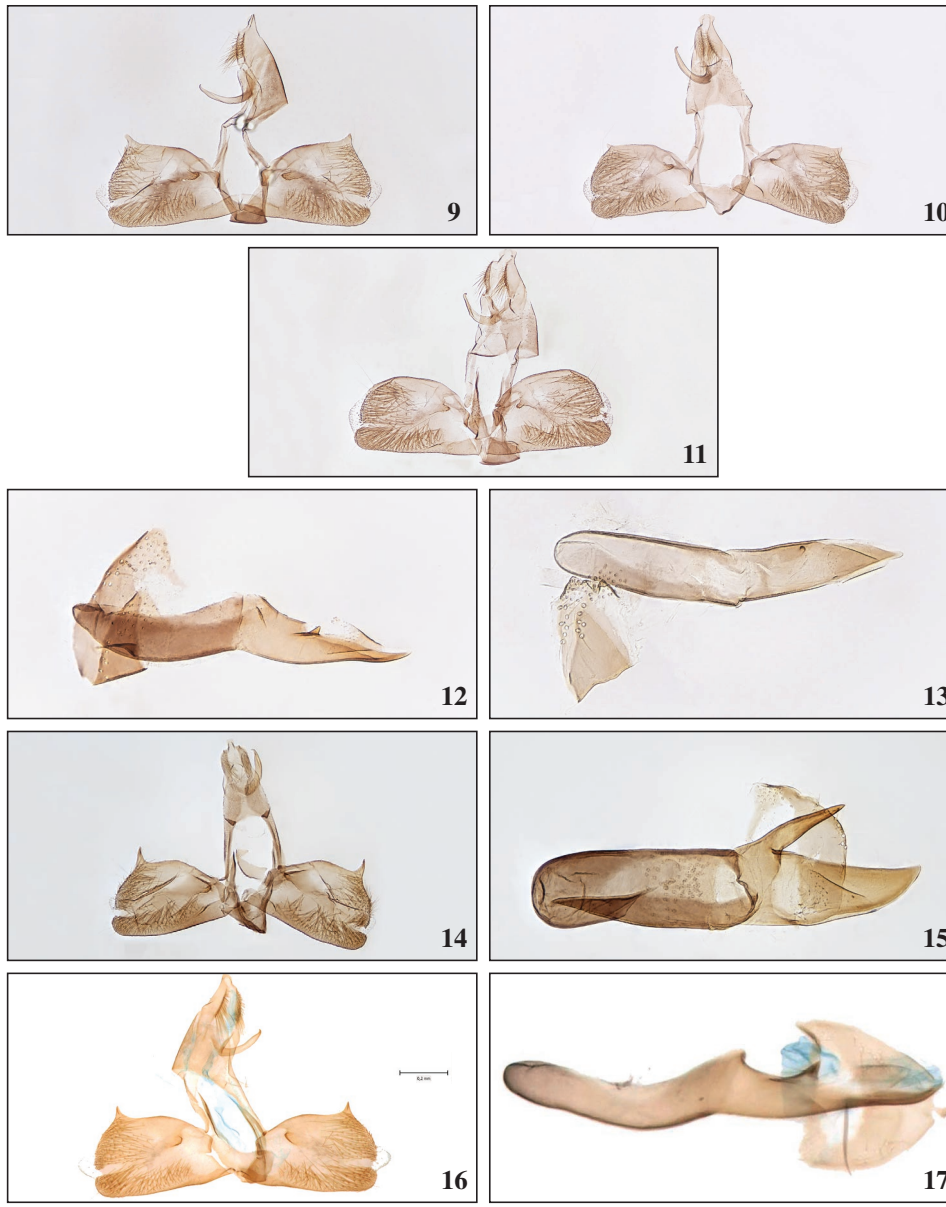
Table 1.– List of specimens sequenced, their voucher codes, collection country, gene fragments sequenced, and GenBank accession numbers.

Voucher code	Genus	Species	Country	Coll. year	CAD	COI-begin	COI-end	EF1a	GAPDH	IDH	MDH	RpS5	Wgl400	Sequnce source
Brh	Brenthia	hexaselena	Costa Rica	2003	KT956454	JQ958512	HQ533063	HQ541460	-	-	KT956661	JQ958481	HQ541541	GenBank
Chp	Choreutis	pariana	USA	2003	JQ958409	JQ958519	HQ533076	HQ541473	JQ958438	JQ958461	JQ958552	JQ958487	HQ541553	GenBank
0278PF	Anthophila	variabilis, sp.n.	Spain, Canary Islands	2017	-	X	-	-	-	-	-	-	-	CILEP BOLD
0279PF	Anthophila	variabilis, sp.n.	Spain, Canary Islands	2017	-	X	-	-	-	-	-	-	-	CILEP BOLD
0280PF	Anthophila	variabilis, sp.n.	Spain, Canary Islands	2017	-	X	-	-	-	-	-	-	-	CILEP BOLD
0281PF	Anthophila	variabilis, sp.n.	Spain, Canary Islands	2019	-	X	-	-	-	-	-	-	-	CILEP BOLD
0282PF	Anthophila	variabilis, sp.n.	Spain, Canary Islands	2017	-	X	-	-	-	-	-	-	-	CILEP BOLD
0283PF	Anthophila	variabilis, sp.n.	Spain, Canary Islands	2016	-	X	-	-	-	-	-	-	-	CILEP BOLD
0284PF	Anthophila	variabilis, sp.n.	Spain, Canary Islands	2019	-	X	-	-	-	-	-	-	-	CILEP BOLD
0285PF	Anthophila	variabilis, sp.n.	Spain, Canary Islands	2019	-	X	-	-	-	-	-	-	-	CILEP BOLD
An_a_CA_2	Anthophila	alpinella	USA	2006	JQ958398	KJ844049	HQ533053	HQ541450	JQ958430	JQ958454	JQ958542	JQ958476	HQ541531	GenBank
An_f_BE_2	Anthophila	fabriciana	Belgium	2006	JQ958399	JQ958507	HQ533054	HQ541451	JQ958431	KJ844055	JQ958543	JQ958477	HQ541532	GenBank
An_JDP1_5570	Anthophila	sp.	Rwanda		KJ844057	KJ844051	KJ844051	KJ844058	KJ844054	KJ844056	-	KJ844060	KJ844061	GenBank
An_OK3	Anthophila	fabriciana	Armenia		-	X	-	-	-	-	-	-	X	LU
An_OK4	Anthophila	fabriciana	Greece		-	X	-	-	-	-	-	-	-	LU
An_sp651	Anthophila	sp.	Peru		-	KJ844050	-	-	KJ844053	-	-	-	-	GenBank
An_th2	Anthophila	threnodes	Madeira		-	KJ844048	-	X	KJ844052	-	-	-	-	GenBank
BIOUG02021_B03	Anthophila	fabriciana	Canada	2010	-	KF808606	-	-	-	-	-	-	-	BOLD
BKR0184	Anthophila	sp	Madagascar	2011	-	MH416295	-	-	-	-	-	-	-	BOLD
CCDB_19579_C10	Anthophila	alpinella	USA	1962	-	X	-	-	-	-	-	-	-	BOLD
CCDB_30827_F04	Anthophila	alpinella	USA	1933	-	X	-	-	-	-	-	-	-	BOLD
Chsp_730791	Anthophila	sp.	Kenya		-	X	-	-	-	-	-	-	-	LU
CLV5430	Anthophila	sp.	Madagascar	2011	-	MH415902	-	-	-	-	-	-	-	BOLD
JR377	Anthophila	sp.	Kenya	2013	-	X	X	X	X	-	X	X	X	LU
JR417	Anthophila	variabilis, sp.n.	Spain, Canary Islands	2017	-	X	X	X	X	-	X	X	-	LU
JR418	Anthophila	variabilis, sp.n.	Spain, Canary Islands	2017	-	X	X	X	X	-	-	-	-	LU
JR419	Anthophila	variabilis, sp.n.	Spain, Canary Islands	2017	-	X	X	X	-	X	-	-	-	LU
NHMO_DAR_11838	Anthophila	fabriciana	Norway	2016	-	X	-	-	-	-	-	-	-	BOLD
TLMF_Lep_03622	Anthophila	fabriciana	Austria	2010	-	JN265169	-	-	-	-	-	-	-	BOLD
UKLB31G05	Anthophila	fabriciana	United Kingdom	2007	-	KF808852	-	-	-	-	-	-	-	BOLD



Figures 3-8.– 3. *Anthophila variabilis* Falck, Karsholt & Rota, sp. n., ♂, Tenerife, 13.5 mm. **4.** *A. variabilis* Falck, Karsholt & Rota, sp. n., ♂, Tenerife, 11 mm. **5.** *A. variabilis* Falck, Karsholt & Rota, sp. n., ♀, Tenerife, 14.5 mm. **6.** *A. variabilis* Falck, Karsholt & Rota, sp. n., ♀, Tenerife, 13 mm. **7.** *A. fabriciana* (Linnaeus, 1767), ♀ Finland, 14 mm. **8.** *A. threnodes* (Walsingham, 1910), ♀, Madeira (Portugal), 12 mm.



Figures 9-17.– 9. *Anthophila variabilis* Falck, Karsholt & Rota, sp. n., ♂, Tenerife, GP 2484PF. **10.** *A. variabilis* Falck, Karsholt & Rota, sp. n., ♂, Tenerife, GP 2503PF. **11.** *A. variabilis* Falck, Karsholt & Rota, sp. n., ♂, Tenerife, GP 2501PF. **12.** *A. variabilis* Falck, Karsholt & Rota, sp. n., phallus, Tenerife, GP 2502PF. **13.** *A. variabilis* Falck, Karsholt & Rota, sp. n., phallus, Tenerife, GP 2503PF. **14.** *A. fabriciana* (Linnaeus, 1767), ♂, Denmark, GP2500PF. **15.** *A. fabriciana* (Linnaeus, 1767), phallus, Denmark, GP2500PF. **16.** *A. threnodes* (Walsingham, 1910), ♂, Madeira (Portugal), GP5236OK. **17.** *A. threnodes* (Walsingham, 1910), phallus, Madeira (Portugal), GP5236OK.

Figures 18-20.– 18. *Anthophila variabilis* Falck, Karsholt & Rota, sp. n., ♀, Tenerife, GP 3284PF. **19.** *A. fabriciana* (Linnaeus, 1767), ♀, Denmark, GP3280PF. **20.** *A. threnodes* (Walsingham, 1910), ♀, Madeira (Portugal), GP5240HH.

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    Book:

    HIGGINS, L. O., 1975.- *The Classification of European Butterflies*: 320 pp. Collins, London.

    Internet:

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New or poorly known West Palaearctic Meessiidae (Lepidoptera: Tineoidea)

R. Gaedike

Abstract

Three species of Meessiidae are described as new to science: *Eudarcia albocapitata* Gaedike sp. n., *Eudarcia lakoniacola* Gaedike sp. n. and *Infurcitinea mayri* Gaedike, sp. n. The hitherto unknown female genitalia of *Infurcitinea olympica* Petersen, 1958 are described and illustrated for the first time. The first records of several species from various countries are published.
KEY WORDS: Lepidoptera, Tineoidea, Meessiidae, new species, West Palaearctic.

Meessiidae nuevos o pobremente conocidos del oeste Paleártico (Lepidoptera: Tineoidea)

Resumen

Se describen tres nuevas especies de Meessiidae para la ciencia: *Eudarcia albocapitata* Gaedike sp. n., *Eudarcia lakoniacola* Gaedike sp. n. y *Infurcitinea mayri* Gaedike, sp. n. Se describen y se ilustran por primera vez, la genitalia desconocida de la hembra de *Infurcitinea olympica* Petersen, 1958. Se publican los primeros registros de algunas especies de varios países.
PALABRAS CLAVE: Lepidoptera, Tineoidea, Meessiidae, nuevas especies, Oeste Paleártico.

Introduction

Through the kindness of my colleague Anton [=Toni] Mayr, Feldkirch (Austria), it was possible to examine rich material collected by him in several regions of Europe. Three previously undescribed taxa are described below. Among material from other colleagues, examined in the past, the hitherto unknown female of one species was identified, as well as the first specimens of species from some countries (GAEDIKE, 2019).

Abbreviations

coll. Mayr	Anton (= Toni) Mayr, Feldkirch, Austria
coll. Richter	Ignac Richter, Prievidza, Slovakia
coll. Roweck	Hartmut Roweck, Kiel, Germany
coll. Wikström	Bo Wikström, Nummela, Finland
gen. präp.	genitalia slide
SDEI	Senckenberg Deutsches Entomologisches Institut, Müncheberg, Germany
TLMF	Tiroler Landesmuseum Ferdinandeum, Innsbruck, Austria

Taxonomy

Eudarcia balcanicum (Gaedike, 1988)
Obesoceras balcaicum [recte: *balcanicum*], Gaedike, 1988. *Beitr. Ent.*, **38**(2): 329, figs 16-18

Material examined: 1 ♂, Italy, Tuscany, Cortona, 1-4-VII-2018, leg. B. Wikström (coll. Wikström). **First record from Italy.**

***Eudarcia albocapitata* Gaedike, sp. n.**

Material examined: Holotype ♀: Italy, Prov. Chieti, PN della Majella, Pian di Valle 790 m, bei Taranta Peligna, N 42º09,6' E 14º09,7', 21-VII-2011, Mayr Toni leg.; gen. präp. Gaedike NR 9901; Holotypus ♀, *Eudarcia albocapitata* sp. n., det. R. Gaedike 2020 (TLMF).

Description (fig. 1): Wingspan 10mm; head brush white, scape of antenna white, flagellum ringed; labial palpus also white on inside, on outside dark creamy-coloured, second segment with numerous bristles, apical segment acute; thorax white, tegulae overlaid with darker scales; fore wing white with a pattern of light yellow-brown scales, forming two bands at fi and fl, with an indication near base and a subapical patch, bordered around apex by a darker line of scales; hind wing white.

Male genitalia: Unknown.

Female genitalia (fig. 4): Anterior apophysis not forked, dorsally fused, ostium somewhat funnel - shaped, laterally each with a finger-shaped prolongation; area of segment VIII around ostium and apical part of ductus bursae more strongly sclerotised, on the distal half of ductus a strongly sclerotised patch; corpus bursae with some thin signa; the distal part of ostium with thin wrinkles.

Diagnosis: Superficially distinguishable by colouration of head brush and the pattern of fore wing from other members of the genus. The structure of the genitalia resembles *E. croaticum* (Petersen, 1962), but the lateral, finger-shaped prolongations are characteristic.

Etymology: The name refers to the colouration of the head brush (Latin: *albus* = white; *caput* = head).

***Eudarcia lakoniacola* Gaedike, sp. n.**

Material examined: Holotype ♂: Greece (Griechenland), 140 m, Peloponnes, Lakonien, Umg. [env. of] Limani Geraka, N 36º46.2' E 23º04.8', 16-V-2009, Mayr Toni leg.; gen. präp. Gaedike NR 9830; Holotypus ♂, *Eudarcia lakoniacola* sp. n., det. R. Gaedike 2020 (SDEI).

Description (fig. 2): Wingspan 8mm; head brush cream-coloured, neck dark brown; antenna as long as fore wing, scape and flagellum unicolourous dark brown; labial palpus cream-coloured on inside, dark on outside, second segment bristled, apical segment short, acute; thorax and tegulae dark grey-brown; fore wing pale creamy with a dark-brown pattern, forming two bands at fi and at fl, a dark base and a dark patch on apex, two short dark stripes between second band and apex; fringe in prolongation of apical patch and of second band also brown; hind wing light grey.

Male genitalia: (fig. 5): Uncus with two thin lobes, slightly curved inwards, with pointed and more strongly sclerotised tip, basally with more strongly sclerotised edge, scapium arched, inner edge dentate, posterior margin of vinculum laterally with a pair of deep incisions, saccus long, with rounded tip; valva more or less parallel-sided, last fourth of costal part abruptly narrower, with rounded tip, costal edge slightly concave, ventral edge from base to fl convex, with narrower fold, phallus two times as long as valva, straight, apically thin, with minute pointed sclerotization at tip.

Female genitalia : Unknown.

Diagnosis: Superficially not clearly distinguishable from many other members of the genus, the genitalia structure shows similarities to *E. creticola* and *E. montanum*. The shape of valva and the curved uncus lobes are clearly different to *creticola*, while the shape of scaphium, the short straight lobe of the uncus and the shape of valva are the clear differences to *montanum*.

Etymology: The name refers to the place of collection of the holotype (Lakonia).

Infurcitinea graeca Gaedike, 1983
Infurcitinea graeca Gaedike, 1983. *Ent. Abh. Mus. Tierk. Dresden*, **46**(7): 122, figs 13-15
Material examined: 1 ♀, NORTHERN MACEDONIA, leg. I. Richter, GP 28976 (coll. Richter). **First record from Northern Macedonia.**

Infurcitinea tauridella Petersen, 1968
Infurcitinea tauridella Petersen, 1968. *Acta ent. bohemoslovaca*, **65**(1): 62, fig. 10
Material examined: 1 ♂, SPAIN, Granada, Baza, Banamaurel, 3-4-VI-2015, leg. H. Roweck & N. Savenkov (coll. Roweck). **First record from Spain.**

Infurcitinea turcica Petersen, 1968
Infurcitinea turcica Petersen, 1968. *Acta ent. bohemoslovaca*, **65**(1): 63, figs 12-13
Material examined: 1 ♀, NORTHERN MACEDONIA, leg. I. Richter, GP 28975 (coll. Richter). **First record from Northern Macedonia.**

Infurcitinea gaedikella Nel, 2003
Infurcitinea gaedikella Nel, 2003. *R.A.R.E.,* **15**(2): 46, figs 1-2
Material examined: 1 ♂, SPAIN, Aragón [Huesca], Balneario de Panticosa, 1650 m, 14-VII-2012, leg. T. Mayr (coll. Mayr). **First record from Spain.**

Infurcitinea mayri Gaedike, sp. n.

Material examined: Holotype ♂: SPAIN (Spanien), Kataluna (Cataluña), Port de la Bonaigua, 1820 m, N 42º38'52", E1º00'13", 19-VII-2006, Mayr Toni leg.; gen. präp. Gaedike NR 9810; Holotypus ♂, *Infurcitinea mayri* sp. n., det. R. Gaedike 2020 (SDEI).

Description (fig. 3): Wingspan 9mm; head brush light grey-coloured, laterally the scales somewhat darker, antenna grey, on underside lighter, labial palpus short, straight, second segment apically with bristle, and similarly light grey-coloured; thorax and tegulae grey, scales apically darker; forewing ground-colour grey with a dark brown pattern, which is not clearly visible because of the rather poor condition of the specimen, the dark scales form two bands at 1/2 and at fl each a band darker is the area near apex and the base; hind wing grey.

Male genitalia (fig. 6): Uncus truncate, laterally with minute pointed tips, vinculum with two lateral processes, the basal edge between them more strongly sclerotised; valva basally broad, costal arm, beginning at fi of valva length, narrowest, apically semi-circularly prolonged, apical edge with some small strongly-sclerotised teeth, ventral edge of valva convex, the costal arm ending basally in a long, thin, curved process; basal edge from apodeme to beginning of ventral edge more strongly sclerotised; phallus fused with the two parts of anellus, straight, narrow, one edge more strongly sclerotised, part of the apical half of anellus with long bristles, and opposite these enlarged in a sickle-shape, the another part slightly curved, nearly as long as first part.

Female genitalia: Unknown.

Diagnosis: The poor condition of the holotype makes it impossible to compare the new species superficially. The genitalia are similar to *I. vartianae* Petersen, 1962. Differences are the apical edge of valva with small teeth, and the anellus with only two parts, while *vartianae* has long bristles on the inside of the apical edge and anellus with three parts.

Etymology: Named in honour of the collector, Anton (=Toni) Mayr, Feldkirch, Austria.

Infurcitinea olympica Petersen, 1958
Infurcitinea olympica Petersen, 1958. *Dt. ent. Z., N. F.*, **5**(3-4): 372, fig. 9
Material examined: 2 ♂♂, ITALY, Tuscany, Cortona, 11-15-VII-2018, leg. B. Wikström (coll. Wikström). **First records from Italy.** 12 ♂♂, NORTHERN MACEDONIA, Bjelovodica, Mermerno jazero,

21-VI-2017, leg. I. Richter (coll. Richter); 2 ♂♂, 1 ♀, Kozhuf mts, 30-VII-2015, leg. I. Richter (coll. Richer). **First records from Northern Macedonia.**

The material from Northern Macedonia contains a female for the first time, it allows to describe the genitalia structure (fig. 7): Segment VIII ventrally convex, ostium funnel-shaped, dorsally with a somewhat triangular process with rounded tip, arms of the furcate anterior apophyses dorsally connected.

Acknowledgements

I wish to thank all colleagues for their kindness in enabling me to examine their material. Special thanks are due to Toni Mayr (Feldkirch, Austria) for permitting the deposition of the holotypes of two species in the collection of the SDEI, to Christian Kutzscher (SDEI) for taking the colour pictures and Andrew Liston (SDEI) for some linguistic improvements to the manuscript.

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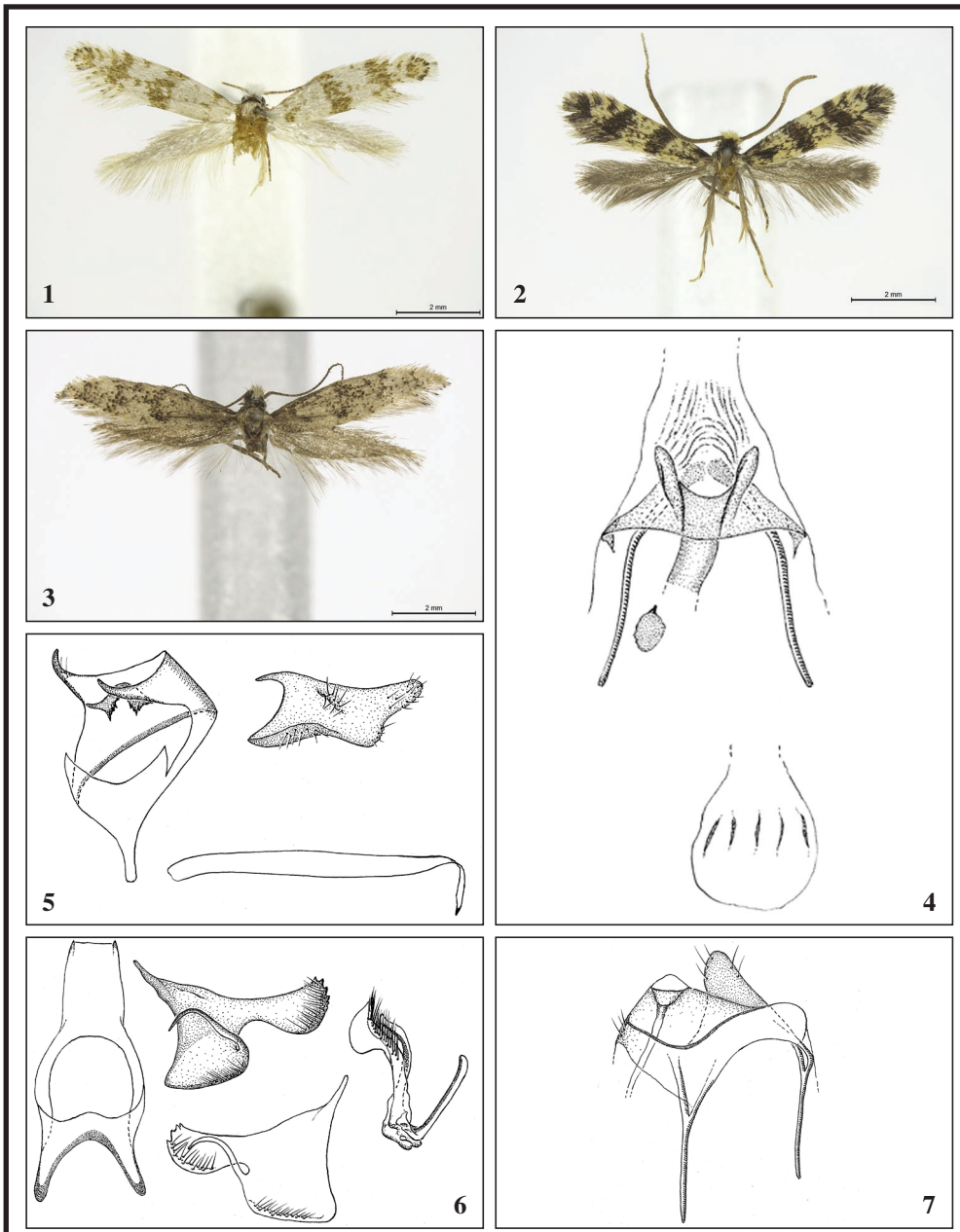

Figs 1-7.– 1. *Eudarcia albocapitata* Gaedike, sp. n., holotype. **2.** *Eudarcia lakoniacola* Gaedike, sp. n., holotype. **3.** *Infurcitinea mayri* Gaedike, sp. n., holotype. **4.** *Eudarcia albocapitata* Gaedike, sp. n., ginopigio. **5.** *Eudarcia lakoniacola* Gaedike, sp. n., andropigio. **6.** *Infurcitinea mayri* Gaedike, sp. n., andropigio. **7.** *Infurcitinea olympica* Petersen, ginopigio.

REVISIÓN DE PUBLICACIONES
BOOK REVIEWS

A. Masó Planes
Ecología y Evolución de los Papilionoidea del Paleártico Occidental (Hexapoda: Lepidoptera)
199 páginas
Formato 25 x 17,5 cm
Ediciones Librería Universitaria, Barcelona, 2020
ISBN: 978-84-18350-24-5

Esta obra más bien se trata de una Tesis Doctoral, en una primera hojeada destacan la gran cantidad de gráficos y fotografías que, junto con numerosas frases hechas (ingeniosas y de calado), contribuyen a hacer más amena y reflexiva la lectura.

Es sin duda única e irrepetible en el futuro y lo es por los dos motivos siguientes: los más de 40 años que duró la ejecución de esta (las prisas actuales hacen imposible una situación parecida) y la dirección por parte del Dr. Margalef (honor reservado a muy pocos e irrepetible por razones obvias).

El contenido de la Tesis se puede dividir en dos partes. En la primera, constituida por los dos primeros capítulos, presenta el resultado del intenso trabajo de campo que tuvo lugar en Aiguafreda (Barcelona, España) a lo largo de un período de tiempo comprendido entre los años 1975 y 1992, inventariándose un total de 91 especies de Lepidoptera distintas.

En el segundo capítulo de esta primera parte el autor delimitó cinco parcelas, situadas entre los 400 y 800 m de altitud y elaboró la distribución con el objetivo de comprobar si existía una correlación entre plantas y Lepidoptera (constituidos por 267 especies vegetales y 2.450 ejemplares de Lepidoptera, pertenecientes a 82 especies). El resultado fue que no se demostró la existencia de una correspondencia entre ambos grupos. O sea, que a partir del estudio de la vegetación no se puede inferir la composición de las poblaciones de Lepidoptera que la cohabitan.

Los tres capítulos restantes, constituyen la segunda y más reciente parte de la Tesis y tratan una temática totalmente distinta por lo que se puede afirmar que tenemos dos "Tesis" en una. Concretamente, en esta parte se pone a prueba la hipótesis de Margalef de que las variaciones del tamaño de las alas de los Lepidoptera se basan en episodios de duplicación de la superficie de estas. O sea, que los ejemplares de mayor tamaño lo son no por tener las escamas de mayor tamaño, sino por tener más escamas. Y no sólo un número mayor de escamas sino números ordenados en una progresión de dos. La existencia de fenómenos de duplicación en el número de escamas alares, contribuyen sin duda a facilitar los fenómenos evolutivos de especiación.

El trabajo para llegar a la conclusión que se expone en esta segunda parte fue ingente: sirva de muestra saber que el número de escamas de un Lepidoptera del género *Colias* supera las 500.000 y que se contabilizaron más de un ejemplar de cada una de las 263 especies distintas que formaba la muestra

El precio de este libro es de 35 euros y los interesados deben dirigirse a

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Una nueva especie del género *Naxa* Walker, 1856, de las montañas Arfak, Papúa Occidental (Indonesia) (Lepidoptera: Geometridae, Orthostixinae)

A. Expósito-Hermosa

Resumen

Se describe *Naxa galae* Expósito, sp. n., con ejemplares de las montañas Arfak, Papúa Occidental (Indonesia). Se proporcionan imágenes de los adultos y de la genitalia del macho y de la hembra.
PALABRAS CLAVE: Lepidoptera, Geometridae, Orthostixinae, *Naxa,* especie nueva, Papúa Occidental, Indonesia.

A new species of the genus *Naxa* Walker, 1856 from the Arfak Mountains, West Papua (Indonesia) (Lepidoptera: Geometridae, Orthostixinae)

Abstract

It is described *Naxa galae* Expósito, sp. n., with exemplars of Arfak Mountains, West Papua (Indonesia). Images of the adults and the corresponding genitalia male and female are provided.
KEY WORDS: Lepidoptera, Geometridae, Orthostixinae, *Naxa,* new species, West Papua, Indonesia.

Introducción

Naxa craspedota Prout, 1924 es la única especie representate de la subfamilia Orthostixinae, descrita de Papúa Occidental (Irian Jaya). Esta especie muestra una morfología externa muy diferente a la de una serie de ejemplares de las montañas Arfak que hemos estudiado. Dichos ejemplares se asemejan mucho más a *Naxa guttulata* Warren, 1894, descrita de Borneo, y *N. kerangatis* Holloway, 1996, descrita de Sarawak, que a *N. craspedota*. Por lo que seguidamente se procede a su estudio y a describirla como una especie nueva.

Abreviaturas usadas

AEH Colección de Andrés Expósito Hermosa. Móstoles (Madrid), España.

Resultados

Naxa galae Expósito, sp. n.

Holotipo ♀: INDONESIA; W.[est] Papua, Arfak Mts. Maybri Vil. +/-1.670 m XI-2019 colector local. Paratipos: INDONESIA; W.[est] Papua, Arfak Mts. Maybri Vil. +/-1.670 m, 1 ♂, XI-2019 colector local

(preparación de genitalia AEH3428); 2 ♀♀, (preparación de genitalia AEH3429). Todos los ejemplares y preparaciones de genitalia quedan depositados en la colección del autor AEH, Móstoles, Madrid (España).

Descripción: (Figs 1-4): La expansión alar del ♂ es de 43 mm y de la ♀ de 51-57 mm. La morfología externa, tanto del macho como de las hembras es muy similar. Fondo de las alas de tono blanco/grisáceo-translúcido; la fila de manchas redondeadas en el área subterminal coinciden con los nervios; la que está en la costa de las alas anteriores es la que resalta más. La fila de manchas del termen es paralela a la anterior y están ubicadas entre los nervios. En la zona basal de la costa se aprecia un trazo negro. La mancha apical de ambas alas es mayor que el resto de ellas y está algo difuminada. Además, existen puntos adicionales en las alas anteriores coincidiendo con la zona mediana de las venas A, Cu y R. El reverso es semejante, pero con las manchas menos marcadas. En las alas posteriores la vena M_2=5 está presente. Antenas bipectinadas con los flagelos del ♂ algo mayores que en los de la ♀. Tórax con las dos manchas negras cerca de la cabeza. Resto del cuerpo algo más oscuro que el fondo de las alas.

Genitalia del macho (Fig. 5): Semejante a *N. guttulata* Warren, 1894 y *N. kerangatis* Holloway, 1996, pero el uncus es más puntiagudo. La valva tiene la costa fuertemente convexa, más que en *N. kerangatis*, y la zona apical no es redondeada sino que es aguda. Juxta bífida y apicalmente asimétrica, con sus brazos finos y puntiagudos (no romos), siendo el derecho más largo. Aedeagus delgado, la vesica sin cornuti con un uniforme proceso de pequeñas particulas (escobinado) central. El octavo tergito poco significativo.

Genitalia de la hembra (Fig. 6): Semejante a *N. kerangatis* Holloway, 1996, pero con diferencias en el sterigma que es más corto y ancho, lo que hace más visible el proceso en forma de púa de su parte central en el colliculum. La bursa copulatrix es más redondeada y el signum es muy poco significativo.

Distribución: Sólo se la conoce de Papúa Occidental (Irian Jaya), de las montañas Arfak, Maybri Vil, Indonesia.

Etimología: Se dedica esta especie nueva a la nieta del autor Gala Expósito Fernández y se la denomina *galae*.

Agradecimientos

Al Dr. Antonio Vives Moreno por su siempre muy estimada ayuda.

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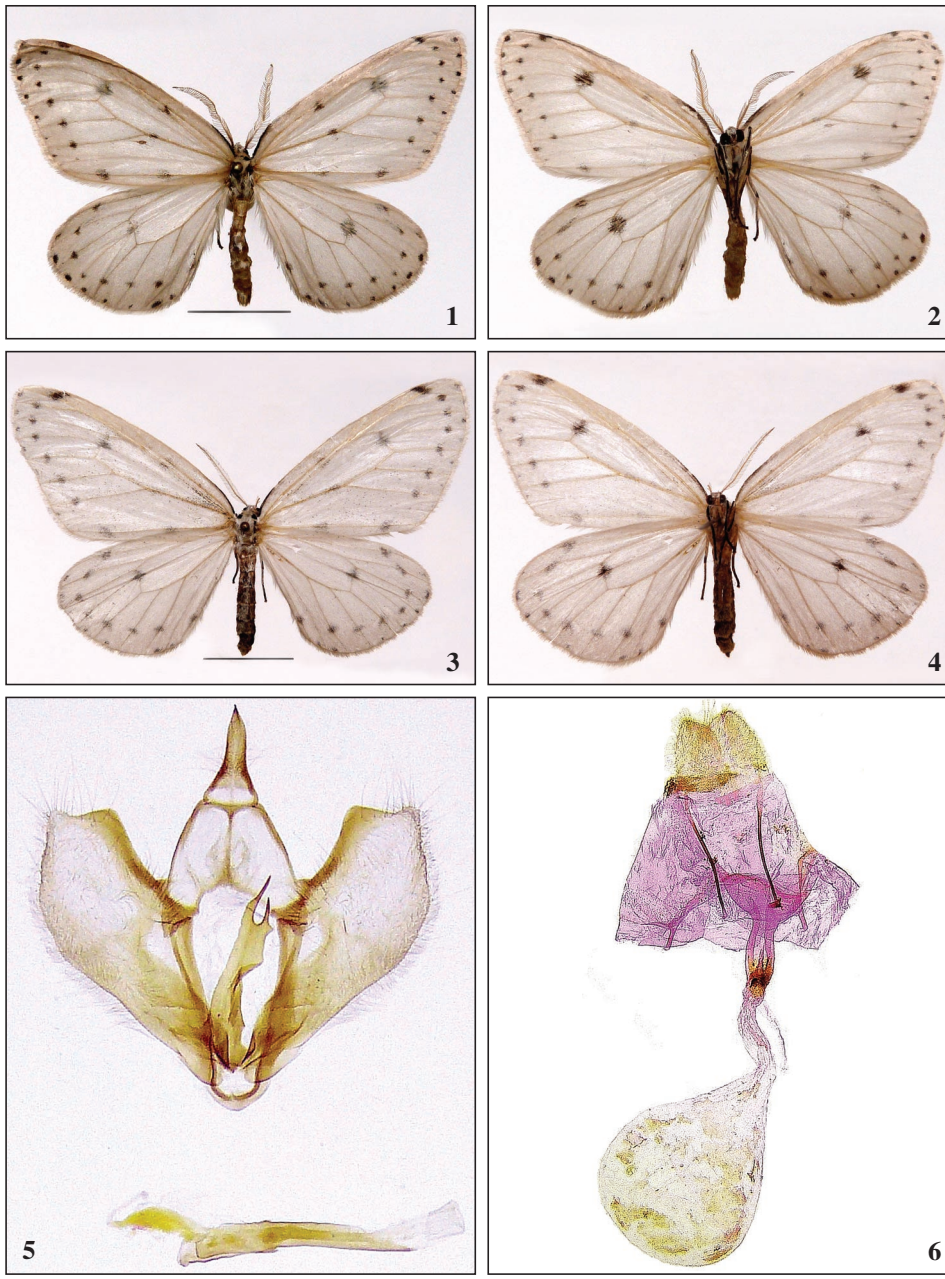

Figs 1-6.– *Naxa galae* Expósito, sp. n., W. Papua, Arfak Mts., Maybri Vil. +/-1.670 m, XI-2019, Indonesia. **1.** Paratipo ♂ Anverso. **2.** Reverso. **3**. Holotipo ♀ Anverso. **4.** Reverso. **5**. Paratipo ♂ Preparación de Genitalia AEH3428. **6**. Paratipo ♀ Preparación de Genitalia AEH3429. (Escala 1 cm).

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Antipastis xylophragma Meyrick, 1926 primera cita sobre *Solanum umbellatum* Mill. y nuevo para México (Lepidoptera: Glyphiterigidae, Acrolepiinae)

I. G. López-Muraira, H. R. Iruegas-Buentello, H. Flores-Martínez & F. Gómez-Leyva

Resumen

Se registra por primera vez para México a *Antipastis xylophragma* Meyrick, 1926 como minador de la hoja de *Solanum umbellatum* Mill. Este Lepidoptera fue anteriormente citado en varias especies de *Solanum* para Argentina, Brasil, Costa Rica, Perú y Sudáfrica.
PALABRAS CLAVE: Lepidoptera, Glyphipterigidae, Acrolepiinae, *Antipastis*, nuevo registro, México.

Antipastis xylophragma **Meyrick, 1926 first record on** *Solanum umbellatum* **Mill. new to Mexico (Lepidoptera: Glyphiterigidae, Acrolepiinae)**

Abstract

First record from Mexico for *Antipastis xylophragma* Meyrick, 1926 as a leaf miner of *Solanum umbellatum* Mill. This Lepidoptera species was previously reported on several *Solanum* species for Argentina, Brazil, Costa Rica, Peru and South Africa.
KEY WORDS: Lepidoptera, Glyphipterigidae, Acrolepiinae, *Antipastis*, new record, Mexico.

Introducción

Antispastis xylophragma Meyrick, 1926 fue descrito por primera vez de un solo ejemplar macho colectado en trampas de luz, en Perú, desde entonces la información sobre esta especie ha estado conformada principalmente por catálogos, listas y varios estudios sobre plantas alimenticias y control biológico de la maleza, destacan los trabajos de OLCKERS *et al*. (2002) y DOS SANTOS *et al*. (2008) sobre insectos asociados al género Solanum y las publicaciones de OLCKERS (2009) y PEDROSA-MACEDO *et al*. (2003) sobre el control biológico de Solanum mauritanium Scop. en África. Por otra parte SOHN *et al*. (2013) presentan los análisis moleculares realizados que soportan la ubicación de Antispastis xylophragma Meyrick, 1926 dentro de la familia Glyphipterigidae y en la subfamilia Acrolopiinae. En este estudio informamos de la presencia de este Lepidoptera en México en una nueva planta nutricia.

Materiales y métodos

Durante el período del 21-X-2018 al 3-II-2019 se realizaron una serie de siete colectas de ho-

jas de una especie de maleza ruderal y de pastizales identificada como *Solanum umbellatum* Mill., utilizando las claves dicotómicas y descripciones de STANDLEY (1924), GENTRY & STANDLEY (1974), NEE (1986) y NEE (1993), las plantas muestreadas fueron localizadas a 2024'25.54"N 10316'56.15"W en el poblado de San Juan Evangelista en el municipio de Tlajomulco de Zúñiga en el Estado de Jalisco, México.

El material vegetal conteniendo hojas con presencia de daños en forma de minaduras (fig. 2), fue colocado en envases de plástico con capacidad de un litro con tapa de malla No. 30 con aperturas de 600 micrómetros y colocados en un cuarto de incubación bajo temperatura controlada a 25 grados centígrados.

Se obtuvieron un total de 17 ejemplares adultos en una proporción de 8 hembras y 9 machos de la especie determinada como *Antispastis xylophragma* Meyrick, utilizando para la identificación la descripción original de MEYRICK (1926), así como las ilustraciones de CLARKE (1969) y SOHN *et al*. (2013) y el análisis diferencial con *Antispastis clarckei* Pastrana por MOREIRA *et al*. (2019).

Los insectos fueron depositados en la colección entomológica ubicada dentro del Herbario CREG del Instituto Tecnológico de Tlajomulco en Jalisco, México. Se consultaron los registros previos de Glyphiterigidae y Acrolepiinae en México usando como base las publicaciones de HEPPNER (1981, 1984); no mostrando registro previo de *A. xylophragma* en México, por último, se utilizó el sistema de clasificación de SOHN *et al*. (2013).

Resultados

Familia Glyphipterigidae Stainton, 1854
Subfamilia Acrolopiinae Heinemann, 1870
Género *Antispastis* Meyrick, 1926

Antispastis xylophragma Meyrick, 1926 (fig. 1)

Material examinado: 9 ♂♂ y 8 ♀♀, San Juan Evangelista, Tlajomulco de Zúñiga, Jalisco, México, 21-X-2018, 17-XI-2018 y 3-II-2019, H. R. Iruegas leg. **Nuevo para México**.

Distribución: Esta especie se conoce de Perú, Cocapata (MEYRICK, 1926); Argentina, Alvear, Ituzaingo, Santo Tomé en Corrientes y Colonia Benítez en Chaco (OLCKERS *et al*., 2002); Brasil, Montenegro, Rio Grande Do Sul (DOS SANTOS *et al*., 2008) y Paraná (PEDROSA-MACEDO *et al*., 2003) y Costa Rica (MOREIRA *et al*., 2019).

Plantas alimenticias

Esta especie se alimenta de *Baccharis anomala* DC (Asteraceae); *Ipomoea cairica* (L.) Sweet (Convolvulaceae) y para Solanaceae en *Nicotiana alata* Link & Otto, *Solanum americanum* Mill., *S. commersonii* Dunal, *S. fastigiatum* Willd., *S. laxum* Spreng., *S. mauritianum* Scop., *S. pseudocapsicum* L., *S. sisymbrifolium* Lamarck, *S. viarum* Dunal, *S. tuberosum* L., S. *melongena* L. y ahora de *Solanum umbellatum* Mill. (fig. 2), que es **nueva planta alimenticia**.

Nuestros resultados indican que el gusano minador *Antispastis xylophragma* es un especie común y abundante en Argentina, Paraguay y Brasil (OLCKERS & GANDOLFO, 2002) y (DOS SANTOS *et al*., 2008), presenta una amplia distribución en la región Neotropical desde Sudamérica a Centroamérica. Con una fuerte preferencia por diversas especies del género *Solanum* y representa potencial como agente de control biológico sobre especies de plantas invasivas. Sin embargo, esto puede constituir un riesgo, como se observó en África al ser rechazado como agente de control biológico de *Solanun mauritanium* Scop., debido a su tendencia a extender su rango de hospedadores a

otras especies del género incluyendo el cultivo de papa, *Solanum tuberosum* L. y berenjena, *Solanum melongena* L. (OLCKERS, 2009).

Conclusión

Antispastis xylophragma Meyrick, es un minador de hojas de diversas especies de *Solanum* preferentemente y es nativa de Sudamérica. Aunque ha sido citada de Costa Rica, es posible que haya sido introducida en México de manera accidental, sin embargo, es más probable que se encuentre en un proceso de migración hacia el norte siguiendo rutas neotropicales. Cabe mencionar que *A. xylophragma* fue seleccionada como candidato para el control biológico de tres especies de maleza del género *Solanum*; *S. mauritanum* Scopoli y *S. sisymbrifolium* Lamarck para Sudáfrica y *S. viarum* Dunal para los Estados Unidos de Norteamérica y es posible que se alimente de muchas especies de *Solanum*, como fue demostrado en el presente estudio minando las hojas de *Solanum umbellatum* Mill.

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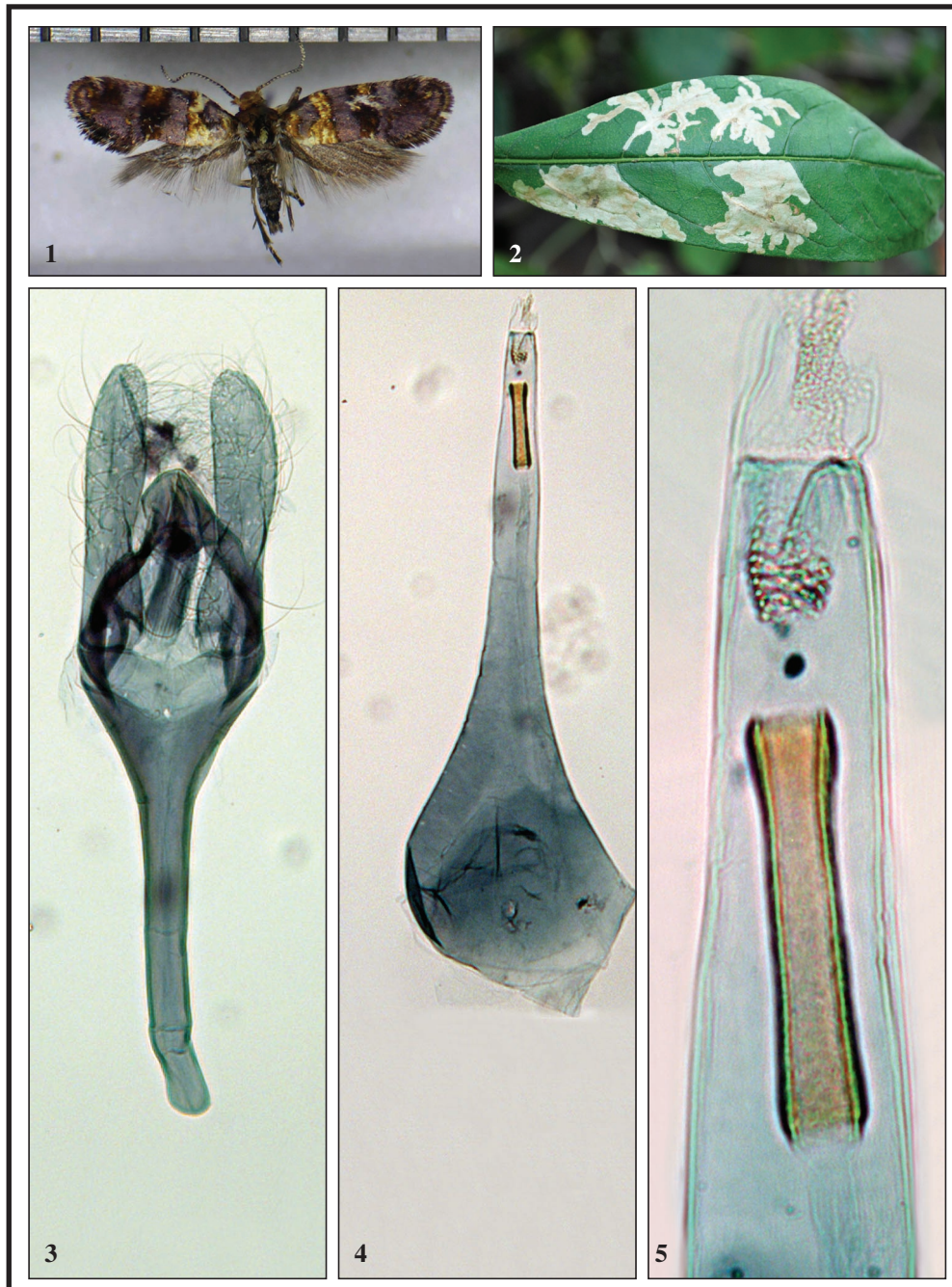

Figuras 1- 4.– 1. *Antispastis xylophragma*, adulto. **2.** Daños de *A. xylophragma*, en hoja de *Solanum umbellatum*. **3.** Andropigio. **4.** Aedeagus. **5.** Detalle del aedeagus.

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Notes and new species of the Neotropical genus *Nycterotis* Felder, 1874 (Lepidoptera: Notodontidae, Nystaleinae)

V. O. Becker

Abstract

Four new species are described: *Nycterotis lineata* Becker, sp. n. and *Nycterotis noelia* Becker, sp. n., from Brazil, *Nycterotis chaconi* Becker, sp. n., from Costa Rica, and *Nycterotis balcazari* Becker, sp. n., from Guatemala. *Nycterotis poecila* Felder, 1874 and *N. dognini* (Draudt, 1932), are very closely related but distinct species.
KEY WORDS: Lepidoptera, Notodontidae, Nystaleinae, *Nycterotis*, new species, Brazil, Costa Rica, Mexico, Guatemala.

Notas y especies nuevas del género Neotropical *Nycterotis* Felder, 1874 (Lepidoptera: Notodontidae, Nystaleinae)

Resumen

Se describen cuatro especies nuevas: *Nycterotis lineata* Becker, sp. n. y *Nycterotis noelia* Becker, sp. n., de Brazil, *Nycterotis chaconi* Becker, sp. n., de Costa Rica y *Nycterotis balcazari* Becker, sp. n., de Guatemala. *Nycterotis poecila* Felder, 1874 y *N. dognini* (Draudt, 1932), están relativamente próximas, pero son especies distintas.
PALAVRAS CLAVE. Lepidoptera, Notodontidae, Nystaleinae, *Nycterotis*, especies nuevas, Brasil, Costa Rica, Guatemala, México.

Introduction

The genus *Nycterotis* Felder, 1874 was overlooked by all authors until WATSON *et al.* (1980: 130), listed it in their catalogue. *N. poecila* Felder, 1874, the type species, was included in *Dasylophia* Packard, 1864 by SCHAUS (1901: 281). BECKER (2014: 17), included 37 species in *Nycterotis*, transferred from *Dasylophia* Packard*, Betola* Schaus, 1901 and *Pentobesa* Schaus, 1901, the last two as synonyms. A further species was added by BECKER (2018). Most of the species currently belonging to this genus have been thoroughly revised -as *Pentobesa*- by WELLER (1991), and THIAUCOURT (2007) and the types of the species deposited in the USNM are illustrated in SCHINTLMEISTER (2016). An examination of type-specimens, and other material in collections, provided new information on the group, including the four species described here. To confirm the similarities and differences of the species treated here with other related species, illustrations of their genitalia are also included, as they had not been published before.

Material and methods

This work is based on 62 specimens, (20 genitalia preparations) in VOB. and on the type-material

in the USNM and the NHMUK. Synoptic collections, representing all these species were taken to those institutions and compared with the types deposited there. 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

FW = Forewing
g. s. = Genitalia slide
HW = Hind wing
NHMUK = Natural History Museum, United Kingdom
USNM = United States National Museum, Washington
VOB = Vitor O. Becker collection, Serra Bonita Reserve, Camacan, Bahia, Brazil

Results and discussion

Nycterotis poecila Felder, 1874 (Figs 3-5, 12-14)
Nycterotis poecila Felder, 1874. *Reise Novara Lep. Het*., (9)**2**(2): pl. 97, fig. 20.
Holotype ♀, VENEZUELA, no further data (NHMUK) [examined].

= *Symmerista fulgens* Druce, 1901. *Ann. Mag. Nat. Hist.,* (7) **7**: 75.

Lectotype ♂, VENEZUELA, [Merida], Merida (NHMUK), here designated [examined]. Synonymized by Schaus, 1901: 281.

Material studied: Types 4 ♂♂, 2. g. s. ECUADOR, Napo, Cosanga, 00º35'S - 77º52'W, 2010 m, 6-9-VII-2019, g. s. 5526 (Becker 160110) (VOB).

Diagnosis: Male (Figs 3, 5) 22-24 mm (48-50 mm wingspan), female (Fig. 4) like male, slightly larger and with FW slightly broader. FW pale yellow, mottled brown and fuscous; oval area at base pale yellow. Thorax dark brown, abdomen dark fuscous. HW fuscous. Male genitalia (Figs 12, 13) with distal portion of costa enlarged to a blunt process; external edge of midplate with two or three large teeth.

Distribution: Venezuela to Ecuador, at high elevations.

Remarks: *Symmerista fulgens* Druce, 1901 was described from two specimens representing both sexes, the male illustrated here is designated lectotype; the female becomes a paralectotype. This and *N. dognini* are extremely similar (see below), as shown by the illustrations. *N. poecila* has FW slightly narrower and the pale patch at base pure pale yellow. The genitalia are also remarkably similar, but the small differences are consistent. The specimens studied were collected at 2.000 m and below, indicating that it flies at lower elevations than *N. dognini.*

Nycterotis dognini (Draudt, 1932) (Figs 1, 2, 15-17)
Dasylophia dognini Draudt, 1932, *in* Seitz. *Gross-Schmett. d. Erde*, **6**: 934, name of substitution.
Lectotype ♂. COLOMBIA, Monte Socorro, 3400-3800 m, Fassl leg. (USNM), designated by Schintlmeister, 2016: 471 [examined].

= *Dasylophia saturata* Dognin, 1911. *Hét. Nouv. Amer. Sud,* **1**: 19. Preoccupied by *Dasylophia saturata* Barnes, 1901. *Cand. Ent*., **33**: 53.

Material studied: Type; 5 ♂♂, 1 ♀, 2 g. s., 1 ♀. ECUADOR: Morona Santiago, Indanza, 2800 m, 24-XII-1992 (Becker 103338); 2 ♂♂, Pichincha, Nanegalito, Bella Vista, 00º01'S - 78º41'W, 2100-2340m, 5-19-III-2012, Sinyaev & Brechlin leg., 21-VI-12-VII-2017, g. s. 5527 (Becker 153166); 1 ♂, Napo, Papallacta, 00º21'S - 78º23'W, 2750 m, 4-5-VII-2019 (Becker 159801); 2 ♂♂, Azuay, 02º46'S - 79º26'W, 2840 m, 19-IV-2012, g. s. 5528, Sinyaev & Brechlin leg. (VOB).

Diagnosis: Male (Fig. 1) 20-22 mm (46-48 mm wingspan), female (Fig. 2) 25 mm (56 mm wingspan); FW pale yellow, mottled brown and fuscous; oval pale area at base dusted brown. HW

fuscous. Thorax dark brown, abdomen dark fuscous. Male genitalia (Fig. 15) with distal portion of valva sub-square nearly rounded; external edge of midplate with four or more small teeth.

Distribution: Ecuador, at high elevations.

Remarks: *Dasylophia saturata* was described based on "plusiers ♂♂", only one syntype has been traced, designated as lectotype. This and *N. poecila* are extremely similar, as shown by the illustrations. The FW in this is slightly broader and the pale patch next to base dusted brown. Their genitalia (Figs 12, 15) are also distinct. Both fly at high elevations in the Andes, from Venezuela to Ecuador, however, as indicated by the specimens studied, all collected between 2.300 and 2.800 m, *N. dognini* flies at higher elevations than *N. poecila.*

Nycterotis lineata **Becker, sp. n.** (Figs 6, 36-38)

Material examined 5 ♂♂, 2 g. s. Holotype ♂, BRAZIL, Paraná, Curitiba, 920 m 10-I-1975 (Becker 1250) (VOB). Paratypes: 3 ♂♂, g. s. 4662, 5459, same data as holotype but 14, 29-XII-1974, 6-IX-1975 (Becker 1247-1249); 1 ♂, Idem, Rio Negro, 22-IX-1970, Becker leg. (VOB).

Diagnosis: Gray with black dashes above cell between veins; no transverse bands; HW whitish.

Description: Male (Fig. 6) 18-21 mm (40-45 mm wingspan). Fuscous; labial palpi dark fuscous dorsally; thorax whitish; patagia behind, and tegula dorsally, with line of sparse blackish scales; FW with black dashes between veins: two short ones on apex, long one from mid of cell, through M1 and M2, to before termen, long one from base to end of cell, longest one from base, below cell, along M3, to before termen; two diffuse, black dots near tornus, between M3-Cu1, and Cu1-Cu2; underside whitish, slightly dusted fuscous towards costa. HW semi-translucent whitish, dusted fuscous towards margins, veins darker. Abdomen fuscous dorsally, pale ventrally; distal margin of 8th sternite (Fig. 38) with pair of complexes, asymmetrical projections.

Male genitalia (Fig. 36): Uncus short, slightly tapered distad, flattened dorso-ventrally; socius short, thick, flattened laterally; valvae asymmetrical, distal, left portion more protruded than the right one; right midplate square, distal margin with series of small teeth; right one a short, bent digit; juxta an inverted sub-triangle, distal margin slightly round, lateral margins slightly concave; vinculum round. Aedeagus (Fig. 37) cylindrical, long, strongly bent distad; vesica minutely combinate.

Distribution: South-eastern Brazil, at high elevation in the Atlantic Forest.

Etymology: From the Latin *line* = line, bearing lines; feminine.

Remarks: Very distinct from all the others in the genus, resembling a *Trajectina* Becker, 2014 species.

Nycterotis noelia **Becker, sp. n.** (Figs 7-8, 18-20, 39)

Material studied: Holotype ♂, BRAZIL, Espirito Santo, Linhares, 40 m, 5-9-IX-1992, g. s. 5530 (Becker 82080). Paratype ♀, Rio de Janeiro, Nova Friburgo, 1100 m, 21-I-1998, g. s. 5536 (Becker 112816) (VOB).

Diagnosis: Mediun size; fuscous, FW mottled brown, pale yellow and blackish; male HW semitranslucent whitish, dusted fuscous towards margins; female HW darker.

Description Male (Fig. 7): 22 mm (50 mm wingspan), female (Fig. 8) 25 mm (58 mm wingspan). Labial palpi dark fuscous; thin, pale line ventrally; frons and vertex pale; antenna with flagellum whitish, pectination fuscous. Thorax pale fuscous, sparsely mixed with dark fuscous scales; posterior margin of patagia dark fuscous; tegula pale yellow, dorsal margin dark fuscous. FW pale yellow mottled dark fuscous, gray and blackish; oval area at base, based of antemedial band, below costa, mixed with yellow and dark fuscous scales; basal dash dark brown; costa fuscous, three small white dots before apex; pale, diffuse band from cell to apex, followed by dark fuscous band from postmedial band to below apex; below this a white dash to termen, followed by an irregular, brown fascia, distad of postmedial band and before termen, forming lunules between veins; small, black dot at end of cell, next to M3; dorsum gray, mottled dark fuscous; underside fuscous, pattern faded. Male HW semitranslucent

whitish, veins dark; smoked fuscous towards margins; light fuscous in female. Abdomen dark fuscous dorsally; pale, diffuse band along middle, turning more defined towards tip; ventrally whitish; thin, dark fuscous line along middle. Distal margin of 8th sternite (Fig. 20) with two strong, irregular, asymmetrical processes.

Male genitalia (Fig. 18): Uncus bifurcated distally, slightly constricted at middle; socii long, thin, slightly thickened apically; distal portion of valva nearly round, edges contorted; juxta round; vinculum nearly round. Aedeagus (Fig. 19) short, strong, with three blunt processes of different sizes apically; vesica with bunch of deciduous, stellar spines.

Female genitalia (Fig. 39): Antrum wide; ostium narrow; ductus bursae short, strongly twisted, distal half strongly sclerotized; corpus bursae globose; two signa: a large, cuneiform plate, and a smaller, U-shaped, opposite; lamella postvaginalis square, distal margin denticulated, two small, rounded processes at distal corners.

Distribution: Southern Brazil, in the Atlantic Forest.

Etymology: A recognition to Ms. Noel Mann, from Massachusetts, for her generous contributions to support the Serra Bonita Reserve Project, Camacan, Bahia.

Remarks: This species belongs to the *N. aroata*-group, similar to *N. densissima* Dyar, 1915 but has HW darker; easily distinguished by the uncus, not bifurcate in *densissima* (Fig. 21) and distinct shape of distal portion of valva. They are also allopatric: *densissima* is known from the Guianas, south to Bahia, Brazil, whereas *N. noelia* is known to the south of this range, from Espirito Santo to Rio de Janeiro, where it is sympatric with *N. typhon* (Draudt, 1932), with which it cannot be confused.

Nycterotis chaconi **Becker, sp. n.** (Figs 9, 10, 24-26, 40)

Material studied: 3 ♂♂, 3 g. s, 2 ♀♀, 1 g. s. Holotype ♂, Costa Rica, Guanacaste, El Coco, 5 m, 27-VIII-1971, g. s. 5596 (Becker 23454) (VOB). Paratypes: 2 ♂♂, g. s. 4653, 1 ♀, g. s. 5537, same data as holotype; 1 ♀, Idem, Santa Rosa, 280 m, 20-IX-2000 (Becker 128001) (VOB).

Diagnosis: Whitish; FW with diffuse, fuscous area from costa, based of postmedial band, extending obliquely towards base; broad, diffuse dark gray fascia from apex, connecting to the postmedial band at M2; postmedial band double; pair of blackish dots before termen, between M3-Cu2; basal dash a crescent below cell. HW whitish, dusted fuscous towards margins, veins darker.

Description: Male (Fig. 9) FW 17 mm (38 mm wingspan), female (Fig. 10) 20 mm (44 mm wingspan). Body pale fuscous. Labial palpi dark fuscous dorsally; vertex whitish; antenna with flagellum white, pectination fuscous. Thorax light fuscous; patagia dark fuscous; tibia and tarsi dark fuscous dorsally. FW whitish; diffuse, fuscous area from costa, based of postmedial band, extending obliquely, covering cell, towards base; basal dash reduced to double crescent below cell; postmedial band double; broad, diffuse dark gray fascia from apex, connecting to postmedial band at M2; pair of blackish dots between M3-Cu2 before termen; small dots along termen, between veins. HW whitish, dusted fuscous towards margins, veins darker. Abdomen 8th sternite (Fig. 26) oblong, deeply indentated, internal margin of each branch with a series of small teeth; apophyses thin.

Male genitalia (Fig. 24): Uncus short, thick; socii as long as uncus, thin; distal portion of valva round with long tail tapering based; midplate reduced to a curved, sharp pointed expansion; juxta oblong, embracing aedeagus; vinculum round, slightly concave at middle. Aedeagus (Fig. 25) strongly curved dorsal, apex expanded, acute-pointed, apical edge serrate.

Female genitalia (Fig. 40): Small; corpus and ductus bursae membranous, ductus narrow; lamellae ante- and postvaginalis a wide semicircle; apophyses short, thin.

Distribution: North western Costa Rica, close to the coast.

Etymology: In honour of the Costa Rican biologist Isidro Chacón, whose life has been dedicated to the knowledge of the Lepidoptera of his country, especially the Notodontidae.

Remarks: This species, like the following, belongs to a group of small, pale species that are very similar, and partially sympatric, that includes the polymorphic *N. lupia* (Druce,1887), *N. wellingi* (Thiaucourt, 1975), *N. colimata* (Dyar, 1925), and *Xylodonta guarana* (Schaus).

***Nycterotis balcazari* Becker, sp. n.** (Figs 11, 33-35)

Material studied: 3 ♂♂, 3 g. s. Holotype ♂, GUATEMALA: Petén, Tikal, 19-22-IX-1973, g. s. 4652 (Becker 23813) (VOB). Paratype ♂, MEXICO: Quintana Roo, Carrillo Puerto, 27-IX-1973, g. s. 5535 (Becker 23941); 1 ♂, same data as paratype, g. s. 5534 (Becker 23938) (VOB).

Diagnosis: Fuscous; FW with two fine, blackish lines: short one from A2, near base, joining A1 before Cu2; second along A2 to before tornus, then angled up to M2, nearly parallel to termen; small black mark before termen, on interspace between Cu2-M3; HW semitranslucent whitish, dusted fuscous along margins.

Description: Male (Fig. 11) 17 mm (38 mm wingspan). Frons pale, vertex dark fuscous; labial palpi dark gray dorsally; antenna fuscous; thorax and abdomen pale fuscous dorsally, pale ventrally; FW fuscous; postmedial band pale, ill-defined; two fine, blackish lines: short one from A2, near base, joining A1 before Cu2; second along A2 to before tornus, then angled up to M2, nearly parallel to termen; small black mark before termen, on interspace Cu2-M3; diffuse dark area distad of postmedial band; cilia blackish, interrupted on veins. HW semitranslucent whitish, veins darker; fuscous along margins, wider along dorsum. Abdomen 8th sternite (Fig. 35) with pair of long rods distad, connected at base, diverging distad, with ridges of minute teeth internally; two short apophyses basally.

Male genitalia (Figs 33): Uncus short, flattened dorso-ventrally; socii small, thin, as long as uncus; distal portion of valva subrectangular, tapering slightly ventral, with a strong distal tooth bent distad, ventral margin concave; a round plate basally; midplate bifurcate; juxta square, embracing aedeagus; vinculum broadly expanded based. Aedeagus (Fig. 34) strongly curved at basal 3rd, apex divided in two pointed expansions with minute serrated edges.

Distribution: Guatemala and Southern Mexico, in the dry lowlands.

Etymology: In honour of the Mexican biologist Manuel Balcázar, Universidad de Colima, for his hospitality and collaboration during a collection expedition to his beautiful country.

Remarks: Similar to *N. eminens* (Schaus, 1920), but darker. Digital projections of 8th sternite much longer than those of *N. lupia* (Figs 27-29, 40) and *N. colimata* (Figs 30-32); genitalia similar, but with distal portion of costa wider, and bearing single distad thorn, whereas narrower and bearing two distad thorns in those (Figs 30, 33). The male from Carrillo Puerto (23938), not included as paratype, has FW heavily dusted dark gray, looking similar to the dark form of *N. lupia* (Druce) (described as *Dicentria ravana* Dognin, 1904, one synonym of this).

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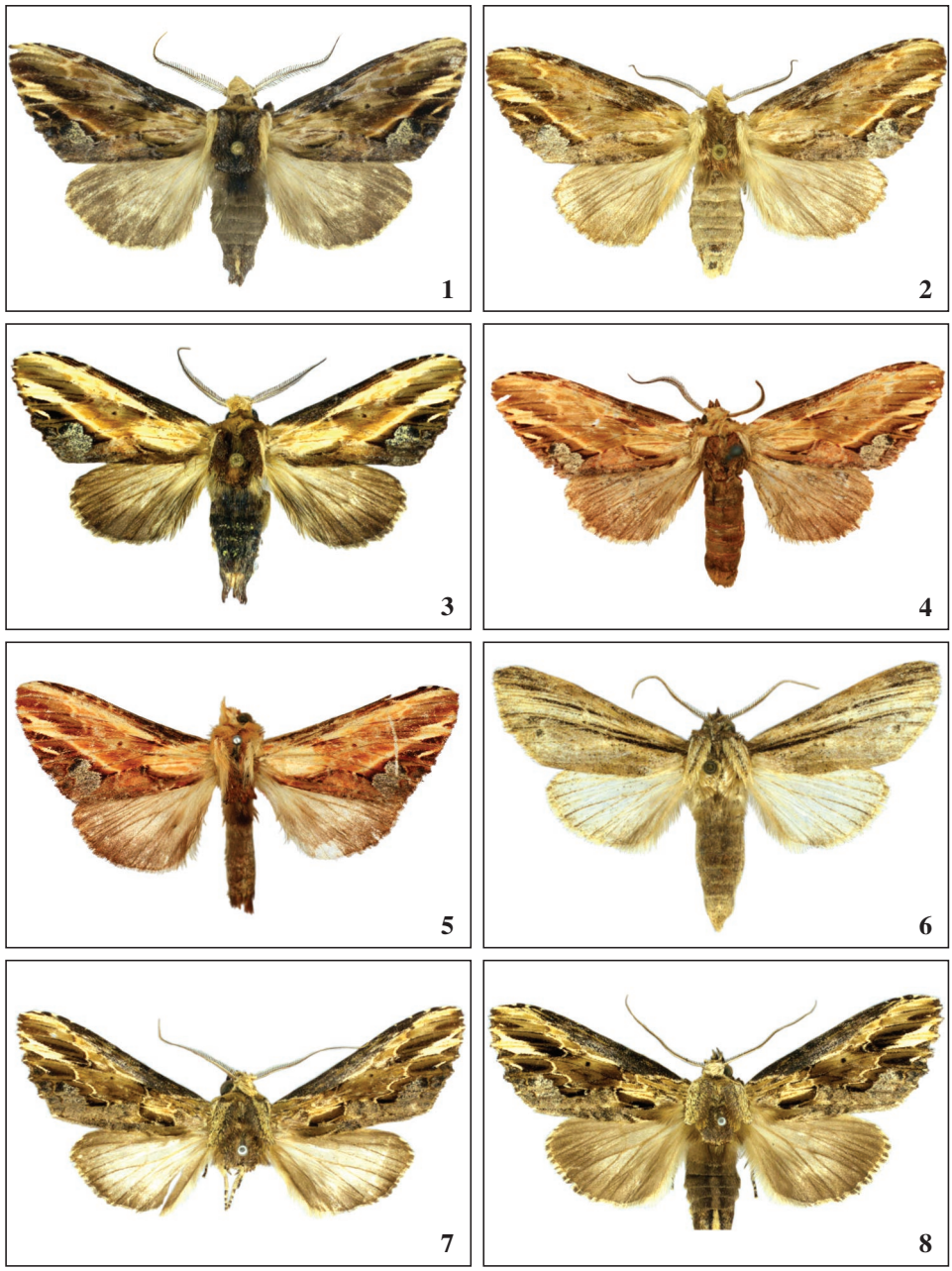
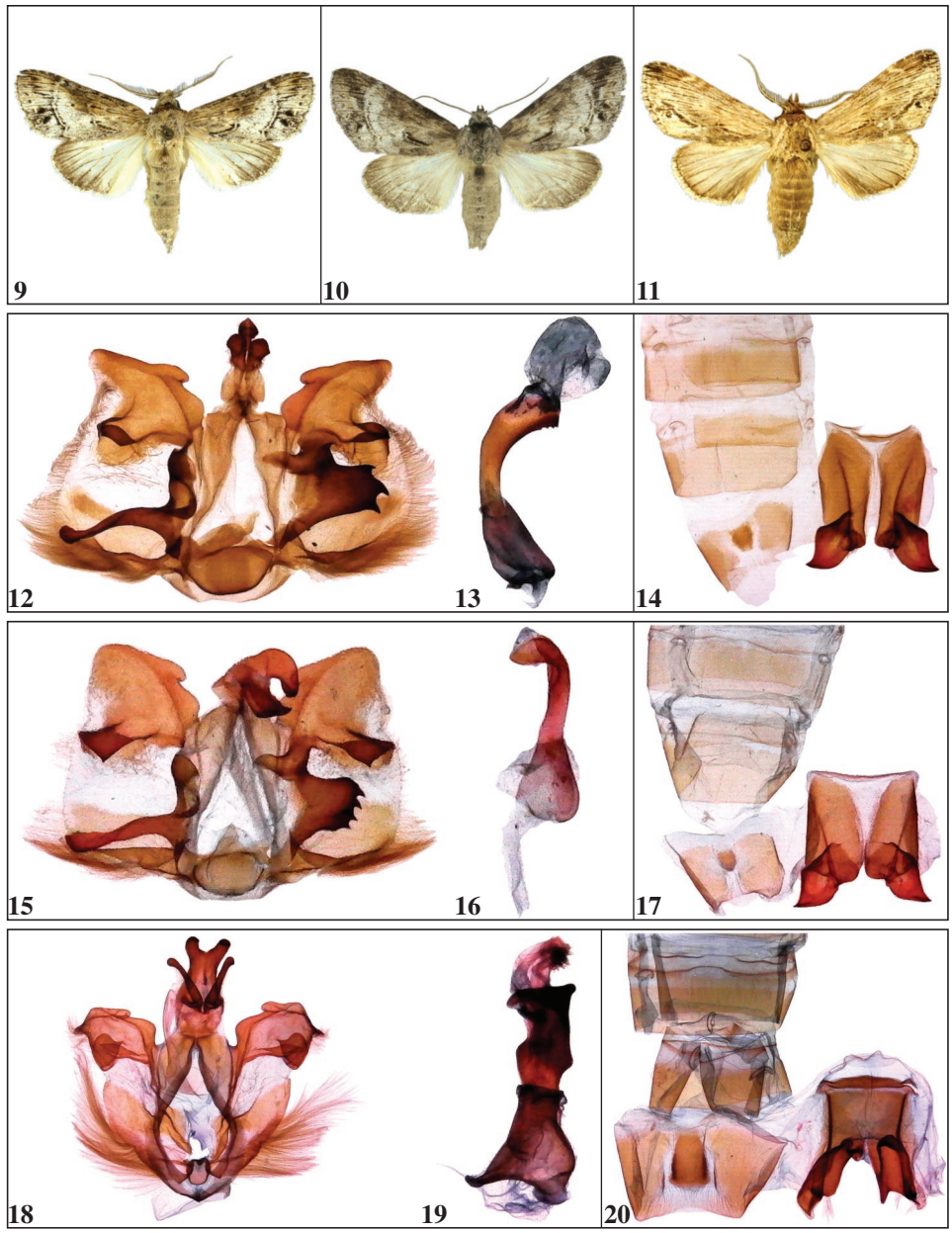
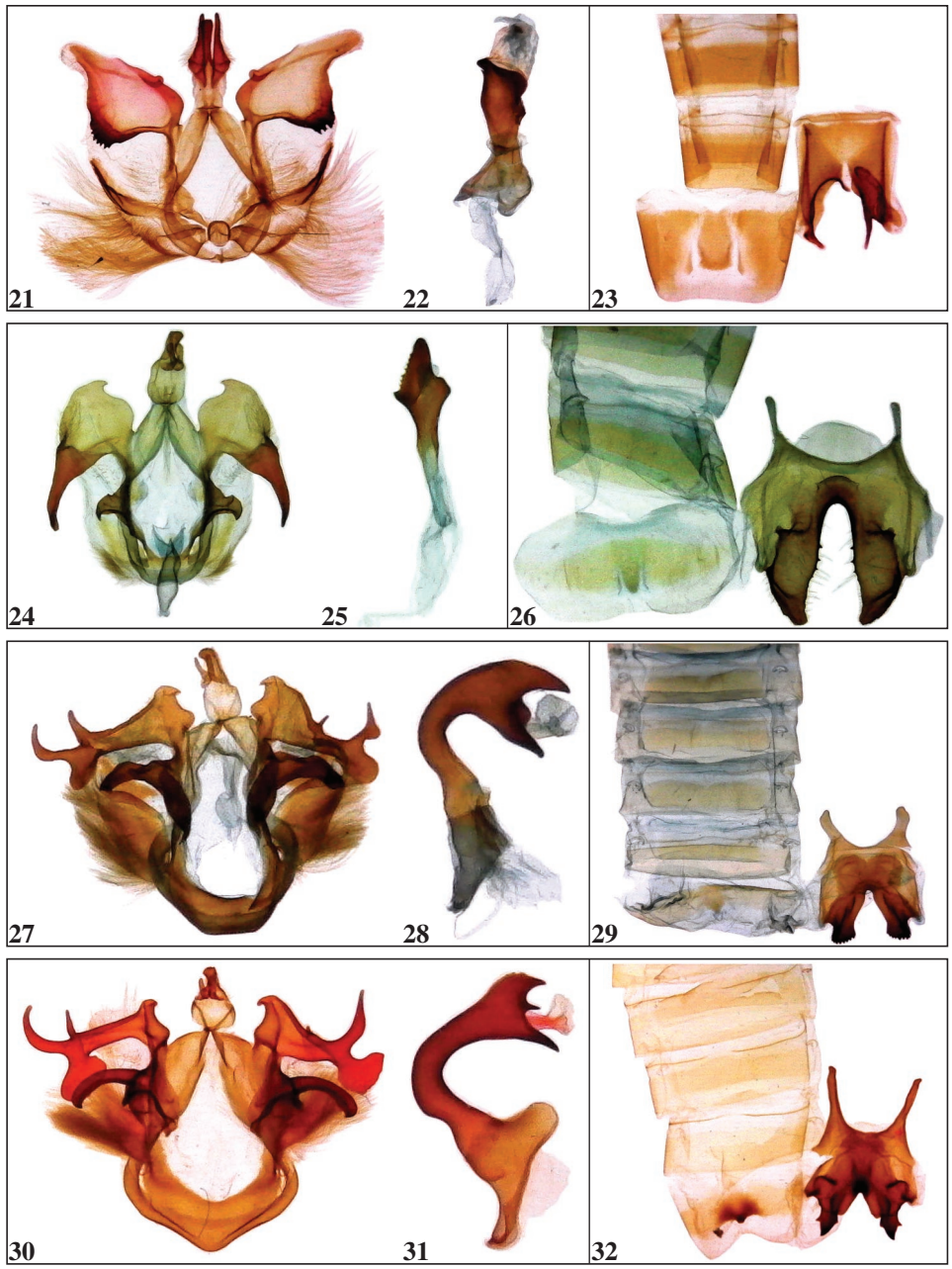


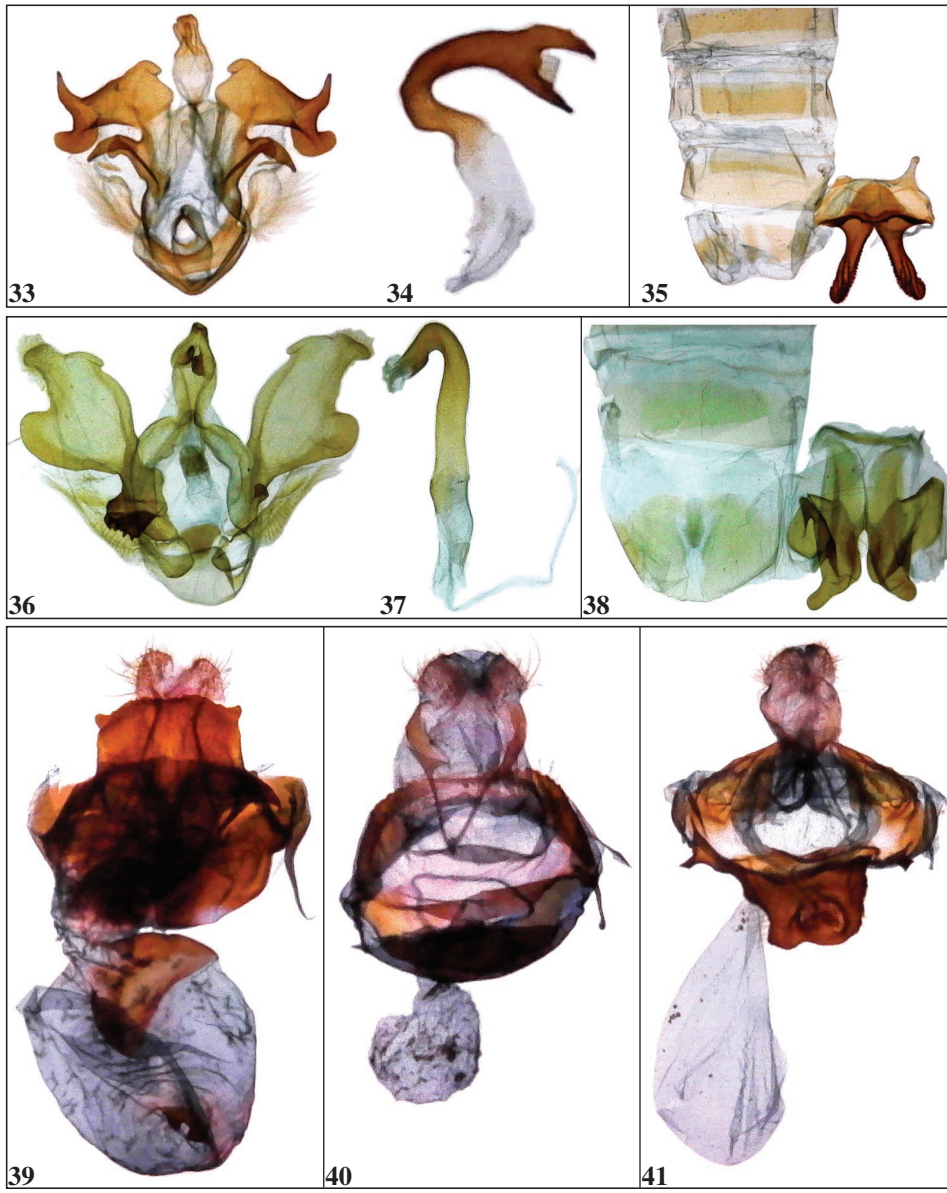
Figs 1-8.– Adults (dorsal view) of *Nycterotis* species: **1-2.** *N. dognini,* Ecuador. **1.** ♂. **2.** ♀. **3-5**. *N. poecila*. **3.** ♂, Ecuador. **4.** ♀ Lectotype, Venezuela. **5.** ♂ Holotype of *N. fulgens,* Venezuela. **6.** *N. lineata* Becker, sp. n., Brazil, ♂ holotype. **7-8.** *N. noelia* Becker, sp. n., Brazil. **7.** ♂ holotype. **8.** ♀ paratype.



Figs 9-20.– Adults (dorsal view) of *Nycterotis* species **9-11**: *N. chaconi* Becker, sp. n., Costa Rica. **9.** ♂ holotype. **10.** ♀ paratype. **11.** *N. balcazari* Becker, sp. n., ♂ holotype, Guatemala. **12-14.–** Genitalia ♂ (ventral view), aedeagus (lateral view) and 8th abdominal segments (ventral view: left tergite, right sternite), of *Nycterotis* species: **12-14**. *N. poecila,* Ecuador. **15-17.** *N. dognini,* Ecuador; **18-20.** *N. noelia* Becker, sp. n., holotype, Brazil.



Figs 21-32.– Genitalia ♂ (ventral view), aedeagus (lateral view) and 8th abdominal segments (ventral view: left tergite, right sternite), of *Nycterotis* species: **21-23.** *N. densissima,* Brazil. **24-26.** *N. chaconi* Becker, sp. n., holotype, Costa Rica. **27-32.** *N. lupia,* Mexico. **30-32.** *N. colimata*, Mexico.



Figs 33-41.– Genitalia ♂ (ventral view), aedeagus (lateral view) and 8th abdominal segments (ventral view: left tergite, right sternite), of *Nycterotis* species: **33-35**. *N. balcazari* Becker, sp. n., holotype, Guatemala. **36-38.** *N. lineata* Becker, sp. n., ♂ paratype, Brazil. Genitalia ♀, (ventral view) of *Nycterotis* species **39.** *N. noelia* Becker, sp. n., ♀ paratype, Brazil. **40.** *N. chaconi* Becker, sp. n., ♀ paratype, Costa Rica. **41.** *N. lupia,* ♀, Mexico.

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Variation in hindwing size and shape of *Plutella xylostella* (Linnaeus, 1758) (Lepidoptera: Plutellidae)

A. Moreno & A. Viloria

Abstract

Plutella xylostella (Linnaeus, 1758) has been claimed to be the most widely distributed Lepidoptera species. However, it is a highly polymorphic species, and there is evidence that what is known as *P. xylostella* is a species group, so it is possible that all records do not correspond to this species. Aim of the work was to evaluate the variability of hindwing size and shape of Venezuelan *P. xylostella* specimens and explore possible differentiation between groups of individuals. For this purpose, 126 specimens belonging to the entomological collections of the Museo del Instituto de Zoología Agrícola Francisco Fernández Yépez (MIZA, Central University of Venezuela) and the Instituto Nacional de Investigaciones Agrícolas (INIA), were sampled.

Variation patterns of wing size and shape were studied by means of landmark-based geometric morphometrics. The analysis revealed significant differences in wing shape between three groups separated by differences observed in the bifurcation of the M vein. These differences may be due to intra- or interspecific variation; there is not enough evidence to discern. In Venezuela, there are three morphotypes of *P. xylostella*, separated based on differences in shape and size of their hindwings. It is important to clarify the identity of these morphotypes by combining these results with further information such as molecular data and immature morphological taxonomy.
KEY WORDS: Lepidoptera, Plutellidae, geometric morphometrics, insect pest, taxonomy, Venezuela.

Variación en el tamaño y la forma del ala posterior de *Plutella xylostella* (Linnaeus, 1758) (Lepidoptera: Plutellidae)

Resumen

Plutella xylostella (Linnaeus, 1758) ha sido señalada como la especie de Lepidoptera con la más amplia distribución. Sin embargo, es una especie altamente polimórfica, existiendo evidencia de que lo que se conoce como *P. xylostella* es en realidad un complejo de especies, en este sentido, es posible que no todos los registros correspondan a esta especie. El objetivo de este trabajo fue evaluar la variabilidad en el tamaño y la forma del ala posterior de especímenes de *P. xlostella* colectados en Venezuela, y explorar una posible diferenciación entre grupos de individuos. Para este propósito, se utilizaron 126 especímenes pertenecientes a las colecciones entomológicas del Museo del Instituto de Zoología Agrícola Francisco Fernández Yépez (MIZA, Universidad Central de Venezuela) y el Instituto Nacional de Investigaciones Agrícolas (INIA).

Los patrones de variación en el tamaño y la forma del ala fueron estudiados mediante morfometría geométrica de hitos discretos. El análisis reveló diferencias significativas en la forma del ala entre tres grupos separados por diferencias observadas en la bifurcación de la vena M. Estas diferencias pueden ser atribuidas a variación intra o interespecífica, no se cuenta con la suficiente evidencia para discernir. En Venezuela, existen tres morfotipos de *P. xylostella* separados con base en diferencias en el tamaño y la forma de las alas posteriores. Es importante esclarecer la identidad de estos morfotipos, combinando estos resultados con información adicional como datos moleculares y taxonomía de inmaduros.
PALABRAS CLAVE: Lepidoptera, Plutellidae, morfometría geométrica, insectos plaga, taxonomía, Venezuela.

Introduction

Plutella xylostella (Linnaeus, 1758), is considered the most universally distributed of all Lepidoptera and the main insect pest of brassicaceous crops worldwide. It requires US$ 1.0 billion globally in estimated management costs in addition to the crop's losses (TALEKAR & SHELTON, 1993). The high incidence of DBM has been explained by the absence of effective natural enemies and its capability to develop resistance to insecticides, as well as, to adapt to very different climatic conditions (SALINAS, 1986; TALEKAR & SHELTON, 1993), which makes it important to study from economic and biological perspectives.

Plutella xylostella is highly variable from morphological, biological and genetic standpoints (JUSTUS & MITCHELL, 1999; CHACKO & NAYARANASAMI, 2002; PICHÓN *et al*., 2006; LANDRY & HEBERT, 2013), which can lead to confusion and misidentifications. In Australia, it was thought that the genus *Plutella* was represented by a single introduced species, *P. xylostella.* However, LANDRY & HEBERT (2013) found two genetically different lineages of this taxon, indistinguishable from each other in external appearance. One corresponds to *P. xylostella,* and the second lineage was described as the new species *Plutella australiana* Landry & Hebert, 2013. Considering this information and the fact that South America has the highest taxonomic diversity of the genus, it is worthwhile looking into Venezuelan specimens, where only *P. xylostella* has been recorded.

Traditionally, wing venation has been used in taxonomic studies of Lepidoptera. Currently, geometric morphometric analysis of insect wings has shown to be a valuable tool for species discrimination (PERRARD *et al.,* 2014), being useful across different taxa and taxonomic levels (VILLEMANT *et al.*, 2007; FRANCOY *et al.,* 2008, 2009, 2011; MARSTELLER *et al.,* 2009; MÁRQUEZ *et al.,* 2011; FERREIRA, 2014; JERATTHITIKUL *et al.,* 2014; PERRARD *et al.,* 2014). Geometric morphometric provides powerful tools to quantify phenotypic variation by employing homologous features in biological forms (BOOKSTEIN, 1991). These tools are able to detect subtle differences that may not be conspicuous in comparative morphology studies and even in a classical morphometric analysis (FERREIRA, 2014).

The aim of this study was to investigate the variations among hindwings of Venezuelan specimens identified as *P. xylostella,* through landmark-based geometric morphometrics analysis, to explore differences between groups of individuals.

Methods

Specimens and data collection

Specimens used in this study come from the entomological collections of the Museo del Instituto de Zoología Agrícola Francisco Fernández Yépez (MIZA, Universidad Central de Venezuela) and the Instituto Nacional de Investigaciones Agrícolas (INIA). A total of 126 individuals were classified either of three groups based on differences that were observed in M vein of hindwing (G1, G2 and G3, see Fig. 1). The overview of the specimens included in the analysis is given in Table I. The right hindwings of each specimen were removed with fine forceps and cleared to visualize the venation with 5% KOH watery solution for ten minutes, then washed with distilled water and transferred to 70% ethanol (ROGGERO & PASSERIN, 2005) with a drop of red China ink. Scales were removed with a bent pin on a vise before mounting the wings on microscope slides with 80% glycerin and secured with a coverslip. Photographs of each wing were taken with a Nikon D5200® controlled by Zerene Stacker AutoMontage® software. A set of ten landmarks covering the wing surface were selected and digitized on x and y coordinates with the TPSDig 2.16® software (ROLHLF, 2010). All the landmarks are the intersections of the wing veins, or at the wing edge (Fig. 2) and correspond to type I landmarks according to BOOKSTEIN (1991).

Table I.– Numbers of specimens by group and sex used in the analysis.

Group	Sex	Number of specimens
1	♂	28
	♀	25
2	♂	14
	♀	15
3	♂	24
	♀	20
	Total	**126**

GEOMETRIC MORPHOMETRICS ANALYSIS

The tps file with raw coordinates of landmarks were loaded into R software (R CORE TEAM, 2018) and then superimposed with gpagen function from geomorph v 3.0.6® package (ADAMS *et al.,* 2018), which performs a generalized Procrustes analysis to estimate shape variables and centroid size (CS). The shape variables were subsequently used for a np-MANOVA using 10K permutations (ANDERSON, 2001; COLLYER *et al.,* 2015; ADAMS *et al.,* 2018) with the advanced.procD.lm function from the abovementioned package (ADAMS *et al.,* 2018). Because wing size and sexual dimorphism may affect wing shape variation, log (CS) and sex were included in the construction of linear models. The *post hoc* pairwise comparisons of group means were also performed using the same number of random permutations. To visualize shape variation patterns, a Principal Components Analysis (PCA) was used and thin-plate spline (TPS) results were added to the axes of the scatter plot. Finally, differences in size were assessed by using a two-way ANOVA on CS in the software GraphPad prism 6® (SWIFT, 1997), considering the group and sex as factors and using Tukey test for *post hoc* pairwise comparisons.

Results

Centroid sizes among the three groups were significantly different (F_{sex}= 13.56, p= 0.0003; F_{group}= 4.990, p = 0.0083), but only four of the pairwise comparisons were significant (Fig. 3). Females belonging to G3 accounted for the highest CS value (2.843 ± 0.199 mm), followed by G2 females (2.721 ± 0.288 mm), while the lowest being accounted for G2 males (2.531 ± 0.225 mm, Fig. 3).

The first two principal components (PC) accumulated 68.2% of the shape variation. The scatter plot of these two PC (Fig. 4) showed that G1 and G3 were clearly separated into distinct groups, while G2 showed overlap with the other two groups. These inter-group shape changes are visualized along first PC axis and are found with the bifurcation of M vein (landmark 10), and the locations where R2 and M1 meet the edge (landmarks 1 and 2, respectively). Results of np-MANOVA (Table II) showed significant differences in shape between these three groups, although allometric and sexual dimorphism effects were significant, their contribution to the overall variation was low (Table II, R^2). Post hoc test showed significant differences between all possible pairwise comparisons ($p < 0.01$ in all cases), except for males and females belonging to the same group ($p = 0.5$ in all cases).

Table II.– Results of np-MANOVA performed on shape variables.

	DF	SS	MS	R^2	F	Z	p
log(CS)	1	0,05091	0,05091	0,08331	18,5319	4,4633	0,0001*
Sex	**1**	**0,00751**	**0,00751**	**0,01229**	**1,9487**	**1,9487**	**0,0294***
Group	2	0,22116	0,110578	0,3619	40,2506	7,6854	0,0001*
Sex*Group	**2**	**0,00459**	**0,002297**	**0,00752**	**0,836**	**1,3263**	**0,086**
Residual	119	0,32692	0,002747	0,5168			
Total	**125**	**0,61119**					

Discussion and conclusions

The geometric morphometrics analysis showed variation in wing size and venation shape between three groups of Venezuelan *Plutella xylostella* specimens. Wing size and shape differences found in other lepidopteran species have been explained by interspecific variation due to hostplant (KHIABAN *et al.,* 2010; CAÑA-HOYOS *et al.,* 2014), environmental heterogeneity (BAI *et al.,* 2016) and geographical variation (MOZAFFARIAN *et al.,* 2007; KHAGHANINIA *et al.,* 2011). However, all the specimens used in this study had the same hostplant (all specimens recorded in *Brassica oleracea* L.) and ordination patterns among localities were not observed.

It has been claimed that pest species show higher variability than those that are not harmful; they are characterized by high morphological and ecological variation, ability to invade unbalanced landscapes such as crops, insensitivity to chemical control, genetic instability and high adaptability (BECHYNÉ & BECHYNÉ, 1970). According to the available information regarding different aspects of *P. xylostella* biology, ecology and taxonomy (ROBINSON & SATTLER, 2001; PICHON *et al.,* 2006; SUBRAMANIAN & LÖEHR, 2006; ROUX *et al.,* 2007; JANSSEN *et al.,* 2008; LANDRY & HEBERT, 2013; JURIC *et al.,* 2017; KARIYAWASAN, 2018), this species meets the abovementioned features, therefore, it is possible that the observed variability in figure 4 represents a continuum of intraspecific variation.

Alternatively, the geometric assessment of insect wings had allowed for accurate taxonomical identification of moth and butterflies species (ROGGERO & PASSERIN, 2005; FERREIRA, 2014; JERATTHITIKUL *et al.,* 2014; PRZYBYTOWICZ *et al.,* 2015). Wing venation has been long used for insect identification and may reflect the evolutionary history with a potential effect of other factors such as body shape, climate, and mimicry selective pressures (PERRARD *et al.,* 2004). According to PERRARD *et al.* (2014), it is a taxonomically relevant marker combining the accuracy of quantitative characters with the specificity required for identification criteria. Hence, the possibility that similar species coexist in Venezuela with *P. xylostella* should not be discarded. The case of *Plutella australiana* (LANDRY & HEBERT, 2013; KARIYAWASAN, 2018) represents evidence that *P. xylostella* is indeed a species-group.

Species identification allows attributing information to recognizable entities thus it is a first and crucial step in biological studies (PERRARD *et al.,* 2014). Misidentifications reduce the utility of applied investigations (such as pest control), because of different results regarding the same taxonomical entity (different species identified as the same) or similar results regarding different entities (one species identified as two or more). Venezuelan specimens identified as *P. xylostella* showed variability that may be taxonomically important, therefore it is important to clarify its source. It could be useful to link these results with additional information such as molecular data and immature morphological taxonomy.

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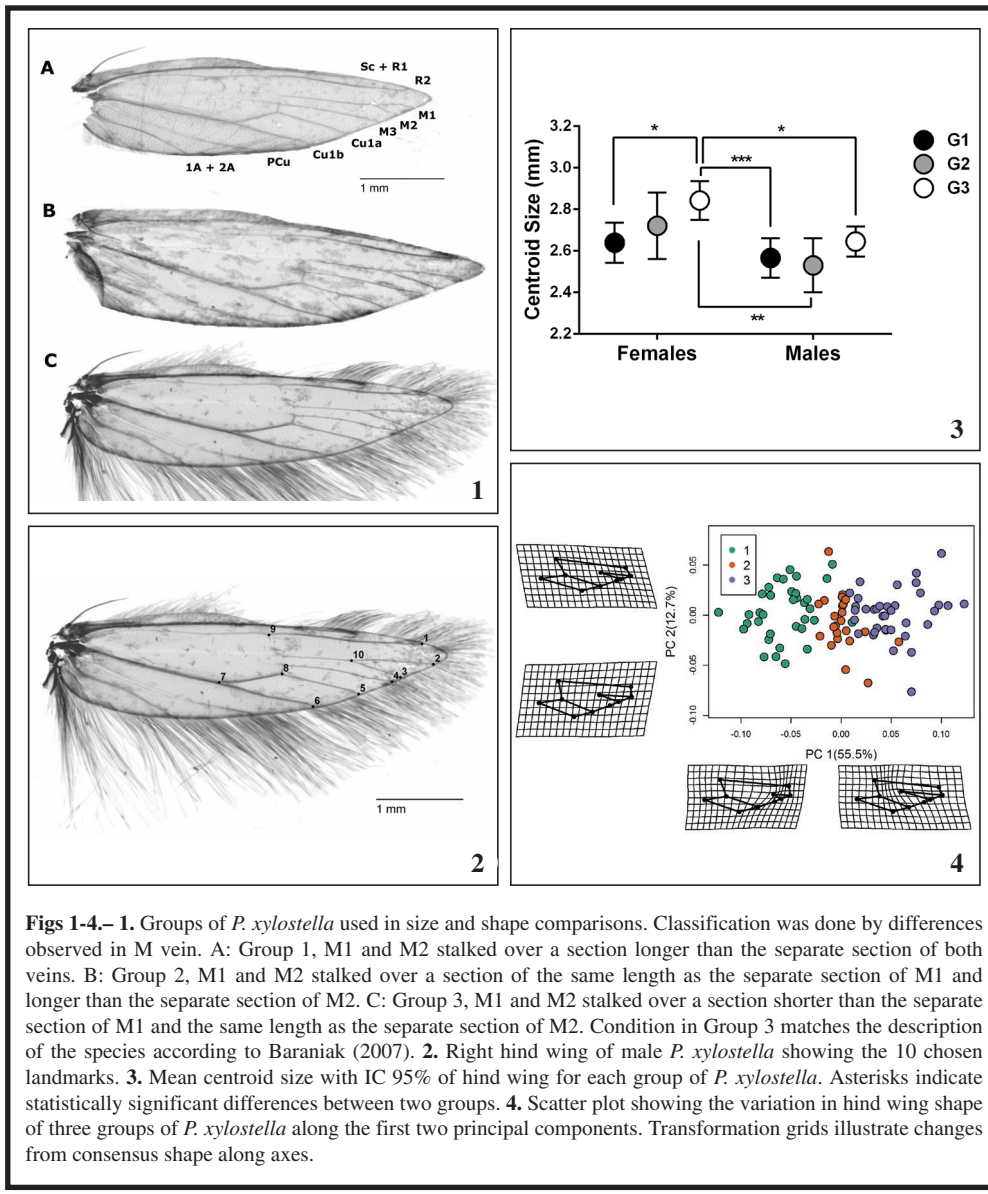

Figs 1-4.– 1. Groups of *P. xylostella* used in size and shape comparisons. Classification was done by differences observed in M vein. A: Group 1, M1 and M2 stalked over a section longer than the separate section of both veins. B: Group 2, M1 and M2 stalked over a section of the same length as the separate section of M1 and longer than the separate section of M2. C: Group 3, M1 and M2 stalked over a section shorter than the separate section of M1 and the same length as the separate section of M2. Condition in Group 3 matches the description of the species according to Baraniak (2007). **2.** Right hind wing of male *P. xylostella* showing the 10 chosen landmarks. **3.** Mean centroid size with IC 95% of hind wing for each group of *P. xylostella*. Asterisks indicate statistically significant differences between two groups. **4.** Scatter plot showing the variation in hind wing shape of three groups of *P. xylostella* along the first two principal components. Transformation grids illustrate changes from consensus shape along axes.

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Cinco nuevas especies para la fauna de España y otras interesantes informaciones lepidopterológicas para España y Sudán (Insecta: Lepidoptera)

A. Vives Moreno & J. Gastón

Se describen dos especies nuevas: *Megacraspedus sinevi* Vives & Gastón, sp. n. (Gelechiidae) y *Sudaniola asselbergsi* Vives & Gastón, sp. n. (Pyralidae). Se cita, por primera vez para la fauna de España a *Aproaerema ochrofasciella* (Toll, 1936), *Cochylimorpha erlebachi* Huemer & Trematerra, 1997 (Tortricidae) y a *Spodoptera frugiperda* (Smith, 1797) (Noctuidae). Se describe el macho de *Paraswamerdamia kitamurae* Gastón & Vives, 2020 (Yponomeutidae) y la hembra de *Symmoca mimetica* Gozmány, 2008 (Autostichidae). Para la fauna de Sudán, se describe la hembra de *Turatia scioneura* (Meyrick, 1929) (Autostichidae).
PALABRAS CLAVE: Insecta, Lepidoptera, nuevas especies, nuevas citas, España, Sudán.

Five new species for the fauna of Spain and other interesting lepidopterological information for Spain and Sudan (Insecta: Lepidoptera)

Abstract

Two new species: *Megacraspedus sinevi* Vives & Gastón, sp. n. (Gelechiidae), *Sudaniola asselbergsi* Vives & Gastón, sp. n. Also, the species *Aproaerema ochrofasciella* (Toll, 1936), *Cochylimorpha erlebachi* Huemer & Trematerra, 1997 (Tortricidae) and *Spodoptera frugiperda* (Smith, 1797) (Noctuidae), are mentioned for the first time for the fauna of Spain. The male of *Paraswamerdamia kitamurae* Gastón & Vives, 2020 (Yponomeutidae) and the female of *Symmoca mimetica* Gozmány, 2008 (Autostichidae), are described. For the fauna of Sudan, the female of *Turatia scioneura* (Meyrick, 1929) (Autostichidae), is described.
KEY WORDS: Insecta, Lepidoptera, new species, new mentions, Spain, Sudan.

Introducción

Como continuación al trabajo iniciado sobre la fauna de Lepidoptera de España (GASTÓN & VIVES MORENO, 2020a, 2020b), se proporcionan nuevos datos que amplían y enriquecen la biodiversidad de la fauna de España. El material estudiado procede igualmente de colecciones particulares y también de los fondos del Museo Nacional de Ciencias Naturales de Madrid, España (MNCN) abarcando varias familias como Yponomeutidae, Autostichidae, Gelechiidae, Tortricidae, Pyralidae y Noctuidae, nos ha permitido descubrir dos especies nuevas para la Ciencia, también hemos encontrado tres especies que son nuevas para la fauna de España y hemos podido describir el macho y la hembra de dos especies donde el correspondiente sexo era desconocido.

Hemos trabajado con material proporcionado por el Finnish Museum of Natural History, Helsinki, Finlandia (FMNH), donde hemos podido estudiar una pequeña serie de 10 ejemplares pertenecientes a la especie *Turatia scioneura* (Meyrick, 1929) de la que sólo se conocía el tipo depositado en The

Natural History Museum, Londres, Reino Unido, que nos ha permitido estudiar la hembra, hasta ahora desconocida.

Material y métodos

El material utilizado para el estudio se ha obtenido mediante muestreos nocturnos y diurnos, con trampas de luz actínica distribuidas en los biotopos apropiados y disponiendo de las autorizaciones de las diferentes regiones afectadas. Para su identificación nos hemos basado en el examen comparativo de los caracteres morfológicos externos y, sobre todo, en el análisis de la estructura genital de los ejemplares. La preparación de los órganos genitales se ha efectuado siguiendo a ROBINSON (1976), con modificaciones. Se han utilizado los microscopios Leica DMLB, Leica MZAPO, NIKON Eclipse E400 y las cámaras digital Leica DFC550, NIKON D3100 y SONY α100 DSLR-A100K con objetivo AF 100 MACRO 1:2,8 (32), e igualmente para el retoque fotográfico, el programa de Adobe Photoshop ©.

Abreviaturas

AV	Antonio Vives
JG	Javier Gastón
ER	Emili Requena
LT	Locus typicus
MNCN	Museo Nacional de Ciencias Naturales, Madrid, España
FMNH	Finish Museum of Natural History, Helsinki, Finlandia
prep. gen.	preparación de genitalia
ET	Especie tipo del género

Resultados

YPONOMEUTIDAE

Paraswamerdamia kitamurae Gastón & Vives, 2020

Paraswamerdamia kitamurae Gastón & Vives, 2020. *SHILAP Revta. lepid*., **48**(190): 309-310, figs 2, 23

LT: Sierra de Gádor, ALMERÍA, ESPAÑA

Material estudiado: ESPAÑA, ALMERÍA, Sierra de Gádor, a 2.020 m, 1 ♂, 31-VII-2019, J. Gastón leg., prep. gen. 7881JG; GRANADA, Sierra Nevada (accesos), a 2.100 m, 1 ♂, 10-VII-1994, J. Gastón leg. y coll., prep. gen. 8219JG.

Descripción del macho (fig. 1): Envergadura, 13,5 mm, (n = 2). La morfología externa no difiere de la de la hembra. Cabeza bien desarrollada con pelos escamiformes blancos. Palpos labiales cortos y rectos. Antenas filiformes recubiertas de pequeñas cerdas de color gris oscuro rematadas en blanco. Tórax con escamas de color gris ocráceo claro uniforme. Tégulas y abdomen recubiertos de las mismas escamas. Alas anteriores estrechas y alargadas con el termen redondeado y algo puntiagudo. Margen costal (externo) levemente cóncavo. El color de fondo es gris claro salpicado de multitud de pequeñas escamas oscuras que lo oscurecen a primera vista. Sobre las venas Sc (subcostal) y A_1, (anal), se distribuyen longitudinalmente desde la base del ala hasta el termen, una serie de minúsculos puntos oscuros que recorren las citadas venas. Presenta una apreciable, aunque difusa, mancha de escamas negras en el extremo exterior de la celda, lo mismo que otra, de mayor tamaño junto al margen interno (dorsal). En la zona postdiscal presenta una serie de tres manchitas oscuras en forma triangular, dos de ellas situadas en los márgenes costal y dorsal y la tercera junto al termen, casi en la zona marginal. Esta se remata en su extremo con una fina línea de escamas oscuras en la base de las fimbrias, que son de color gris claro rematadas en negro. Las alas posteriores son estrechas y apuntadas fuertemente hacia el

ápice, sin ángulo anal. Son de color gris claro uniforme, sin manchas. Las fimbrias, de gran longitud son también de color gris claro uniforme.

Genitalia del macho (fig. 9): Tegumen ancho y corto. Uncus provisto de sendos socius largos y puntiagudos. Valvas cortas, anchas con apéndices costales alargados y estrechos situados en la base de la misma. La costa es recta hasta el pollex, algo puntiagudo. El pollex se curva hacia el margen interno de la valva. Sacculus característico del género, formando un apéndice con forma de cazo, esclerotizado en su extremo y despegado claramente de la valva. Saccus largo, de la misma longitud que las valvas, cilíndrico y rematado en su extremo por un abultamiento esférico altamente esclerotizado. Aedeagus cilíndrico, alargado y de una longitud similar al saccus, sin espinas.

Biología: No se conocen los estados inmaduros ni las plantas nutricias de las orugas. Los imagos se capturaron en cotas altas, por encima de 2.000 m, en las laderas orientadas al sur tanto de Sierra Nevada como en la Sierra de Gádor. Por los datos de que disponemos hasta la fecha, la especie vuela.

Distribución: Según nuestros datos, la especie se encuentra en las provincias españolas de Almería y Granada.

Detalles: Las diferencias en la genitalia del macho, con su especie más próxima *Paraswamerdamia albicapitella* (Scharfenberg, 1805) se localizan en el sacculus, que en esta especie es menor y rematado en punta (fig. 10), no en forma de cazo como en *P. kitamurae*. La principal diferencia de la genitalia de las hembras estriba en la forma y tamaño de la lamella postvaginalis (GASTON &VIVES, 2020).

AUTOSTICHIDAE

Symmoca mimetica Gozmány, 2008

Symmoca mimetica Gozmány, 2008, *in* Gaedike. *Microlep. Pal*., **13**: 109-110, pl. 15, fig. 48, pl. 126, fig. 48

LT: Rebate, ALICANTE; Aledo, MURCIA, ESPAÑA

Material estudiado: ESPAÑA, ALMERÍA, Desierto de Tabernas, a 471 m, 1 ♀, 14-X-2006, M. Rondós leg., J. Gastón col., prep. gen. 1240ER.

Descripción de la hembra (fig. 2): Envergadura, 13,0 mm, (n = 1). La morfología no difiere esencialmente de la del macho. Antenas de color gris oscuro. Palpos labiales grises claros. Cabeza de color gris blanquecino, al igual que el tórax, pero este mezclado con pelos castaños y blancos grisáceos, sin tonalidades amarillentas. Alas anteriores con fondo de color beige algo oscuro; tres manchas costales uniformemente separadas comenzando desde la base del ala hasta la más cercana al termen que se sitúa aproximadamente a 1/3 del mismo. El punto de la celda desplazado ligeramente hacia la base, colocado en diagonal con el punto próximo al margen interno del ala. Los puntos del límite de las celdas fusionados. El arco formado por los puntos negros de la zona submarginal, está muy definido. Fimbrias blanquecinas. Alas posteriores de color gris ahumado uniforme con fimbrias de color blanco amarillento.

Genitalia de la hembra (fig. 15): Papilas anales bien desarrolladas. Apófisis posteriores de gran tamaño sobrepasando el VIII segmento. Apófisis anteriores de tamaño medio sobrepasando el ostium. VIII segmento trapezoidal, ancho y corto. Ostium cóncavo bordeado por un área labial de longitud doble a la anchura del ostium y muy esclerotizada. Antrum ancho, corto, levemente esclerotizado, con forma de copa y que presenta un brusco estrechamiento en el contacto con el ductus bursae. Ductus bursae de mucha longitud, cilíndrico o ligeramente trapezoidal, membranoso con tendencia a presentar en su parte posterior ligeros pliegues. Bursa ovoidal, membranosa con un signum de buen tamaño, muy visible, esclerotizado y de forma sensiblemente romboidal, de aristas casi lisas o con ligeras puntas poco apreciables.

Biología: No se conocen los estados inmaduros ni las plantas nutricias de las orugas.

Distribución: Según nuestros datos, la especie se distribuye por España y se encuentra en las provincias de Alicante, Murcia y Valencia (GOZMÁNY, 2008), y ahora también de Almería.

Detalles: La hembra de *Symmoca mimetica* Gozmány, 2008 puede confundirse con *S.*

perobscurata Gozmány, 1957 y *S. petrogenes* Walsingham, 1907; se diferencia de la primera en el tamaño y forma del antrum (mayor en *S. perobscurata*), así como en los bordes dentados que presenta el signum de la bursa en esta especie. La diferencia con la segunda está en el signum, que es sumamente pequeño en *S. petrogenes*, tanto que pasa desapercibido (GOZMANY, 2008).

Turatia Amsel, 1942
Turatia Amsel, 1942. *Veröff. dt. Kol. Übersee-Mus*., **3**: 234
ET: *Holcopogon morettii* Turati, 1926. *Atti Soc. ital. Sci. Nat*., **65**: 70, fig. 38 [33]
= *Ilionarsis* Gozmány, 1959. *Ann. hist.-nat. Mus. nat. hung*., **51**: 369
ET: *Ilionarsis foeldvarii* Gozmány, 1959. *Ann. hist.-nat. Mus. nat. hung*., **51**: 369, fig. 5

Turatia scioneura (Meyrick, 1929)
Holcopogon scioneura Meyrick, 1929. *Exot. Microlep*., **3**(17): 515
LT: Sinkat, SUDÁN

Material estudiado: SUDÁN, Sinkat, 9 ♂♂ (prep. gen. 2-14AV, 3-14AV), 1 ♀ (prep. gen. 1-14AV), 28-X-1962, S. Panelius leg. (FMNH).

Descripción de la hembra (fig. 3): No encontramos diferencias significativas con el macho, por lo que transcribimos la descripción original de MEYRICK (1929: 515): *"♂, 19 mm. Head, thorax grey-whitish, face white. Palpi second joint pale grey, apical edge white, terminal joint white mixed pale grey. Antennae light grey, shortly ciliated. Fore-wings rather narrow (narrower than in* bubulcella*), apex obtuse, termen very obliquely rounded; 7 absent; whitish sprinkled light grey, appearing grey-whitish; an undefined median streak of grey suffusion from near base to ⁄, some fuscous sprinkling (sic) from this along fold; discal stigmata forming small elongate spots of blackish irroration, slight streaks of fuscous irroration along upper edge of cell between these, and along veins between this and costa: cilia whitish. Hindwings whitish-grey; cilia whitish. SUDAN, Sinkat, October (H. B. Johnson): 1 ex.*".

Genitalia de la hembra (fig. 17): Papilas anales bien desarrolladas y ligeramente esclerotizadas. Apófisis posteriores de gran tamaño sobrepasando el VIII segmento y llegando hasta el ostium. Apófisis anteriores también de gran longitud sobrepasando el antrum hasta el colicolum del ductus bursae. EI VIII segmento es levemente trapezoidal, con sendas bandas verticales más esclerotizadas que el resto. Ostium en forma de V y placa postvaginalis en forma de V inversa con el vértice redondeado y muy esclerotizada. Antrum estrecho, cilíndrico, de mediano tamaño y altamente esclerotizado, rematado en su parte anterior, en el contacto con el ductus bursae, por un brusco estrechamiento algo deformado y retorcido. Ductus bursae de mediana longitud, cilíndrico o ligeramente trapezoidal, membranoso. Bursa ovoidal, membranosa con un signum de tamaño medio, muy visible, esclerotizado y de forma irregular absolutamente bordeada de espinas de diferente tamaño y forma.

Biología: No se conocen los estados inmaduros ni las plantas nutricias de las orugas. Los imagos se capturaron en el mes de octubre.

Distribución: Sólo se conoce de la localidad típica en Sinkat, Sudán.

Detalles: Esta especie fue originalmente incluida en el género *Holcopogon* Staudinger, 1859 (STAUDINGER, 1859), posteriormente en *Ilionarsis* Gozmány, 1959 (GOZMÁNY, 1959) y actualmente en *Turatia* Amsel, 1942 (GOZMÁNY, 2000), opinión que seguimos aquí.

GELECHIIDAE

Aproaerema ochrofasciella Toll, 1936 (fig. 4)
Aproaerema ochrofasciella Toll, 1936. *Ann. Mus. zool. polon.,* **11**: 408, pl. 49, figs 22-25
LT: Podolien, Kreis Zaleszczyki, Ubierzowa, POLONIA

Material estudiado: ESPAÑA, BURGOS, San Martín de Don, a 770 m, 1 ♀, 14-VIII-2020, J. Gastón leg., prep. gen. 8275JG (fig. 16).

Biología: Las larvas se alimentan de *Astragalus glycyphyllos* L. y *Colutea arborescens* L. (Fabaceae).

Distribución: Según nuestros datos la especie tiene una distribución Eurosiberiana (ELSNER *et al*., 1999), habiéndose citado posteriormente de Austria (BUCHNER, 2004), Francia (VARENNE & NEL, 2015), Italia (HUEMER, 2016), Suiza (SWISSLEPTEAM, 2010), por lo tanto, la especie resulta **nueva para España**.

Detalles: Siguiendo a VIVES MORENO (2014), debería colocarse detrás de *Syncopacma sangiella* (Stainton, 1863), actualmente *Aproaerema sangiella* (Stainton, 1863).

***Megacraspedus sinevi* Vives & Gastón, sp. n.**

Material estudiado: Holotipo, 1 ♂, ESPAÑA, Burgos, Castrobarto, 770 m, 27-VI-2020, J. Gastón leg., prep. gen. 8245JG, depositado en el Museo Nacional de Ciencias Naturales, en Madrid, España (MNCN).

Descripción del macho (fig. 5): Envergadura, 9,5 mm (n=1). Cabeza bien desarrollada con pelos escamiformes de color gris compactos en la frente y en la zona alta del epicráneo. Palpos labiales bien desarrollados, con el segundo segmento dirigido hacia el frente y bien cubierto, por su parte inferior, de una densa capa de pelos escamiformes de color blanquecino en la parte superior y gris en su parte inferior. El tercer segmento, que se encuentra recubierto de pelos escamiformes muy cortos de color blanquecino excepto en la punta, que son negros, es delgado, afilado y forma un ángulo de 120º con el segundo segmento y se dirige hacia la parte superior. Antenas filiformes recubiertas de pequeñas cerdas de color gris ocráceo muy oscuro. Tórax y tégulas recubiertas de escamas de color gris, iguales que la cabeza. Abdomen recubierto de las mismas escamas que el tórax. Los tres pares de patas, tanto el fémur como la tibia están recubiertos de pelos de color gris muy claro, casi blanco, aunque se observan ligeras salpicaduras de escamas de gris oscuro. Alas anteriores con el margen costal acusadamente convexo y el ápex sumamente apuntado. Margen externo angulado, tanto que se confunde con el margen interno. El color de fondo de las alas anteriores es gris, uniforme; destacan dos puntos negros (más bien dos pequeñas líneas) situadas a 1/3 y 2/3 desde la base del ala hacia el apex y colocadas sobre la vena CuA_1 (cubital). Las fimbrias están muy desarrolladas y son de color gris claro. Las alas posteriores son de color ocre-grisáceo uniforme y sus fimbrias del mismo color que las de las alas anteriores.

Genitalia del macho (fig. 11): Uncus cilíndrico, alargado, con el extremo redondeado. Gnathos muy esclerotizado, con forma de gancho de longitud menor que el uncus. Tegumen potente, rectangular. Valvas alargadas y delgadas, casi rectangulares, aunque de geometría variable que hace que su extremo (cucullus) se presente retorcido en las preparaciones. La valva, en su base, presenta un potente proceso costal giboso rematado en una gruesa punta formada por la agrupación y fusión de tejido base y espinas. Sacculus presente en forma de lóbulo. Vinculum con dos grandes procesos. Escleritos laterales cortos y gruesos. Saccus triangular y muy potente, con cresta eslerotizada central. Aedeagus cilíndrico con un coecum penis muy ensanchado, de forma globular y con una pequeña banda de espinas exteriores que separan la parte globular de la cilíndrica.

Hembra: Desconocida.

Biología: Desconocida.

Distribución: Sólo conocida de la localidad tipo.

Detalles: De momento mantenemos esta nueva especie en el género *Megacraspedus* Zeller, 1857 y siguiendo a VIVES MORENO (2014), debería de colocarse, provisionalmente, detrás de *M. balnerariellus* (Chretién, 1907).

Etimología: Dedicamos esta nueva especie a nuestro estimado colega el Dr. Sergej Sinev (San Petersburgo, Rusia), eminente especialista en la familia Gelechiidae.

TORTRICIDAE

Cochylimorpha erlebachi Huemer & Trematerra, 1997 (fig. 6)

Cochylimorpha erlebachi Huemer & Trematerra, 1997. *Bool. Zool. Agr. Bachic*., (2)**29**(1): 46, figs 1-5
LT: Verona Monte, ITALIA

Material estudiado: ESPAÑA, Burgos, Castrobarto, a 770 m, 1 ♂, 26-VIII-2020, J. Gastón leg., prep. gen. 8177JG (fig. 12).

Biología: Desconocida. Periodo de vuelo desde julio hasta septiembre (HUEMER & TREMATERRA, 1997; RAZOWSKI, 2009).

Distribución: Según nuestros datos la especie se distribuye por el norte de Italia, (Trentino y Véneto), en alturas comprendidas entre los 300 y los 1.126 m. (PINZARI *et al*., 2006) y en Francia (Altos Alpes) (RAZOWSKI, 2002, 2009), por lo tanto, la especie resulta **nueva para España.**

Detalles: Siguiendo a VIVES MORENO (2014), debería colocarse detrás de *Cochylimorpha hilarana* (Herrich-Schäffer, 1851).

PYRALIDAE

Sudaniola asselbergsi Vives & Gastón, sp. n.

Material estudiado: Holotipo, 1 ♂, ESPAÑA, Granada, Albuñol, 27-VIII-1979, A. Vives leg., prep. gen. 1360AV, depositado en la colección A. Vives / Museo Nacional de Ciencias Naturales, en Madrid (MNCN). Paratipos: 6 ♂♂, 5 ♀♀: Almería, Retamar, a 25 m, 1 ♀, 20-X-2017, J, Gastón leg y coll.; Granada, Melicena, a 150 m, 1 ♀, 6-IX-2016, J. Gastón leg. y coll.; Idem, 1 ♀, 1 ♂, J, Gastón leg y coll., prep. gen. 5502JG y 5501JG; Barranco Escalate, a 90 m, 1 ♂, 19-V-2019, Tx. Revilla leg. y coll., prep. gen. 7322JG; Idem, 2 ♂♂, 10-IX-2020, J. Gastón leg. y coll., prep. gen. 7282JG y 7283JG; Vélez de Benaudalla, a 100 m, 1 ♀, 12-X-2018, Tx. Revilla leg. y coll., prep. gen. 7288JG; Idem, 1 ♂, 19-V-2019, Tx. Revilla leg. y coll., prep. gen. 7321JG; La Bernardilla, a 100 m, 1 ♀, 19-X-2017, J, Gastón leg y coll., prep. gen. 7370JG; Málaga, Urbanización Punta Lara, Nerja, a 25 m, 1 ♂, 2-IX-1994, Tx. Revilla leg. y coll. (REVILLA, 2015).

Descripción del macho (fig. 7): Envergadura, 13,10 mm (n=3). Cabeza bien desarrollada con pelos escamiformes de color ocre claro compactos en la frente y en la zona alta del epicráneo. Palpos labiales bien desarrollados, con el segundo y tercer segmentos dirigidos hacia el frente y bien cubiertos de una compacta capa de pelos escamiformes que son de color gris oscuro en el segundo segmento y blanco ocráceo en el tercer segmento, donde se alterna en su base y extremo con pelos de color gris oscuro. Antenas filiformes recubiertas de pequeñas cerdas de color gris ocráceo muy oscuro. Patagio donde destacan por dos filas de escamas bien desarrolladas; la más próxima al epicráneo está formada por escamas predominantemente de color rojizo asalmonado, y la más próxima al tórax de color ocre claro, casi blanco. Tórax y tégulas recubiertas de escamas de color predominante ocre claro, aunque entremezcladas con escamas de color rojizo asalmonado y alguna de color gris oscuro. Abdomen recubierto de escamas de color uniforme ocre claro. Los tres pares de patas, tanto el fémur como la tibia están recubiertos de pelos de color ocre muy claro, casi blanco, alternándose en franjas con pelos de color gris casi negro. Los tarsos están recubiertos de pelos gris oscuro, casi negros. Alas anteriores con el margen costal ligeramente convexo y el ápex suavemente redondeado. Margen externo casi vertical y poco redondeado. El color de fondo de las alas anteriores es gris uniforme, formado por la salpicadura de infinidad de escamas de color gris oscuro entremezcladas con escamas de color gris muy claro. Destacan tres franjas verticales (o casi) desde la base del ala hasta el termen. La más próxima a la base (situada en la zona basal), dispone de una pequeña zona de escamas negras, poco perceptibles, rematada hacia el exterior por estrecha banda blanca y otra de escamas rojizas en su extremo; la segunda franja, que es la más visible al ser muy ancha, se sitúa en la zona discal formando un ligero arco desde la costa hasta el margen interno del ala, y se compone de tres franjas de escamas de color blanco, negro y rojizo asalmonado (en el orden desde la base del ala al termen), recercadas por dos estrechas franjas de escamas negras en sus externos. Por último, la tercera franja situada en la zona postdiscal, es estrecha y zigzagueante, y se compone de dos líneas de escamas oscuras y paralelas. Destacan dos puntos negros (más bien dos

pequeñas líneas) situados en la zona postdiscal entre los espacios de las venas V6 y V4. También se observan varios puntos negros en la zona marginal (unos cinco), justo en el límite con el termen. Las fimbrias de las alas anteriores son de color gris oscuro en su base y gris claro en su extremo. Las alas posteriores, con la geometría típica de la familia, son de color uniforme ocre-grisáceo muy claro, casi plateado, y sus fimbrias, bien desarrolladas, son de color gris muy claro.

Genitalia del macho (fig. 13): Uncus piramidal con el extremo redondeado. Gnathos formado por un grueso y esclerotizado apéndice recto con su extremo muy puntiagudo y casi tan largo como el uncus situado en la conjunción de dos lóbulos que forman el extremos de los brazos del gnathos. Valvas alargadas con la costa ligeramente convexa con un cordón marginal esclerotizado y levemente desviadas hacia arriba en su ápex con el cucullus redondeado. Sacculus ligeramente esclerotizado y ondulante ocupando el primer tercio de la valva. Juxta triangular, claramente bilobular, con dos potentes brazos delgados y divergentes estrechándose paulatinamente hacia sus extremos, que se rematan en una punta redondeada. Saccus de tamaño medio, triangular y apuntado. Aedeagus cilíndrico, de mediano tamaño con el coecum muy redondeado. Vesica forrada en su parte basal y central de infinidad de minúsculos granos muy esclerotizados. El octavo segmento del abdomen incluye una culcita muy característica, formada por dos brazos esclerotizados separados desde su base, que es ancha, y retorcidos hacia sus respectivos exteriores, adquiriendo la apariencia de la letra PI invertida.

Descripción de la hembra (fig. 8): Envergadura, 11,70 mm, (n = 4). La morfología de las hembras no difiere de la de los machos.

Genitalia de la hembra (fig. 18): Papilas anales de bien desarrolladas, muy anchas en su base y apuntadas en su extremo, que es redondeado. Apófisis posteriores de mediano tamaño, lo mismo que las anteriores. El octavo segmento dispone de una escotadura en el borde posterior. Ostium con forma de U muy abierta, remarcada por un cordón esclerotizado y un antrum campaniforme y membranoso. Ductus bursae corto, cilíndrico y membranoso, que se ensancha visiblemente antes de su contacto con la bursa, donde se aprecia con claridad una placa o signum alargada de bordes dentados. Bursa ovoidal, membranosa, con el ductus seminalis colocado en su parte posterior y recubierta en su pared interna y en uno de sus lados, de unos finos gránulos que comienzan en la mitad de la bursa y se extienden hasta el ductus, rodeando la placa descrita anteriormente.

Biología: Desconocida. No se conocen los estados inmaduros ni las plantas que sustentan a las orugas. Los imagos se capturaron en biotopos próximos a la costa mediterránea, fundamentalmente en ramblas kársticas formadas por calizas y dolomías en el piso bioclimático termomediterráneo, y a altitudes que oscilan desde el nivel del mar a 150 m. Por los datos de que disponemos, hemos comprobado que vuela al menos en dos generaciones; la primera y más abundante en mayo y la segunda en septiembre-octubre, aunque no descartamos que lo haga en una única generación desde mayo a octubre, ya que se han capturado escasos ejemplares en agosto.

Distribución: Conocida únicamente de las provincias de Almería, Granada y Málaga.

Detalles: Hasta ahora se consideraba que la población española de esta especie correspondía a *Sudaniola remanella* Roesler, 1973 (ROESLER, 1985), pero las diferencias en su genitalia demuestran la validez de este nuevo taxón. En los machos éstas radican, sobre todo, en la esclerotización de la culcita del 8º segmento (figs. 13b y 13c) además de la geometría de las valvas; en las hembras, en la ausencia de la placa esclerotizada que está presente en la base del ductus bursae de *Sudaniola asselbergsi* Vives & Gastón, sp. n. Siguiendo a VIVES MORENO (2014), debería colocarse donde está *Sudaniola remanella* Roesler, 1973, especie que debe de eliminarse de la fauna española.

Etimología: Dedicamos esta nueva especie a nuestro estimado colega Jan E. F. Asselbergs (GD Bergen op Zoom, Países Bajos), eminente especialista en Pyraloidea.

NOCTUIDAE

Spodoptera frugiperda (Smith, 1797)
Phalaena frugiperda Smith, 1797, *in* Smith & Abbot. *Lep. Ins. Georgia*, **2**: 191, pl. 96

LT: Georgia, EE.UU.
= *Laphygma macra* Guenée, 1852, *in* Boisduval & Guenée. *Hist. nat. Ins., Noct*., **5**: 157
LT: BRASIL, COLOMBIA, GUYANA
= *Laphygma? inepta* Walker, 1856. *List Specs. Lep. Ins. Brit. Mus*., **9**: 190
LT: Santarem, BRASIL, VENEZUELA
= *Prodenia signifera* Walker, 1856. *List Specs. Lep. Ins. Brit. Mus*., **9**: 193
LT: Georgia, EE.UU, VENEZUELA
= *Prodenia plagiata* Walker, 1856. *List Specs Lep. Ins. Brit. Mus*., **9**: 194
LT: JAMAICA
= *Prodenia autumnalis* Riley, 1871. *3rd. Rep. Ins. Missouri*: 109, figs. 45, 46a
LT: Missouri, EE.UU.
= *Laphygma frugiperda fulvosa* Riley, 1871. *3rd. Rep. Ins. Missouri*: 117, fig. 46b
LT: Missouri, EE.UU.
= *Laphygma frugiperda obscura* Riley, 1871. *3rd. Rep. Ins. Missouri*: 117, fig. 46c
LT: Missouri, EE.UU.

Material estudiado: ESPAÑA, Tenerife, 2 ♂♂, 15-VII-2020, A. González leg., prep. gen. 61725AV (MNCN_Ent 265978) (fig. 14), capturados en trampas adhesivas tipo Delta en cartón engomado con feromonas específicas.

Biología: Es una especie polífaga y sus principales plantas nutricias son el maíz (*Zea mays* L.), la caña de azúcar (*Saccharum officinarum* L.), el sorgo (*Sorghum bicolor* (L.) Moench), el arroz (*Oryza sativa* L.) y en Brasil, el algodón (*Gossypium hirsutum* L.). Cuenta con una veintena de plantas huésped menores, entre las que se incluyen la cebolla (*Allium cepa* L.), el cacahuete (*Arachis hypogaea* L.), el pimiento (*Capsicum annuum* L.), el crisantemo de floristería (*Dendranthema grandiflorum* Ramat.), el clavel (*Dianthus caryophyllus* L.), el boniato (*Ipomoea batatas*(L.) Lam.), la alfalfa (*Medicago sativa* L.), el tabaco (*Nicotiana tabacum* L.), la judía (*Phaseolus vulgaris* L.), el tomate (*Solanum lycopersicum* L.), la berenjena (*Solanum melongena* L.) y otras especies de Brasicacea, Cucurbitacea y Poaceae.

Distribución: Por los datos que disponemos, esta especie se distribuye desde el sur de Canadá hasta el norte de Argentina y Chile (POGUE, 2002). En el año 2016 se detectó su presencia en el África subsahariana, concretamente en Nigeria, Santo Tomé y Príncipe (GOERGEN *et al.,* 2016) ocupando toda la región Afrotropical y alcanzando Egipto en 2019 (VENNILA *et al*., 2019), Mauritania (EPPO, 2020a) e Israel (EPPO, 2020b). Se extiende por Asia llegando a la India en 2018 (REPALLE *et al*., 2020) y en 2019 ya se encuentra en el Yemen, Bangladesh, Myanmar, Sri Lanka, Tailandia y más recientemente en China, Corea del Sur, Japón (VENNILA *et al*., 2019), Pakistán (NAEEM-ULLAH *et al.,* 2019), Laos (FAO, 2019), Filipinas (IPPC, 2019), Indonesia (EPPO, 2019) y Vietnam (USDA GAIN, 2019). Durante los primeros meses de 2020 ha sido capturada, en trampas, en las islas de Saibai y Erub en el Estrecho de Torres (IPPC, 2020) y en el norte de Australia continental (QUEENSLAND GOVERNMENT, 2020). Ahora se encuentra en las **Islas Canarias, España**.

Detalles: Es considerada como una de las más importantes plagas para la agricultura a nivel mundial. Siguiendo a VIVES MORENO (2014), esta especie hay colocarla detrás de *S. cilium* (Guenée, 1852, *in* Boisduval & Guenée). En la misma trampa pudimos encontrar y estudiar 3 ♂♂ de *Leucania loreyi* (Duponchel, 1827, *in* Godart & Duponchel), prep. gen. 61724 (MNCN_Ent 265977).

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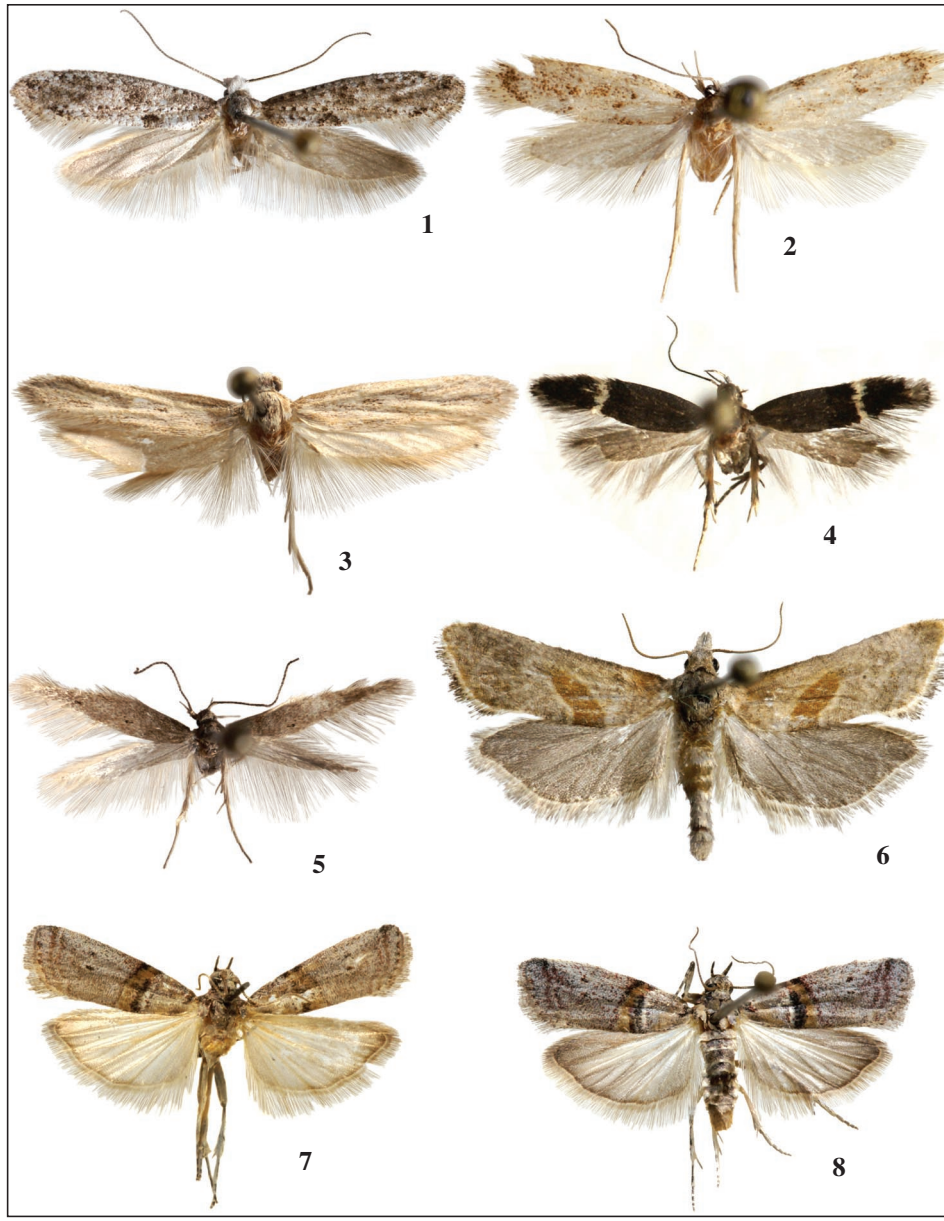
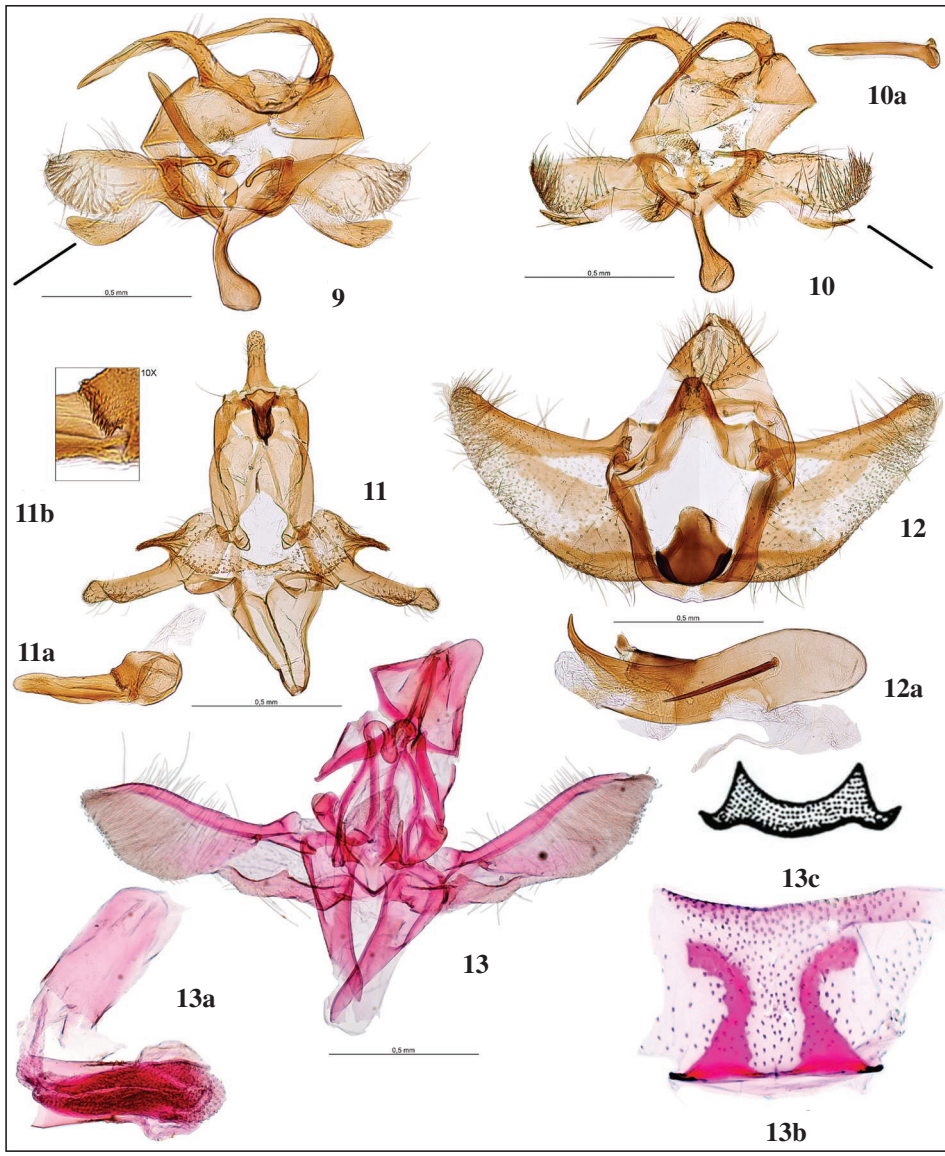
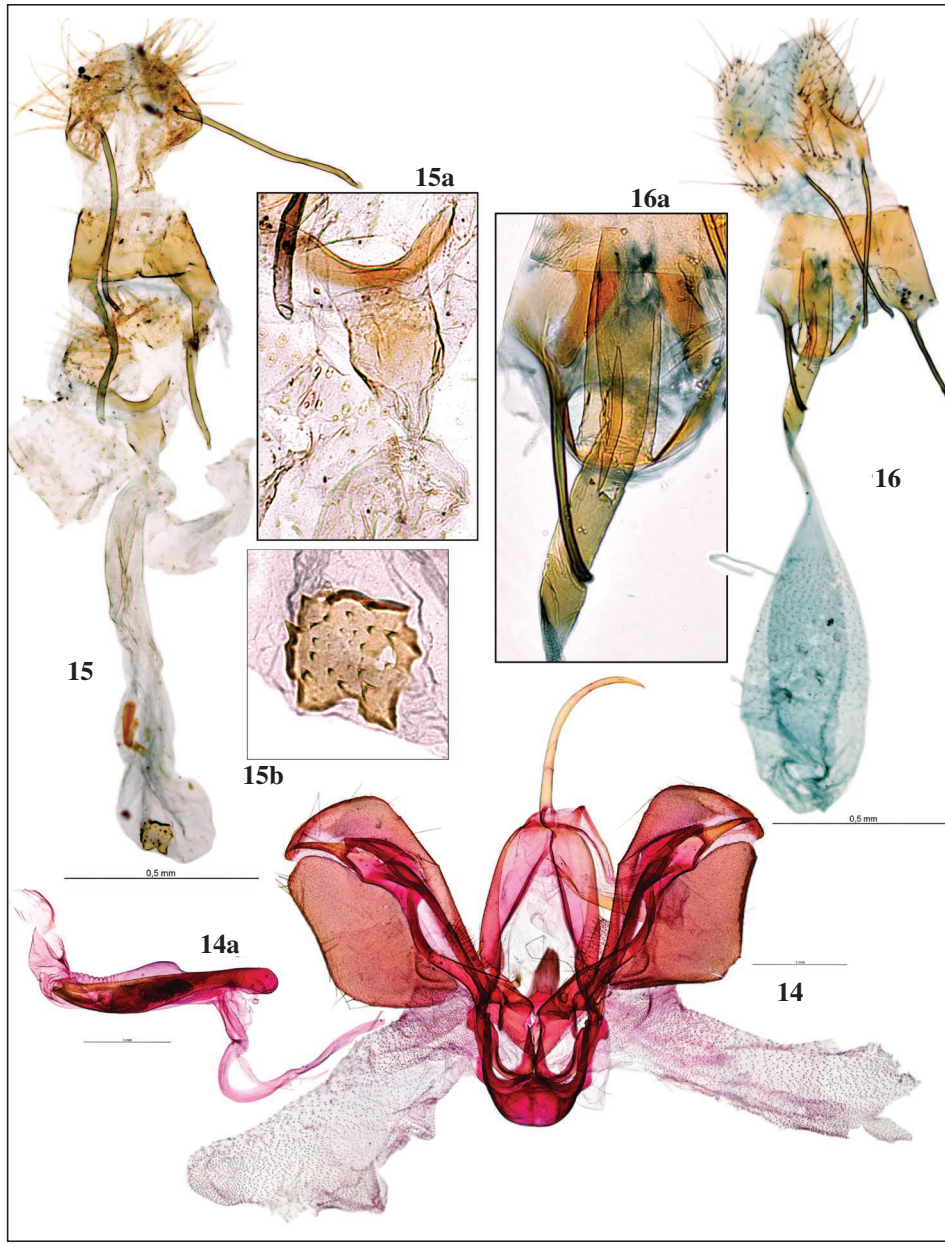


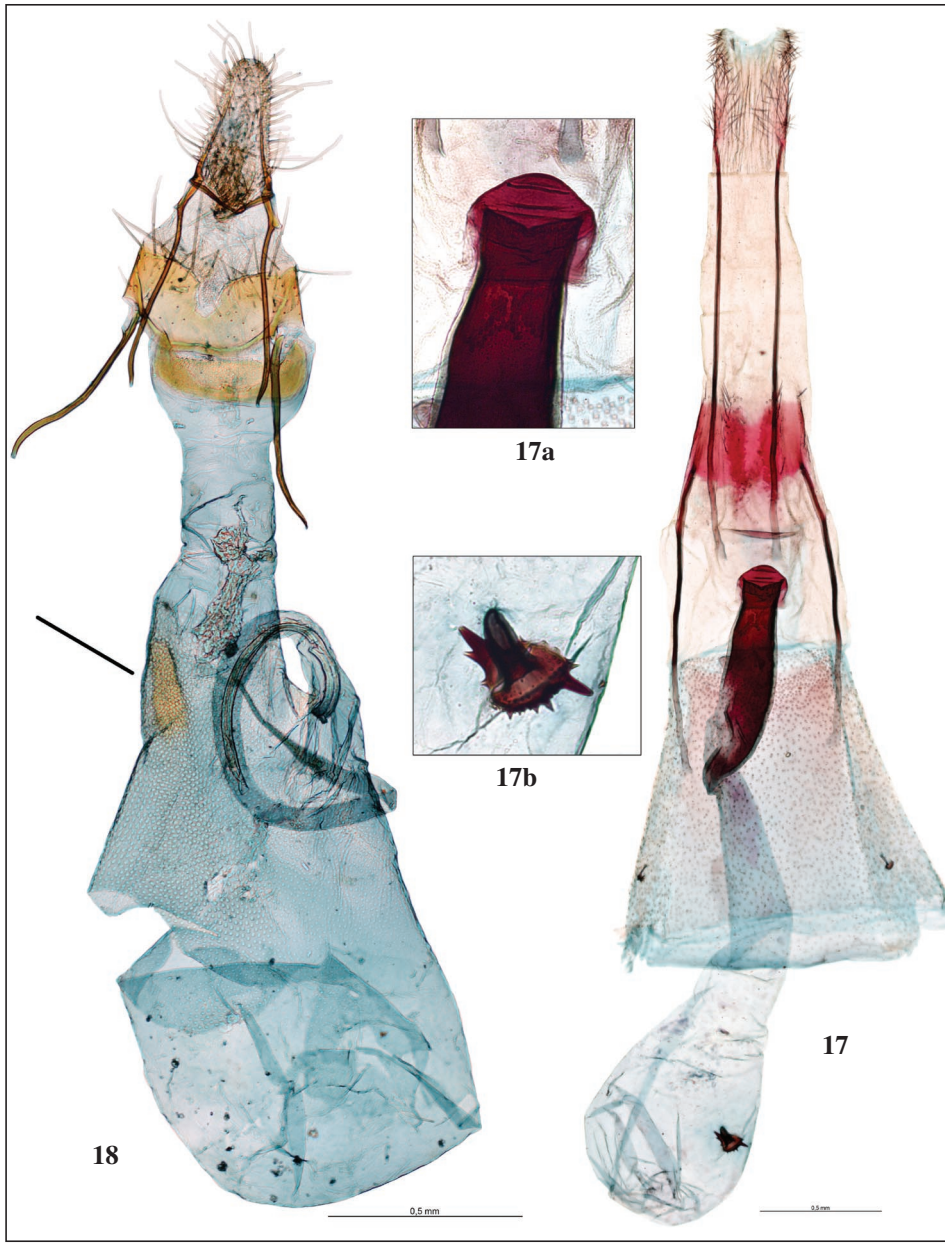
Figs 1-8.– Adulto: **1.** *Paraswamerdamia kitamurae* Gastón & Vives, 2020, ♂. **2.** *Symmoca mimetica* Gozmány, 2008, ♀. **3.** *Turatia scioneura* (Meyrick, 1929), ♀. **4.** *Aproaerema ochrofasciella* Toll, 1936, ♀. **5.** *Megacraspedus sinevi* Vives & Gastón, sp. n., ♂, holotypus. **6.** *Cochylimorpha erlebachi* Huemer & Trematerra, 1997, ♂. **7.** *Sudaniola asselbergsi* Vives & Gastón, sp. n., ♂, holotypus. **8.** *Sudaniola asselbergsi* Vives & Gastón, sp. n., ♀, paratypus.



Figs 9-13.– Genitalia macho: **9.** *Paraswamerdamia kitamurae* Gastón & Vives, 2020, prep. gen. 8219JG. **10.** *Paraswamerdamia albicapitella* (Scharfenberg, 1805), prep. gen. 8221JG. **10a.** Idem, aedeagus. **11.** *Megacraspedus sinevi* Vives & Gastón, sp. n., holotypus, prep. gen. 8245JG. **11a.** Idem, aedeagus. **11b.** Idem, detalle del aedeagus. **12.** *Cochylimorpha erlebachi* Huemer & Trematerra, 1997, prep. gen. 8177JG. **12a.** Idem, aedeagus. **13.** *Sudaniola asselbergsi* Vives & Gastón, sp. n., holotypus, andropigio, prep. gen. 1316AV. **13a.** Idem, aedeagus. **13b.** Idem, culcita del 8º segmento, paratypus, prep. gen. 7321JG. **13c.** *Sudaniola remanella* Roesler, 1973, culcita del 8º segmento, paratypus, siguiendo a ROESLER (1973).



Figs 14-16.– Genitalia macho y hembra: **14.** *Spodoptera frugiperda* (Smith, 1797), prep. gen. 61725AV. **14a.** Idem, aedeagus. **15.** *Symmoca mimetica* Gozmány, 2008, prep. gen. 1240ER. **15a.** Idem, detalle ostium y antrum. **15b.** Idem, detalle del signum. **16.** *Aproaerema ochrofasciella* Toll, 1936, prep. gen. 8275JG. **16a.** Idem, detalle del antrum y ductus bursae.



Figs 17-18.– Genitalia hembra: **17.** *Turatia scioneura* (Meyrick, 1929), prep. gen. 1-14AV. **17a.** Idem, ostium. **17b.** Idem, signum de la bursa. **18.** *Sudaniola asselbergsi* Vives & Gastón, sp. n., paratypus, prep. gen. 7370JG.

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An application of the synthetic sex attractants from the series "EFETOV-2" for studying Procridinae in Italy (Lepidoptera: Zygaenidae)

K. A. Efetov, E. E. Kucherenko & G. M. Tarmann

Abstract

The enantiomers of 2-butyl 2-dodecenoate synthesised in the Crimean Federal University are known as the sex attractants for Procridinae species (Lepidoptera: Zygaenidae). These compounds, alone and in combination, were applied for studying the Zygaenidae fauna in Italy for four years from 2015 to 2018. We evaluated the effectiveness of the three following variants: EFETOV-2 (the racemic mixture of (2*R*)-butyl 2-dodecenoate and (2*S*)-butyl 2-dodecenoate), EFETOV-S-2 (the *R*-enantiomer alone) and EFETOV-S-S-2 (the *S*-enantiomer alone). The males of three genera of Procridinae were attracted to the lures from the series "EFETOV-2": *Rhagades* Wallengren, 1863 (one species), *Adscita* Retzius, 1783 (six species), and *Jordanita* Verity, 1946 (four species). The sex attractants for species *Adscita* (*Adscita*) *italica* (Alberti, 1937), *A.* (*A.*) *alpina* (Alberti, 1937), *A.* (*A.*) *dujardini* Efetov & Tarmann, 2014, and one endemic species *Jordanita* (*Jordanita*) *tenuicornis* (Zeller, 1847) were found for the first time. Moreover, a hybridisation zone between *A.* (*A.*) *italica* and *A.* (*A.*) *alpina* was discovered by the application of the sex attractants. *Rhagades* (*Rhagades*) *pruni* ([Denis & Schiffermüller], 1775) was recorded for the first time for more than 100 years in Piemonte and for the first time ever in the Ligurian Alps.
KEY WORDS: Lepidoptera, Zygaenidae, Procridinae, sex attractants, monitoring, distribution, hybridisation, EFETOV-2, EFETOV-S-2, EFETOV-S-S-2, 2-butyl 2-dodecenoate, Alps, Liguria, Italy.

Una aplicación del atrayente sintético sexual de la serie "EFETOV-2" para estudiar los Procridinae en Italia (Lepidoptera: Zygaenidae)

Resumen

Los enantiómeros de 2-butyl 2-dodecenoato sintetizados in la Universidad Federal de Crimea, son conocidos como atrayentes sexual para las especies de Procridinae (Lepidoptera: Zygaenidae). Estos compuestos solos y en combinación, fueron aplicados para el estudio de la fauna de Zygaenidae en Italia durante cuatro años desde el 2015 al 2018. Evaluamos la efectividad de las tres siguientes variantes: EFETOV-2 (la mezcla racémica de (2*R*)-butyl 2-dodecenoato y (2*S*)-butyl 2-dodecenoato), EFETOV-S-2 (solo el *R*-enantiómero) y EFETOV-S-S-2 (solo el *S*-enantiómero). Los machos de tres géneros de Procridinae fueron atraídos a los señuelos de la series "EFETOV-2": *Rhagades* Wallengren, 1863 (una especie), *Adscita* Retzius, 1783 (seis especies) y *Jordanita* Verity, 1946 (cuatro especies). Fue hallado, por primera vez, el atrayente sexual para las especies *Adscita* (*Adscita*) *italica* (Alberti, 1937), *A.* (*A.*) *alpina* (Alberti, 1937), *A.* (*A.*) *dujardini* Efetov & Tarmann, 2014 y una especie endémica *Jordanita* (*Jordanita*) *tenuicornis* (Zeller, 1847). Sin embrago, con la aplicación de los atrayentes sexuales, fue descubierta una zona de hibridación entre *A.* (*A.*) *italica* y *A.* (*A.*) *alpina*. *Rhagades* (*Rhagades*) *pruni* ([Denis & Schiffermüller], 1775) fue registrado por primera vez, en más de 100 años, en el Piemonte y por primera vez en los Alpes de Liguria.
PALABRAS CLAVE: Lepidoptera, Zygaenidae, Procridinae, atrayente sexual, monitoreo, distribución, hibridación, EFETOV-2, EFETOV-S-2, EFETOV-S-S-2, 2-butyl 2-dodecenoato, Alpes, Liguria, Italia.

Introduction

In recent years, there has been an increasing interest in studies of sex pheromones and sex attractants of Insecta. A considerable amount of research has been published on the application of these molecules for pest management and monitoring of rare and endangered species (WITZGALL *et al*., 2010; EFETOV *et al*., 2014b; OLEANDER *et al*., 2015; LARSSON, 2016; CIZEJ & TREMATERRA, 2017; WILSON *et al*., 2017; GREGG *et al*., 2018). Sex pheromones and sex attractants are also used for faunal and evolutionary studies of Lepidoptera (ROELOFS & ROONEY, 2003; SUBCHEV *et al*., 2016; RAZOV *et al*., 2017; CAN *et al*., 2019). Field experiments with sex attractants and/or sex pheromones, such as for Zygaenidae (Lepidoptera), have allowed researchers to discover new species (KEIL, 2016; EFETOV *et al*., 2018a), detect low-density populations of harmful or rare moths (EFETOV *et al*., 2019b; TARMANN *et al*., 2019; VRENOZI *et al*., 2019) and discover new data about the distribution of Zygaenids (CAN CENGIZ *et al*., 2018).

To date, the family Zygaenidae is represented by five subfamilies: Inouelinae Efetov & Tarmann, 2017; Procridinae Boisduval, 1828; Chalcosiinae Walker, 1865; Callizygaeninae Alberti, 1954; and Zygaeninae Latreille, 1809 (EFETOV, 2001b; EFETOV *et al*., 2004, 2006, 2014a, 2015a; EFETOV & HAYASHI, 2008; EFETOV & SAVCHUK, 2009, 2013; EFETOV & TARMANN, 2017a; EFETOV & KNYAZEV, 2014; KNYAZEV *et al*., 2015a, 2015b; HOFMANN & TREMEWAN, 2017). During the last 30 years, extensive revisional work has been carried out on the Palaearctic Zygaenidae with many new species described on the base of morphological and molecular analysis (EFETOV, 1992, 1996a, 1996b, 1997a, 1997b, 1998, 1999, 2001a, 2006, 2010; EFETOV & TARMANN, 1999, 2013a, 2013b, 2014a, 2016a, 2016b, 2017b; MOLLET & TARMANN, 2007, 2018; TARMANN & DROUET, 2015; EFETOV *et al*., 2019a, 2019c). Forty five species of Zygaenidae are currently known from Italy, of which three are endemic, viz. *Jordanita* (*Jordanita*) *tenuicornis* (Zeller, 1847) (Procridinae), *Zygaena* (*Mesembrynus*) *rubicundus* (Hübner, 1817), and *Z.* (*Zygaena*) *oxytropis* Boisduval, 1828 (Zygaeninae) (EFETOV, 1994, 2004; BERTACCINI & FIUMI, 1999; NAUMANN *et al*., 1999; EFETOV *et al*., 2011b; EFETOV & TARMANN, 2014b; HOFMANN & TREMEWAN, 2017). However, the occurrence of *J.* (*Gregorita*) *algirica* (Rothschild, 1917) needs confirmation because the examined historical specimens from Sicily are the only reference material that is available, and no other records are known. Two species, *Z.* (*Z.*) *nevadensis* Rambur, 1858, and *Z.* (*Z.*) *angelicae* Ochsenheimer, 1808, have been found only recently on Italian territory. The earlier published data on *Z.* (*Z.*) *nevadensis* have been proved to be erroneous and this species was newly discovered on La Sila in Calabria (EFETOV *et al*., 2011b). Recently, based on the differences in habitus, genitalia morphology and DNA barcoding data, one new species, viz. *Adscita* (*Adscita*) *dujardini* Efetov & Tarmann, 2014, has been described from Italy, France, Switzerland and Slovenia (EFETOV & TARMANN, 2014b). Here this species replaces *A.* (*A.*) *albanica* (Naufock, 1926) which is restricted to the Balkans, Ukraine, and Russia. Despite the fact that the rich Italian Zygaenidae fauna is well investigated, a lot of questions about the origin, distribution, biology, and ecology of Zygaenidae of the Apennine Peninsula remain still open and need to be discussed.

EFETOV *et al*. (2015b) investigated the fauna of Zygaenidae in Italy using the *R*- and *S*-enantiomers of 2-butyl (7*Z*)-dodecenoate which have been identified as female sex pheromone components of *Illiberis* (*Primilliberis*) *rotundata* Jordan, 1907, a species known from East Asia (SUBCHEV *et al*., 2009). The attractiveness of these molecules has been shown for many Procridinae species (EFETOV *et al*., 2010, 2011a; SUBCHEV *et al*., 2010, 2012, 2013). In this study we used the *R*- and *S*-enantiomers of another ester, viz. 2-butyl 2-dodecenoate, synthesised in the Crimean Federal University (EFETOV *et al*., 2014c). These molecules also attracted the males of Procridinae (EFETOV *et al*., 2016, 2018b, 2019b). There were three main aims of our work: 1) to check the attractiveness of (2*R*)-butyl 2-dodecenoate and (2*S*)-butyl 2-dodecenoate and their mixture for the Italian Procridinae species; 2) to discover new data about the occurrence and distribution of Zygaenidae in Italy; 3) to look for presumed extinct species (e. g. *Rhagades* (*Rhagades*) *pruni* ([Denis & Schiffermüller], 1775) in Piemonte).

Materials and methods

Field observations with synthetic sex attractants from the series "EFETOV-2" were undertaken in

Italy for four years from 2015 to 2018. We tested the sex attractants in six provinces (Bolzano, Pordenone, Udine, Vicenza, Macerata, L'Aquila) in 2015; in eleven provinces (Bolzano, Aosta, Sondrio, Lecco, Bergamo, Brescia, Torino, Cuneo, Parma, Imperia, Savona) in 2016; in four provinces (Bolzano, Imperia, Savona, Genova) in 2017; and in four provinces (Bolzano, L'Aquila, Potenza, Cosenza) in 2018. A detailed table with locality information where Procridinae species were attracted is given in Table 1.

2-butyl 2-dodecenoate were synthesised in the Crimean Federal University as described in EFETOV *et al*. (2014c). We tested the attractiveness of (2*R*)-butyl 2-dodecenoate alone (EFETOV-S-2), (2*S*)-butyl 2-dodecenoate alone (EFETOV-S-S-2) and their racemic mixture (EFETOV-2). For preparing baits, the different sex attractants were applied onto grey rubber vial caps fixed on cardboard rectangles and labelled. The lures were attached to twigs on bushes or on the clothes of the researcher (when he slowly crossed the biotope). The attracted specimens were collected by netting them near the lure. In some cases, transparent Delta traps were also used. The removable sticky layers were covered with Tanglefoot® insect glue. Control traps (without attractants) were necessarily placed in these localities. All captured and attracted moths were recorded and determined by the genitalia examination.

All maps are compiled from the BioOffice database of the Tiroler Landesmuseen, Innsbruck, Austria.

Two-letter code of studied provinces: BZ - Bolzano, PN - Pordenone, UD - Udine, TO - Torino, CN - Cuneo, PR - Parma, IM - Imperia, SV - Savona, MC - Macerata, AQ - L'Aquila, CS - Cosenza.

Results and discussion

It was shown that (2*R*)-butyl 2-dodecenoate and (2*S*)-butyl 2-dodecenoate, alone and in combination, were attractive for the males of eleven Procridinae species and two hybrid populations (Table 2). The total numbers of the attracted specimens to the sex attractants from the series "EFETOV-2" are listed in Table 3.

Table 3.– The total numbers of the males of Procridinae species attracted to the sex attractants from the series "EFETOV-2" in different provinces of Italy. Specimens collected by baited traps are marked with an asterisk. The two-letter code is an abbreviation of the province name.

Attracted species	EFETOV-2	EFETOV-S-2	EFETOV-S-S-2
Rhagades pruni	–	–	18 ♂♂ (TO, CN, IM)
Adscita statices	–	4 ♂♂ (IM)	–
Adscita statices × *alpina*	–	5 ♂♂ (IM)	–
Adscita alpina	9 ♂♂ (BZ)	40 ♂♂ (CN, SV, BZ)	–
Adscita alpina × *italica*	7 ♂♂ (SV)	–	–
Adscita italica	17* ♂♂ (AQ)	19 ♂♂ (AQ, CS)	17 ♂♂ (AQ)
Adscita geryon	–	4 ♂♂ (BZ, AQ)	–
Adscita dujardini	1* ♂ (MC)	1* ♂ (MC)	–
Adscita mannii	1* ♂ + 18 ♂♂ (AQ, CS)	19 ♂♂ (BZ, PN, UD, AQ)	8 ♂♂ (IM, AQ, CS)
Jordanita notata	–	1* ♂ + 7 ♂♂ (PN, MC)	3 ♂♂ (IM, AQ)
Jordanita tenuicornis	–	1 ♂ (AQ)	3 ♂♂ (AQ)
Jordanita globulariae	–	4 ♂♂ (PN)	–
Jordanita subsolana	–	419 ♂♂ (TO, IM, PR, BZ, AQ)	–

Some Procridinae species demonstrated a strong preference for only one type of the attractant. For example, the males of *Rhagades* (*Rhagades*) *pruni* were attracted only to the baits with EFETOV-S-S-2. It should be noted that *Rh.* (*Rh.*) *pruni* was found for the first time since its last record of more than 100 years ago in Piemonte near Torino in 1906 and for the first time ever in the Ligurian Alps. Three new populations (Fig. 1) of this presumed extinct species were found only with the help of the sex attractant. It has recently been shown that EFETOV-S-S-2 contributed to the rediscovery of *Rh.* (*Rh.*) *pruni* in Spain on the southern side of the Pyrenees where this species is also a very rare (EFETOV *et al*., 2019b). Together, these studies suggest that the sex attractant EFETOV-S-S-2 is a sensitive and efficient tool for monitoring populations of

Rh. (*Rh.*) *pruni*. It is interesting that this species is mentioned as a pest on apple (*Malus toringoides* Hughes) and *Prunus* spp. in Japan (TARMANN, 2003).

In contrast to *Rh.* (*Rh.*) *pruni* the species *Jordanita* (*Solaniterna*) *subsolana* (Staudinger, 1862) (with more than 400 attracted specimens) reacted only to EFETOV-S-2. For instance, during 30 minutes enormous masses of this species (more than 100 specimens) were attracted to the lure with EFETOV-S-2 attached to the hat of the researcher (Fig. 2). The males showed active sexual behaviour: they trembled by wings, moved antennas, opened valves, touched the rubber cap by the end of abdomen and tried to copulate with it. This means that our type of the sex attractant was very effective for detection of *J.* (*S.*) *subsolana* in biotopes. New localities could be discovered in three provinces, viz. Torino, Imperia and Parma (Fig. 3).

One more species, viz. *Jordanita* (*Jordanita*) *globulariae* (Hübner, 1793), came to the lures with EFETOV-S-2. Thus, *R*-enantiomer attracts *J.* (*S.*) *subsolana* and *J.* (*J.*) *globulariae*, while *S*-enantiomer has high attractiveness for the males of *Rh.* (*Rh.*) *pruni*.

All three variants of the sex attractants from the series "EFETOV-2" were active for *Adscita* (*Tarmannita*) *mannii* (Lederer, 1853). They are new synthetic sex attractants for this species. Besides this, the attractiveness of other esters of 2-butanol, viz. (2*S*)-butyl (9*Z*)-tetradecenoate, (2*S*)-butyl (7*Z*)-dodecenoate and (2*R*)-butyl (7*Z*)-dodecenoate, were proved for the males of *A.* (*T.*) *mannii* some years ago (SUBCHEV *et al*., 2010; EFETOV *et al*., 2015b; RAZOV *et al*., 2017). It is interesting to note that for this species the *S*-enantiomers of these esters are more active than the corresponding *R*-enantiomers. EFETOV *et al*. (2015b) demonstrated that when three variants of the attractants ((2*S*)-butyl (7*Z*)-dodecenoate, (2*R*)-butyl (7*Z*)-dodecenoate and their mixture) were present in the habitat, the males of *A.* (*T.*) *mannii* came mainly to the *S*-enantiomer alone. When only (2*R*)-butyl (7*Z*)-dodecenoate and the mixture were present, some specimens could be found in traps baited with the mixture. The males of *A.* (*T.*) *mannii* were captured by the traps baited with (2*R*)-butyl (7*Z*)-dodecenoate only if other types of the lures were absent in biotopes. Our results coincide with those observed in earlier studies. The males of *A.* (*T.*) *mannii* were attracted to the lures EFETOV-S-2 (*R*-enantiomer) if we used only this one attractant during observations. In case when all three types of the lures were applied, *A.* (*T.*) *mannii* came to EFETOV-S-S-2 (*S*-enantiomer) or EFETOV-2 (the mixture). It should be noted that the differences between our sex attractants and other attractive esters for *A.* (*T.*) *mannii* are in the position of the double bond (at the 2nd carbon atom instead of the 7th or 9th) and for (2*S*)-butyl (9*Z*)-tetradecenoate in the carbon chain length of fatty acids (12 C instead of 14 C). There are two important implications from these findings. Firstly, the presence of the *R*-enantiomers of biologically active esters does not influence the attractiveness of the corresponding *S*-enantiomers for *A.* (*T.*) *mannii*. Secondly, stereochemistry of molecules is important for the identification of the sex attractants by olfactory receptors of moths.

Three closely related species, viz. *Adscita* (*Adscita*) *statices* (Linnaeus, 1758), *A.* (*A.*) *alpina* (Alberti, 1937), and *A.* (*A.*) *italica* (Alberti, 1937), reacted actively to the investigated sex attractants. The males of *A.* (*A.*) *statices* were attracted only to the lures baited with EFETOV-S-2. The males of *A.* (*A.*) *alpina* were mainly attracted to EVETOV-S-2 and to EFETOV-2. The males of *A.* (*A.*) *italica* were caught by the sticky trap with EFETOV-2 (Fig. 4); in addition, they also came to the lures with EFETOV-S-S-2 and EFETOV-S-2. The sex attractants for *A.* (*A.*) *alpina* and *A.* (*A.*) *italica* have been found for the first time while the attractiveness of EFETOV-2 and EFETOV-S-2 for *A.* (*A.*) *statices* was demonstrated in our previous studies (EFETOV & GORBUNOV, 2016; CAN CENGIZ *et al*., 2018). In the Ligurian Alps these three species of the subgenus *Adscita* have their distributional borders. In recent years it has been observed that there is a hybrid belt between *A.* (*A.*) *statices* and *A.* (*A.*) *alpina* in the western Ligurian Alps (GUENIN & TARMANN, 2016). Hybrid zones between these two species have been known throughout the Alps for a long time (white squares on Fig. 5) (TARMANN, 1979; GUENIN, 2013, 2016). However, there was still a distributional gap of about 70 km (as the crow flies) between *A.* (*A.*) *alpina* in the West and *A.* (*A.*) *italica italica* (Alberti, 1937) in the East in the Ligurian Alps and the Ligurian Apennine. *A.* (*A.*) *italica italica* is an endemic subspecies of the Apennine Peninsula and had its western known distribution around Genova. In summer 2017 the field work to study this so-called distributional gap in the Ligurian Alps and the Ligurian Apennines was carried out with the help of the sex attractants from the series "EFETOV-2". As soon as the males were detected, the females had to be found because *A.* (*A.*) *alpina* and *A.* (*A.*) *italica* can

only be distinguished clearly by different structures in the female genitalia (Figs 6, 7). The distributional limits of *A*. (*A*.) *alpina* and *A*. (*A*.) *italica* were determined and hybrids between *A*. (*A*.) *alpina* and *A*. (*A*.) *italica* were discovered for the first time. The contact area between these two species is farther to the East than was expected and *A*. (*A*.) *alpina* is recorded for the first time from the Apennines (province Savona: Montenotte inferiore) (Fig. 5). Hybrids *Adscita alpina* × *italica* with intermediate female genitalic structures (Fig. 8) were found at five localities, four in the Ligurian Apennines (province Genova: Valle Gorgasso, Madonna della Guardia; province Savona: Piampaludo, Case del Oca) and one in the eastern Ligurian Alps (province Savona: Bardinetto) (black squares on Fig. 5).

Adscita (*Adscita*) *dujardini* Efetov & Tarmann, 2014, was found in large numbers in 2015 at its type-locality (more than 50 specimens on flowers of *Geranium sanguineum* L.). In spite of this fact, there were only two males (one in EFETOV-2 trap and one in EFETOV-S-2 trap) glued from 16-VI-2015 to 18-VI-2015. It means that the attractants have no strong attraction for the males of this species. However, the empty control trap (without attractants) indicates that it was not accidently that the specimens were attracted into traps with the attractants EFETOV-2 and EFETOV-S-2. The males of the endemic Italian species *Jordanita* (*Jordanita*) *tenuicornis* (Zeller, 1847) also reacted to two attractants: EFETOV-S-2 and EFETOV-S-S-2. The sex attractants for these two species were found for the first time.

It is worth mentioning about the study of diurnal rhythms of pheromone communication of some species of Procridinae in Italy. It is known that the time of the day when the males react to the sex pheromone is usually synchronized with the time when the conspecific females release pheromones. Therefore observations on calling females or the attraction of males to a pheromone (or synthetic attractant) source could be used for these investigations. On 08-09-VI-2015 a twenty four hour experiment with the attractant EFETOV-S-2 was carried out by G. M. Tarmann in the province Pordenone, Magredi di Cellina, Vivaro S. The researcher slowly crossing the biotope testing the attractant attached to his hat for 30 minutes, with a break for one hour thirty minutes. In total, 12 exposures of the sex attractant were carried out. The males of three species, viz. *A*. (*T*.) *mannii*, *Jordanita* (*Tremewania*) *notata* (Zeller, 1847), and *J*. (*J*.) *globulariae*, were found in the biotope and attracted to EFETOV-S-2 (Table 4). The males of *J*. (*T*.) *notata* and *J*. (*J*.) *globulariae* reacted to the lures from 2 to 5 a.m. while the males *A*. (*T*.) *mannii* were attracted from 6 to 7 p.m. In our further field observations, most of *A*. (*T*.) *mannii* males (27 from 33) were attracted between 3 and 7 p.m. This fact does not contradict the results received in the described experiment. Thus, the sexual activity of *A*. (*T*.) *mannii* is high late in the afternoon. The peak of the searching behaviour of *J*. (*T*.) *notata* and *J*. (*J*.) *globulariae* occurs at night before sunrise.

Table 4.– The diurnal rhythms of sexual activity of the three Procridinae species studied with the help of the attractant EFETOV-S-2 in province Pordenone on 08-09-VI-2015.

Time of observations	***Jordanita notata***	***Jordanita globulariae***	***Adscita mannii***
08:30-09:00	2 ♂♂ and 1 ♀ flying in the meadow	–	3 ♂♂ resting on the grass
10:30-11:00	2 ♂♂ flying in the meadow	–	6 ♂♂ sitting and flying in the meadow
12:30-13:00	–	–	1 ♂ flying in the meadow
14:30-15:00	–	–	–
16:30-17:00	–	–	–
18:30-19:00	1 ♀ sitting on the grass	–	12 ♂♂ attracted
20:30-21:00	–	–	–
22:30-23:00	–	–	–
00:30-01:00	–	–	–
02:30-03:00	6 ♂♂ attracted	1 ♂ attracted	–
04:30-05:00	1 ♂ attracted	3 ♂♂ attracted	–
06:30-07:00	–	–	Ca 20 (♂♂ and ♀♀) sitting on the grass

Conclusions

The males of three genera of Procridinae were attracted to the lures from the series "EFETOV-2", viz. *Rhagades* Wallengren, 1863 (one species), *Adscita* Retzius, 1783 (six species), and *Jordanita* Verity, 1946 (four species).

The synthetic sex attractants for four Zygaenidae species, viz. *A.* (*A.*) *italica*, *A.* (*A.*) *alpina*, *A.* (*A.*) *dujardini*, and *J.* (*J.*) *tenuicornis* (the latter is endemic to Italy), were found for the first time. These attractants are (2*R*)-butyl 2-dodecenoate and (2*S*)-butyl 2-dodecenoate alone or in a mixture.

New localities of the Italian Procridinae species were found, including the hybridisation zone between *A.* (*A.*) *italica* and *A.* (*A.*) *alpina*.

The presumed extinct species *Rh.* (*Rh.*) *pruni* was rediscovered after more than 100 years in Piemonte.

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Table 1.– Localities monitored by the sex attractants from the series "EFETOV-2" in 2015-2018 in Italy. Lures placed in traps are marked with an asterisk.

Region / Province / Locality	Code	GPS coordinates	Altitude	Habitat	Dates	Type of lures
Piemonte / Torino / Alpi Cozie, Valle di Susa, Bardonecchia SW, Pian del Colle	TO1	E 06º40'16" N 45º03'02"	1450 m	Historical dry flowery mountain meadow on terraces on the edge of the forest	09-VII-2016	EFETOV-S-2
Piemonte / Torino / Alpi Cozie, Valle di Susa, Eclause	TO2	E 06º53'36" N 45º05'10"	1385 m	Dry flowery meadows on the edge of bushes, rocky places and stone walls	09-VII-2016	EFETOV-S-2 EFETOV-S-S-2
Piemonte / Torino / Alpi Cozie, Valle di Susa, Fenils (NE Salbertrand)	TO3	E 06º54'18" N 45º05'03"	1125 m	Deciduous forest with clearings	08, 09-VII-2016	EFETOV-S-2 EFETOV-S-S-2
Piemonte / Cuneo / Valle Tanaro, Bagnasco W, road to Battifolio	CN	E 08º01'31" N 44º19'00"	766 m	Dry flowery meadows on the edge of the forest	31-V-2016 04, 06-VII-2016	EFETOV-S-2 EFETOV-S-S-2
Liguria / Imperia / Passo della Colletta	IM1	E 07º43'33" N 44º06'44"	1625 m	Mountain meadows East of the pass with rich vegetation	06-VII-2016	EFETOV-S-2
Liguria / Imperia / Colle Langan	IM2	E 07º43'36" N 43º58'06"	1080-1090 m	Flowery mountain meadows (large complex) in terraces	05-VII-2016	EFETOV-S-S-2
Liguria / Imperia / Monte Ceppo	IM3	E 07º45'38" N 43º56'03"	1470-1480 m	Flowery mountain meadow, rocky vegetation, and bushes	05-VII-2016 22-VI-2017	EFETOV-S-2 EFETOV-S-S-2
Liguria / Imperia / Drego S	IM4	E 07º48'31" N 43º59'37"	1060-1080 m	Dry mountain steppe, meadows, rocky vegetation, and bushes	30-V-2016 04-VII-2016 24-VI-2017	EFETOV-2 EFETOV-S-2 EFETOV-S-S-2
Liguria / Savona / Bormida valley, Callizzano, S of Camping Laghetti	SV1	E 08º07'13" N 44º14'11"	660 m	Meadow north of road	02-VI-2017	EFETOV-S-2
Liguria / Savona / Piampeludo S	SV2	E 08º34'55" N 44º27'44"	868 m	Flowery meadow with dry and moist parts	01-VI-2017	EFETOV-2 EFETOV-S-2 EFETOV-S-S-2
Emilia-Romagna / Parma / Viazzano E	PR	E 10º04'28" N 44º41'36"	170-180 m	Grassy slope with dry meadows on the edge of the forest	01-VI-2016	EETOV-2 EFETOV-S-2
Trentino-Alto Adige / Bolzano / Alto Adige, Vinschgau, Mals, Sesvenna, Taufers, Avignatal, Trockenhang	BZ1	E 10º26'37" N 46º38'41"	1450 m	Dry undisturbed steppe slope	16-VII-2016	EFETOV-S-2 EFETOV-S-S-2
Trentino-Alto Adige / Bolzano / Alto Adige, Vinschgau, Mals, Sesvenna, Plantapatsch (Bergstation Lift)	BZ2	E 10º29'37" N 46º42'37"	2120 m	Open grassy area at the border of the forest	22-VII-2015	EFETOV-S-2
Trentino-Alto Adige / Bolzano / Alto Adige, Vinschgau, Mals, Sesvenna, Prämajur W, Ochsenberg	BZ3	E 10º30'07" N 46º42'18"	1900 m	Roadside in the forest	22-VII-2015	EFETOV-S-2

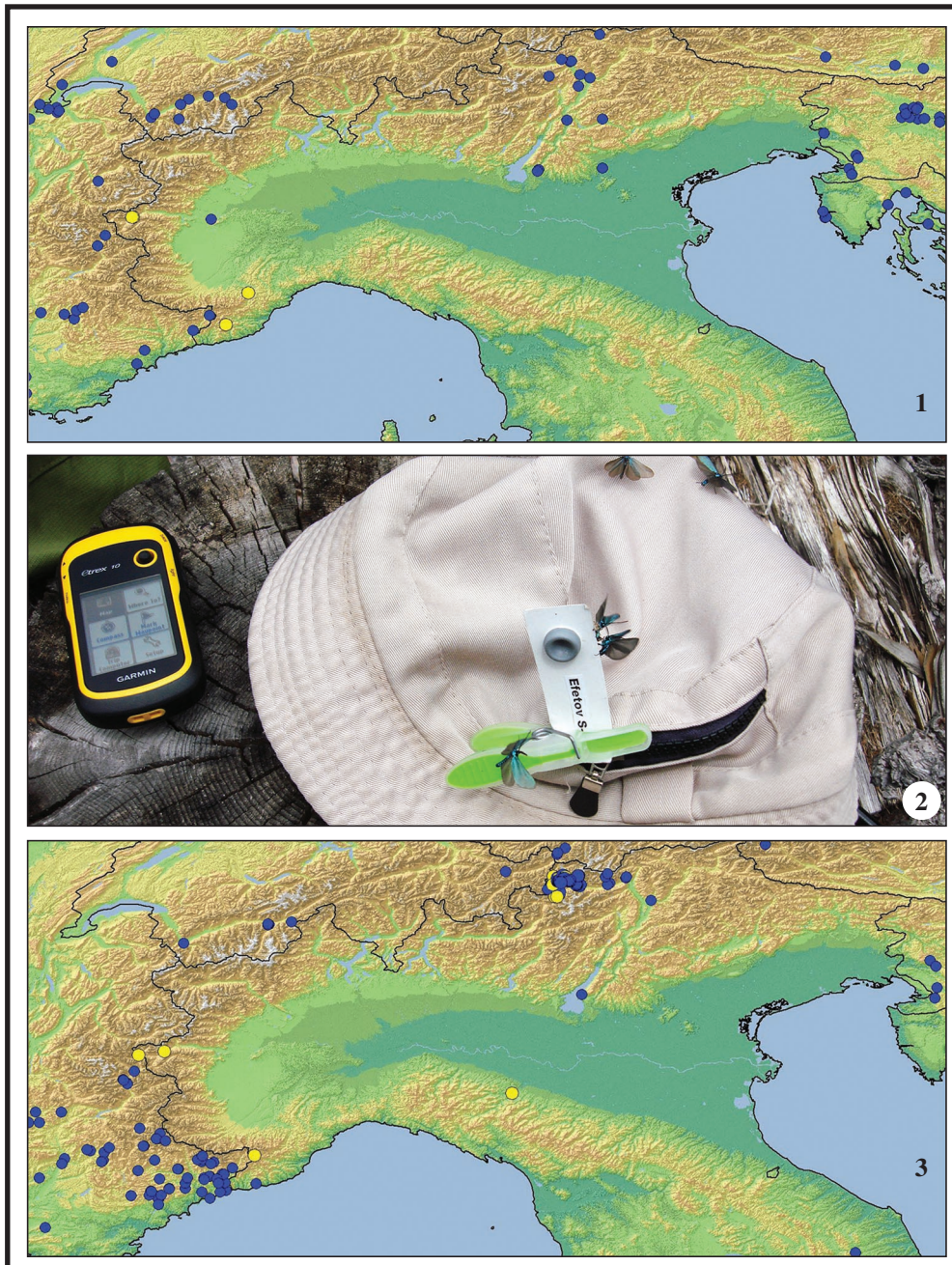
Trentino-Alto Adige / Bolzano / Alto Adige, Vinschgau, Mals, Sesvenna, Schleiserleiten W, Verschleis	BZ4	E 10°30'54" N 46°41'48"	1320 m	Steep SW exposed steppe slope with rich vegetation on the edge of the forest	01-VII-2016	EFETOV-S-2
Trentino-Alto Adige / Bolzano / Alto Adige, Vinschgau, Mals, Laatsch W, Calvaweide NEU	BZ5	E 10°30'13" N 46°40'02"	1010-1050 m	Newly created pasture due to road building activities with secondary vegetation	06-VII-2017	EFETOV-S-2
Trentino-Alto Adige / Bolzano / Alto Adige, Vinschgau, Mals, Laatsch SW, Arzweg, Pasarggwald SW	BZ6	E 10°31'20" N 46°39'52"	1080 m	Clearing in the forest	01-VIII-2018	EFETOV-S-2
Trentino-Alto Adige / Bolzano / Alto Adige, Vinschgau, Mals, Laatsch, Eselweg, Trockenhang	BZ7	E 10°31'21" N 46°40'41"	1340-1415 m	Steep slope with rich steppe vegetation on the edge of the forest	04-VIII-2016 13, 21-VII-2017 22-VI-2018	EFETOV-S-2 EFETOV-S-S-2
Trentino-Alto Adige / Bolzano / Alto Adige, Vinschgau, Mals, Laatsch, Eselweg, Schafhütte	BZ8	E 10°30'36" N 46°40'29"	1420-1440 m	Rocky steep steppe with rich vegetation on the edge of the forest	13-VII-2017 22-VI-2018	EFETOV-S-2 EFETOV-S-S-2
Trentino-Alto Adige / Bolzano / Alto Adige, Vinschgau, Mals, Laatsch, Oberberg	BZ9	E 10°30'31" N 46°40'38"	1635 m	Forestry trail in the forest with meadows with diverse vegetation	20-VII-2017	EFETOV-S-2
Trentino-Alto Adige / Bolzano / Alto Adige, Vinschgau, Mals, Laatsch, Terzaboden	BZ10	E 10°30'27" N 46°40'48"	1790 m	Pasture with fairly poor diversity	20-VII-2017	EFETOV-S-2
Trentino-Alto Adige / Bolzano / Alto Adige, Vinschgau, Mals, Laatsch, Plovadeng	BZ11	E 10°27'48" N 46°40'48"	2015 m	Meadow with fairly diverse vegetation	20-VII-2017	EFETOV-S-2
Trentino-Alto Adige / Bolzano / Alto Adige, Vinschgau, Mals, Laatsch, Terza S	BZ12	E 10°29'26" N 46°40'44"	2145 m	Meadow with fairly diverse vegetation	20-VII-2017	EFETOV-S-2
Trentino-Alto Adige / Bolzano / Alto Adige, Vinschgau, Mals, Malser Heide N, Burgeiser Marein N	BZ13	E 10°32'27" N 46°44'10"	1495 m	Flowery meadows	02-VIII-2016	EFETOV-S-2
Trentino-Alto Adige / Bolzano / Alto Adige, Vinschgau, Mals, "Hoache" (Hochacker)	BZ14	E 10°33'18" N 46°41'26"	1156-1175 m	Flowery meadows above town of Mals	09, 10-VI-2016	EFETOV-S-2
Trentino-Alto Adige / Bolzano / Alto Adige, Vinschgau, Mals, Ötztaler Alpen, Sankt Martin	BZ15	E 10°32'50" N 46°42'12"	1450 m	Flowery meadows above the chapel in the forest	27-VII-2016	EFETOV-S-2
Trentino-Alto Adige / Bolzano / Alto Adige, Vinschgau, Mals, Ötztaler Alpen, Griggles	BZ16	E 10°33'13" N 46°42'24"	1500 m	Flowery moist meadows in the forest	27-VII-2016	EFETOV-S-2
Trentino-Alto Adige / Bolzano / Alto Adige, Vinschgau, Mals, Ötztaler Alpen, Malettes W, Mitterhütt	BZ17	E 10°33'19" N 46°41'57"	1540 m	Flowery meadows	27-VII-2016	EFETOV-S-2 EFETOV-S-S-2
Trentino-Alto Adige / Bolzano / Alto Adige, Vinschgau, Mals, Ötztaler Alpen, Malettes, Mitterhütt SE	BZ18	E 10°33'26" N 46°41'52"	1545 m	Heavily overgrazed steep "meadow" between rocks and places with rocky soil	13-VII-2015	EFETOV-2 EFETOV-S-2
Trentino-Alto Adige / Bolzano / Alto Adige, Vinschgau, Mals, Ötztaler Alpen, Malettes NE, Hegefläche	BZ19	E 10°33'19" N 46°42'12"	1600 m	Flowery meadows	27-VII-2016	EFETOV-S-2

Trentino-Alto Adige / Bolzano / Alto Adige, Vinschgau, Mals, Malettes E, Raweingraben	BZ20	E 10°34'09" N 46°41'34"	1490 m	Open meadows with rich vegetation in the forest	13-VII-2015	EFETOV-2 EFETOV-S-2
Trentino-Alto Adige / Bolzano / Alto Adige, Vinschgau, Mals, Tartsch NE, Rauscheck-Graben	BZ21	E 10°34'10" N 46°41'13"	1222 m	Valley with flowery meadows with dry and moist parts	10-VI-2016	EFETOV-S-2
Trentino-Alto Adige / Bolzano / Alto Adige, Vinschgau, Mals, Tartsch, Rawein Trockenhang	BZ22	E 10°35'57" N 46°40'48"	1485 m	Dry steppe slope on the edge of the forest with bushes	12-VII-2017	EFETOV-S-2 EFETOV-S-S-2
Trentino-Alto Adige / Bolzano / Alto Adige, Vinschgau, Mals, Tartsch, Spätwiesen	BZ23	E 10°35'23" N 46°40'54"	1565 m	Pasture on the edge of the forest, dry meadows	12-VII-2017	EFETOV-S-2
Trentino-Alto Adige / Bolzano / Alto Adige, Vinschgau, Mals, Tartscher Wald NE	BZ24	E 10°36'04" N 46°40'58"	1610-1612m	Forest with dry meadows in clearings	12-VII-2017	EFETOV-S-2
Trentino-Alto Adige / Bolzano / Alto Adige, Vinschgau, Matschertal, Matscher Walweg, Valferz ESE	BZ25	E 10°38'33" N 46°42'41"	1715 m	Flowery band along the old irrigation channels on the edge of dry mountain meadows with rocks	13-VII-2015	EFETOV-2 EFETOV-S-2
Trentino-Alto Adige / Bolzano / Alto Adige, Vinschgau, Matscher Tal, Rastif ENE	BZ26	E 10°39'43" N 46°43'08"	1706 m	Flowery meadows beside the river	01-VII-2016 21-VI-2018	EFETOV-S-2
Trentino-Alto Adige / Bolzano / Alto Adige, Vinschgau, Matscher Tal, Außer Glieshof, Brücke	BZ27	E 10°40'42" N 46°43'21"	1788 m	Flowery meadow beside the river	21-VI-2018	EFETOV-S-2
Trentino-Alto Adige / Bolzano / Alto Adige, Vinschgau, Matscher Tal, Glies N, Tawarill	BZ28	E 10°40'57" N 46°43'38"	1825 m	Open meadows in the forest	14-VII-2015	EFETOV-2 EFETOV-S-2
Trentino-Alto Adige / Bolzano / Alto Adige, Vinschgau, Matscher Tal, Glies N, Tawarill	BZ29	E 10°41'06" N 46°43'50"	1900-2020 m	Steep slope with dry forest	14-VII-2015	EFETOV-S-2
Trentino-Alto Adige / Bolzano / Alto Adige, Vinschgau, Ortlergruppe, Stilfserjochstraße, Franzenshöhe NW, between U-turn 16 and 17	BZ30	E 10°28'27" N 46°32'01"	2330 m	Flowery meadows with rich vegetation above the road along a small creek	23-VII-2015	EFETOV-2 EFETOV-S-2
Trentino-Alto Adige / Bolzano / Alto Adige, Vinschgau, Ortlergruppe, Stilfserjochstraße, between U-turn 30	BZ31	E 10°29'16" N 46°31'55"	2000 m	Bend of the road with a parking place near the forest with flowery meadows	23-VII-2015	EFETOV-S-2
Trentino-Alto Adige / Bolzano / Alto Adige, Burg Sprechenstein SE	BZ32	E 11°54'30" N 45°53'23"	1320-1350 m	Flowery meadow	28-VI-2015	EFETOV-S-2
Friuli-Venezia Giulia / Pordenone / Magredi di Cellina, Vivaro S	PN	E 12°46'12" N 46°03'23"	120 m	Large plains with steppe vegetation mixed with dry and wet meadows	08, 09-VI-2015	EFETOV-S-2
Friuli-Venezia Giulia / Udine / Val Resia, Resia San Giorgio W	UD	E 13°16'43" N 46°22'37"	390 m	Flowery meadow at the roadside near the forest	24-VI-2015	EFETOV-S-2

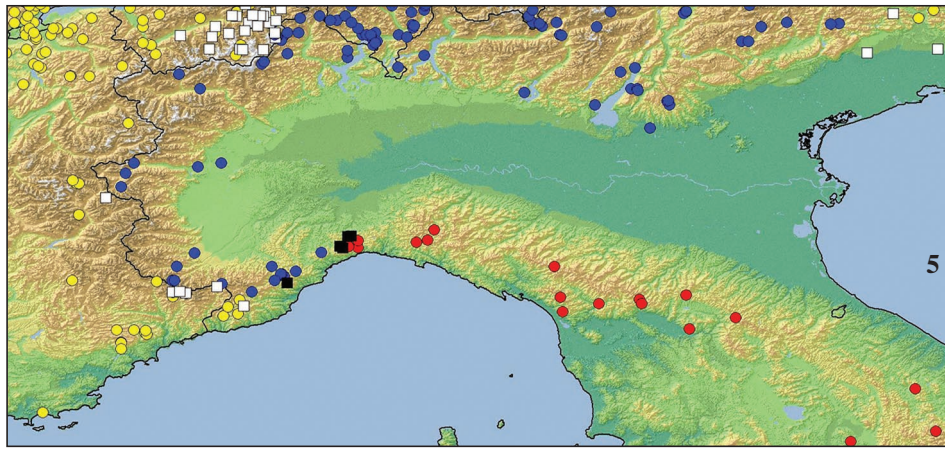
Marche / Macerata / Monte San Vicino W, ca. 3 km SW Pian dell'Elmo	MC	E 13º03'21" N 43º19'36"	1180-1190 m	Flowery mountain meadows	16-18-VI-2015	*EFETOV-2 *EFETOV-S-2 EFETOV-S-2
Abruzzo / L'Aquila / Sperone, 2 km S	AQ1	E 13º43'39" N 41º55'47"	1180-1190 m	Flowery meadows with bushes and rich vegetation	16, 17-VI-2015	*EFETOV-2 *EFETOV-S-2 EFETOV-S-2
Abruzzo / L'Aquila / La Montagnola, vic. Daino	AQ2	E 13º56'11" N 41º48'09"	1362-1365 m	Bushes on rocky calcareous ground and dry grassy-flowery open vegetation	28-VI-5-VII-2018	*EFETOV-2 *EFETOV-S-S-2 EFETOV-S-S-2
Calabria / Cosenza / La Sila Graeca, La Fossiata E	CS1	E 16º36'55" N 39º23'36"	1316-1334 m	Bushes and wet and dry grassy-flowery open vegetation beside small river	01-VII-2018	*EFETOV-2 *EFETOV-S-S-2 EFETOV-S-2
Calabria / Cosenza / La Sila Grande, Monte Botte Donato E	CS2	E 16º26'18" N 39º17'52"	1670-1695 m	Bushes and dry grassy-flowery open vegetation	02, 03-VII-2018	EFETOV-2 EFETOV-S-2 EFETOV-S-S-2

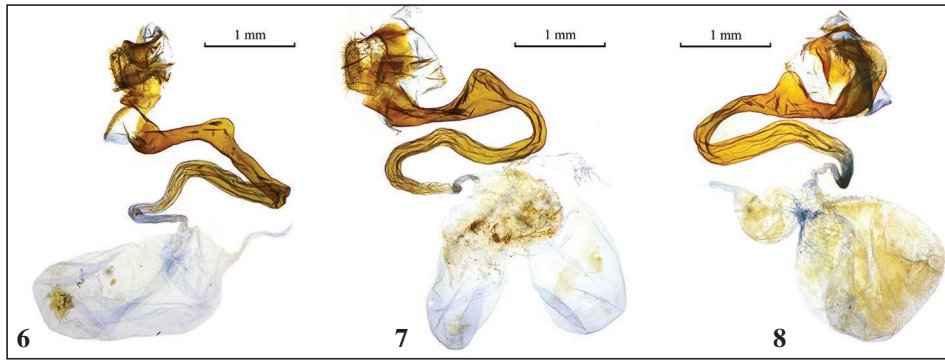
Table 2.– The males of Procridinae species attracted to the sex attractants from the series "EFETOV-2" in Italy in 2015-2018. Specimens collected by baited traps are marked with an asterisk.

Attracted species	EFETOV-2	EFETOV-S-2	EFETOV-S-S-2
Rhagades pruni	–	–	2016: 5 ♂♂ TO2, 3 ♂♂ TO3, 9 ♂♂ CN 2017: 1 ♂ IM4
Adscita statices	–	2016: 3 ♂♂ IM3 2017: 1 ♂ IM3	–
Adscita statices × *alpina*	–	2016: 4 ♂♂ IM4 (30-V), 1 ♂ IM4 (04-VII)	–
Adscita alpina	2015: 2 ♂♂ BZ25, 7 ♂♂ BZ30	2015: 2 ♂♂ BZ25, 9 ♂♂ BZ30 2016: 1 ♂ CN (31-V), 7 ♂♂ BZ14, 11 ♂♂ BZ21, 1 ♂ BZ26 2017: 2 ♂♂ SV1, 1 ♂ BZ5, 1 ♂ BZ8 2018: 2 ♂♂ BZ26, 3 ♂♂ BZ27	–
Adscita alpina × *italica*	2017: 7 ♂♂ SV2	–	–
Adscita italica	2018: 17* ♂♂ AQ2	2015: 1 ♂ AQ1 2018: 9 ♂♂ CS1, 11 ♂♂ CS2	2018: 17 ♂♂ AQ2
Adscita geryon	–	2015: 2 ♂♂ BZ25, 1 ♂ BZ29, 1 ♂ AQ1	–
Adscita dujardini	2015: 1* ♂ MC	2015: 1* ♂ MC	–
Adscita mannii	2018: 1* ♂ + 1 ♂ AQ2, 17 ♂♂ CS2	2015: 5 ♂♂ BZ32, 12 ♂♂ PN, 1 ♂ UD, 1 ♂ AQ1	2016: 1 ♂ IM2, 2 ♂♂ IM4 (04-VII) 2018: 2 ♂♂ CS2, 3 ♂♂ AQ2
Jordanita notata	–	2015: 1* ♂ MC, 7 ♂♂ PN	2016: 2 ♂♂ IM2 2018: 1 ♂ AQ2
Jordanita tenuicornis	–	2015: 1 ♂ AQ1	2018: 3 ♂♂ AQ2
Jordanita globulariae	–	2015: 4 ♂♂ PN	–
Jordanita subsolana	–	2015: 2 ♂♂ BZ2, 1 ♂ BZ3, 8 ♂♂ BZ18, 6 ♂♂ BZ20, 19 ♂♂ BZ28, 63 ♂♂ BZ29, 7 ♂♂ BZ31, 1 ♂ AQ1 2016: 1 ♂ TO1, 10 ♂♂ TO3, 2 ♂♂ IM1, 1 ♂ PR, 1 ♂ BZ1, 1 ♂ BZ4, 11 ♂♂ BZ7, 2 ♂♂ BZ13, 5 ♂♂ BZ15, 18 ♂♂ BZ16, 40 ♂♂ BZ17, 2 ♂♂ BZ19 2017: 20 ♂♂ BZ7 (13-VII), 7 ♂♂ BZ7 (21-VII), 69 ♂♂ BZ8, 100 ♂♂ BZ9, 2 ♂♂ BZ10, 6 ♂♂ BZ11, 1 ♂ BZ12, 1 ♂ BZ22, 1 ♂ BZ23, 4 ♂♂ BZ24 2018: 1 ♂ BZ7, 1 ♂ BZ8, 2 ♂♂ BZ6	–



Figures 1-3.– 1. Distribution map of *Rhagades pruni* in Italy with new data (yellow dots). **2.** The males of *Jordanita subsolana* attracted to the lure EFETOV-S-2, province Bolzano, Alto Adige, Vinschgau, Mals, Laatsch, Oberberg, 20-VII-2017. **3.** Distribution map of *Jordanita subsolana* in Italy with new data (yellow dots).





Figures 4-8.– 4. Sticky trap baited with EFETOV-2 with 17 ♂♂ of *Adscita italica* and 1 ♂ of *Adscita mannii*, province L'Aquila, La Montagnola, vic. Daino, 05-VII-2018. **5.** Distribution of *Adscita statices* (yellow dots), *Adscita alpina* (blue dots), *Adscita italica* (red dots), hybrids *Adscita statices* × *alpina* (white squares) and *Adscita alpina* × *italica* (black squares). **6.** Female genitalia of *Adscita alpina*. **7.** Female genitalia of *Adscita italica*. **8.** Female genitalia of *Adscita alpina* × *italica* hybrid.

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The Brazilian species of the genus *Arhacia* Herrich-Schäffer, 1855 with description of a new species (Lepidoptera: Notodontidae, Dicranurinae)

V. O. Becker

Abstract

Two species of *Arhacia* Herrich-Schäffer, 1855 are recorded from Brazil: *A. combusta* (Herrich-Schäffer, 1854) (= *postbrunnea* Rothschild, 1917, syn. n.), and *A. imitata* Becker, sp. n. Images of adults and genitalia are presented.
KEY WORDS: Lepidoptera, Notodontidae, Dicranurinae, *Arhacia*, new species, new synonym, Brazil, Neotropical.

Las especies brasileñas del género *Arhacia* Herrich-Schäffer, 1855, con la descripción de una especie nueva (Lepidoptera: Notodontidae, Dicranurinae)

Resumen

Dos especies de *Arhacia* Herrich-Schäffer, 1855 se registran para Brasil: *A. combusta* (Herrich-Schäffer, 1854) (= *postbrunnea* Rothschild, 1917, syn. n.) y *A. imitata* Becker, sp. n. Se presentan imágenes de los adultos y de la genitalia.
PALABRAS CLAVE: Lepidoptera, Notodontidae, Dicranurinae, *Arhacia*, nueva especie, nueva sinonimia, Brasil, Neotropical.

Introduction

The Neotropical genus *Arhacia* Herrich-Schäffer, 1855 included four species: *A. combusta* (Herrich-Schäffer, [1854]) from Brazil, *A. imitans* (Schaus, 1911) and *A. lignaris* Schaus, 1911, from Costa Rica, and *A. postbrunnea* Rothschild, 1917 from French Guiana (BECKER, 2014). In the author's collection two species from Brazil are present, one of them described below as new. *Arhacia* is related to *Truncaptera* Becker, 2014 both in external pattern and shape of genitalia, especially to the *fascis*-group. They can be easily distinguished by the antenna, short ciliated in *Arhacia* whereas long pectinated in the other.

Material and methods

This work is based on 29 specimens: 15 specimens (9 g. s.) in VOB, 14 specimens in AMC, and on the type-material in the USNM and the NHMUK. Synoptic collections, representing all the species were taken to these institutions and compared with the types deposited there. The holotype of the new species is 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
BA = Bahia State, Brazil
FW = Forewing
g. s. = genitalia slide
HW = Hind wing
MNHU = Museum für Naturkunde der Humboldt-Universität, Berlin, Germany
NHMUK = The Natural History Museum, London, UK (formally The British Museum of Natural History)
PR = Paraná State, Brazil
RJ = Rio de Janeiro State, Brazil
RS = Rio Grande do Sul State, Brazil
SP = São Paulo State, Brazil
TP = Type-species
USNM = United States National Museum, Washington, USA
VOB = Vitor O. Becker collection, Serra Bonita Reserve, Camacan, Bahia, Brazil

Results

The material in the author's collection indicates that two species of *Arhacia,* have been collected in Brazil: a dark brown one, *A. combusta*, and a paler one, almost identical to *A. imitans* from Costa Rica, which has been wrongly identified, in all collection examined, as *A. combusta*. Differences in the genitalia confirmed their difference. There are two main reasons for such misidentifications: the absence of material of *A. combusta* in all collections, and the illustrations by DRAUDT (1932: pl. 147e), who figured the female of *A. combusta* and a paler male, with hind wings pale yellow, representing the undescribed species.

Arhacia Herrich-Schäffer, 1855
Aussereur. Schmett., **1**: 11
TS: *Anodonta combusta* Herrich-Schäffer, 1854. *Aussereur. Schmett*., **1**: 78, figs 81-82

Arhacia combusta (Herrich-Schäffer, 1854) (Figs 1-3, 14)

Anodonta combusta Herrich-Schäffer, 1854. *Aussereur. Schmett*., **1**: 78, figs 81-82. Syntype ♀, BRAZIL: No further data (MNHU) [examined]

Arhacia postbrunnea Rothschild, 1917. *Novit. Zool*., **26**: 238, pl. 8, fig. 16. Holotype ♂, FRENCH GUIANA: St. Jean du Maroni (NHMUK) [examined], **syn. n.**

Diagnosis: Male 25 mm (56 mm wingspan) (Fig. 1), female FW 28-30 mm (60-66 mm wingspan) (Figs 2-3). Dark fuscous brown. FW bordered with double dark brown band; a dark brown dash at the middle of the wing, just below cell, from base to short distance before termen. Genitalia (Fig. 14) proportionally too small in relation to moth size and abdomen volume; ostium narrow; ductus short, twisted; corpus bursae globose, walls very thin; signum absent.

Material studied: 3 ♀♀ (2 g. s.), BRAZIL: BA, Boa Nova, caatinga, 14º36'S - 40º26'W, 750 m, 4-8-XII-2013 (Becker 150592; g. s. 5386, 5387).

Remarks: *A. combusta* was described from an unspecified number of specimens, at least one male and one female, as illustrated by HERRICH-SCHÄFFER (1854: figs 81-82). These illustrations clearly belong to the same species, showing both wings dark brown. SCHINTLMEISTER (2013: 46, fig. on front cover, inside), who examined the material deposited in all the European museums, found only one female at the MNHU. There is no information, either in the original description or in the labels, where the type-series was collected in Brazil. The type-locality of it is synonym, *A.*

postbrunnea, indicates it is an Amazonian species. The three specimens mentioned above, were collected in the Caatinga, a Brazilian biome poorly sampled.

***Arhacia imitata* Becker, sp. n.** (Figs 4, 5, 7-9, 13)

Material studied: Holotype ♂, BRAZIL: SP, São Luis do Paraitinga, 23º20'S - 45º06'W, 900 m, 12-17-XI-2001 (Becker 133850) (VOB). Paratypes: 1 ♂, 1 ♀, BA, Camacã, 15º23'S - 39º33'W, 800 m, 15-XI-1995, XI-2011 (Becker 106014 (g. s. 5392), 147001 (g. s. 5390)) (VOB); RJ, Nova Friburgo, 800 m, 22-I-1993 (Becker 85766 (g. s. 5391) (VOB); 4 ♂♂, PR, Telemaco Borba, 750 m, 15-XI-1995 (Becker 97149 (g. s. 4086) (VOB); 4 ♂♂, SP, São José do Barreiro, 22º43'S 44º36'W, 1580 m, 15-30-III-2020 (Thöny) (AMC, VOB); 1 ♂, SC, São Bento do Sul, Serra do Rio Natal, 26º19'S - 49º18'W, 600 m (Moser, Mielke & Casagrande) (AMC); 1 ♀, Idem, São Bento do Sul, Rio Vermelho, 800 m, III-2005 (Rank & Moser) (AMC); 5 ♂♂, 1 ♀, RS, Morro Reuter, Fazenda Padre Eterno, 29º32'S - 50º58'S, 500-600 m, 25-IX-1982, 24-X-1992, 8-X-1994, 20-X-2001, 11-14-X-2005 (Moser) (AMC); 1 ♂, Idem, São Francisco de Paula, Rio Santa Cruz, 700 m, 24-25-X-2005 (Moser) (AMC); 1 ♂, Idem, Encruzilhada do Sul, 30º47'S – 52º36'W, 9-10-XI-2018 (Moser) (AMC).

Diagnosis: Pale ochreous; FW bordered with a narrow, brown band; a brown dash along middle, just below cell, from base to a short distance before termen; HW pale yellow, tinged brown on tornus. Thorax and abdomen, dorsaly, with a broad, rusty brown band along middle.

Description: FW male: 25-30 mm (55-62 mm wingspan) (Fig. 4), female: 28 mm (60 mm wingspan) (Fig. 5). Head dark brown; frons, in the middle, vertex, and labial palpi, ventraly, pale yellow; antenna ochreous. Thorax pale yellow; a broad dark brown band along middle; patagia dark brown; tegula tinged brown. Fore legs, mid and hind tarsi brown. FW pale ochreous, bordered with narrow, brown band, double along termen and tornus; long, brown dash in the middle, just below cell. Abdomen rusty brown dorsally; pale yellow ventraly; distal margin of 8th sternite with a pair of flat protrusions, rounded apically (Fig. 9).

Male genitalia (Figs 7, 8): Uncus short, in the shape of pyramid, mid ridge triangular, short; valva a short triangle, costa with a blunt triangular expansion distal; juxta square; vinculum round. Aedeagus thin, as long as genitalia, sinuose, apex curved; inception of ductus seminalis at basal third; vesica with no spines.

Female genitalia (Fig. 13): Ostium bursae ring-shaped with square expansion distal; ductus bursae thick distad, basal 2/3 twisted, sclerotized; corpus bursae globose, signum absent.

Distribution: Brazil, from southern Bahia to Rio Grande do Sul, along the Atlantic Forest biome.

Remarks: Female genitalia bigger than those of *A. combusta,* and with ductus bursae much longer. *A. imitata* is similar to *A. imitans* (Fig. 6), described from Costa Rica, but slightly larger, on average, and with genitalia (Figs 10, 11), as well as distal margin of 8th sternite (Fig. 12) distinct. This has mid ridge of uncus longer, and aedeagus straight, not bent at apex, and vesica bearing an area with small spines. In VOB there are four males, three from Costa Rica, Cartago, Turrialba (Becker 23023, g. s. 5388, 5389), and one from Belize (Becker 23906, g. s. 4087).

Etymology: From the Latin *imitor -atus* = mimic, imitate, about its smilarity with the other species in the genus; feminine.

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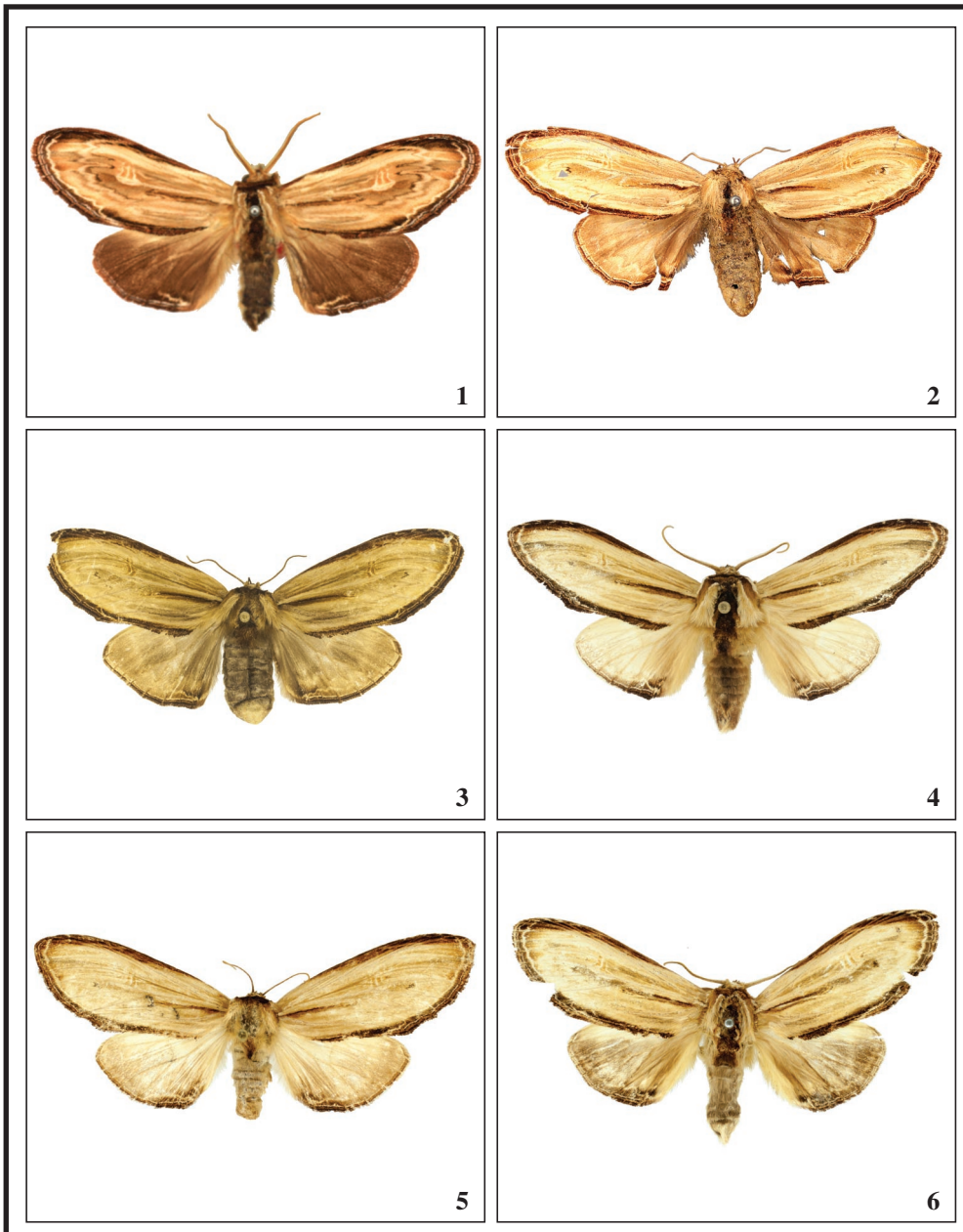
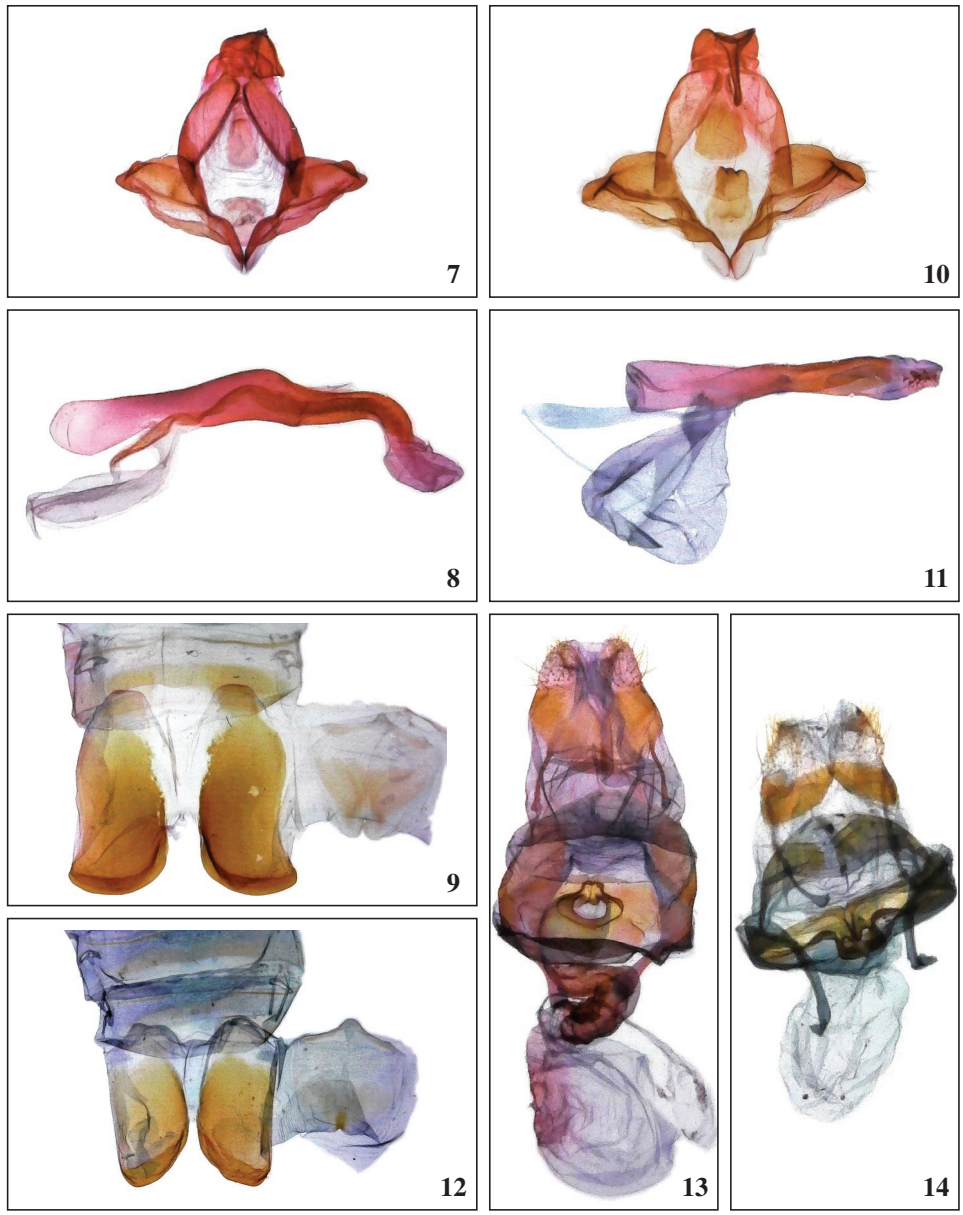


Figs 1-6.– Adults of *Arhacia* species, dorsal view: **1.** *A. combusta* (Herrich-Schäffer) (= *postbrunnea* Rothschild, ♂ holotype), French Guiana; **2.** *A. combusta* (Herrich-Schäffer), ♀ Syntype, Brazil; **3.** *A. combusta* (Herrich-Schäffer), ♀, Brazil, BA, Boa Nova; **4.** *A. imitata* Becker, sp. n., ♂, Holotype, Brazil, SP, São Luiz do Paraitinga; **5.** *A. imitata* Becker, sp. n., ♀ Paratype, Brazil, BA, Camacã; **6.** *A. imitans* (Schaus), ♂, Costa Rica, Cartago, Turrialba.



Figs 7-14.– Genitalia, ventral view, and 8th abdominal segments of *Arhacia* species: **7.** *A. imitata* Becker, sp. n., genitalia, paratype ♂, Brazil; **8.** *A. imitata* Becker, sp. n., aedeagus, lateral view; **9.** *A. imitata* Becker, sp. n., 8th segment (left, sternite; right, tergite); **10.** *A. imitans* (Schaus), ♂ genitalia, Costa Rica; **11.** *A. imitans* (Schaus), aedeagus, lateral view; **12.** *A. imitans* (Schaus), 8th segment (left, sternite; right, tergite); **13.** *A. imitata* Becker, sp. n., ♀ genitalia, paratype, Brazil; **14.** *A. combusta* (Herrich-Schäffer), ♀ genitalia, Brazil, BA, Boa Nova.

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Una nueva especie de *Copitarsia* Hampson, 1906 en América y consideraciones sobre *Copitarsia decolora* (Guenée, 1852) (Lepidoptera: Noctuidae, Cucullinae)

A. O. Angulo & T. S. Olivares

Resumen

Se describe una nueva especie de *Copitarsia* Hampson, 1906, basada en especímenes recoletados en Colombia y México; *C. euryonix* Angulo & Olivares, sp. n. Se han revisado 13 ejemplares de *Copitarsia*, incluyendo los ejemplares tipos de *Copitarsia uncilata* Burgos & Leiva, 2010. Se proporcionan caracteres diagnósticos, fotos de adultos y genitalia. Esta nueva especie es afin a *Copitarsia decolora* (Guenée, 1852) y es comparada diferencialmente con ella.
PALABRAS CLAVES: Lepidoptera, Noctuidae, Cuculliinae, *Copitarsia*, nueva especie, Colombia, México.

A new species of *Copitarsia* Hampson, 1906 in America and some accounts on *Copitarsia decolora* (Gueneé, 1852) (Lepidoptera: Noctuidae, Cuculliinae)

Abstract

A new species of *Copitarsia* Hampson, 1906 is described based on specimens collected in Colombia and México. *C. euryonix* Angulo & Olivares, sp. n., 13 males of *Copitarsia* genus included types of *C. uncilata* Burgos & Leiva, 2010 are revised. Diagnostic characters of this new species are given, and photographies of adult and male genitalia are provided. This new species is akin to *Copitarsia decolora* (Guenée, 1852) and is compared differentially with it.
KEY WORDS: Lepidoptera, Noctuidae, Cuculiinae, *Copitarsia*, new species, Colombia, Mexico.

Introducción

Las plagas de insectos endémicas de un país, potencialmente son de un gran interés para los cultivos agrícolas de otros países, asimismo muchas de ellas son cuarentenarias; entre éstas se encuentran algunas especies del género *Copitarsia* Hampson, 1906, que tienen una fuerte incidencia en la prosperidad de los cultivos agrícolas, por lo cual es necesario conocer las especies que se encuentran en los países americanos; de los dos grupos de especies que posee este género, ANGULO & OLIVARES (2003) indican que el grupo especie *decolora* es el más importante en cuanto a su estatus de especies de interés agrícola; es así que este grupo de especies debe ser atendido adecuadamente en su estatus sistemático entre sus componentes.

En un reciente trabajo POGUE (2014) - para el grupo especie *decolora* - indica que *Copitarsia paraturbata* Castillo & Angulo, 1991 es una sinonimia de *C. incommoda* (Walker, 1865) y que *C. uncila-*

ta Burgos & Leiva, 2010 es una sinonimia de *C. decolora* (Guenée, 1852)*;* finalmente describe una nueva especie *C. gibberosa* Pogue, 2014.

Con lo anteriormente mencionado el grupo-especie *decolora* ahora está compuesto por las siguientes cuatro especies:

Copitarsia corruda Pogue & Simmons, 2008
Copitarsia decolora (Guenée, 1852)
= *Copitarsia uncilata* Burgos & Leiva, 2010, *in partim*
Copitarsia gibberosa Pogue, 2014
Copitarsia incommoda (Walker, 1865)
= *Copitarsia paraturbata* Castillo & Angulo, 1991

Materiales y métodos

Material Examinado: 13 ♂♂ con sus correspondientes preparaciones de genitalia, del material depositado en el Museo de Zoología de la Universidad de Concepción, Concepción, Chile (MZUC-UCCC).

Entre los métodos habituales del trabajo taxonómico y sistemático, se realizaron las preparaciones de la genitalia del macho de acuerdo a ANGULO & WEIGERT (1977); además se utilizó la clave de POGUE (2014) basada en la genitalia del macho, para la correspondiente identificación de los ejemplares estudiados.

Resultados

Copitarsia euryonix Angulo & Olivares, sp. n.

Material examinado: Holotipo 1 ♂ (fig. 5) Colombia, Cundinamarca, Facatativa, Los Moyos, Km 20, Autopista Bogotá - Medellín, a 200 m aprox., N04º 40' 56'' W74º 21' 34'' cruce al Rosal, CI La Plazoleta Ltda, Finca Luisa María, a 2.600 m, 6-I-2005, C. Jara leg.; fitófago en *Alstroemeria* sp var Amor.

Paratipos: 5 ♂♂: Colombia, Cundinamarca, Bogotá, Rosal, 1 ♂, es el Paratipo de *Copitarsia uncilata* Burgos & Leiva, 2010, MZUC-UCCC nº 42404 (Copi 4); Cundinamarca, Sopo, 1 ♂, es el Paratipo de *Copitarsia uncilata* Burgos & Leiva, 2010, 26-X-2006, MZUC-UCCC nº 42405 (Copi 32). México, Texcoco, Col. Postgraduados, 1 ♂, es el Paratipo de *C. uncilata* Burgos & Leiva, 2010, 27-VIII-2002, R. Flores leg., MZUC-UCCC Nº 42413 (Copi 11). Colombia, Cundinamarca, Funza, Vereda, Siete Trojes, Finca Santa Bárbara Ltda N04º 43' 09''W 74º 12' 58'', a 2.550 m, 1 ♂, 17-I-2005, C. Jara leg., Fitófago en *Alstroemeria* sp var Yellow; Cundinamarca, Sopó, San Gabriel, 1 ♂.

Diagnosis: Alas anteriores con bandas subterminal delimitadas con escamas castaño-oscuras y en el centro con escamas castaño-claras; bandas subterminal y posterior transversa festoneada, intermitente, con escamas castaño-oscuras,, mancha orbicular levemente delimitada con escamas castaño-oscuras con una mancha ovalada en el centro, reniforme difusa, no delimitada, banda terminal definida por triángulos de escamas negras (Fig.1)

Genitalia del macho: Un tipo de uncus deprimido- laminar [lo que no es común], unicorporal continuo de ápice ancho y laminar con una pequeña y corta puntita apical central (Fig. 3); el digitus - terminalmente algo cóncavo - posee una extensión digitiforme dorsal muy corta (Fig. 4); próxima a *C. decolora.*

El tipo de uncus unicorporal continuo de ápice ancho y laminar con una pequeña y corta punta apical central (Fig. 3); este carácter lo presentan ejemplares de Colombia y México; además el digitus posee una extensión digitiforme dorsal muy corta (Fig. 4); lo que es propio y típico de *Copitarsia euryonix* Angulo & Olivares, sp. n.

Etimologia: Del latín *eury*: ancho; *onix*: uña, debido a que el uncus es deprimido.

Copitarsia decolora (Guenée, 1852) (Fig. 2)
Mamestra decolora Guenée, 1852. *Hist. Nat. Ins. Spec. Gén. Lépid*., **5**: 190
L.T.: Colombia

El uncus laminar de *C. decolora* es grueso bicorporal - al parecer articulado - en que el uncus medioapical se "inserta o articula" con una lámina ovalada ancha apical que finaliza con una pequeña y corta punta apical central (Fig. 5), este tipo de uncus se asemeja a una cabeza de flecha o lanza, este carácter lo poseen los ejemplares de Colombia y México; el digitus - terminal y evidentemente cóncavo - presenta una extensión digitiforme dorsal notable (Fig. 6)y lo que es propio y típico de *Copitarsia decolora*; estos caracteres están descritos y representados en la figura 5 en la descripción original de *C. uncilata* Burgos & Leiva, 2010 y corresponde a *C. decolora* (ver POGUE, 2004, fig. 4; POGUE, 2014, fig. 3f); aquí se encuentra el holotypus y algunos de los paratypi utilizados para la descripción de *C. uncilata* Burgos & Leiva, 2010.

Material examinado: 7 ♂♂: 1 ♂, es el holotipo de *C. uncilata* Burgos & Leiva, 2010 (ver fig. 6], COLOMBIA, 25-VII-2007, C. I. Jardines Los Andes, *Copitarsia uncilata*, MZUC-UCCC nº 42400 (Copi 15); 1 ♂, COLOMBIA, Cundinamarca, Facatativa, Los Moyos, 200 m, es el Paratipo de *C. uncilata*; *Copitarsia uncilata* Burgos & Leiva, 2010], MZUC-UCCC nº 42402 (copi 30); 1 ♂, es el Paratipo de *C. uncilata* Burgos & Leiva, 2010], COLOMBIA, Cundinamarca. Munchia, *Alstroemeria* sp., MZUC_UCCC nº 42406 (copi6); 1 ♂, es el Paratipo de *C. uncilata* Burgos & Leiva, 2010. MÉXICO, Montecillo, Texcoco, J. L. Velez, 12-VI-2008, MZUC-UCCC nº 42408 (copi10); 1 ♂, es el Paratipo de *C. uncilata* Burgos & Leiva, 2010. COLOMBIA, Cundinamarca, Facativa, Los Moyos, 16-X-2004, MZUC-UCCC nº 42407 (copi31); 1 ♂, es el Paratipo de *C. uncilata* Burgos & Leiva, 2010; Cundinamarca, Facativa, Los Moyos, 13-X-2004, MZUC-UCCC nº 4240 3(copi33); 1 ♂, es el Paratipo de *C. uncilata* Burgos & Leiva, 2010. MÉXICO, Chapingo, Nestor Bautista, 15-XI-1992, MZUC-UCCC nº 42412 (copi9).

Conclusiones

El carácter del uncus- tan peculiar de *C. decolora* lo presentan algunos ejemplares de México (Texcoco) y Colombia (Jardín de los Andes) que eran parte de los ejemplares paratypi con que se describió *C. uncilata* Burgos & Leiva (in partim).

Con la descripción de esta nueva especie el grupo especie *decolora* queda constituido por cinco especies:

Copitarsia corruda Pogue & Simmons, 2008
Copitarsia decolora (Guenée, 1852)
***Copitarsia euryonix* Angulo & Olivares, sp. n.**
Copitarsia gibberosa Pogue, 2014
Copitarsia incommoda (Walker, 1865)

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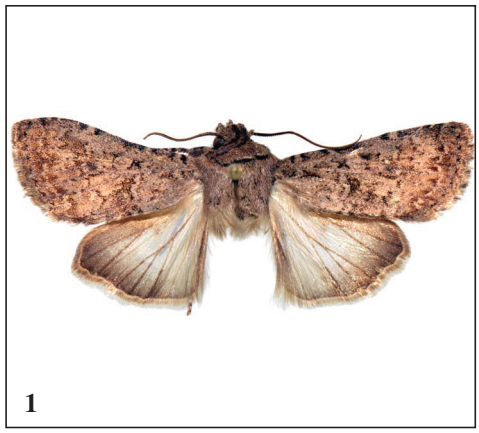

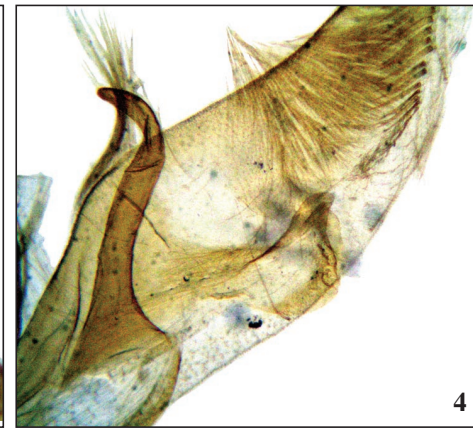

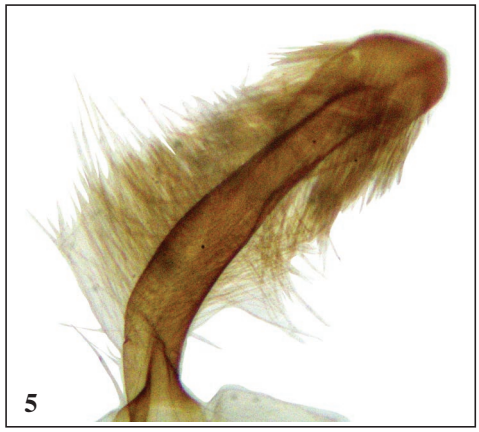

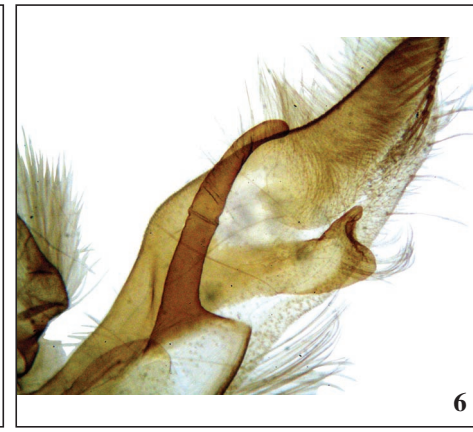

Figs 1-6.– *Copitarsia euryonix* Angulo & Olivares, sp. n. **1.** Adulto ♂. **3.** Uncus. **4.** Digitus. *Copitarsia decolora* (Gn.). **2.** Adulto ♂. **5.** Uncus; **6.** Digitus.

SHILAP Revista de lepidopterología, 48 (192) diciembre 2020: 762-768 eISSN: 2340-4078 ISSN: 0300-5267

SUMARIO DEL VOLUMEN 48 / *CONTENTS OF VOLUME 48*

– **J. Agius & J. Formosa.–** *Stemmatophora combustalis* (Fischer von Röslerstamm, 1842) new to the Maltese Islands (Lepidoptera: Pyralidae) / Stemmatophora combustalis *(Fischer von Röslerstamm, 1842) nueva para Malta (Lepidoptera: Pyralidae)* 223-224

– **A. O. Angulo & T. S. Olivares.–** Una nueva especie de *Copitarsia* Hampson, 1906 en América y consideraciones sobre *Copitarsia decolora* (Guenée, 1852) (Lepidoptera: Noctuidae, Cucullinae) / *A new species of* Copitarsia *Hampson, 1906 in America and some accounts on* Copitarsia decolora *(Guenée, 1852) (Lepidoptera: Noctuidae, Cucullinae)* 757-761

– **G. Baldizzone.–** The South American Coleophoridae of the Zoological Museum of Copenhagen. Contribution to the knowledge of the Coleophoridae. CXLIII (Lepidoptera: Coleophoridae) / *Los Coleophoridae suramericanos del Museo Zoológico de Copenhague. Contribución al conocimiento de los Coleophoridae. CXLIII (Lepidoptera: Coleophoridae)* 197-222

– **G. Baldizzone.–** *Coleophora antiqua* Baldizzone, sp. n. a new species from Algeria. Contribution to the knowledge of the Colephoridae CXLIV (Lepidoptera: Coleophoridae) / Coleophora antiqua *Baldizzone, sp. n. una nueva especie de Argelia. Contribución al conocimiento de los Coleophoridae CXLIV (Lepidoptera: Coleophoridae)* 375-378

– **G. Bassi.–** Notes on Afrotropical Crambinae. A new species of *Sebrus* Błeszyński, 1970 from Malawi (Lepidoptera;: Pyraloidea) / *Notas sobre los Crambinae afrotropicales. Una nueva especie de* Sebr*us Błeszyński, 1970 in Malawi (Lepidoptera: Pyraloidea)* 119-123

– **V. O. Becker.–** The Brazilian species of the genus *Eustema* Schaus, 1901, with description of a new genus and species (Lepidoptera: Notodontidae, Heterocampinae) / *Las especies brasileñas del género* Eustema *Schaus, 1901, con la descripción de un género y una especie nuevos (Lepidoptera: Notodontidae, Heterocampinae)* 569-576

– **V. O. Becker.–** Notes and new species of the Neotropical genus *Nycterotis* Felder, 1874 (Lepidoptera: Notodontidae, Nystaleinae) / *Notas y especies nuevas del género Neotropical* Nycterotis *Felder, 1874 (Lepidoptera: Notodontidae, Nystaleinae)* 699-708

– **V. O. Becker.–** The Brazilian species of the genus *Arhacia* Herrich-Schäffer, 1855 with description of a new species (Lepidoptera: Notodontidae, Dicranurinae) / *Las especies brasileñas del género* Arhacia *Herrich-Schäffer, 1855, con la descripción de una especie nueva (Lepidoptera: Notodontidae, Dicranurinae)* 751-756

– **M. Bippus.–** Review of the Genus *Orygocera* Walsingham, 1897 from the Mascarenes with description of a new species (Lepidoptera: Depressariidae, Stenomatinae) / *Revisión del género* Orygocera *Walsingham, 1897 de las Mascareñas con descripción de una nueva especie (Lepidoptera: Depressariidae, Stenomatinae)* 403-409

– **M. F. V. Corley & S. Ferreira.–** Taxonomic notes on Portuguese Microlepidoptera II. *Cochylimorpha punctiferana* (Ragonot, 1881) stat. rev., a neglected Portuguese species (Lepidoptera: Tortricidae) / *Notas taxonómicas sobre Microlepidoptera de Portugal II.* Cochylimorpha punctiferana *(Ragonot, 1881) stat. rev., uma espécie negligenciada (Lepidoptera: Tortricidae)* / Notas taxonómicas sobre Microlepidoptera de Portugal II. *Cochylimorpha punctiferana* (Ragonot, 1881) stat. rev., una especie descuidada (Lepidoptera: Tortricidae) 147-151

– **M. F. V. Corley, J. Numes, J. Rosete, R. Terry & S. Ferreira.–** New and interesting Portuguese Lepidoptera records from 2019 (Insecta: Lepidoptera) / *Novos e interessantes registos portugueses de Lepidoptera em 2019 (Insecta: Lepidoptera)* / Nuevas e interesantes citas portuguesas de Lepidoptera en 2019 (Insecta: Lepidoptera) .. 609-641

– **L. Cui, D. Xue & N. Jiang.–** Two new species of the tribe Rhodometrini Agenjo, 1951 from Sichuan, China (Lepidoptera: Geometridae) / *Dos nuevas especies de la tribu Rhodometrini Agenjo, 1951 de Sichuan, China (Lepidoptera: Geometridae)* 167-172

– **K. A. Efetov, E. E. Kucherenko & G. M. Tarmann.–** An application of the synthetic sex attractans from the series "EFETOV-2" for studying Procridinae in Italy (Lepidoptera: Zygaenidae) / *Una aplicación del atrayente sexual de la serie "EFETOV-2" para estudiar los Procridinae de Italia (Lepidoptera: Zygaenidae)* 733-749

– **K. A. Efetov & G. M. Tarmann.–** On the biology, ecology and conservation of *Jordanita (Gregorita) hispanica* (Alberti, 1937) (Lepidoptera: Zygaenidae, Procridinae) / *Sobre la biología, ecología y conservación de* Jordanita (Gregorita) hispanica *(Alberti, 1937) (Lepidoptera: Zygaenidae, Procridinae)* 351-361

– **K. A. Efetov & G. M. Tarmann.–** On the biology, ecology and early stages of *Rhagades (Wiegelia) predotae*

(Naufock, 1930) (Lepidoptera: Zygaenidae, Procridinae) / *Sobre la biología, ecología y primeros estadios de* Rhagades (Wiegelia) predotae *(Naufock, 1930) (Lepidoptera: Zygaenidae, Procridinae)* 513-524

– **A. Expósito-Hermosa.–** Una nueva especie del género *Synegia* Guenée, 1858 de las Islas Molucas: Ceram-Seram, Indonesia (Lepidoptera: Geometridae, Ennominae, Baptini) / *A new species of the genus* Synegia *Guenée, 1858 from Moluccas Islands: Ceram-Seram, Indonesia (Lepidoptera: Geometridae, Ennominae, Baptini)* 253-255

– **A. Expósito Hermosa.–** Una nueva especie del género *Tridrepana* Swinhoe, 1895 de las islas de Samar, Leyte y Panay (Filipinas) (Lepidoptera: Drepanidae, Drepaninae) */ A new species of the genus* Tridrepana *Swinhoe, 1895 from the Samar, Leyte and Panay Islands (Philippines) (Lepidoptera: Drepanidae, Drepaninae)* 525-528

– **A. Expósito-Hermosa.–** Una nueva especie del género *Naxa* Walker, 1856, de las montañas Arfak, Papúa Occidental (Indonesia) (Lepidoptera: Geometridae, Orthostixinae) / *A new species of the genus* Naxa *Walker, 1856 from the Arfak Mountains, West Papua (Indonesia) (Lepidoptera: Geometridae, Orthostixinae)*..... 689-691

– **P. Falck, R. Gaedike & A. Vives Moreno.–** New data on Tineidae and Meessiidae from the Canary Islands, Spain (Lepidoptera: Tineoidea) / *Nuevos datos sobre Tineidae y Meessiidae de las Islas Canarias, España (Lepidoptera: Tineoidea)*..... 487-497

– **P. Falck & A. Hausmann.–** *Scopula villumi* Falck & Hausmann, sp. n. from Tenerife, Canary Islands, Spain (Lepidoptera: Geometridae, Sterrhinae) / Scopula villumi *Falck & Hausmann, sp. n. de Tenerife, Islas Canarias, España (Lepidoptera: Geometridae, Sterrhinae)* 507-511

– **P. Falck, O. Karsholt & J. Rota.–** A new species of *Anthophila* Haworth, 1811 with variable male genitalia from the Canary Islands (Spain) (Lepidoptera: Choreutidae) / *Una nueva especie de* Anthophila *Haworth, 1811 con la variable genitalia del macho de las Islas Canarias (España) (Lepidoptera: Choreutidae)*..... 671-681

– **R. Gaedike.–** The Tineoidea of Morocco (Lepidoptera: Meessiidae, Tineidae) / *Los Tineoidea de Marruecos (Lepidoptera: Meessiidae, Tineidae)* 179-189

– **R. Gaedike.–** New or poorly known West Palaearctic Meessiidae (Lepidoptera: Tineoidea) / *Meessiidae nuevos o pobremente conocidos del oeste Paleártico (Lepidoptera: Tineoidea)* 683-687

– **M. Garre, H. Rietz, R. M. Rubio, J. J. Guerrero & A. S. Ortiz.–** Nuevos datos de la familia Geometridae del Parque Nacional y Parque Natural de Sierra Nevada (Almería-Granada, España) (Lepidoptera: Geometridae) / *New records of the family Geometridae from the National Park and Natural Park of Sierra Nevada (Almeria-Granada, Spain) (Lepidoptera: Geometridae)* 379-384

– **M. Garre, R. M. Rubio, J. J. Guerrero & A. S. Ortiz.–** Estudio preliminar de los Macroheterocera del Parque Natural Sierra María-Los Vélez (Almería, España) (Insecta: Lepidoptera) / *Preliminary study of the Macroheterocera from the "Sierra María-Los Vélez" Natural Park (Almeria, Spain) (Insecta: Lepidoptera)*..... 411-424

– **J. Gastón, V. Redondo & Tx. Revilla.–** Dos nuevos microlepidópteros para la Península Ibérica: *Epinotia cinereana* (Haworth, 1811) y *Denisia similella* (Hübner, 1796) (Lepidoptera: Tortricidae, Oecophoridae) / *Two new microlepidoptera for the Iberian Peninsula:* Epinotia cinereana *(Haworth, 1811) and* Denisia similella *(Hübner, 1796) (Lepidoptera: Tortricidae, Oecophoridae)* 65-70

– **J. Gastón & A. Vives Moreno.–** Contribución al conocimiento de los Lepidoptera de España con la descripción de cuatro nuevas especies para nuestra fauna y otras citas de interés (Insecta: Lepidoptera) / *Contribution to the knowledge of the Lepidoptera of Spain with description of four new species for our fauna and other interesting records (Insecta: Lepidoptera)*..... 307-324

– **J. Gastón & A. Vives Moreno.–** Descripción de cuatro nuevas especies y otras citas de interés para la fauna de Lepidoptera de España (Insecta: Lepidoptera) / *Description of four new species and other records of interest for the Lepidoptera fauna of Spain (Insecta: Lepidoptera)*..... 545-564

– **J. Grados, J. J. Ramírez, J. Farfán & J. Cerdeña.–** Contribution to the knowledge of the genus *Corematura* Butler, 1876 in Peru, with the report of a new synonym (Lepidoptera: Erebidae, Arctiinae, Arctiini, Ctenuchina) / *Contribución al conocimiento del género* Corematura *Butler, 1876 en Perú, con la relación de una sinonimia (Lepidoptera: Erebidae, Arctiinae, Arctiini, Ctenuchina)*..... 71-82

– **J. J. Guerrero, M. Garre, R. M. Rubio & A. S. Ortiz.–** Lepidoptera invernales y nuevos datos de la fauna del Parque Natural de la Serranía de Cuenca (Cuenca, España) (Insecta: Lepidoptera) / *Wintry Lepidoptera and new records for the fauna from the "Serranía de Cuenca" Natural Park (Cuenca, Spain) (Insecta: Lepidoptera)*..... 59-64

– **J. J. Guerrero, R. M. Rubio, M. Garre & A. S. Ortiz.–** Contribución al conocimiento de los Noctuidae de la vertiente asturiana del Parque Nacional de los Picos de Europa (Asturias, España) (Insecta: Lepidoptera) / *Contribution to the knowledge of the family Noctuidae from the "Picos de Europa" National Park (Asturias, Spain) (Insecta: Lepidoptera)* 5-26

– **J. J. Guerrero, R. M. Rubio, M. Garre & A. S. Ortiz.–** Nuevas aportaciones al conocimiento de los Geometridae y Noctuidae de la Sierra del Taibilla y de la Reserva Natural de la Sierra de las Cabras (Albacete-Murcia, España) (Insecta: Lepidoptera) / *New records to Geometridae and Noctuidae moth fauna from the "Sierra del Taibilla" and the "Sierra de las Cabras" Natural Reserve (Albacete-Murcia, Spain) (Insecta: Lepidoptera)*..... 529-544

– **M. Huertas-Dionisio.–** Estados inmaturos de Lepidoptera (LVIII). *Morophaga morellus* (Duponchel, 1838) en Huelva, España (Lepidoptera: Tineidae, Scardiinae) / *Immature stages of Lepidoptera (LVIII).* Morophaga morellus *(Duponchel, 1838) in Huelva, Spain (Lepidoptera: Tineidae, Scardiinae)* 89-94

– **M. Huertas-Dionisio.–** Estados inmaturos de Lepidoptera (LX). *Nemapogon granella* (Linnaeus, 1758) en Barcelona, España (Lepidoptera: Tineidae, Nemapogoninae) / *Immature stages of Lepidoptera (LX).* Nemapogon granella *(Linnaeus, 1758) in Barcelona, Spain (Lepidoptera: Tineidae, Nemapogoninae)* 425-432

– **M. Huertas-Dionisio & P. M. Bernabé-Ruiz.–** Estados inmaturos de Lepidoptera (LIX). *Nemapogon nevade-*

lla (Caradja, 1920) en Huelva, España (Lepidoptera: Tineidae, Nemapogoninae) / *Immature stages of Lepidoptera (LIX).* Nemapogon nevadella *(Caradja, 1920) in Huelva, Spain (Lepidoptera: Tineidae, Nemapogoninae)* ... 299-305

– **S. Kizildağ.–** Molecular evaluation of the phylogenetic position of *Loxostege ayhanana* Kemal & Koçak, 2017 from East Turkey (Lepidoptera: Crambidae, Pyraustinae) / *Evolución molecular de la posición filogenética de* Loxostege ayhanana *Kemal & Koçak, 2017 del este de Turquía (Lepidoptera: Crambidae, Pyraustinae)* 39-45

– **S. Kizildağ.–** The first DNA barcoding records of three *Evergestis* Hübner, [1825] 1816 species in Turkey with molecular evaluations (Lepidoptera: Crambidae, Glaphyriinae) / *El primer registro del ADN código de barras de tres especies de* Evergestis *Hübner, [1825] 1816 en Turquía con evaluación molecular (Lepidoptera: Crambidae, Glaphyriinae)* 289-297

– **T. Koren, B. Lauš, N. Tvrtković & R. Verovnik.–** Butterfly diversity of Lička Plješevica Mountain chain, Croatia (Lepidoptera: Papilionoidea) / *Diversidad de las mariposas de la cadena montañosa de Lička Plješevica, Croacia (Lepidoptera: Papilionoidea)* 257-283

– **R. A. Lakasamana, N. G. H. B. Sinulingga, I. A. Ferlianda, M. N. Samosir, S. B. Pane, S. K. Khadan, W. de S. Tavares, M. Tarigan & A. Duran.–** First report of *Ophiusa disjungens* (Walker, 1858) on *Acacia mangium* Willd. (Fabaceae), and damage and notes of its biology on *Eucalyptus* (Myrtaceae) commercial plantations in Sumatra, Indonesia (Lepidoptera: Erebidae) / *Primer registro de* Ophiusa disjungens *(Walker, 1858) sobre* Acacia mangium *Will. (Fabaceae) y daños y notas de su biología sobre plantaciones comerciales de* Eucalyptus *(Myrtaceae) en Sumatra, Indonesia (Lepidoptera: Erebidae)* 439-447

– **K. Larsen.–** Description of two new species in the genus *Pseudococcyx* Swatchek, 1958 from Spain and Turkey (Lepidoptera: Tortricidae, Eucosmini) / *Descripción de dos nuevas especies en el género* Pseudococcyx *Swatchek, 1958 de España y Turquía (Lepidoptera: Tortricidae, Eucosmini)* 173-178

– **K. Larsen.–** Discovery of the Tribe Polyorthini Obraztsov, 1966 in the Canary Islands. Description of the genus *Canaria* Larsen, gen. n. and the species *C. palmariana* Larsen, sp. n. and *C. gomeriana* Larsen, sp. n. (Lepidoptera: Tortricidae, Chlidanotinae, Polyorthini) / *Descubrimiento de la tribu Polyorthini Obraztsov, 1966 en las Islas Canarias. Descripción del género* Canaria *Larsen, gen. n. y las especies* C. palmariana *Larsen, sp. n. y* C. gomeriana *Larsen, sp. n. (Lepidoptera: Tortricidae, Chlidanotinae, Polyorthini)* 325-332

– **A. Laštůvka & Z. Laštůvka.–** New faunistic records of moths from the Iberian Peninsula (Insecta: Lepidoptera) / *Nuevos registros de Lepidoptera de la Península Ibérica (Insecta: Lepidoptera)* 47-58

– **Gy. M. László.–** Contribution to the knowledge of the Afrotropical *Evonima* Walker, 1865 generic complex with description of two new genera and two new species (Lepidoptera: Nolidae, Nolinae) / *Contribución al conocimiento del complejo genérico afrotropical de* Evonima *Walker, 1865, con la descripción de dos nuevos géneros y dos nuevas especies (Lepidoptera: Nolidae, Nolinae)* 389-401

– **W. C. Li.–** A new species of *Crambus* Fabricius, 1798 from China (Lepidoptera: Crambidae) / *Una nueva especie de* Crambus *Fabricius, 1798 de China (Lepidoptera: Crambidae)* 603-607

– **I. G. López-Muraira, H. R. Iruegas-Buentello, H. Flores-Martínez & F. Gómez-Leyva.–** *Antispastis xylophragma* Meyrick, 1926 primera cita sobre *Solanum umbellatum* Mill. y nuevo para México (Lepidoptera: Glyphipterigidae, Acrolepiinae) / Antispastis xylophragma *Meyrick, 1926 first record on* Solanum umbellatum *Mill. New to Mexico (Lepidoptera: Glyphipterigidae, Acrolepiinae)* 693-697

– **A. Moreno & A. Viloria.–** Variation in hindwing size and shape of *Plutella xylostella* (Linnaeus, 1758) (Lepidoptera: Plutellidae) / *Variación en el tamaño y la forma del ala posterior de* Plutella xylostella *(Linnaeus, 1758) (Lepidoptera: Plutellidae)* 709-716

– **G. Nandi Das, A. Payra, D. CK & K. Chandra.–** Notes on some rare and elusive butterflies from Namdapha National Park, Arunachal Pradesh, India with rediscovery of two subspecies (Lepidoptera: Papilionoidea) / *Notas sobre algunas mariposas infrecuentes y escurridizas del Parque Nacional de Namdapha, Arunachal Pradesh, India con el descubrimiento de dos subespecies (Lepidoptera: Papilionoidea)* 225-237

– **A. E. Naydenov, I. A. Makhov, S. V. Vasilenko & R. V. Yakovlev.–** Checklist of the Geometridae of the Saur Mountains and adjacent territories (Eastern Kazakhstan) (Lepidoptera: Geometridae) / *Lista detallada de los Geometridae de las montañas del Saur y territorios adyacentes (Este de Kazajistán) (Lepidoptera: Geometridae)* 643-649

– **A. E. Naydenov & R. V. Yakovlev.–** The first information about Geometridae of Katun Nature Reserve, Central Altai, Russia (Lepidoptera: Geometridae) / *La primera información acerca de los Geometridae de la Reserva Natural de Katún, Altái Central, Rusia (Lepidoptera: Geometridae)* 101-108

– **K. Nupponen.–** Re-evaluation of some problematic taxa of Palaearctic Scythrididae, with descriptions of three new species and two new synonyms (Lepidoptera: Scythrididae) / *Reevaluación de algunas taxa problemáticas de Scythrididae paleárticos con descripción de tres nuevas especies y dos nuevas sinonimias (Lepidoptera: Scythrididae)* 363-374

– **M. Pinzari.–** First description of the male genitalia of *Psorosa lacteomarginata* (A. Costa, 1888) (Lepidoptera: Pyralidae, Phycitinae) / *Primera descripción de la genitalia del macho de* Psorosa lacteomarginata *(A. Costa, 1888) (Lepidoptera: Pyralidae, Phycitinae)* 109-113

– **M. Pinzari & M. Pinzari.–** *Mesophleps ochracella* (Turati, 1926) new to Italy (Lepidoptera: Gelechiidae) / Mesophles ochracella *(Turati, 1926), nueva para Italia (Lepidoptera: Gelechiidae* 125-128

– **M. Pinzari & M. Pinzari.–** First external description of the female of *Stygioides italica* Mazzei & Yakovlev, 2016 (Lepidoptera: Cossidae) / *Primera descripción externa de la hembra de* Stygioides italica *Mazzei & Yakovlev, 2016 (Lepidoptera: Cossidae)* 565-568

– **M. Pinzari & P. Pinzari.–** The genus *Hypsotropha* Zeller, 1848 in Italy and description of *H. aenigmatica* Pin-

zari & Pinzari, sp. n. (Lepidoptera: Pyralidae, Phycitinae, Peoriini) / *El género* Hypsotropha *Zeller, 1848 en Italia, con la descripción de* H. aenigmatica *Pinzari & Pinzari, sp. n. (Lepidoptera: Pyralidae, Phycitinae, Peoriini)* 581-588

– **I. Richter & J. Šumpich.–** *Scythris camelella* Walsingham, 1907 record in Spain as new species for Europe (Lepidoptera: Scythrididae) / Scythris camelella *Walsingham, 1907 registrado en España como una nueva especie para Europa (Lepidoptera: Scythrididae)* 115-117

– **P. J. C. Russell, L. Bartolozzi, R. L. Hawkins, W. J. Tennent & T. Léger.–** Designation of lectotypes for some Spanish and other western European *Melitaea* taxa, some with mixed syntypic series of *M. phoebe* ([Denis & Schiffermüller], 1775) and *M. ornata* Christoph, 1893 (Lepidoptera: Nymphalidae) / *Designación de lectotipos de* Melitaea *taxa de algunas españolas y otras del oeste europeo, algunas con series sintípicas mezcladas de* M. phoebe *([Denis & Schiffermüller], 1775) y* M. ornata *Christoph, 1893 (Lepidoptera: Nymphalidae)* 449-472

– **S. Scalercio.–** Macroheterocera of a mixed Calabrian black pine-European beech forest of Sila Mountains (Italy) (Insecta: Lepidoptera) / *I Macroheterocera di una foresta mista di pino nero di Calabria e faggio dei monti della Sila (Italia) (Insecta: Lepidoptera)* / Los Macroheterocera de un bosque mixto de pino negro de Calabria y haya de los montes de Sila (Italia) (Insecta: Lepidoptera) 651-669

– **S. Shahreyari-Nejad, M. Esfandiari, A. Rasekh, M. S. Mossadegh & A. Shirvani.–** Faunistic records of Noctuidae from Iran, with two new records for the country (Insecta: Lepidoptera) / *Registros faunísticos de Noctuidae de Irán, con dos nuevos registros para el país (Insecta: Lepidoptera)* 239-252

– **J. Šumpich, M. Dvořák, M. Pinker & T. Kadlec.–** Records of *Dodia* Dyar, 1901 species in Russian Altai (Lepidoptera: Erebidae, Arctiinae) / *Registros de las especies de* Dodia *Dyar, 1901 en el Altái ruso (Lepidoptera: Erebidae, Arctiinae)* 95-99

– **W. de S. Tavares, S. K. Khadan, A. M. Hendrik, M. Tarigan, R. Asfa, R. V. Yakovlev, T. Tachi, A. Duran, C. Y. Wong & M. Sharma.–** Notes on the biology and natural enemies of *Polyphagozerra coffeae* (Nietner, 1861) infesting *Eucalyptus pellita* F. Muell. (Myrtaceae) trees in Riau, Indonesia (Lepidoptera: Cossidae, Zeuzerinae) / *Notas sobre la biología y enemigos naturales de* Polyphagozerra coffeae *(Nietner, 1861) infestando árboles de* Eucalyptus pellita *F. Muell. (Myrtaceae) en Riau, Indonesia (Lepidoptera: Cossidae, Zeuzerinae)* 323-349

– **E. V. Tsvetkov.–** New taxa of Tortricidae moths from West Kazakhstan (Lepidoptera: Tortricidae) / *Nuevas taxas de Tortricidae del oeste de Kazajstán (Lepidoptera: Tortricidae)* 129-139

– **E. V. Tsvetkov.–** Description of *Pima karatauensis* Tsvetkov, sp. n. from Kazakhstan (Lepidoptera: Pyralidae, Phycitinae) / *Descripción de* Pima karatauensis *Tsvetkov, sp. n. de Kazajistán (Lepidoptera: Pyralidae, Phycitinae)* 481-485

– **P. Ya. Ustjuzhanin, V. V. Dubatolov & A. N. Streltzov.–** Pterophoridae of the Great Ussuri Island (Khabarovsk suburbs), Russia (Lepidoptera: Pterophoridae) / *Pterophoridae de la gran isla Bolshoy Ussurysky (suburbios de Khabarovsk), Rusia (Lepidoptera: Pterophoridae)* 27-30

– **V. Vieira.–** Primeiro registo de *Thera cupressata* (Geyer, [1831]) para as ilhas dos Açores (Portugal) (Lepidoptera: Geometridae) / *First record of* Thera cupressata *(Geyer, [1831]) for the Azores islands (Portugal) (Lepidoptera: Geometridae)* / Primer registro de *Thera cupressata* (Geyer, [1831]) para las islas Azores (Portugal) (Lepidoptera: Geometridae) 83-87

– **V. Vieira.–** Primeira citação de *Cydalima perspectalis* (Walker, 1859) para a ilha de São Miguel, Açores (Portugal) (Lepidoptera: Crambidae) / *First record of* Cydalima perspectalis *(Walker, 1859) from São Miguel Island, Azores (Portugal) (Lepidoptera: Crambidae)* / Primera cita de *Cydalima perspectalis* (Walker, 1859) para la isla de São Miguel, Azores (Portugal) (Lepidoptera: Crambidae) 141-146

– **A. Villalobos-Moreno & J. A. Salazar.–** Contribución al conocimiento de los Lepidoptera de la cuenca del río Frío, Santander, Colombia (Lepidoptera: Papilionoidea) / *Contribution to the knowledge of Lepidoptera of Frio river basin, Santander, Colombia (Lepidoptera: Papilionoidea)* 153-166

– **A. Vives Moreno.–** Contribución al conocimiento de los Lepidoptera Heterocera en Guinea Ecuatorial. Dos géneros y tres especies nuevas para la fauna de este país (Lepidoptera: Nolidae, Hyblaeidae, Erebidae) / *Contribution to the knowledge of the Lepidoptera Heterocera in Equatorial Guinea. Two genera and three species new for the fauna of this country (Lepidoptera: Nolidae, Hyblaeidae, Erebidae)* 593-602

– **A. Vives Moreno & J. Gastón.–** Cinco nuevas especies para la fauna de España y otras interesantes informaciones lepidopterológicas para España y Sudán (Insecta: Lepidoptera) / *Five new species for the fauna of Spain and other interesting lepidopterological information for Spain and Sudan (Insecta: Lepidoptera)* 717-731

– **Ju. S. Volkova.–** *Vadimas* Volkova, gen. n., a new genus of Megalopigidae (Insecta: Lepidoptera) / Vadimas *Volkova, gen. n., un nuevo género de Megalopygidae (Insecta: Lepidoptera)* 31-38

– **R. Wąsala & J. Nowacki.–** *Desertoplusia bella* (Christoph, 1887) - a new noctuid moth species from Armenia (Lepidoptera: Noctuidae) / Desertoplusia bella *(Christoph, 1887) - una nueva especie para Armenia (Lepidoptera: Noctuidae)* 285-287

– **R. V. Yakovlev & Gy. M. László**.– New species of Zeuzerinae from the Democratic Republic of São Tomé and Principe (Lepidoptera: Cossidae) / *Nueva especie de Zeuzerinae de la República Democrática de Santo Tomé y Príncipe (Lepidoptera: Cossidae)* 433-437

– **R. V. Yakovlev, A. E. Naydenov & F. C. Penco.–** *Ceuroma* Yakovlev, Naydenov & Penco, gen. n. - new Genus of Neotropical Zeuzerinae (Lepidoptera: Cossidae) / Ceuroma *Yakovlev, Naydenov & Penco, gen. n. - género nuevo de Zeuzerinae Neotropical (Lepidoptera: Cossidae)* 473-479

– **R. V. Yakovlev , F. C. Penco & A. E. Naydenov.–** Three new species of the genus *Psychonoctua* Grote, 1865

from Argentina and the Caribbean Islands (Lepidoptera: Cossidae, Zeuzerinae) / *Tres especies nuevas del género* Psychonoctua *Grote, 1865 de Argentina y de las islas del Caribe (Lepidoptera: Cossidae, Zeuzerinae)*..... 499-505
– Code of Ethics for the Scientific Journal SHILAP Revista de lepidopterología..... 124, 698
– Código Ético para la Revista Científica SHILAP Revista de lepidopterología..... 118, 692
– 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*.....100, 306, 498, 592
– Cómo ser socio de la Sociedad Hispano-Luso-Americana de Lepidopterología / *How to be membership of the Sociedad Hispano-Luso-Americana de Lepidopterología*.....4, 196, 388, 580
– Instructions to authors wishing to publish in *SHILAP Revista de lepidopterología*.....152, 362, 486, 682
– Lista de Socios altas y bajas / *List of Fellows join and cease*..... 650
– Normas para los autores que deseen publicar en *SHILAP Revista de lepidopteología*.....114, 350, 480, 512, 670
– Noticias Generales / *General News*.....191-192, 288, 750
– Publicaciones disponibles en la Sociedad / *Society available publications*.....190, 506, 732
– Organismo Rector de SHILAP / *Officers and Council of SHILAP*.....2, 194, 386, 578
– Revisión de publicaciones / *Book reviews*.....46, 88, 140, 238, 256, 284, 298, 402, 410, 438, 448,589-591, 608, 642, 688
– J. Tennent.– *The butterflies of the Canary Islands - a field guide plus* por / by M. Payne..... 589-591
– R. Macià Vila.– *Ecología y Evolución de los Papilionoidea del Paleártico Occidental (Hexapoda: Lepidoptera)* por / *by* A. Masó Planas..... 688
– A. Vives Moreno.– *Fauna d'Italia. Lepidoptera Coleophoridae* por / *by* G. Baldizzone..... 46
– A. Vives Moreno.– *The Moths of Europe, Volume 5: Noctuids* por / by P. Leraut..... 88
– A. Vives Moreno.– *The Moths of Europe, Volume 6: Noctuids* por / by P. Leraut..... 140
– A. Vives Moreno.– *Splendid Ghost Moths and Their Allies. A Revision of Australian Abantiades, Oncopera, Aenetus, Aechaeoaenetus and Zeilotypia (Hepialidae)* por / by T. J. Simonsen..... 238
– A. Vives Moreno.– *The Lepidoptera fauna of a crater valley in the Great Escarpment of South Africa: The Asante Sana Project* por / by W. Mey & M. Krüger (†)..... 258
– A. Vives Moreno.– *La familia Hesperiidae en la Península Ibérica* por / by A. Blázquez-Caselles, V. A. Garretas- Muriel & Mª. T. Santamaría-Hernández..... 284
– A. Vives Moreno.– *The Geometrid Moths of Europe. Volume 6. Subfamily Ennominae II* por / by B. Müller, S. Erlacher, A. Hausmann, H. Rajaei, P. Sihvonen & P. Skou..... 298
– A. Vives Moreno.– *A Taxonomic Atlas of the Eurasian and North African Noctouidea. Noctuinae III. Poliina* por / by Z. Varga, G. Ronkay, P. Gyulai, A. Kiss & L. Ronkay..... 448
– A. Vives Moreno.– *Atlas motyli Polski* por / *by* J. Nowacki & J. Buszko..... 608
– A. Vives Moreno.– *Nordic-Baltic Checklist of Lepidoptera* por / *by* L. Aarvick, B. Å. Bengtsson, H. Elven, P. Ivinski, U. Jürivete, O. Karsholt, M. Mutanen & N. Savenko..... 642
– Sumario del Volumen 48 / *Contents of Volume 48*..... 762-768

Nuevas taxa y cambios nomenclaturales propuestos en el Volumen 42 /
New Taxa and Nomenclatural changes proposed in Volume 42

Nuevos géneros / ***New genus***

Vadimas Volkova 32
Canaria Larsen 326
Ceuroma Yakovlev, Naydenov & Penco 474
Kanaria Larsen 512
Rapanodonta Becker 572

Nuevas especies / ***New species***

Autostichidae

Symmoca requenai Gastón & Vives (España / *Spain*) 549
Symmoca redondoi Gastón & Vives (España / *Spain*) 551

Choreutidae

Anthophila variabilis Falck, Karsholt & Rota (Islas Canarias, España / *Canary Islands, Spain*) 674

Coleophoridae

Coleophora andina Baldizzone (Perú / *Peru*) 200
Coleophora aconcaguae Baldizzone (Chile / *Chile*) 201
Coleophora rasmusseni Baldizzone (Argentina / *Argentina*) 204

Coleophora peruana Baldizzone (Perú / *Peru*)....205
Coleophora antiqua Baldizzone (Argelia / *Algeria*)....376

Cossidae

*Psychonoctua cracens*Yakovlev, Penko & Naydenov (Islas Caimán / *Caiman Islands*)....500
Psychonoctua ravida Yakovlev, Penko & Naydenov (Islas Caimán / *Caiman Islands*)....500
Psychonoctua diiorioi Yakovlev, Penko & Naydenov (Islas Caimán / *Caiman Islands*)....501

Crambidae

Sebrus kovtunovichi Bassi (Malaui / *Malawi*)....120
Crambus duospineus Li (China / *China*)....603

Gelechiidae

Monochroa felixi Gastón & Vives (España / *Spain*)....315
Megacraspedus carolustertius Gastón & Vives (España / *Spain*)....553
Megacraspedus sinevi Vives & Gastón (España / *Spain*)....721

Geometridae

Rhodometra rosea Cui, Xue & Jiang (China / *China*)....168
Casilda hemirosea Cui, Xue & Jiang (China / *China*)....169
Synegia fernandezi Expósito (Indonesia / *Indonesia*)....253
Scopula villumi Falck & Hausmann (Islas Canarias, España / *Canary Islands, Spain*)....508
Tridrepana yazakii Expósito (Filipinas / *Philippines*)....525
Naxa galae Expósito (Indonesia / *Indonesia*)....689

Lypusidae

Agnoea (Agnoea) emarella Gastón & Vives (España / *Spain*)....309
Agnoea (Agnoea) lvovskyi Gastón & Vives (España / *Spain*)....312
Agnoea (Agnoea) revillai Gastón & Vives (España / *Spain*)....547

Meessiidae

Eudarcia albocapitata Gaedike (Italia / *Italy*)....684
Eudarcia lakoniacola Gaedike (Grecia / *Greece*)....684
Infurcitinea mayri Gaedike (España / *Spain*)....685

Megalopigidae

Vadimas zolotuhini Volkova (Ecuador / *Ecuador*)....33
Vadimas radogast Volkova (Ecuador / *Ecuador*)....34

Noctuidae

Copitarsia euryonix Angulo & Olivares (Colombia / *Colombia*)....758

Notodontidae

Eustema argentata Becker (Brasil / *Brazil*)....571
Nycterotis lineata Becker (Brasil / *Brazil*)....701
Nycterotis noelia Becker (Brasil / *Brazil*)....701
Nycterotis chaconi Becker (Brasil / *Brazil*)....702
Nycterotis balcazari Becker (Guatemala / *Guatemala*)....703
Arhacia imitata Becker (Brasil / *Brazil*)....753

Pyralidae

Pima karatauensis Tsvetkov (Kazajstán, Turquestán / *Kazakhstan, Turkestan*)....482
Hypsotropha aenigmatica Pinzari & Pinzari (Italia / *Italy*)....584
Sudaniola asselbergsi Vives & Gastón (España / *Spain*)....722

Scythrididae

Apostibes ustyurtensis Nupponen (Kazajistán / *Kazahstan*) 364
Scythris kuldchuktaui Nupponen (Uzbekistán / *Uzbekistan*) 365
Scythris praecox Nupponen (Kazajistán / *Kazahstan*) 366

Tineidae

Anomalotinea tabelli Gaedike (Marruecos / *Morocco*) 185
Rhodobates carsteni Falck, Gaedike & Vives (Islas Canaria, España / *Canary Islands, Spain*) 489
Tinea laurisilvaella Falck, Gaedike & Vives (Islas Canarias, España / *Canary Islands, Spain*) 491

Tortricidae

Phtheochroa accurata Tsvetkov (Kazajistán / *Kazakhstan*)....130
Phtheochroa suleimana Tsvetkov (Kazajistán / *Kazakhstan*) 131
Eucosma paulorosea Tsvetkov (Kazajistán / *Kazakhstan*)....132
Pseudococcyx friedmariana Larsen (España / *Spain*) 174
Pseudococcyx oskariana Larsen (Turquía / *Turkey*)....175
Canaria palmariana Larsen (España / *Spain*)....326
Canaria gomeriana Larsen (España / *Spain*) 327

Yponomeutidae

Paraswammerdamia kitamurae Gastón & Vives (España / *Spain*)....309

Nuevas subespecies / ***New subspecies***

Tortricidae

Eucosma fulvana suncretana Tsvetkov (Kazajistán / *Kazakhstan*)....133

Nuevas sinonimias / ***New synonymies***

Erebidae

Glaucopis tricolor Packard, 1869 de / from *Corematura chrysogastra* (Petry, 1833)....73

Notodontidae

Arhacia postbrunnea Rothschild, 1917 de / from *Arhacia combusta* (Herrich-Schhäffer, 1854)....752

Pyralidae

Hypsotropha gallohispanicella Leraut, 2019 de / from *Hypsotropha roseostrigella* Ragonot 1901 584

Scythrididae

Scythris parenthesella Bengtsson, 2002 de / from *Scythris aciella* Bengtsson, 1997 367
Scythris rotundella K. Nupponen, 2010 de / from *Scythris cretacella* K. Nupponen & T. Nupponen, 2000 367

Nuevas combinaciones / ***New combinations***

Cossidae

Ceuroma mucorea (Herrich-Schäffer, [1853]) desde / from *Cossus mucoreus* Herrich-Schäffer, [1853] 475

Notodontidae

Rapanodonta rapana (Jones, 1908) desde / from *Eustema rapana* Jones, 1908 572

Nymphalidae

Melitaea ornata ornatiformis Sagarra, 1931 desde / from *Melitaea phoebe* f. *ornatiformis* Sagarra, 1931....134

Fechas de publicación en números / ***Dates of Publications in Numbers***

Nº 189. 1-192 ....30-III-2020

Nº 190. 193-384....30-VI-2020

Nº 191. 385-576....30-IX-2020

Nº 192. 577-768....30-XII-2020